CAPaBLE Programme Final Report

Project Reference Number: CBA2016-10SY-Sutrisno

RAPID MAPPING TECHNIQUE FOR DISASTER OBSERVATION AND GLOBAL CHANGE DATA AQUISITION

The following collaborators worked on this project:

1. Prof. Dr. Mazlan Bin Hashim, UTM, Malaysia, mazlanhashim@utm.my
2. Dr. Rahman Saifoel, EuroUSC, Netherlands, rahman.syaifoel@eurousc.com
3. Assist. Prof. Dr. Rongjun Qin, OSU, USA, qin.324@osu.edu
4. Prof. Peter Tian-Yuan Shih, CTSPRS/NCTU, Taiwan, tysih@mail.nctu.edu.tw
5. Dr. Pramaditya Wicaksono, Puspic, Faculty of Geography, UGM, Indonesia, prama.wicaksono@geo.ugm.ac.id

MAPIN/ISRS

CBA2016-10SY-Sutrisno:

"RAPID MAPPING TECHNIQUE FOR DISASTER OBSERVATION AND GLOBAL CHANGE DATA ACQUISITION"

Final Report submitted to APN

OVERVIEW OF PROJECT WORK AND OUTCOMES

1. Project Information

Project Duration	:	1 year
Funding Awarded	:	USD 35,000
Key organizations involved	:	1. Indonesian Society for Remote Sensing 2. Puspic, Faculty of Geography, University of Gadjah Mada (UGM), Dr. Pramadita Wicaksono 3. Universiti Teknologi Malaysia (UTM), Prof. Dr. Mazlan Bin Hashim 4. EuroUSC - Netherlands, Dr. Rahman Syaifoel 5. The Ohio State University (OSU), Assist. Prof. Dr. Rongjun Qin 6. Chinese Taipei Society of Photogrammetry and Remote Sensing (CTSPRS)/ National Chiao Tung University(NCU) - Taiwan, Prof. Peter Tian-Yuan Shih

2. Project Summary

The regional Southeast Asia is the most prone area to disaster (Sapir et al, 2015). The hazards may vary from earthquake, tsunami, volcano eruption, landslide, flooding, drought, forest fire and may lead to the global environmental change, if they are not instantly monitored and managed (Smith, 2013). In this case, the development of rapid mapping technique that integrated both imageries from near real-time remote sensing satellite system and UAVs (Unmanned Aerial Vehicle System) with the support of the ancillary data may develop a rapid mapping method to provide rapid information for any regional authority in coping with the disaster that could be lead to the global environmental change. This method needs to be acknowledged and practiced by young scientists of the high-risk countries; in which they will assist to disseminate the technology to any policymakers and environmental stakeholders. In response to that, a summer school was held. The output of this project is the completion of capacity building of the science-based knowledge of young scientists form Southeast Asia countries dealing with the Rapid Mapping technology and the completion of a participatory forum to promote rapid mapping method to end users. Meanwhile, the outcome of this project is the enhanced knowledge of young scientists in providing accurate and rapid information for such humanitarian purpose, recognizing and enhancing knowledge of rapid mapping method by implementing recent technology, and cooperation among scientists in facing disaster and environment issues

Keywords: Rapid mapping, Southeast Asia, UAVs, Remote sensing, Capacity building

3. Activities Undertaken

1. Project planning meeting as the preparation step for the implementation of the project

2. Two Focus discussion groups (FGDs) to discuss the rapid mapping method (RapMet) development as the instruments that will be used in the capacity building steps, the detail plan to invite young scientists from Southeast Asia member countries and to evaluate the implementation of the project.
3. Kick-off meeting to launch the project and collecting valuable information for the implementation of the project and the development of the RapMet
4. Development of rapid mapping system and the preparation of summer school-method, hardware, software and tutorial module
5. Summer school for improving the science-based knowledge of young scientists in rapid mapping technique
6. Seminars to publish the result of the projects.
7. Publication: article preparation

4. Key facts/figures

- The development of Rapid Mapping Method
- 27 young scientists have been trained in this Rapid Mapping Summer School
- Participants are provided with a brief but important knowledge of aviation law with regard to UAV's operations

5. Potential for further work

This project can be further implemented in the future, where an ASEAN disaster authority can utilize the methods or systems that has been developed in this project to collect rapid information on disaster/prone areas, the trained young scientists may become contact persons for this disaster authority to provide more detail spatial information of the prone area. This young scientist can also train the local people on rapid mapping knowledge and develop the participatory mapping community in their countries. If these plans are implemented consistently, in the future, more people will be saved and the changing global environment will be further decreasing.

6. Publications

Participants articles for summer topics:

1. Chaipimonplin.Tawee. (2016). Global Navigation Satellite System in Thailand. Retrieved from http://mapin.or.id/wp-content/uploads/2016/11/Tawee-Chaipimonplin_Global-Navigation-Satellite-System-in-Thailand.pdf
2. Nurul, Fahmi, Muhammad. (2016). Assessment of Forest Change Using Normalized Difference Vegetation Index (NDVI) from Satellite Landsat 8 Imagery (Case Study at Garut, West Java). http://mapin.or.id/wp-content/uploads/2016/11/Paper_Fahmi_Muhammad-Nurul_Assessment-of-Forest-Change-Using-Normalized-Difference-Vegetation-Index-NDVI-from-Satellite-Landsat-8-Imagery-Case-Study-at-Garut-West-Java.pdf
3. NIep, Sheila. (2016). Natural flooding detection using Sentinel 1A in Phnom Penh, Cambodia. http://mapin.or.id/wp-content/uploads/2016/11/Seila-Nhiep_Natural-flooding-detection-using-Sentinel-1A-in-Phnom-Penh-Cambodia.pdf
4. Yanuarsyah, Iksal. (2016). The current condition of GNSS in Indonesia to support Indonesian one map policy. http://mapin.or.id/wp-content/uploads/2016/11/Iksal-Yanuarsyah_The-Current-Condition-of-GNSS-in-Indonesia.pdf

5. Che'Man, Noordini. (2016). Global Navigation Satellite System application in Malaysia. http://mapin.or.id/wp-content/uploads/2016/11/Noordini-binti-Che%E2%80%99Man_Global-Navigation-Satellite-System-application-in-Malaysia.pdf
6. Firdaus, Cecep Andritela. (2016). Observation GNSS Data BAKO Stations Quality with RTKLIB. http://mapin.or.id/wp-content/uploads/2016/11/Cecep-Andritela_Observation-GNSS-Data-BAKO-Stations-Quality-With-RTKLIB_2016_1.compressed.pdf

Articles are also prepared for publication, such as Capacity Buildings of Rapid Mapping Technique For Data Acquisition: A Case of Summer School for APN science bulletin and Coping With Natural Disaster: Evaluation Of Capacity Building Through Summer School Approach for Disaster Prevention and Management: An International Journal

7. Awards and honours

Not available.

8. Pull quote

Collaborators:

Rongjun Qin, The Ohio State University, USA. It was a wonderful experience to lecture and interact with regional scientists and governors in this summer school. I am glad that everyone in the summer school has learned essential geospatial techniques that could be directly used, and advanced further in their professional career, which will bring new aspects of using geo-spatial techniques for rapid disaster assessments and responses.

Rahman Syaifoel, EuroUSC Benelux. In Southeast Asia, disasters come and go in turns throughout the year. For disaster mitigation and to coping with it, accurate surface area information is required. ASEAN is very large and it will be better if not just rely on satellite imagery alone. The unmanned aircraft will greatly help create a better image of the terrain in terms of mitigation and disaster management. Low flying drones will not be blocked by clouds. Therefore, imaging with drones will be very useful in this sector. Mapin's move to include active UAV actors like Eurousc is excellent. Indonesia and other countries within ASEAN has enacted legislation that limits drone operations. Therefore, the perpetrators of the survey are also very necessary to be equipped with knowledge in the field of civil aviation. Keep in mind, drone is not a toy. UAVs should be treated as aircraft.
Globally, the new sector in the field of survey with the drones is growing rapidly. The participants are expected to actively carry out the survey with the help of UAV Monitoring and remote sensing by RPAS generates enormous and accurate data. Good data will result in good (disaster) management. In accordance with the needs of industry and to comply with government regulations related to civil aviation, we have to carry out certification training of UAV operators in the ASEAN region. I am happy to be of little help to equip the participants with the knowledge of drone operation. The participants enthusiastically attended this training.

Trainees:

Man Van-Nguyen, Vietnam Academy of Science and technology – Institute of Geography
After one week training in Indonesia, I know to apply Data Fusion to combine Optical and SAR remotely sensed image to improve the accuracy of the classification techniques, as on the ground, many features have the same reflected characters in Optical but different in Radar images. Moreover, they showed me how to use Drones in natural hazard research, take to me the field trip to see the real happened hazard. Back to my country, I have presented this lecture again to my colleague. It is very impressive to them as the spatial resolution of the images taken by Drones is super high and it’s very useful to combine with the ground data.

Edgardo G. Macatulad, University of The Philippines
The RapMet Summer school was a very good experience for me. I gained new knowledge. I was able to learn how to better utilize Remote sensing (RS) technologies, specifically for disaster mapping and management. I learned the basics of UAV mapping and how this can further augment and complement the data obtained from satellite RS. I learned the different capabilities of RTKlib for GNSS processing. Aside from this, I was able to try other tools and software that can be utilized for processing RS and UAV data for rapping mapping.

9. References

1. Bendib, A. and Mahdi Kalla. (2016). Apllication of WebGis in The Development of Interactive Interface for Urban Management in Batna City. Journal of Engineering and Technology Research Vol. 8(2), pp 13-20. DOI: 10.5897/JETR2015.0579
2. Cooper, Harris, Kelly Charrlton, Jeff.C. Valentine and Laura Muhlenbruck. (2000). Making the Most of Summer School: A Meta analytic and Narrative Review. Monograph of the society for Research in Child development Serial No 260, vol. 65(1).
3. Ezequiel, C.A., Matthew Cua, Nathaniel C. Libatique, Gregory L. Tangonan, Raphael Alampay, Rollyn T. Labuguen, Chrisandro M. Favila, Jaime Luis E. Honrado, Vinni Canos, Charles Devaney, Alan B. Loreto, Jose Bacusmo, Benny Palma. (2015). UAV aerial imaging applications for post-disaster assessment, environmental management and infrastructure development. 2014 International Conference on Unmanned Aircraft Systems (ICUAS). May 27-30, 2014. Orlando
4. Flusser, Jan., Filip Sroubek, and Barbara Zitova B. (2007). Image Fusion: Principles, Methods, and Applications. Lecture Note in Tutorial EUSIPCO 2007. Institute of Information Theory and Automation Academy of Sciences of the Czech Republic
5. Global asia blog. (2016). Disaster ASEAN! Through the Disaster Management Cycle. http://globalasiablog.com/2016/12/06/disaster-asean-through-the-disaster-management-cycle/
6. Gandhi, G,M., S. Parthiban, N. Thummalu and A.Christy. (2015). NDVI: Vegetation Change Detection Using Remote Sensing and GIS – A Case Study of Vellore District. Provesia Computer Science Vol 57: pp 1199-1210. doi.org/10.1016/j.procs.2015.07.415
7. Garzelli, Andrea, Luca Capobianco and Filippo Nencini. (2008). Fusion of multispectral and panchromatic images as an optimisation problem. Image Fusion. doi.org/10.1016/B978-0-12-372529-5.00005-6
8. Liu, Yongqiang, John Stanturf and S. Goodrick. (2010). Wildfire Potential Evaluation During A Drough Event With a Regional Climate Model and NDVI. Ecological Infromatics. Vol 5/5; pp 418-428
9. Pettorelli, Nathalie, J.O.Vik, A.Mysterud, J.Gaillard, C.J. Tucker and N.C. Stenseth. (2005). Using The satellite-derive NDVI to assess ecological Responses to Environmental Change. Trends in Ecology and evolution, Vol20/9;pp 503-510.
10. Sapir, Debarati Guha, Philippe Hoyois and Regina Below. (2015). Annual Disaster Statistical Review 2015: The Numbers and Trends. Centre for Research on the Epidemiology of Disasters (CREP) -Institute of Health and Society (IRSS), Université catholique de Louvain. Brussels, Belgium
11. Sida, (2002). Method for Capacity Development: A report for Sida's Project group capacity development as a strategic questions. Swedish International Development Cooperation agency.
12. Smith, Keith, 2013. Environmental Hazards: Assessing Risk and Reducing Disaster. 6TH edition. Routlege. New York
13. Wan, Tao and Zenghan Qin. (2011). An application of Comprehensive Sensing for Image Fusion. International Journal of Computer Mathematics. Vol 88;18. dx.doi.org/10.1080/00207160.2011.598229

10. Acknowledgments

We would like to express our gratitude to the Asia-Pacific Network for Global Change Research for giving us the opportunity to carry out this activity, to the academic community of the university of Gajah Mada that has assisted the implementation of this activity, to the National Ciao Tung University that has facilitated the dissemination of this activity in ASEAN - Taiwan forum and to the collaborators: Prof Dr, Mazlan bin hashim, Dr.Rahman Saifoel, Assist.Prof.Dr. Rongjun Qin, Prof. Peter Tian-Yuan Shih and Dr. Pramaditya Wicaksono who have assisted to carry out this activity to success.

Table of Contents

1. Introduction

The Asia-Pacific countries face many impacts due to the natural disasters such as earthquake, tsunami, volcano eruption, landslide, flooding, drought, forest fire etc. These will lead to the global environmental change if they are not instantly monitored and sustainably managed (Smith, 2013). The rapid mapping technology has a good potential to overcome these problems, one of which to manage the risk reduction and the resilience of environment to disaster and environmental changes. United Nations Institute for Training and Research (UNITAR) has that program since 2003, dedicated to supporting humanitarian decision-making and ground operations by increasing situational awareness with just-in-time analysis of disaster and crisis areas using optical and radar satellite data, called as UNOSAT humanitarian rapid mapping. Indeed, on 26 July 2005 foreign ministers of ASEAN member states signed the agreement on disaster management and emergency response (AADMER) in Vientiane with an aim to provide effective mechanisms to achieve substantial reduction of disaster losses in all social economic and environmental assets.

Considering the Southeast Asia region, where more than 41% of the world's natural disasters occurs (Sapir et al, 2015; Global Asia blog, 2016), is exposed to almost all types of hazards, the rapid mapping technique is urgently needed. The rapid mapping method (RapMet) simple prototype is developed in this project. RapMet integrates the near real-time remote sensing data with spatial data acquired from remotely piloted aircraft system (RPAS) or UAVs, and supported by local knowledge is one of the science-based tool that provide a practical rapid mapping technique. This method needs to be acknowledged and practiced by young scientists, decision-makers and end users in the high risk developing countries, such as the ASEAN countries. The young scientists will assist to disseminate the technology to policy makers,the environmental stakeholder and end users.

Therefore, the objective of this project is to (1) train young scientists in practical ways on rapid spatial data acquisition into information needed for sustainable management and disaster risk reduction, (2) promote the rapid mapping technique as a tool to assist decision-makers in managing disaster risk reduction and rapid environmental changes.

In response to that, a summer school was held in accordance with the 2nd International conference of Indonesian Society for Remote sensing (ISRS) 2016 in Yogyakarta, Indonesia. The aim of this summer school is to assist young scientists to improve their knowledge in the implementation of the rapid mapping technique for providing fast and accurate geospatial information for the decision-making processes. About 27 young scientists from Southeast Asia countries participated in the summer school. Case studies in how to implement the RapMet for landslide disasters that commonly occur in Southeast Asia countries and usedBanjarnegara area that prone to landslide as the study area.

The spatial information from this technique was needed for better management of the environment, especially for prevention from any land use change caused by disasters and for any humanitarian aspects. The model of disasters using RapMet can be implemented for other disasters and global change management that many Asia-Pacific countries have experienced for years. Therefore, this activity is relevant to the risk reduction and resilience of APN agenda, since it will fill the gap of providing rapid data for maintaining sustainable environment, emergency responses and humanitarian aspects that still become problems for Southeast Asia countries. The result of the project will be beneficial in providing spatial disaster information to any global, regional or local environment and disasters institutions and policymakers.

2. Methodology

The methodologies used in this project include image fusion, NDVI and WebGIs methods for RapMet development; Summer school, seminars and FGDs/meetings for capacity development method.

As the main objective of this project is to improve the science-based knowledge of young scientists in practical rapid mapping process, the steps of the project include:

1. Preparation
2. RapMet development
3. Capacity development
4. Evaluation
5. Dissemination and publication

2.1. Preparation

The preparation stage includes meetings and Focus group discussion (FGDs) (Appendix 1). Components prepared in this stage, i.e;

a. Detailed planning of the summer school

b. Criteria for summer school participants

The criteria are as follow:

i. She/he has a geospatial sciences or earth sciences background
ii. Understand remote sensing and GIS method and technology
iii. Understand the concept of surveying and mapping
iv. Be able to operate the computer, especially the common knowledge in GIS, remote sensing and surveying-mapping
v. Age max 40 years-old
vi. Nationality of Southeast Asia countries
vii. Have a passion to advance their knowledge in Rapid mapping and new technology of remote sensing.

The candidate should submit:

i. Letter of interest to participate in the Summer School
ii. CV with the new photo (4 x 6 cm)
iii. Scan copy of Passport
iv. Health document support from the local doctor

c. FGDs for RapMet development (Appendix 1)
d. Kick-off meetings (Appendix 2) to determine the adopted RapMet (Rapid Mapping Method) from the previous research, method, software, hardware, type of data and lecturer module and the agreement of all parties to run the project. In this step, policymakers from relevant authority are also be invited as discussant.

2.2. RapMet Development

The Rapid Mapping concept that hopefully will fulfil the need of rapid information for further emergency response, humanitarian aspects or other post-disaster management was illustrated as follow;

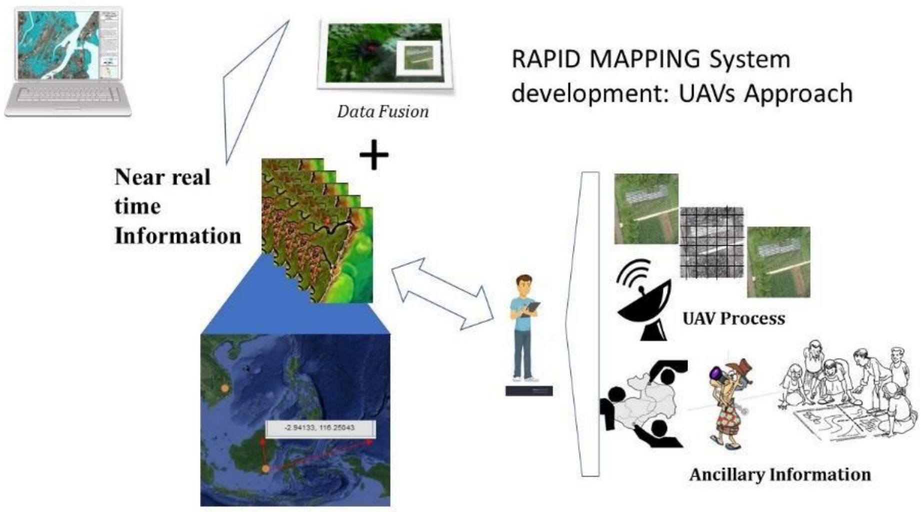


Figure 1. Illustration of Rapid Mapping Concept

The system consists of:

a. Near real-time multiple remote sensing image processing, from middle resolution satellite or others to high temporal resolution satellite images. This stage requires the location, the nearby environment and infrastructure of the disaster-prone area. A NDVI and image fusion method were applied to sharpen the spatial information of the prone area. The implementation of NDVI method to assess the environmental change and disasters provides simple and rapid information (Pettorelli et al, 2005; Liu et al, 2010); image fusion assists to sharp the image map to determine the disaster-prone area (Garzelli, 2008; Wan and Qin, 2011)). The Pan Sharpening-the image fusion method-in which high resolution panchromatic data is fused with lower resolution multispectral data to create a colorized high-resolution dataset, was employed in this step. Therefore, for rapid assessment the combination of these two methods is the best way to be employed.
b. UAV data acquisition and processing. The process may include prone disaster data acquisition (the prone area for landslide); whereas the implementation of UAs should follow; UAV- captured images should be 60% forward and side overlap; ground control points (GCPs) acquisition using conventional surveying method that should collect more than 9 GCPs; other ancillary data should also be collected; UAV image selection process, co-registration of the selected UAVs images using the UTM standard and conventional photogrammetric method will be employed to obtain the orthophoto map.
c. Data fusion and change data analysis whereas the registered UAVs image will be integrated with other near real-time RS data, and
d. Developing and input the data into a system such as WebGis for easy accessibility and visible spatial information to the decision-makers and end users. WebGIS offering the flexibility to work remotely, collaboratively, plan and share information especially when using the open source tool (Bendib and Kalla, 2016)

The flow chart of Rapid Mapping Method (RapMet) development is illustrated as follow:

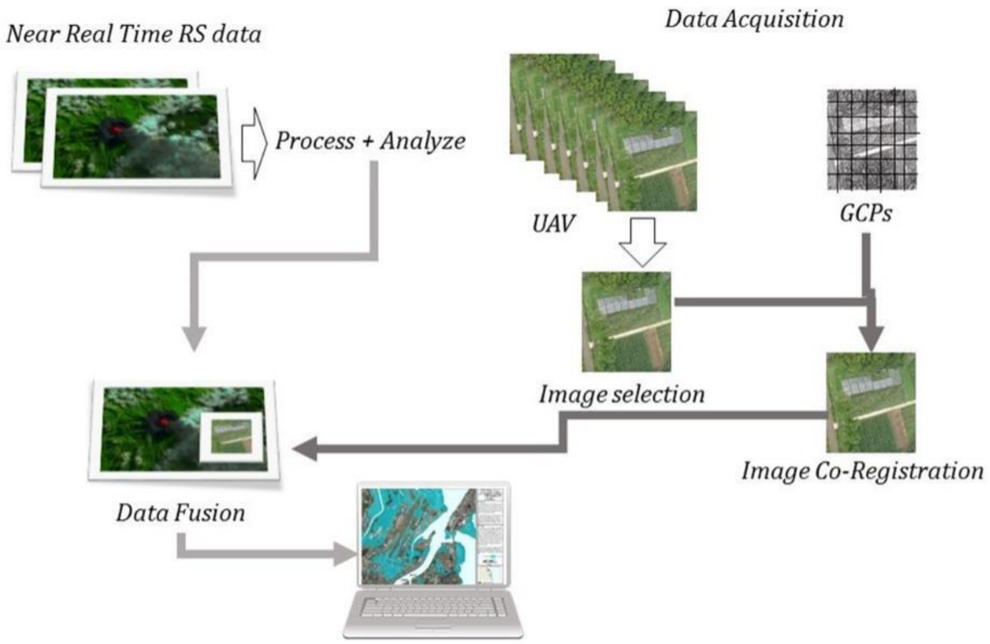


Figure 2. Illustration of Rapid Mapping system (RapMet) development

and the process of obtaining orthophoto map by using UAVs is illustrated as follow;

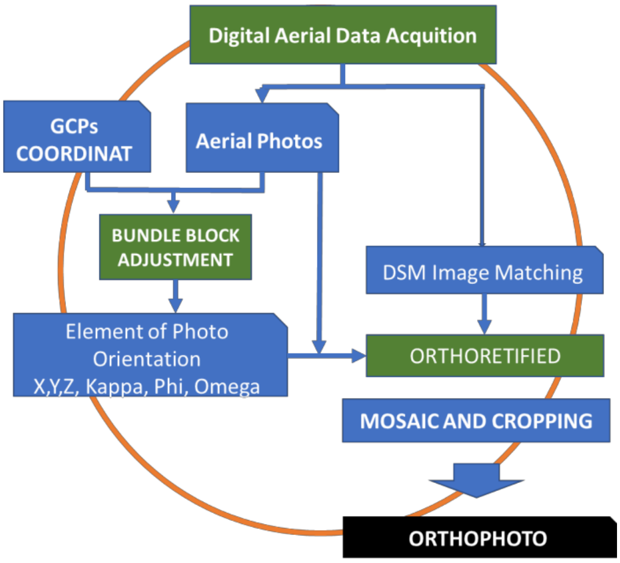


Figure 3. The process of obtaining orthophoto map from UAVs

2.3. Capacity development

Summer school was selected as the project capacity building method. The selection of the method was supported by Sida (2005) that states education and training-as it is in the summer school framework-is the best way to improve the science-based knowledge of young scientists; and so does Cooper et al (2000) that states summer school programs focus on accelerated learning have a positive impact on the knowledge and skills of participants. The improvement of this summer school method is; the practice of operating UAVs was also implemented in the classroom either by using mini UAVs or computer simulation; while the practice of using UAVs to collect real data was carried out in the field of an existing prone area in Banjarnegara.

2.4. Evaluation

An evaluation of the capacity building has also been done in a FGDs method. The observation of each participant's activities during the summer school and their opinions regarding the summer school has also been observed as the input data for evaluation. The result of the summer school evaluation will be published in the scientific journal.; such as Disaster Prevention and Management: An International Journal

2.5. Disseminations and publication

This project will be disseminated in the national seminar and international forum. Meanwhile, an article of related topic will also be submitted to the APN Science Bulletin and will be submitted in Disaster Prevention and Management: An International Journal. Besides, the selected individual papers have been published on ISRS website and the group presentation has also been published on ISRS website and presented at the 2nd ICOIRS in Yogjakarta, on October 17 to 19, 2016.

3. Results & Discussion

3.1. FGD and Kick-off meetings

Two FGDs and kick-off meeting were held in Bogor and Yogjakarta. The meetings were for discussion about the development of the Rapid mapping method system (RapMet), summer school program and its implementation (appendix 1 and 2).


FGDs


Kick-off Meetings

Figure 4. FGDs and Kick-off Meeting

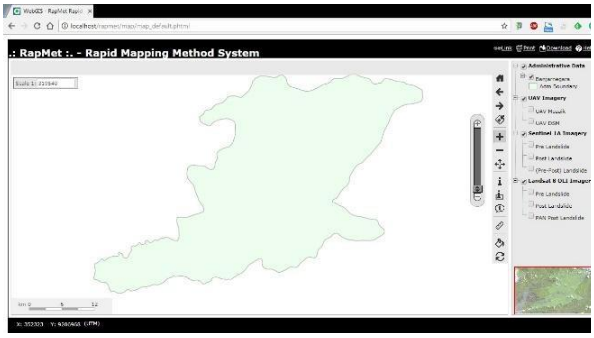
3.2. Rapid Mapping method system (RapMet) development

Following the concept of Rapid Mapping method, a simple WebGIS system by using open source software “Open geosuite“ was developed. This system was taught in the summer school for its utilization and its concept on data acquisition, analysis and shared. Therefore, the Rapid Mapping module should include:

a. How to access to the near real-time remote sensing data
b. How to analyze the remote sensing data to obtain the information of the prone area in faster and more informative ways
c. How to map the detailed of prone area in the field by using UAVs
d. How to share the information by using WebGIS

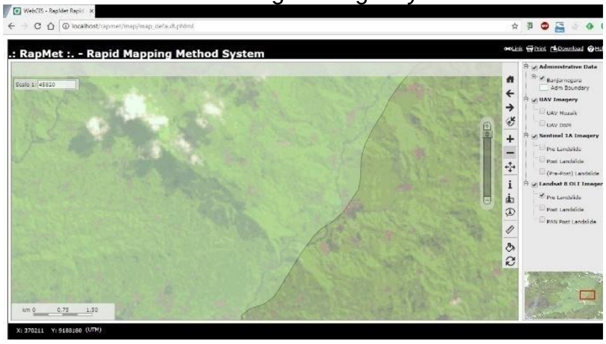
The description of what were taught at the summer school can be seen in Appendix 3

The demo of the RapMet system is illustrated in the following figure:



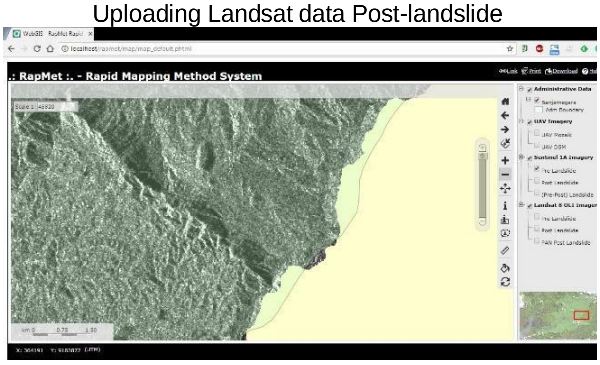
Searching for Regency

Uploading Landsat data Pre-landslide

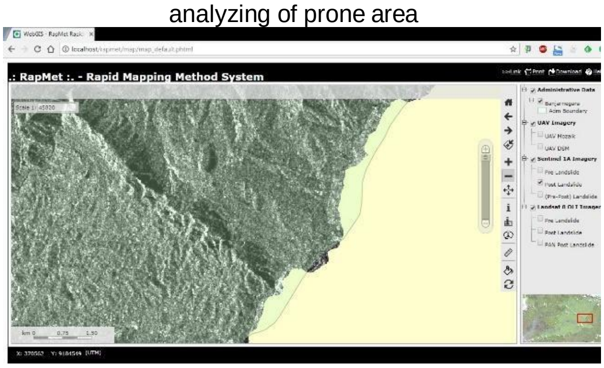


Uploading Landsat data Post-landslide

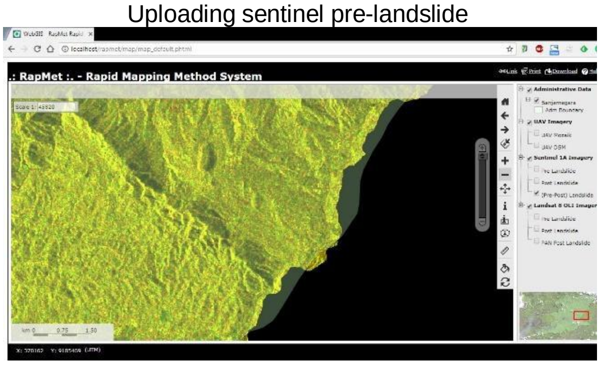
analyzing of prone area



Uploading sentinel pre-landslide



Uploading sentinel post landslide



Analyzing the prone area

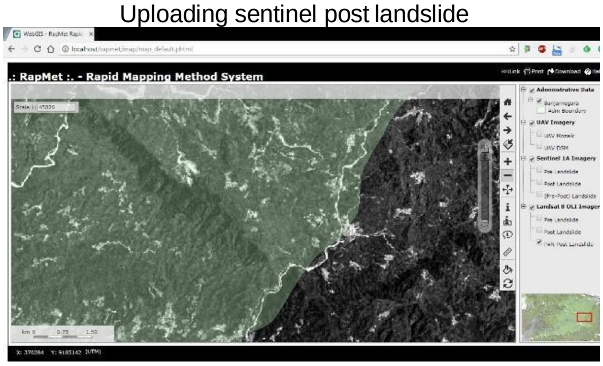
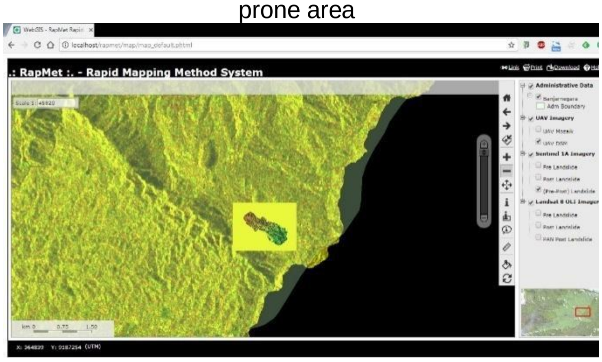
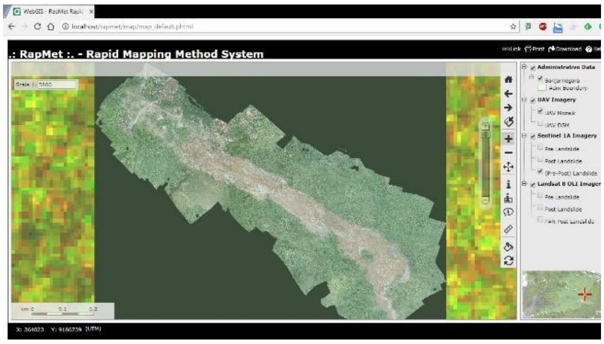


Image fusion Landsat and Sentinel for determining the prone area

Uploading the UAVs data from the field



Uploading The DSM



Browsing the detail spatial information of the prone area

Browsing the detail spatial information of the prone area

Browsing the detail spatial information of the prone area

Browsing the detail spatial information of the prone area

Figure 5. Rapid Mapping Method (RapMet) System

The concept of rapid mapping development based on WebGis has been studied by the participants of the summer school, and its RapMet prototype has also been practiced. However, the development of this WebGis still needs to be studied further by the participants considering the constraints of software diversity and knowledge related to information technology.

3.3. Summer School

Summer school has been successfully implemented from October 11th, 2016 to October 17th 2016, venue at Sahid Rich Hotel, Yogjakarta. The summer school was joined by 27 participants (Appendix 3), coming from Southeast Asian countries-Indonesia, Malaysia, Brunei, Thailand, Vietnam, Cambodia, Myanmar, Lao and Philippines-and Australia. The method of summer school consisted of class lecture or tutorial; class practicing–to download data, to analyze data, to operate UAVs using mini UAVs and computer simulation and to share the data in the RapMet system; field practicing-to operate UAVs in the field and recognize the characteristics of landslide disasters and assignments–group presentation in 2nd ICOIRS, papers and feedback for Summer School.

Figure 6-a. Summer School Participants

Remark from ISRS president

Remark from AHA Center (Ms. Malyn Tumonong)

Remark and opening from the Dean of Faculty of Geography – Gadjahmada University

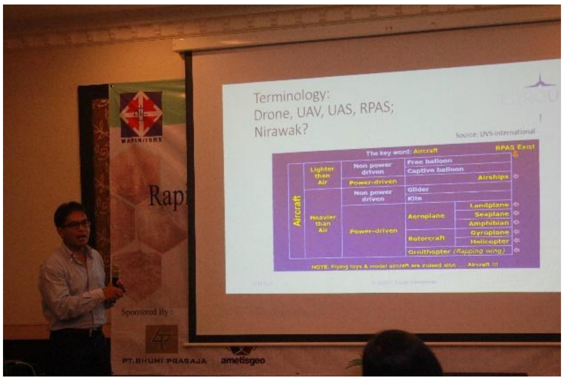
Lecturers

Figure 6-b. Opening Ceremony

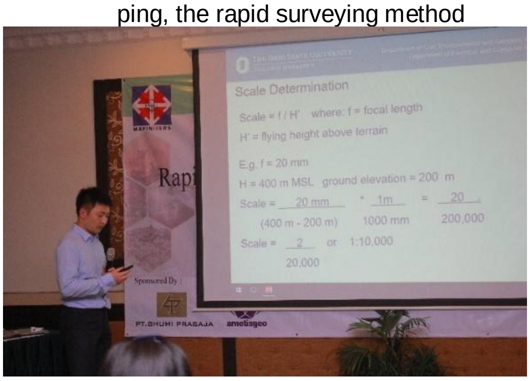
RS for disaster management: Near real-time RS data for rapid mapping technique

Practice: Near real-time remote sensing analysis

GNSS & GCPs and photogrammetry for rapid mapping, the rapid surveying method



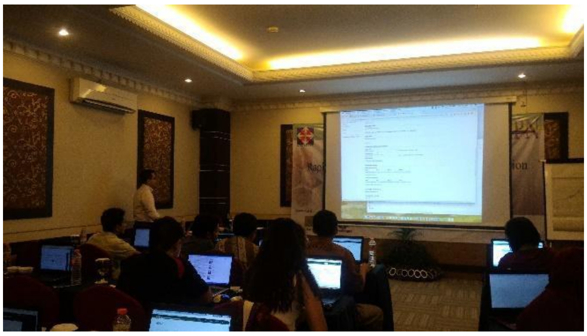
Technique and method of data acquisition for rapid mapping using UAVs



Spatial data acquisition using UAVs and its processing

Data Collecting and fusion

Integrated the near real-time remote sensing and UAV-derive data



WebGis: Introduction and Practice

Figure 6-c. In class Lecture

List of participants and lecture material can be seen in Appendix 3.

Download data and prone area analysis practice/Practice: Near real-time remote sensing analysis

Practice: Data Fusion

Practice of GCPs and photogrammetry

Creating aerial orthophoto map practice

Practice: UAVs simulation

Mini UAVs

RapMet Practice and RapMet Presentation preparation

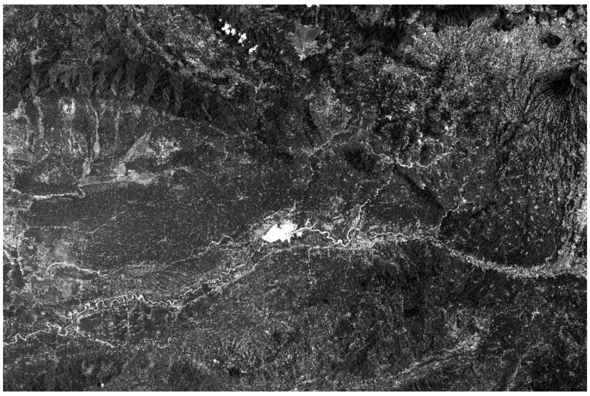
Figure 6-d. In-class practicing

UAVs practice lecture

Figure 6-e. Field practicing

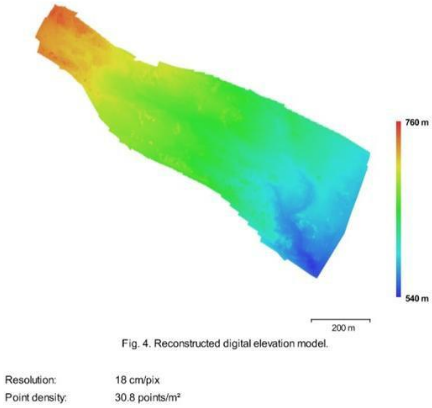
Figure 6-f. Closing

The result of The field data acquisition and in-class processing can be seen in this following Figure



NDVI

Fusi image



DEM

Orthophoto image

Figure 7. Result of data analysis and data acquisition

The best spatial information is difficult to obtain from medium-resolution remote sensing images or other lower resolutions, especially for near real-time imageries. Rapid initial analysis is indispensable for the development of a rapid mapping method, which can be accomplished by the NDVI and Image fusion methods. Image fusion assist to achieve high spatial and spectral resolutions by combining images from two sensors into one new image containing information the quality of which cannot be achieved otherwise (Flusser et al., 2007). Meanwhile, The NDVI can be helpful in predicting the unfortunate natural disasters to provide humanitarian aid, damage assessment and furthermore to device new protection strategies, through the changing of vegetation cover (Gandhi et al, 2015). However, to obtain more detailed information related to the disaster area, it is necessary to carry out further detail mapping which can be fulfilled by orthophoto image which can be obtained by using UAVs. Initial experience shows that the combination of aerial surveys- using UAVs- and collaborative sharing with domain experts results in richer information (Ezequiel, et al., 2015).

3.4. Seminar and conference

The result of the summer school and the development of the RapMet was disseminated at the 2nd International conference of Indonesian Remote sensing society in Yogyakarta, on October 17th 2017, Seminar of Remote sensing for disaster management in Pakuan University, Bogor May 4th, 2017 (Appendix 4) and ASEAN TAIWAN Forum on Land Surveying And Geomatics: Datum, Cadaster and Hazard in Taipei City, July 10th 2017 (Appendix 5). The summary of the seminar stated the need of rapid mapping, the education of young scientists in coping with the disasters and the participatory approach as the best way in educating people to obtain spatial information of disasters.

Figure 8. Presentation of Summer school in 2nd ICOIR, Yogjakarta

Seminar Remote sensing for disaster

ASEAN-Taiwan forum on Land Surveying and Geomatics: Datum, Cadaster and Hazard

Figure 9. Seminar and international meeting

4. Evaluation

The instrument for implementation evaluation of the summer school was also developed. An FGD was also carried out to assess the summer school implementation. The result of the evaluation will be submitted to Disaster Prevention and Management: An International Journal. The result of the evaluation indicates that the summer school can improve the science-based knowledge of young scientists and they are willing to implement the knowledge they were obtained in their own countries and Southeast Asia disasters and humanitarian authorities

. While the RapMet prototype was used as an example system in this summer school, the possibility of its application still needs to be developed and assessed by the legal authority.

5. Dissemination and publication

The project results were disseminated through a national seminar, international forum and conference. A national seminar of Remote sensing for disaster management was held in Pakuan University,Bogor May 4th, 2017 (Appendix 4) and an international forum was held in ASEAN TAIWAN Forum on Land Surveying and Geomatics: Datum, Cadaster and Hazard was held in Taipei City, July,10th 2017 (Appendix 5). The summer school's participants also presented their interest in remote sensing for disaster knowledge at the 2nd International conference of Indonesian Remote sensing society in Yogyakarta, October 17-19, 2016 (http://mapin.or.id/summer- school/).

The articles of summer school evaluation will be submitted to Disaster Prevention and Management: An International Journa , and the articles of Capacity Buildings of Rapid Mapping Technique For Data Acquisition: A Case of Summer School has been submitted to APN Science Bulletin. Some papers of the participants have been published at http://mapin.or.id/summer-school/ and in the Proceeding of the 2nd ICOIRS.

6. Conclusions

Based on the assessment, this summer school has increased the science-based knowledge of the participants in the rapid data acquisition, participatory rapid mapping and the network system for providing basic spatial information in certain disasters. However, the assessment also concluded that operating the UAVs for obtaining data are timely dependable and the majority of participants need more practice in data capturing using the drone. The RapMet system developed in this project and has been shared to summer school's participants, participants of 2nd ICOIRS, participants of the national seminar and the ASEAN-Taiwan forum has successfully promoted the important implementation of the system to assist any emergency response, humanitarian aspects and other post-disaster management. So, it can be said that the project has successfully obtained its goals in capacity development and promoting the utilization of Rapid mapping method system (RapMet).

7. Future Directions

The Rapid mapping method system (RapMet) developed in this project is better to be installed in the regional disaster or humanitarian authority. Conversion systems need to be made to convert or connect this system with the system that may already existed in the legal authority.

The regional authority can utilize the knowledge of the Southeast Asia young scientists who participated in the summer school for local and detail data acquisition. For this purpose, these young scientists can set up teams in their respective areas to map out the disaster areas which of course can choose participatory methods as the best method of collecting information in the region. Moreover, these young scientists in their testimonials were eager to apply the gained of knowledge to assist reducing disaster risks and all aspects of change both locally and globally. The development of this network needs to be continued on the activities as desired by the AHA center, which the representative of young scientists in each Southeast Asia country can quickly assist them with more detailed data related to disaster.

References

1. Bendib, A. and Mahdi Kalla. (2016). Applciation of Webgis in The Development of Interactive Interface for Urban Management in Batna City. Journal of Engineering and Technology Research Vol. 8(2), pp 13-20. DOI: 10.5897/JETR2015.0579
2. Cooper, Harris, Kelly Charrlton, Jeff.C. Valentine and Laura Muhlenbruck. (2000). Making the Most of Summer School: A Meta analytic and Narrative Review. Monograph of the society for Research in Child development Serial No 260, vol. 65, no 1.
3. Ezequiel, C.A., Matthew Cua, Nathaniel C. Libatique, Gregory L. Tangonan, Raphael Alampay, Rollyn T. Labuguen, Chrisandro M. Favila, Jaime Luis E. Honrado, Vinni Canos, Charles Devaney, Alan B. Loreto, Jose Bacusmo, Benny Palma. (2015). UAV aerial imaging applications for post-disaster assessment, environmental management and infrastructure development. 2014 International Conference on Unmanned Aircraft Systems (ICUAS). May 27-30, 2014. Orlando
4. Flusser, Jan., Filip Sroubek, and Barbara Zitova B. (2007). Image Fusion: Principles, Methods, and Applications. Lecture Note in Tutorial EUSIPCO 2007. Institute of Information Theory and Automation Academy of Sciences of the Czech Republic
5. Global asia blog. (2016). Disaster ASEAN! Through the Disaster Management Cycle. http://globalasiablog.com/2016/12/06/disaster-asean-through-the-disaster-management-cycle/
6. Gandhi, G,M, S. Parthiban, N. Thummalu and A.Christy. (2015). NDVI: Vegetation hange Detection Using Remote Sensing and GIS – A Case Study of Vellore District. Provesia Computer Science Vol 57: pp 1199-1210. doi.org/10.1016/j.procs.2015.07.415
7. Garzelli, Andrea, Luca Capobianco and Filippo Nencini. (2008). Fusion of multispectral and panchromatic images as an optimisation problem. Image Fusion. doi.org/10.1016/B978-0-12-372529-5.00005-6
8. Liu, Yongqiang, John Stanturf and S. Goodrick. (2010). Wildfire Potential Evaluation During A Drough Event With a Regional Climate Model and NDVI. Ecological Infromatics. Vol 5/5; pp 418-428
9. Pettorelli, Nathalie, J.O.Vik, A.Mysterud, J.Gaillard, C.J. Tucker and N.C. Stenseth. (2005). Using The satellite-derive NDVI to assess ecological Responses to Environmental Change. Trends in Ecology and evolution, Vol20/9; pp 503-510.
10. Sapir, Debarati Guha, Philippe Hoyois and Regina Below. (2015). Annual Disaster Statistical Review 2015: The Numbers and Trends. Centre for Research on the Epidemiology of Disasters (CREP) -Institute of Health and Society (IRSS), Université catholique de Louvain. Brussels, Belgium
11. Sida, (2002.) Method for Capacity Development: A report for Sida's Project group capacity development as a strategic questions. Swedish International Development Cooperation agency.
12. Smith, Keith, (2013). Environmental Hazards: Assessing Risk and Reducing Disaster. 6TH edition. Routlege. New York
13. Wan, Tao and Zenghan Qin. (2011). An application of Comprehensive Sensing for Image Fusion. International Journal of Computer Mathematics. Vol 88;18. dx.doi.org/10.1080/00207160.2011.598229

Appendices

Appendix 1. FGD of RapMet Development

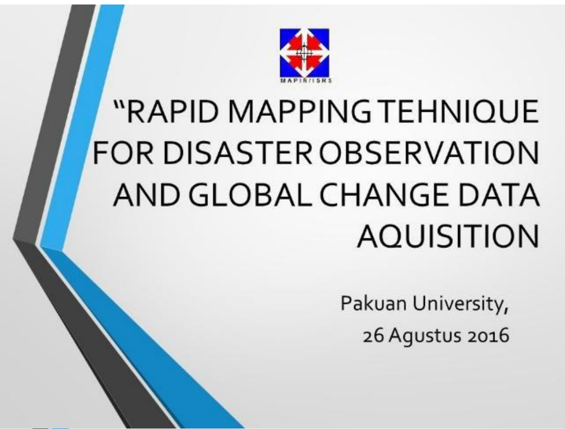
FGD-1

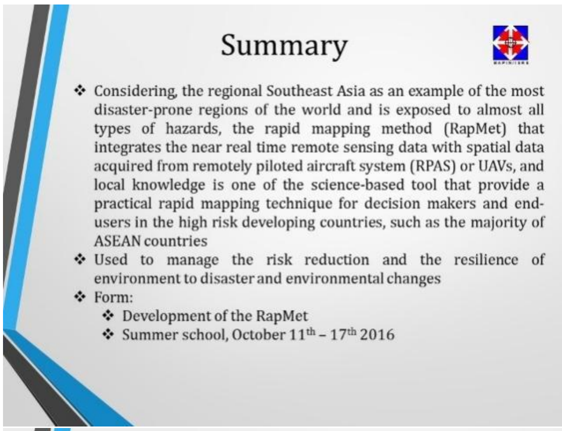
Date: August 24th 2016

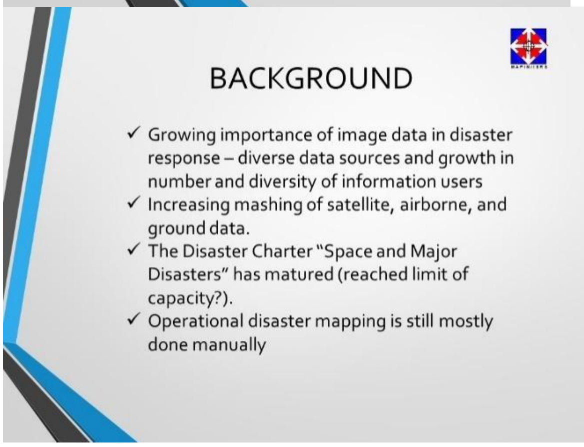
Venue: Pakuan University Bogor

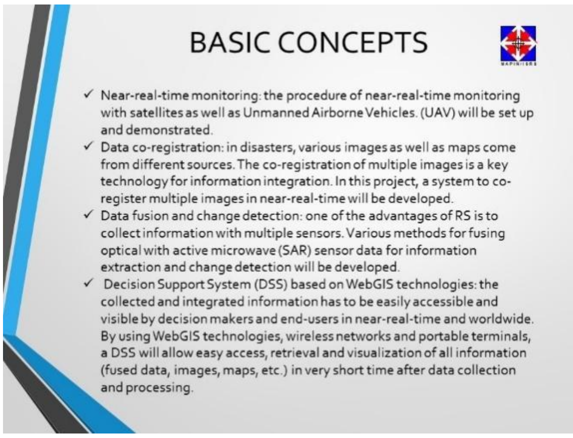
Funding: Indonesian Society for Remote Sensing (ISRS), USD 500

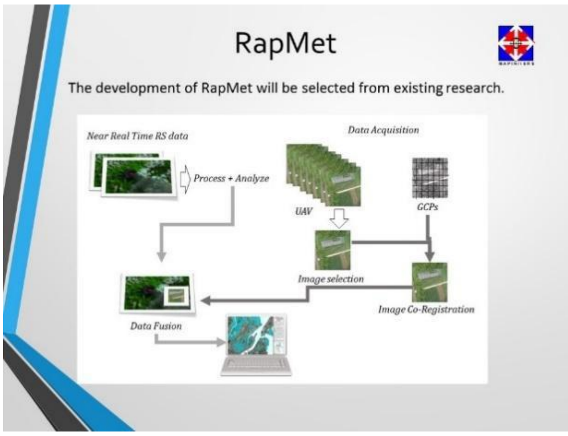
1.1. Discussion material, comment and input











RapMet

- Near real time multiple remote sensing image processing, from modis/Terra Aqua
- UAV data acquisition and processing.
  - ✓ The process may include prone disaster data acquisition (the prone area for flood) whereas the UAV- captured images should be 60 % forward and side overlap;
  - ✓ ground control points (GCPs) acquisition using conventional surveying method that should collect more than 9 GCPs;
  - ✓ other ancillary data inventory;
  - ✓ UAV image selection process, either manually or digitally;
  - ✓ co-registration of the selected UAVs images using the UTM standard and conventional photogrammetric method,
- Data fusion and change data analysis whereas the registered UAVs image will be integrated with other near real time RS data and
- Developing and input the data into a system such as WebGis for easy accessibility and visible spatial information to the decision makers and end-users.

How Rapid it is

Near Real Time RS Data Acquisition:
https://earthdata.nasa.gov/earth-observation-data/near-real-time/download-nrt-data
http://modis.gsfc.nasa.gov/
Others?

Near real time data process:
- ✓ Water change analysis
- ✓ Water marks
- ✓ Others ??

UAV data Acquisition & Process:
- Data Acquistion: Kulon Progo
- mapping process:
  - GCPs
  - Image Selection
  - Image Co-Registration

Data Fusion:
Overlay of Near Real Time + UAVs Data

How Rapid it is

Development of The system → WEBGISS
Information: emergency Response information?
Others?
What kind of information:
- Prone area
- Shelter
- Others

Can do automatic from Data Fusion?
Process ??

All the collected and integrated information will be made easily accessible and visible to decision makers and end-users in near-real-time and worldwide using WebGIS technologies. The user will perform a query on certain data (spatial or non-spatial) from his client application, running generally within a Web browser, and the results are provided by a remote server to the Web browser. Such functionalities are the core of a so-called Decision Support Systems (DSS), a suitable way to allow online access to multiple users, manage critical situations and take decisions within a very short time (Dai, J. Et all., 1994)

Summer School

1. Date: October, 11th – 17th, 2016
2. Place: ......
3. Aim to assist the young scientists to improve their knowledge in the implementation of the rapid mapping technique for providing fast and accurate geospatial information for the decision making processes
4. 25 young scientists from Asean countries will be invited to be participated in the summer school. Local are also invited for special price
5. Form: Lecturer and Field Survey
6. Lecturers:
   a) Prof. Dr. Mazlan Bin Hashim: RS for disaster, Near real time RS data for rapid mapping technique
   b) Dr. Rahman Syaifoel : technique and method of data acquisition for rapid mapping using UAVs
   c) Assist.Prof. Dr. Rongjun Qin: spatial data acquisition using UAVs and its processing
   d) Prof. Peter Tian-Yuan Shih: GCPs and photogrammetry for rapid mapping , the rapid surveying method
   e) Dr. Pramadita Wicaksono: integrated the near real time remote sensing and UAV-derive data
   f) Others expertises: Field works for UAVs operating, RApMet system
7. Field Survey: **The prone area such as Kali Code or Kulon Progo for flooding**

TENTATIVE AGENDA
Tuesday, 11th October 2016: a. Opening ceremony b. Lecture: RS for disaster management, Near real time RS data for rapid mapping technique, (Prof. Dr. Mazlan Bin Hashim) c. Pusfaja (LAPAN) d. Lecturer: GCPs and photogrammetry for rapid mapping, the rapid surveying method (Prof. Peter Tian-Yuan Shih) e. Prof Fahmi (10 sd 14 off), UGM
Wednesday, 12th October 2016 a. Lecturer: technique and method of data acquisition for rapid mapping using UAVs (Dr. Rahman Syaifoel) b. Lecturer: spatial data acquisition using UAVs and its processing (Assist.Prof. Dr. Rongjun Qin) c. in integrated the near real time remote sensing and UAV-derive data (Dr. Pramadita Wicaksono) d. Lecturer: UAV Training (Gadjahmada University)
Thursday, 13th October 2016 a. Lecturer: RapMet System b. Practice of RapMet c. Pak Iwan Setyawan
Friday, 14th October 2016 Field visit
Saturday, 15th October 2016 a. Practice of RapMet: RongJun Qin b. Cultural performance and dinner
Sunday, 16th October 2016 Free excursions
Monday, 17th October 2016

PLEASE,
COMMENT AND INPUT

COMMENT AND INPUT

1. Red tide should be consider as part of hazard
2. Suggested location: Kulon Progo, for flood
3. Data:
   1. Near real time: Modis/Terra Aqua, Mtsat, GsMap, KulonProgo before and after flood (LAPAN)
   2. Mtsat, GsMap → for simulation
   3. Sentinel: Aster, landsat olie-8. SPOT Kulon Progo before and after flood (LAPAN)
4. UAV: Mr. Barandi UGM
5. Software: Ilwis, Quantum, Grass, Esri/Google Earth Engine
6. LAPAN:
   1. Regional Support Office (RSO) UN SPIDER
   2. Has been united with sentinel Asia.
   3. request to JAXA for emergency respond (before and after)
   4. Analysis of prone area
   5. Sent the result to BNPB – the national authority of disaster)
7. WebGIS:
   1. Analysis the prone area
   2. Evacuation area
8. other

COMMENT AND INPUT

8. RapMet team:
   - ✓ GCPs: Prof Fahmi, UGM
   - ✓ Multi sensor analisis: Pusfaja LAPAN
   - ✓ Iwan Setiawan
   - ✓ Fusi: Micky, Agung, UGM
   - ✓ IT: Agung Syetiawan, Suseno
   - ✓ UAVs: Pak catur, UGM, OSU

9. Time schedule
Modules discussion: the kick off meeting
Request data: - data Mtsat, Landsat, Sentinel-1 and SPOT: 18 September 2016
Multi Sensor analysis, model, Module, UAVs : 25 September 2016
- Cloud simulation
- Fusion
- UAV
- Prone area

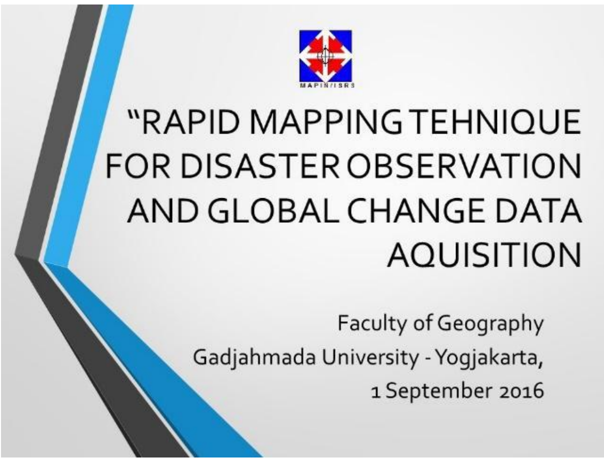
FGD-2,

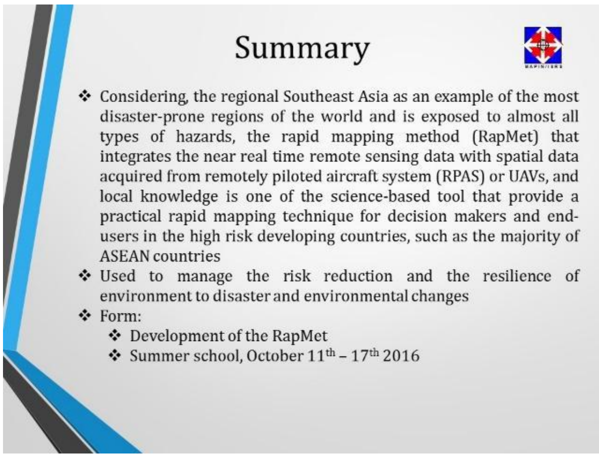
Date: September 1st, 2016

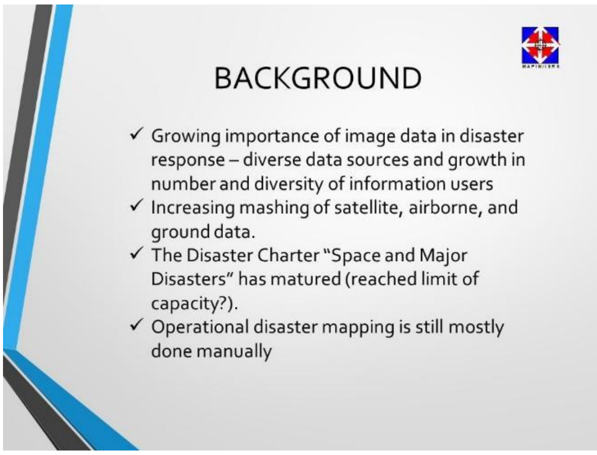
Venue: University of Gadjahmada, Yogjakarta,

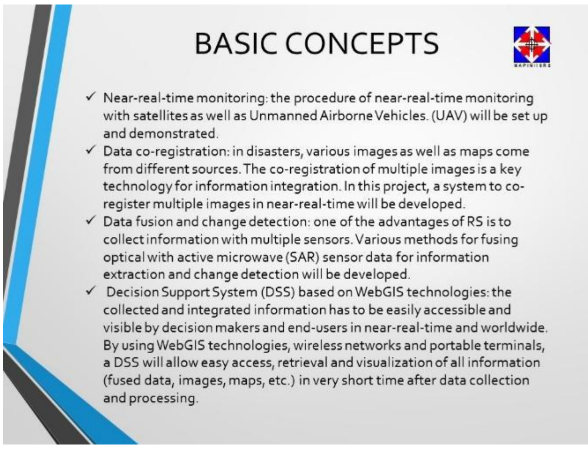
Funding: Funding: Indonesian Society for Remote Sensing (ISRS), USD 1000

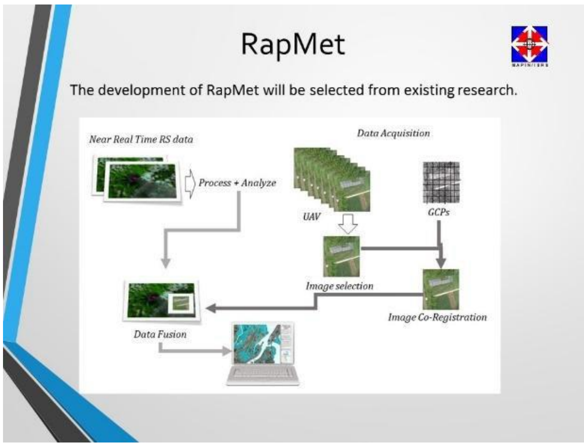
1.2. Discussion material, comment and input

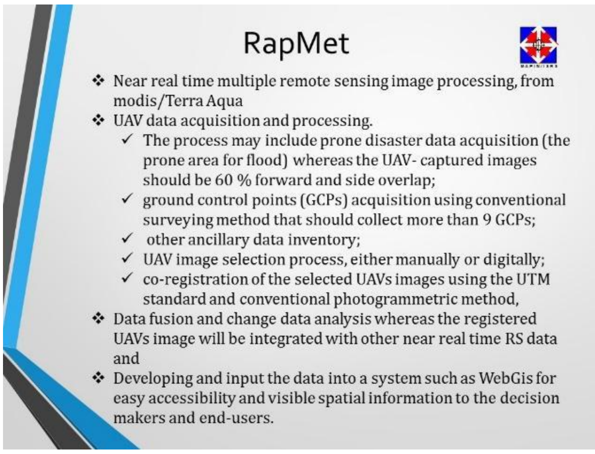


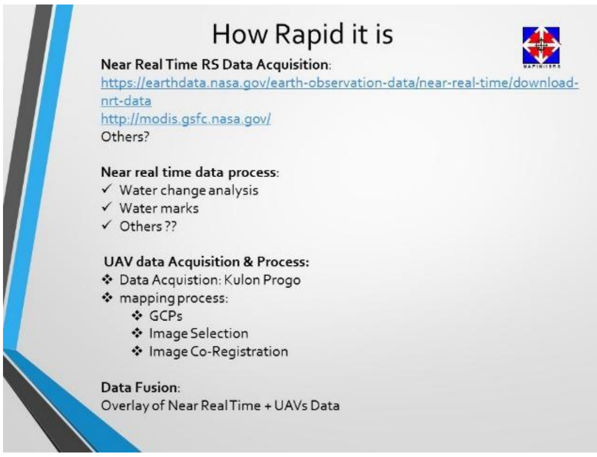


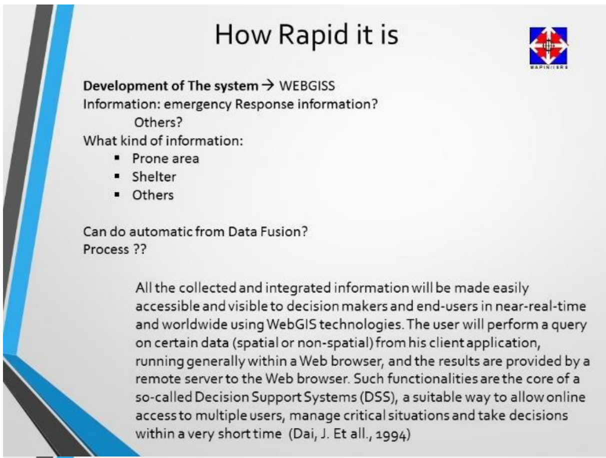


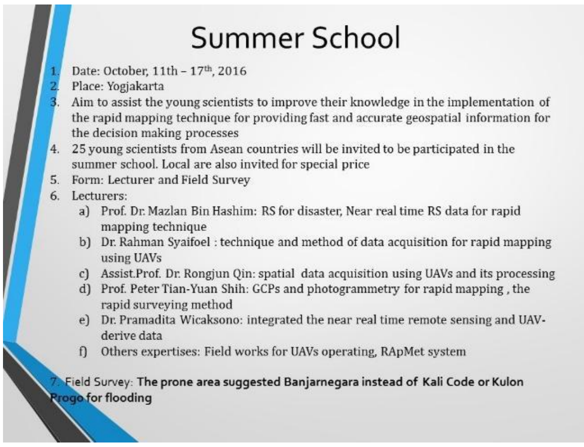


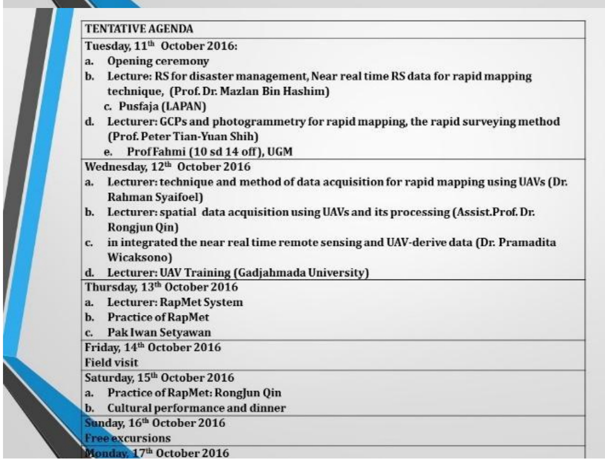


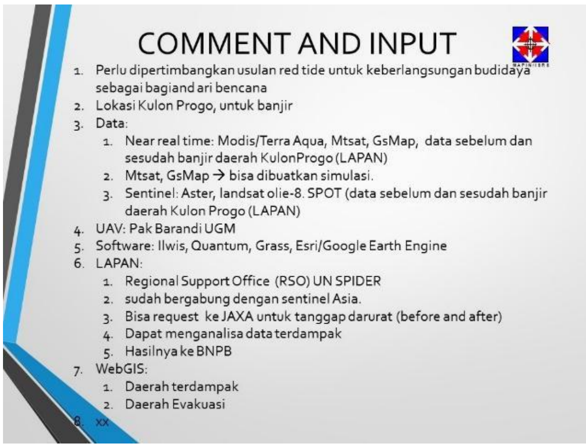

RapMet
❖ Near real time multiple remote sensing image processing, from modis/Terra Aqua
❖ UAV data acquisition and processing.
✓ The process may include prone disaster data acquisition (the prone area for flood) whereas the UAV- captured images should be 60 % forward and side overlap;
✓ ground control points (GCPs) acquisition using conventional surveying method that should collect more than 9 GCPs;
✓ other ancillary data inventory;
✓ UAV image selection process, either manually or digitally;
✓ co-registration of the selected UAVs images using the UTM standard and conventional photogrammetric method,
❖ Data fusion and change data analysis whereas the registered UAVs image will be integrated with other near real time RS data and
❖ Developing and input the data into a system such as WebGis for easy accessibility and visible spatial information to the decision makers and end-users.

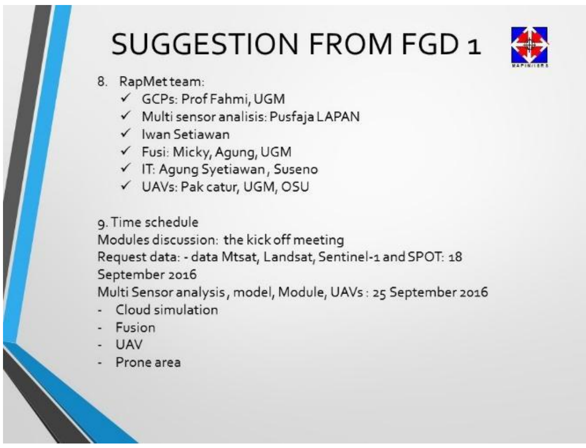

How Rapid it is
Near Real Time RS Data Acquisition:
https://earthdata.nasa.gov/earth-observation-data/near-real-time/download-nrt-data
http://modis.gsfc.nasa.gov/
Others?
Near real time data process:
✓ Water change analysis
✓ Water marks
✓ Others ??
UAV data Acquisition & Process:
❖ Data Acquistion: Kulon Progo
❖ mapping process:
❖ GCPs
❖ Image Selection
❖ Image Co-Registration
Data Fusion:
Overlay of Near Real Time + UAVs Data


How Rapid it is
Development of The system → WEBGISS
Information: emergency Response information?
Others?
What kind of information:
▪ Prone area
▪ Shelter
▪ Others
Can do automatic from Data Fusion?
Process ??
All the collected and integrated information will be made easily accessible and visible to decision makers and end-users in near-real-time and worldwide using WebGIS technologies. The user will perform a query on certain data (spatial or non-spatial) from his client application, running generally within a Web browser, and the results are provided by a remote server to the Web browser. Such functionalities are the core of a so-called Decision Support Systems (DSS), a suitable way to allow online access to multiple users, manage critical situations and take decisions within a very short time (Dai, J. Et all., 1994)

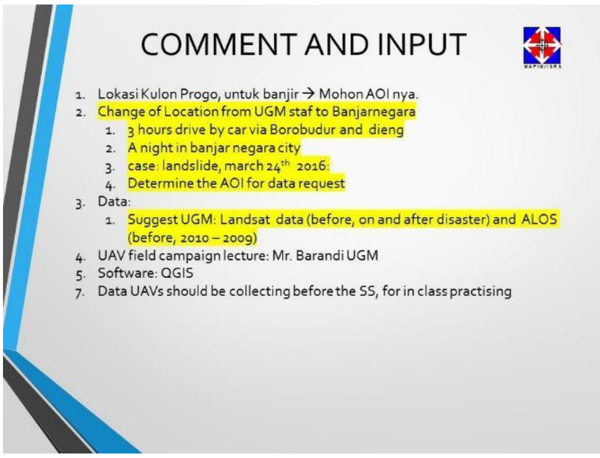

Summer School
1. Date: October, 11th – 17th, 2016
2. Place: Yogjakarta
3. Aim to assist the young scientists to improve their knowledge in the implementation of the rapid mapping technique for providing fast and accurate geospatial information for the decision making processes
4. 25 young scientists from Asean countries will be invited to be participated in the summer school. Local are also invited for special price
5. Form: Lecturer and Field Survey
6. Lecturers:
a) Prof. Dr. Mazlan Bin Hashim: RS for disaster, Near real time RS data for rapid mapping technique
b) Dr. Rahman Syaifoel : technique and method of data acquisition for rapid mapping using UAVs
c) Assist.Prof. Dr. Rongjun Qin: spatial data acquisition using UAVs and its processing
d) Prof. Peter Tian-Yuan Shih: GCPs and photogrammetry for rapid mapping , the rapid surveying method
e) Dr. Pramadita Wicaksono: integrated the near real time remote sensing and UAV-derive data
f) Others expertises: Field works for UAVs operating, RApMet system
7. Field Survey: The prone area suggested Banjarnegara instead of Kali Code or Kulon Progo for flooding


TENTATIVE AGENDA
Tuesday, 11th October 2016:
a. Opening ceremony
b. Lecture: RS for disaster management, Near real time RS data for rapid mapping technique, (Prof. Dr. Mazlan Bin Hashim)
c. Pusfaja (LAPAN)
d. Lecturer: GCPs and photogrammetry for rapid mapping, the rapid surveying method (Prof. Peter Tian-Yuan Shih)
e. Prof Fahmi (10 sd 14 off), UGM
Wednesday, 12th October 2016
a. Lecturer: technique and method of data acquisition for rapid mapping using UAVs (Dr. Rahman Syaifoel)
b. Lecturer: spatial data acquisition using UAVs and its processing (Assist.Prof. Dr. Rongjun Qin)
c. in integrated the near real time remote sensing and UAV-derive data (Dr. Pramadita Wicaksono)
d. Lecturer: UAV Training (Gadjahmada University)
Thursday, 13th October 2016
a. Lecturer: RapMet System
b. Practice of RapMet
c. Pak Iwan Setyawan
Friday, 14th October 2016
Field visit
Saturday, 15th October 2016
a. Practice of RapMet: RongJun Qin
b. Cultural performance and dinner
Sunday, 16th October 2016
Free excursions
Monday, 17th October 2016


COMMENT AND INPUT
1. Perlu dipertimbangkan usulan red tide untuk keberlangsungan budidaya sebagai bagian dari bencana
2. Lokasi Kulon Progo, untuk banjir
3. Data:
1. Near real time: Modis/Terra Aqua, Mtsat, GsMap, data sebelum dan sesudah banjir daerah KulonProgo (LAPAN)
2. Mtsat, GsMap → bisa dibuatkan simulasi.
3. Sentinel: Aster, landsat olie-8. SPOT (data sebelum dan sesudah banjir daerah Kulon Progo (LAPAN)
4. UAV: Pak Barandi UGM
5. Software: Ilwis, Quantum, Grass, Esri/Google Earth Engine
6. LAPAN:
1. Regional Support Office (RSO) UN SPIDER
2. sudah bergabung dengan sentinel Asia.
3. Bisa request ke JAXA untuk tanggap darurat (before and after)
4. Dapat menganalisa data terdampak
5. Hasilnya ke BNPB
7. WebGIS:
1. Daerah terdampak
2. Daerah Evakuasi
8. xx


SUGGESTION FROM FGD 1
8. RapMet team:
✓ GCPs: Prof Fahmi, UGM
✓ Multi sensor analisis: Pusfaja LAPAN
✓ Iwan Setiawan
✓ Fusi: Micky, Agung, UGM
✓ IT: Agung Syetiawan, Suseno
✓ UAVs: Pak catur, UGM, OSU
9. Time schedule
Modules discussion: the kick off meeting
Request data: - data Mtsat, Landsat, Sentinel-1 and SPOT: 18 September 2016
Multi Sensor analysis, model, Module, UAVs : 25 September 2016
- Cloud simulation
- Fusion
- UAV
- Prone area


PLEASE,
COMMENT AND INPUT



Rundown Acara

Date	Time	Training Matreials	Lecture
11 Oct '16	08.00 – 08.30	Pembukaan	
	08.30 – 10.00	RS for disaster management, Near real time RS data for rapid mapping technique	Prof. Dr. Mazlan Bin Hashim
	10.15 – 11.45		LAPAN
	13.00 – 14.30		Danang Sri Hadmoko
	14.30 – 16.00	GCPs and photogrammetry for rapid mapping, the rapid surveying method (Prof. Peter Tian-Yuan Shih	Prof. Peter Tian-Yuan Shih
	16.15– 18.00	Practise OF GCPs and photogrammetrt	Prof. Peter Tian-Yuan Shih
12 Oct '16	08.00 – 09.30	technique and method of data acquisition for rapid mapping using UAVs	Dr. Rahman Syaifoel
	09.45 – 11.15	spatial data acquisition using UAVs and its processing	Prof. Dr. Rongjun Qin
	11.15 – 12.45	Pengantar UAVs	Barandi Sapta Widartono
	14.00 – 18.00	UAVs Practise	Prof. Dr. Rongjun Qin
			Barandi Sapta Widartono

Rundown Acara

Date	Time	Training Material	Lecture
13 Oct '16	08.00 – 09.30	**in integrated the near real time remote sensing and UAV-derive data**	Prama
	09.45 – 11.15	Data Fussion	Micky
	11.15 – 12.45	**Practise Data Fussion**	Agung
	14.00 – 15.00	Pengantar RapMet	Mr X...
	15.15 – 18.00	WEBGIS	Iwan Setyawan
			Agung dan Suseno
14 Oct '16	07.00	Kumpul di lobby	
	07.00 – 10.00	Perjalanan ke banjar negara	
	10.00 – 16.00	Praktek lapangan	
	16.00 – 17.00	Ke hotel	
	17 00 - selesei	Acara bebas dan evaluasi	

Rundown Acara

Tgl	Jam	Materi	Pengajar
15 Oct '16	07.00 – 12.00	Excursion ke dieng	
	12.00 – 15.00	Kembali ke yogya	
16 Oct '16	07.00 – 12.00	Practise: Rapmet Presentation	
	12.00 – 15.00	Cultural performance	

Appendix 2. Kick-off Meeting

Date: September 26th –27th 2016

Venue: Seameo Biotrop meeting room – Bogor

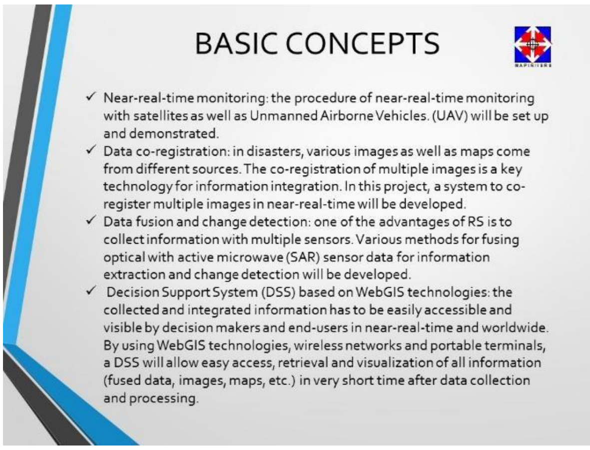
Funding: APN, in-kind from Seameo biotrop for accommodation

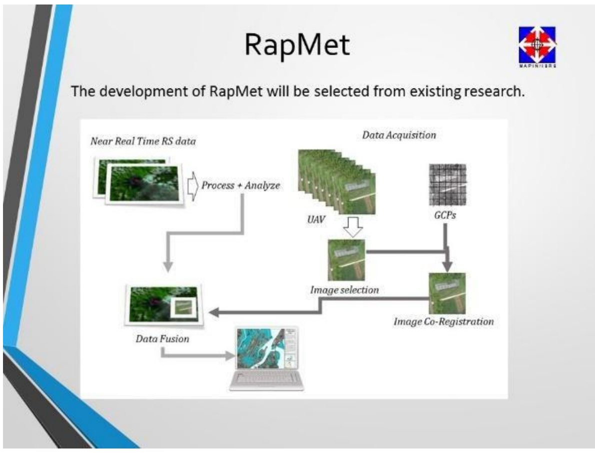
2.1. Kick-off Meeting Agenda

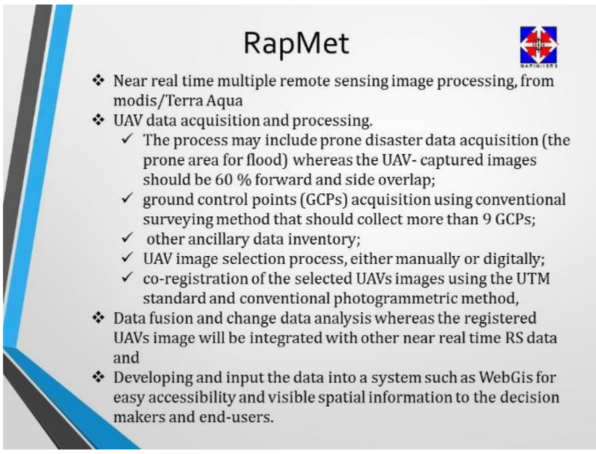
Monday, September 26th 2016		
08.00 – 09.00	Registration	
09.00 – 09.30	Opening ceremony	
	Remarks from ISRS	ISRS chairperson
	Remarks and Opening	Chairman Of seameo Biotrop
09.30 – 10.00	Coffee break	
10.00 – 10.30	Rapid Mapping Technique for Disaster Observation and Global Change Data Acquisition	Prof. Dr. Dewayany Sutrisno (ISRS)
10.30 – 11.00	Design Disaster Management Information System	Dr. Hari Cahyanto (seameo Biotrop)
11.00 – 12.00	Discussion	
12.00 – 13.30	Lunch	
13.30 – 14.00	WebGis Development	Dr. Iwan Setyawan
14.00 – 15.00	Discussion	
15.00 – 15.30	Conclusion	
Tuesday, September 27th 2016		
09.00 – 12.00	Meeting of the RapMet Design	RapMet Team
12.00 – 13.30	Lunch	
13.30 – 14.00	Conclusion and closing of Kick-off meeting	ISRS President

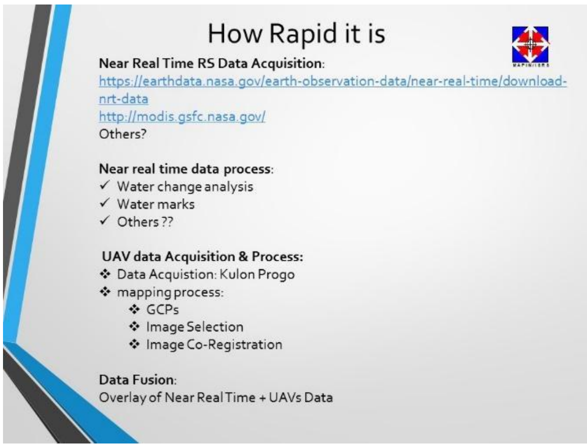
2.2. Presentation material

Presentation 1: Rapid Mapping Technique for Disaster Observation and Global Change Data Acquisition









How Rapid it is

Development of The system → WEBGISS

Information: emergency Response information?

Others?

What kind of information:

- Prone area
- Shelter
- Others

Can do automatic from Data Fusion?

Process ??

All the collected and integrated information will be made easily accessible and visible to decision makers and end-users in near-real-time and worldwide using WebGIS technologies. The user will perform a query on certain data (spatial or non-spatial) from his client application, running generally within a Web browser, and the results are provided by a remote server to the Web browser. Such functionalities are the core of a so-called Decision Support Systems (DSS), a suitable way to allow online access to multiple users, manage critical situations and take decisions within a very short time (Dai, J. Et all., 1994)

TENTATIVE AGENDA

Tuesday, 11th October 2016:

a. Opening ceremony

b. Lecture: RS for disaster management, Near real time RS data for rapid mapping technique, (Prof. Dr. Mazlan Bin Hashim)

c. Pusfaja (LAPAN)

d. Lecturer: GCPs and photogrammetry for rapid mapping, the rapid surveying method (Prof. Peter Tian-Yuan Shih)

e. Prof Fahmi (10 sd 14 off), UGM

Wednesday, 12th October 2016

a. Lecturer: technique and method of data acquisition for rapid mapping using UAVs (Dr. Rahman Syaifoel)

b. Lecturer: spatial data acquisition using UAVs and its processing (Assist.Prof. Dr. Rongjun Qin)

c. in integrated the near real time remote sensing and UAV-derive data (Dr. Pramadita Wicaksono)

d. Lecturer: UAV Training (Gadjahmada University)

Thursday, 13th October 2016

a. Lecturer: RapMet System

b. Practice of RapMet

c. Pak Iwan Setyawan

Friday, 14th October 2016

Field visit

Saturday, 15th October 2016

a. Practice of RapMet: RongJun Qin

b. Cultural performance and dinner

Sunday, 16th October 2016

Free excursions

Monday, 17th October 2016

Summer School

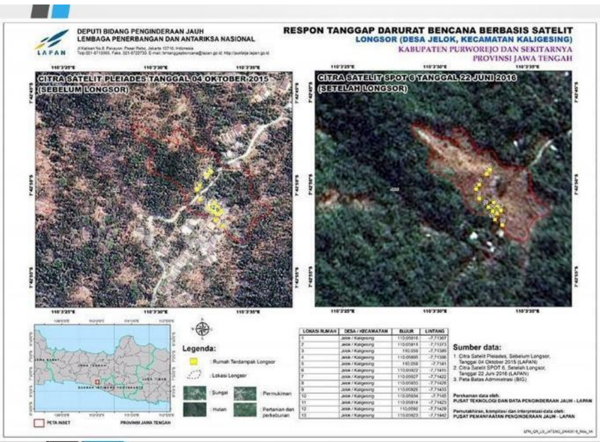
1. Date: October, 11th – 17th, 2016
2. Place: Sahid Rich Hotel, Yogyakarta
3. Aim to assist the young scientists to improve their knowledge in the implementation of the rapid mapping technique for providing fast and accurate geospatial information for the decision making processes
4. 25 young scientists from Southeast Asia countries will be invited to be participated in the summer school. Local are also invited for special price
5. Format: Lecturer and Field Survey
6. Lecturers:
   a) Prof. Dr. Mazlan Bin Hashim: RS for disaster, Near real time RS data for rapid mapping technique
   b) Dr. Rahman Syaifoel : technique and method of data acquisition for rapid mapping using UAVs
   c) Dr, Danang sri Hadmoko; Natural disaster
   d) Prof. Dr. Rongjun Qin,: spatial data acquisition using UAVs and its processing
   e) Prof. Peter Tian-Yuan Shih: GCPs and photogrammetry for rapid mapping , the rapid surveying method
   f) Dr. Barandi Sapta Widartono: UAVs Mapping implementation and its processiong,
   g) Dr. Pramadita Wicaksono: integrated the near real time remote sensing and UAV-derive data
   h) Armaiki Yusmur and Agung Wibowo: Data Fussion and Change Data Analysis
   i) Iwan Setyawan: WebGIs
   j) RapMet system: Dewayany Surisno and Agung Syetiawan

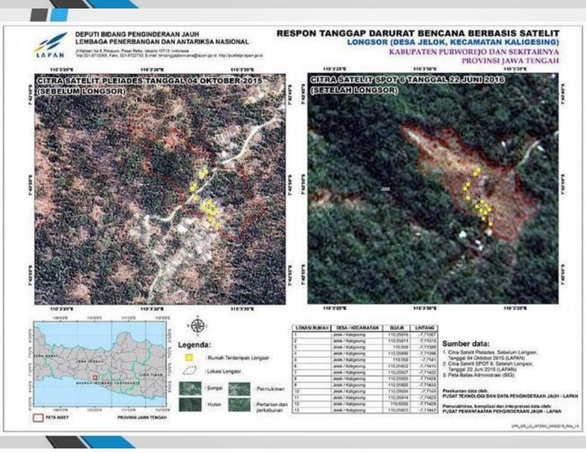
PARTICIPANTS

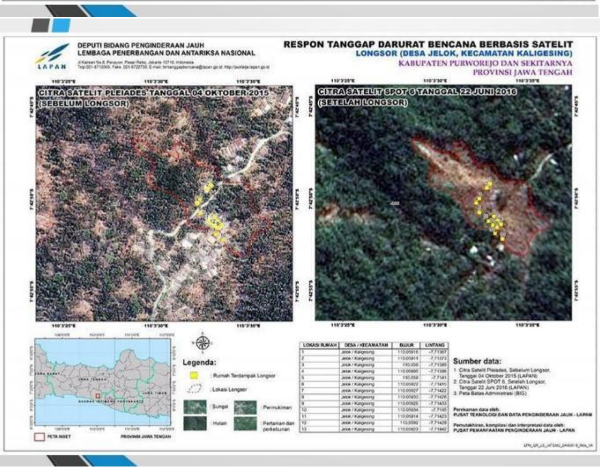
1. Nurhazwana Jumat, Brunei , Univ. Brunei Darussalam
2. Nur Azrinah Binti Omar, Brunei , Univ. Brunei Darussalam
3. Intareeya Sutthivanich, Thailand , Suranaree University of Technology
4. Tawee Chaipimonplin, Thailand Chiang Mai University
5. Manh Van Nguyen, Vietnam, Department of Remote Sensing
6. Nguyen Kim Anh, Vietnam, Vietnam Academy of Science and Technology
7. Rim Reach, Cambodia Giz-Cambodia
8. Nheip Seila, Cambodia, Institute of Cambodia
9. Thet Htoo Naing, Myanmar, Department of Meteorology and hydrology, Naypyitaw
10. Mai Sabai OO, Myanmar, Department of Meteorology and hydrology, Naypyitaw
11. Mary Bongon, Philippines, Bicol University College of Engineering Legazpi City
12. Engr. Edgardo G. Macatulad, Philippines, University of Philippines
13. Jose Grabriel Noveno, Philippines, Departement of Education, Philippines
14. Muhammad Ikhwan Jamaludin, Malaysia, International Islamic University Malaysia
15. Noordini binti Che'man, Malaysia, University Teknologi Malaysia

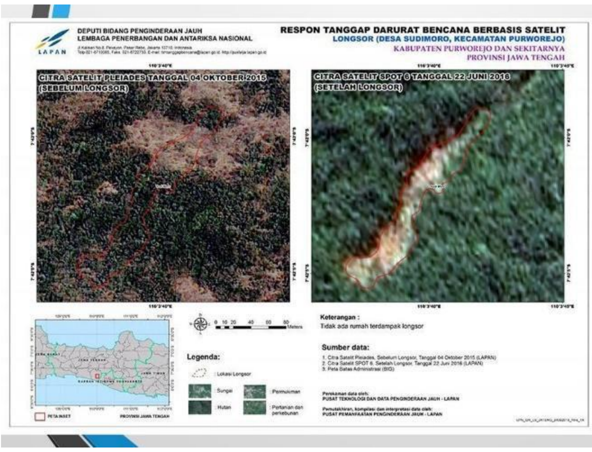
PARTICIPANTS

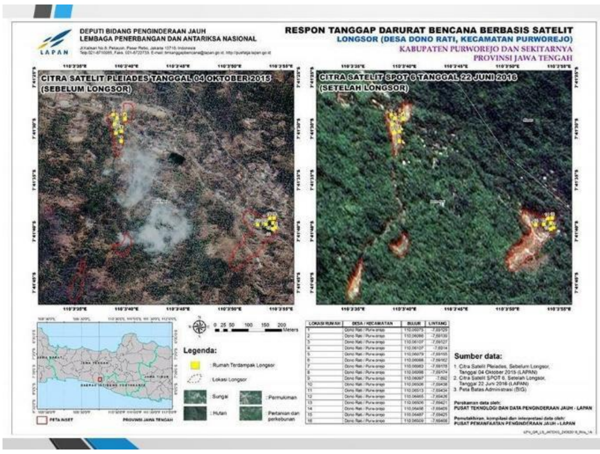
16. Linclon J. Lewis, Singapore, FCL – ETCZ Singapore
17. Arif Yudo Krisdianto, Indonesia, Dinas Pertanian Papua
18. BIG
19. **Jasmine May J Sabado, Philippines, Development of The Philippines**
20. **Edy Irwansyah, Indonesia, Bina Nusantara university**
21. **Endra Gunawan, Indonesia, The Forest Trust Indonesia**
22. **Summer Koirala, Nepali, University of Salzburg**
23. **Kieu Van Hoan, Vietnam, Hanoi National University of Education**
24. **De Guzman, Nelchelle Anne, Philippines, Bicol University**
25. **Fita anggraini Yuliana, Indonesia, bbsdlp**
26. **Dessy Apriyanti Indonesia, UNPAK**
27. **Khalid Saifullah, Indonesia, S.P. IPB**
28. Iksal Yanuarsyah, Indonesia, UIKA
29. Cecep , Indonesia, LSTP
30. **Deni Sabriyati, Indonesia UGM**
31. **Prima Dinta Rahma Syam, Indonesia, ugm**

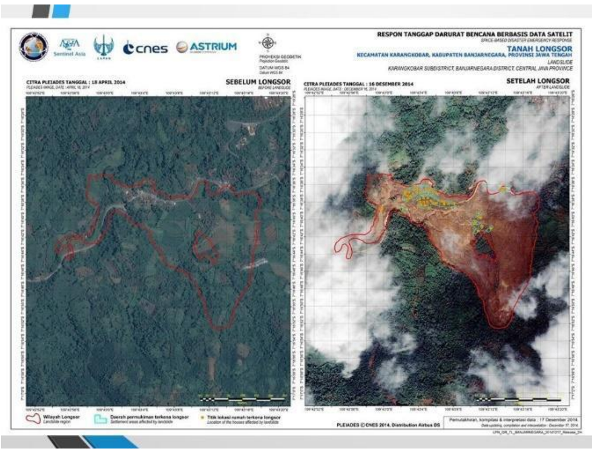


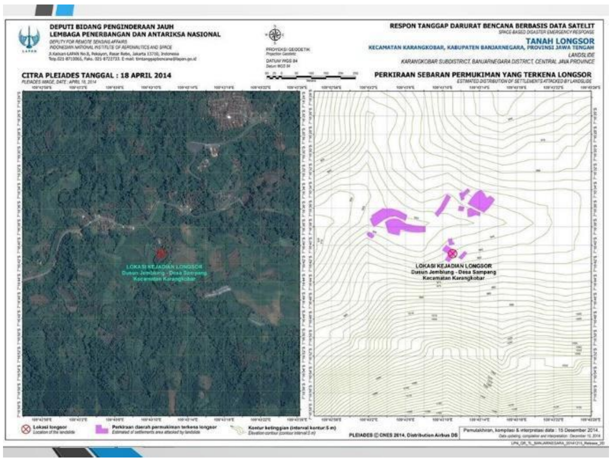




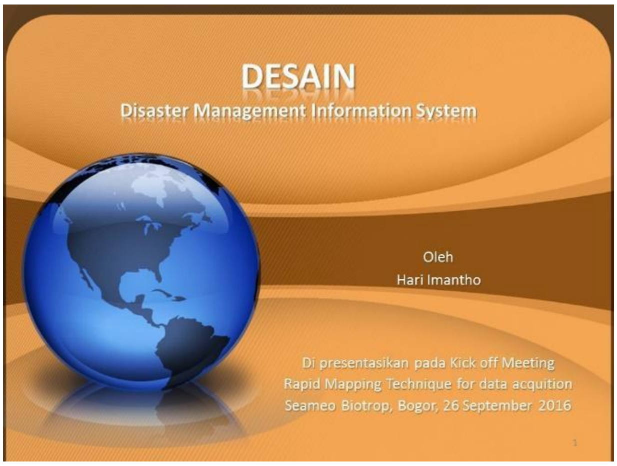


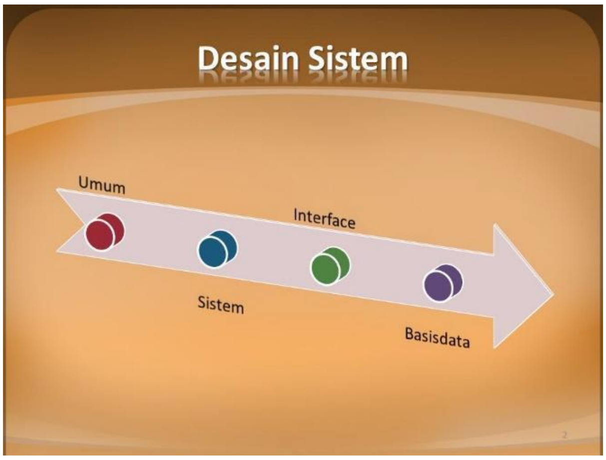


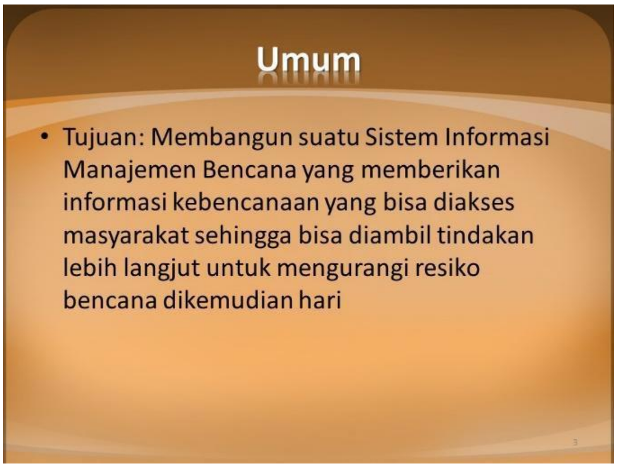




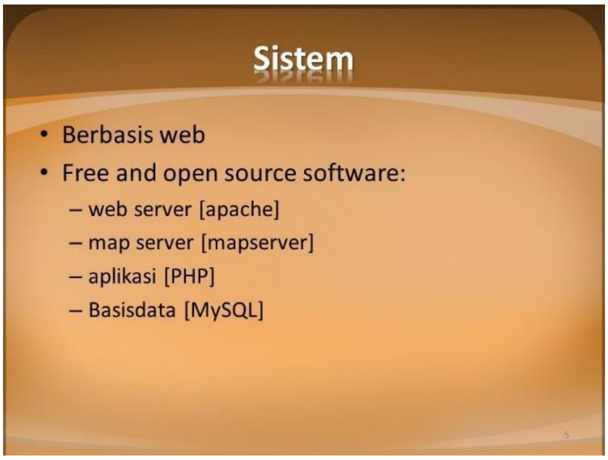
Presentation 2: Design Disaster Management Information System

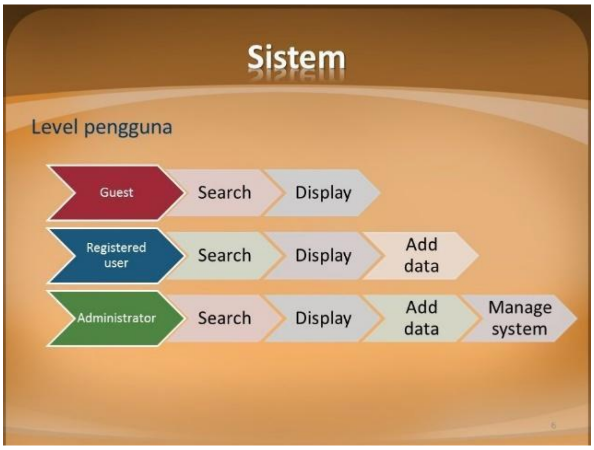


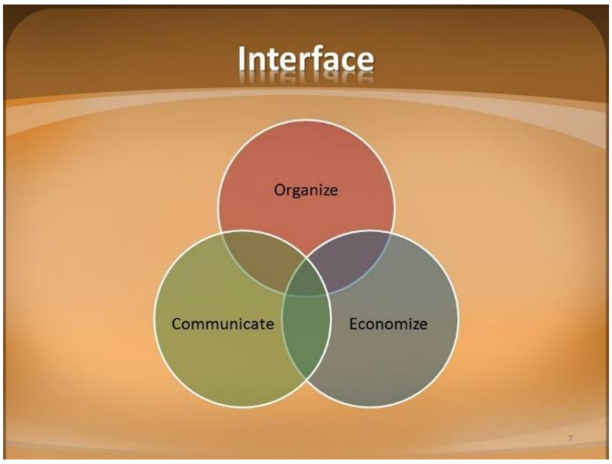


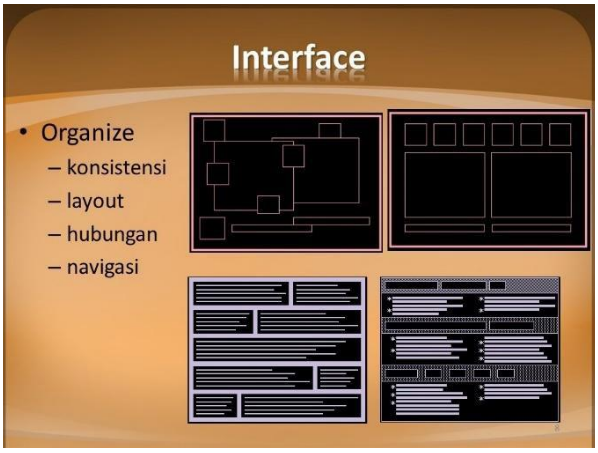

Umum
• Tujuan: Membangun suatu Sistem Informasi Manajemen Bencana yang memberikan informasi kebencanaan yang bisa diakses masyarakat sehingga bisa diambil tindakan lebih langjut untuk mengurangi resiko bencana dikemudian hari

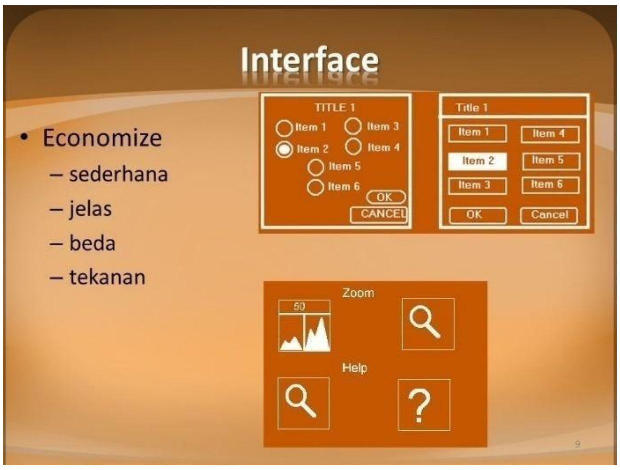

Umum
Kemampuan sistem:
1. Menampilkan data
2. Mencari data
3. Upload data
4. Share data
5. Bagian dari IDSN

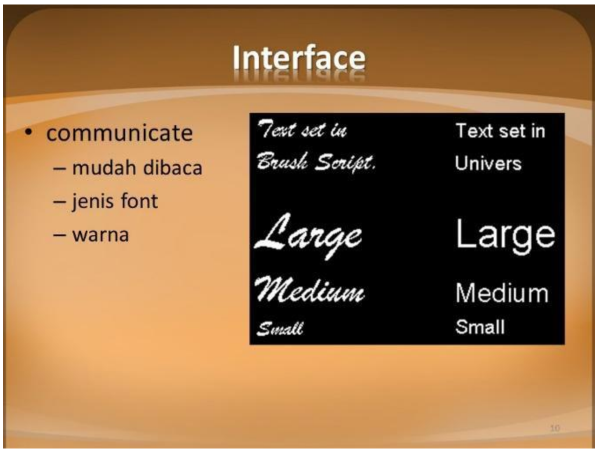

Sistem
• Berbasis web
• Free and open source software:
– web server [apache]
– map server [mapserver]
– aplikasi [PHP]
– Basisdata [MySQL]

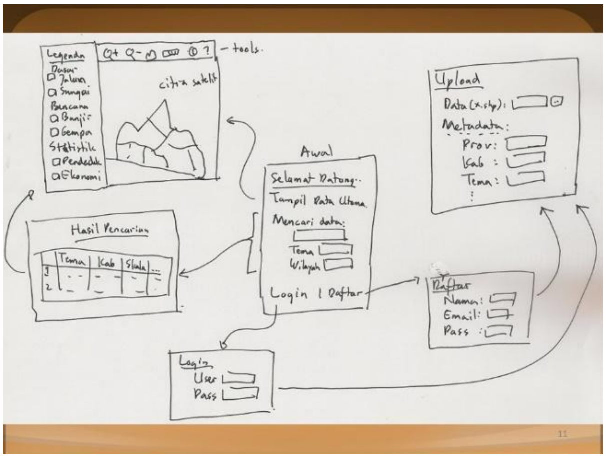

Sistem
Level pengguna
Guest
Search
Display
Registered user
Search
Display
Add data
Administrator
Search
Display
Add data
Manage system

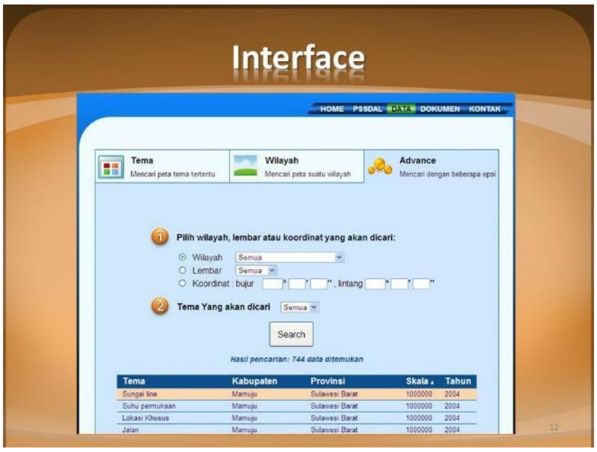

Interface
Organize
Communicate
Economize


Interface
• Organize
– konsistensi
– layout
– hubungan
– navigasi

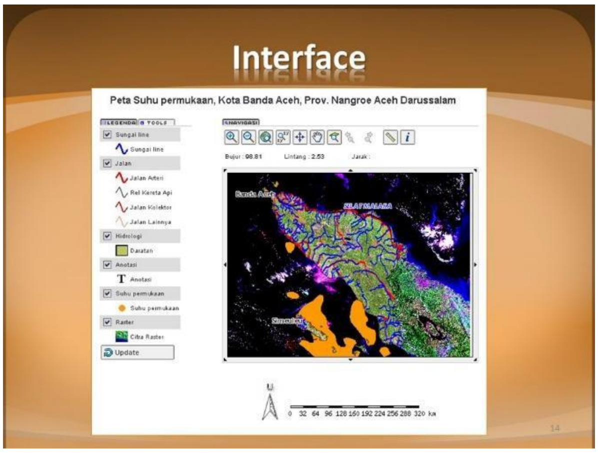

Interface
• Economize
– sederhana
– jelas
– beda
– tekanan
TITLE 1
Item 1
Item 2
Item 3
Item 4
Item 5
Item 6
OK
CANCEL
Title 1
Item 1
Item 2
Item 3
Item 4
Item 5
Item 6
OK
Cancel
Zoom
50
Help
?

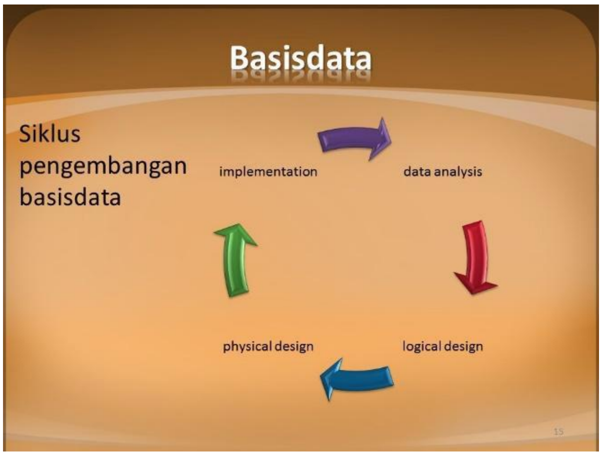

Interface
• communicate
– mudah dibaca
– jenis font
– warna
Text set in Brush Script.
Text set in Univers
Large
Large
Medium
Medium
Small
Small



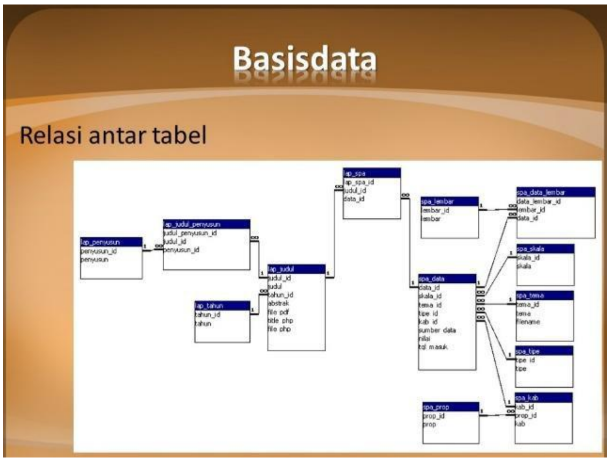

Interface
HOME PSSDAL DATA DOKUMEN KONTAK
Tema
Wilayah
Advance
Search


Interface
Tema
Wilayah
Advance
Data Suhu permukaan
Menampilkan Peta
Metadata
WMS Link

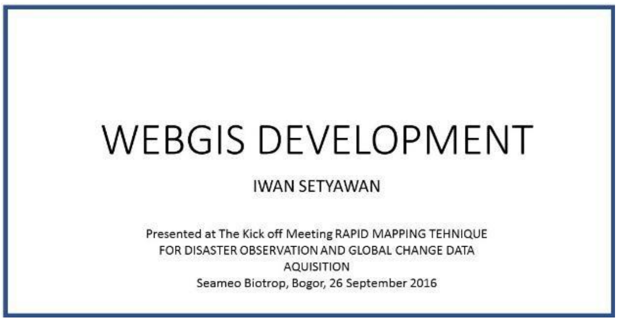

Interface
Peta Suhu permukaan, Kota Banda Aceh, Prov. Nangroe Aceh Darussalam

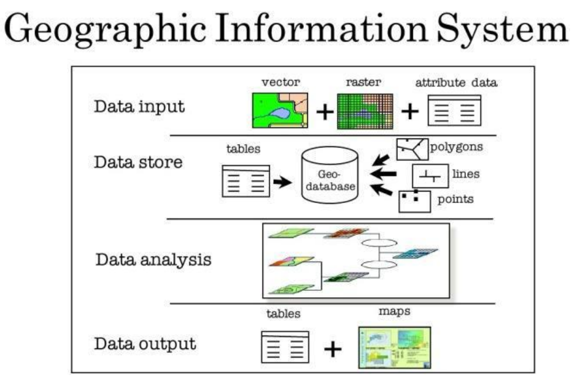


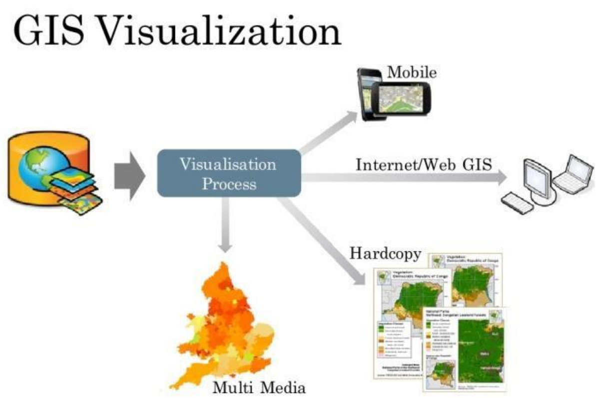
Field	Type	Collation	Attributes	Null	Default	Extra	Action
data_id	mediumint(9)			No		auto_increment	
skala_id	tinyint(4)			No	0		
tema_id	mediumint(9)			No	0		
tipe_id	tinyint(4)			No	0		
kab_id	smallint(6)			No	0		
tahun_id	smallint(6)			No	0		
nilai	text	latin1_swedish_ci		No			
bujur_min	float			Yes	NULL		
bujur_max	float			Yes	NULL		
lintang_min	float			Yes	NULL		
lintang_max	float			Yes	NULL		
sumber_data	varchar(250)	latin1_swedish_ci		No			
proses_data	varchar(250)	latin1_swedish_ci		No			
kegunaan	varchar(250)	latin1_swedish_ci		No			
keterangan	varchar(250)	latin1_swedish_ci		No			
tgl_masuk	varchar(15)	latin1_swedish_ci		No			

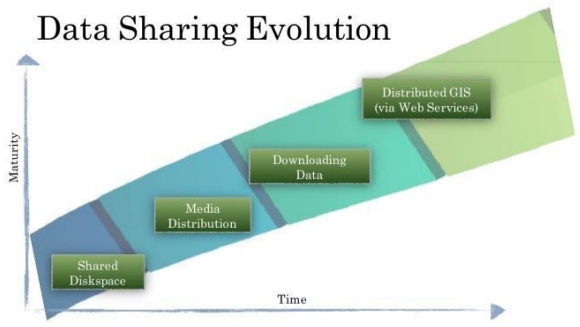


Presentation 3: WebGis Development

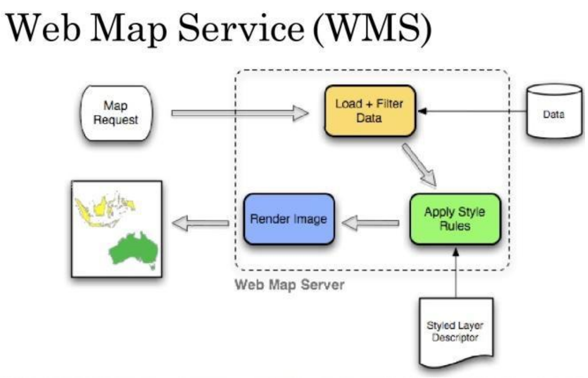


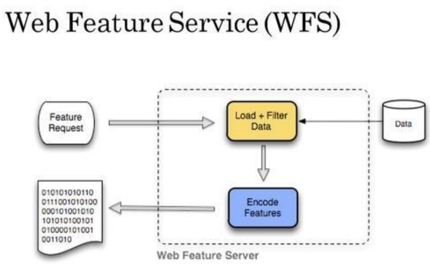


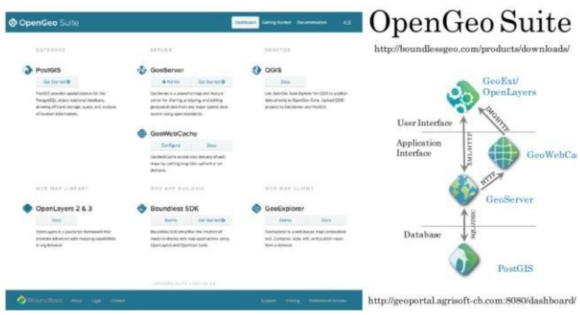

GIS Visualization
Mobile
Visualisation Process
Internet/Web GIS
Hardcopy
Multi Media


Data Sharing Evolution
Maturity
Distributed GIS (via Web Services)
Downloading Data
Media Distribution
Shared Diskspace
Time

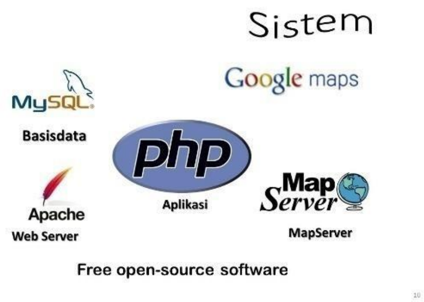

User Interface
Web-based
Desktop
Tiling
Web Services
Application Server
Database
Web GIS Application


Web Map Service (WMS)
Map Request
Load + Filter Data
Data
Render Image
Apply Style Rules
Web Map Server
Styled Layer Descriptor


Web Feature Service (WFS)
Feature Request
Load + Filter Data
Data
Encode Features
Web Feature Server

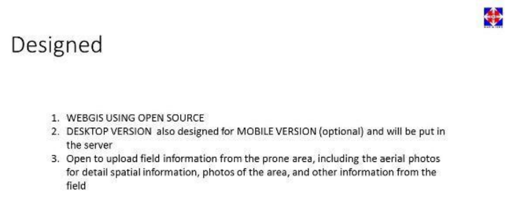

OpenGeo Suite
http://boundlessgeo.com/products/downloads/
User Interface
Application Interface
Database
GeoExt/ OpenLayers
GeoWebCa
GeoServer
PostGIS
http://geoportal.agrisoft-cb.com:8080/dashboard/

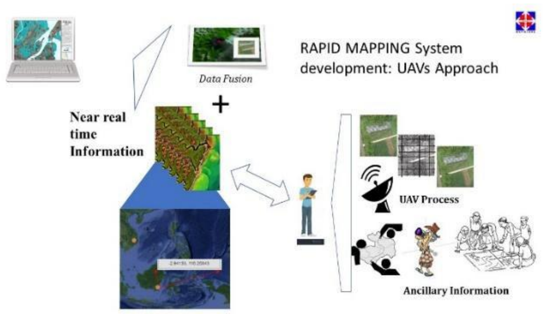

DMIS
KEMAMPUAN SISTEM
MENAMPILKAN DATA
MENCARI DATA
UPLOAD DATA
SHARING DATA
BAGIAN DARI IDSN

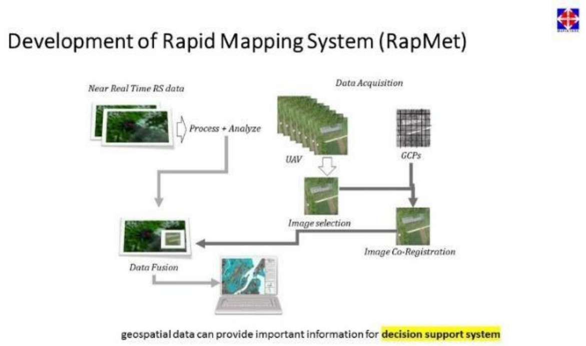

Sistem
Google maps
MySQL
Basisdata
php
Aplikasi
Apache
Web Server
MapServer
MapServer
Free open-source software

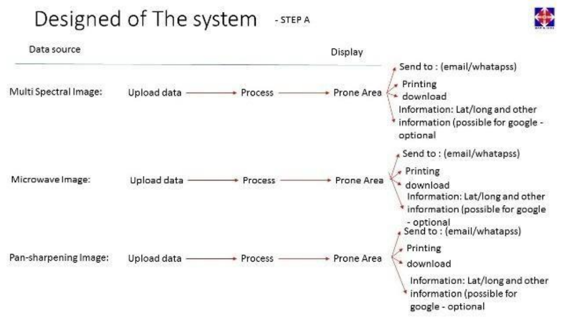
2-3 Discussion Material, day 2

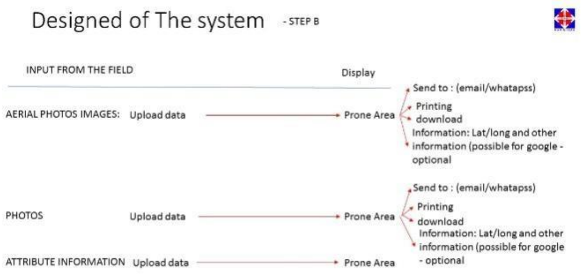
Discussion on RapMet System development

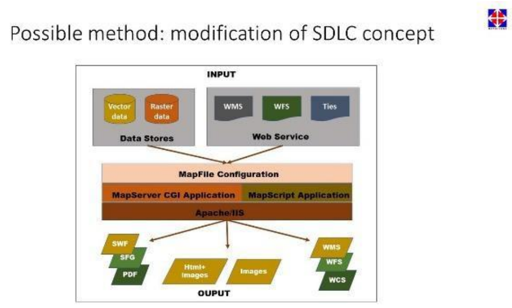












2-4 List of participants of Kick-off Meeting

Daftar Hadir

Kick Off meeting Summer School

"Rapid Mapping Techniques For Disaster Observation and Global Change Data Acquisition Summer School"

Date : September 26 - 27th, 2016

Time : 09.30 – Thru

Place : SEAMEO BIOTROP

Agenda :

1. Kick Off meeting Summer School
2. Presentation the material for Summer School
3. Discussion

No	Name	Instance	Sign
1	Dewayany	MAPIN	
2	JANTHY. T. H.	MAPIN	
3	Prama	UGM	
4	Yatin S.	MAPIN	
5	ARMAIKI Y	MAPIN / BIOTROP	
6	Cecep	MAPIN	
7	Iksal Y	MAPIN	
8	Agung Syetiawan	BIG	
9	Jalu. S	BIG	
10	AGUNG WIBOWO	MAPIN	
11	Harry Imantho	BIOTROP	
12	Yosef Prihanto	BIG	
13	Reiza M A	MAPIN	
14	Dadan Ramdhani	BIG / ITB	

No	Name	Instance	Sign
15	Syarif Budhiman	LAPAN	
16	Nanang Samodra	MAPIN	
17	DHIMAS WIRATMOKO	"	
18	Ariani Andayani	KKP	
19	Iwan Setiawan	Agrisoft	
20	Indah Wahyuningsih	Walindo	
21	JASYANTO	LAPAN	
22	Anang Wahyu Sejati	UNDIP	
23	Rizatus Shofiyati	BBSDLP - MoA	
24	Dahlan	Univ. Syiah Kuala	
25	Bambang E Leksono	Komwil Bandung ITB	
26	Agustan	MAPIN	
27	Aflat Anugrahadi	Kowil Jakarta	
28	Laju Gandharum	BPPT	
29	Leo Rijadi	LAPAN	
30	Dra. Bitta Pigawati, M.	Komwil Jateng	
31			
32			
33			
34			
35			
36			
37			
38			

APPENDIX 3. Summer School

Date: October 11th–17th 2016

Venue: Sahid Rich Hotel, Yogjakarta

Funding; APN; ISRS (administrative staff, goodie bags, national participants support, software, module, data and materials); universiti of Technology Malaysia (UTM), EuroUsc, University of Gadjahmada, Ohio state University, NCTU/CTSPRS (meetings support, software, module, data and materials); NCTU/NCTU (dissemination of the result in Asean- Taiwan Forum) – approximately 23.000 USD in-kind and 6.500 USD in cash.

3.1. Summer School Program

SCHEDULE OF SUMMER SCHOOL RAPID MAPPING TEHNIQUE FOR DISASTER OBSERVATION AND GLOBAL CHANGE DATA AQUISITION		
Sahid Rich Hotel **Yogyakarta, October 11th - 17th, 2016**		
Monday, 10th 2016		
08.00 - 17.00	Registration	
Tuesday, October 11th 2016		
08.00 - 08.30	Opening ceremony	
	Remarks from ISRS	ISRS chairperson
	Remarks Opening	Malyn Tumonong (AHA center)
	Remarks and opening	The dean of Faculty of Geography
08.30 - 10.00	RS for disaster management: Near real-time RS data for rapid mapping technique	Prof. Dr. Mazlan Bin Hashim
10.00 - 10.15	Coffee Break	
10.15 - 11.45	Practice: Remote sensing Data Processing for Disaster Rapid Mapping	Parwati, S.Si., M.Sc./ Prof, Mazlan Bin Hashim
11.45 - 13.00	Lunch	
13.00 - 14.30	GNSS Data and Processing	Prof. Peter Tian-Yuan Shih
14.30 - 16.00	GNSS Data and Processing	Prof. Peter Tian-Yuan Shih
16.00 - 16.15	Coffee Break	
16.00 - 17.30	Practice of GNSS Data and Processing	Prof. Peter Tian-Yuan Shih
Wednesday, October 12th 2016		
08.00 - 09.30	Practice: Remote Sensing for disaster mapping method: A case of landslide from the near real time to the multi sensor middle scale	Dr. Danang Sri Hadmoko
09.30 - 09.45	Coffee Break	

09.45 - 11.15	UAVs Role in Disaster Management	Dr. Rahman Syaifoel
11.15 - 12.45	UAVs (Unmanned Aerial Vehicle) Data acquisition and processing	Prof. Dr. Rongjun Qin
12.45 – 13.45	Lunch *Practice: UAVs simulation*	
13.45 - 15.15	UAVs Practice	Prof. Dr. Rongjun Qin/ Prof. Peter Tian-Yuan Shih
15.15 - 15.30	Coffee Break *Practice: UAVs simulation*	
15.30 - 17.30	UAVs Practice	Prof. Dr. Rongjun Qin/ Prof. Peter Tian-Yuan Shih
17.30 – 18.00	*Practice: UAVs simulation*	
Thursday, October 13th 2016		
08.00 - 09.30	Integrated the near real-time remote sensing and UAV-derived data	Dr. Pramaditya Wicaksono
09.30 - 09.45	Coffee Break *Practice: UAVs simulation*	
09.45 - 11.15	Data Collecting and fusion	Armaiki Yusmur, S.Si.
11.15 - 12.45	Practice: Image Fusion Processing in QGIS And ARCGIS	Agung and Armaiki Yusmur, S.Si.
12.45 - 14.00	Lunch *Practice: UAVs simulation*	
14.00 - 14.15	Coffee Break *Practice: UAVs simulation*	
14.15 - 15.45	WebGis: Introduction and Practice	Iwan Setiawan, S.Si., PM.
15.45 - 18.00	Introduction to UAVs Field Campaign	Dr. Barandi Sapta Widartono
Friday, October 14th 2016		
(Field trip and excursion)		
06.45 - 07.00	gathering at the lobby	Committee
07.00 - 10.00	Trip to Banjarnegara	
10.00 - 16.00	field mapping using UAVs demo	Dr. Barandi Sapta Widartono and team
16.00 - 17.00	Travel to hotel in Banjarnegara	
17.00 - 20.00	Dinner and cultural performance	Committee
Saturday, October 15th 2016		
(Field trip and excursion)		
07.00 - 12.00	excursion to Dieng and Borobudur temple	Committee
12.00 - 15.00	Lunch and travel to Yogyakarta	
15.00 - ……	Free time	
Sunday, October 16th 2016		
08. 00 -09.30	Introduction to RapMet	Prof. Dewayany Sutrisno

09.30 – 09.45	Coffee Break	
09.30 – 12.00	Practice: RapMet Presentation preparation	Committee
12.00 – 13.00	Lunch	
13.00 -….	Free time	
Monday, October 17th 2016		
08.00 - 12.00	Attending the opening ceremony of 2nd ICOIRS	Committee
	Presentation the result of SS	
12.00 - ….	Going back home to the SS participants /continue attending the ICOIRS/ other activities	

3-2 Summer school participants

No	Nama	Affiliation	Nationality
1.	Arif Yudo Krisdianto	West Papua Assessment Institute for Agricultural Technology- Ministry of Agricultural	Indonesia
2.	Cecep Andritela Firdaus	LSTP MAPIN	Indonesia
3.	Elvira Isir	Geospatial Information Agency (BIG)	Indonesia
4.	Eng. Edgardo G. Macatuland	Melchor Hall University of the Philippines	Philippines
5.	Intareeya Sutthivanich	Suranaree University of Technology	Thailand
6.	Jose Gabriel Noveno	Department of Education	Philippines
7.	May Sabai Oo	Department of Meteorology and Hydrology	Myanmar
8.	Manh Van Nguyen	Department of Remote Sensing	Vietnam
9.	Mary Ruth Bongon	Bicol University	Philippines
10.	Muhammad Ikhwan Jamaludin	International Islamic University Malaysia	Malaysia
11.	Nguyen Kim Anh	Vietnam Academy of Science and Technology	Vietnam
12.	Nheip Seila	Institute of Cambodia	Cambodian
13.	oordini binti Che'man	University Teknologi Malaysia	Malaysia
14.	Nurhazwana Jumat	Univ. Brunei Darussalam	Brunei Darussalam
15.	Rim Reach	Giz-Cambodia	Cambodian
16.	Tawee Chaipimonplin	Chiang Mai University	Thailand
17.	Thet Htoo Naing	Department of Meteorology and hydrology	Myanmar
18.	Muhammad Ikhsan	Universitas Teuku Umar	Indonesia
19.	Fita Anggraini Yuliana	BBSDLP	Indonesia
20.	Dessy Apriyanti	Universitas Pakuan	Indonesia
21.	Iksal Yanuarsyah	Geoinformatics-Universitas Ibnu Khaldun	Indonesia
22.	Muhammad Al- Amin Hoque	The University of Queensland	Bangladesh
23.	Prasevianto Estu Broto	LAPAN	Indonesia
24.	Arsya Rasyadan	LAPAN	Indonesia
25.	Deni Sabriyati	UGM	Indonesia
26.	Prima Dinta Rahma Syam	UGM	Indonesia
27.	Muhammad Nurul Fahmi	PT. Bhumi Prasaja	Indonesia

3-3 List of Lectures

ATTENDENCE LIST

Lecture

Summer School

"Rapid Mapping Technique for Disaster Observation and Global Change Data Acquisition"

Date : Tuesday, 11 October 2016
Place : The Sahid Rich Hotel

No.	Name	Affiliation	Nationality	Sign
1.	Prof. Dr. Ir. Dewayany M.AppSc	ISRS chairperson	Indonesia	
2.	Prof. Dr.rer.nat Muh. Aris Marfa'i, M.Sc.	The Dean of Faculty of Geography	Indonesia	
3.	Prof. Dr. mazlan Bin Hashim	Universiti Technology Malaysia	Malaysia	
4.	Parwati, S.Si.	Indonesian National Institute of Aeronautics and space	Indonesia	
5.	Dr. Danang Sri Hadmoko	Gadjah Mada university	Indonesia	
6.	Prof. Peter Tian –Yuan Shih	National Chiao Tung university (NCU) NCTU	Thailand	Peter T. Y. Shih

ATTENDENCE LIST

Lecture

Summer School

"Rapid Mapping Technique for Disaster Observation and Global Change Data Acquisition"

Date : Wednesday, 12th October 2016
Place : The Rich Sahid Hotel, Yogyakarta

No.	Name	Affiliation	Nationality	Sign
1	Dr. Danang Sri Hadmoko	Gadjah Mada university	Indonesia	
2	Dr. Rahman Syaifoel	EuroUSC	Netherland	
3	Prof. Dr. Rongjun Qin	The Ohio State University	United States	
4	Prof. Peter Tian – Yuan Shih	National Chiao Tung University (NCTU)	Taiwan	Peter Shih

ATTENDENCE LIST

Lecture

Summer School

"Rapid Mapping Technique for Disaster Observation and Global Change Data Acquisition"

Date : Thursday, 13th October 2016
Place : The Rich Sahid Hotel, Yogyakarta

No.	Name	Affiliation	Nationality	Sign
1	Dr. Pramaditya Wicaksono	Gadjah Mada university	Indonesia	
2	Armaiki Yusmur, S.Si	Seameo Biotrop	Indonesia	
3	Marsudi Agung Wibowo	UeroMap	Indonesia	
4	Iwan Setiawan, S.Si., PM.	PT. Agrisoft Citra Buana	Indonesia	
5	Dr. Barandi Sapta Widartono	Gadjah Mada University	Indonesia	

3.4 Messages from participants

INDIVIDUAL EXTENDED REPORT

NAME	:	Arif Yudo Krisdianto, S.P.
AFFILIATION	:	West Papua Assessment Institute For Agricultural Technology – Ministry Of Agricultural
Address	:	Manokwari, Indonesia
T/F	:	+62 81344333722

First of all, I would like to thank you to Secretariat MAPIN and the Committee of Summer School in Jogjakarta for the opportunity that I have got that enrich my experience and give me new insights as well, especially when interacting with the participants and presenters from several scientific backgrounds.

Summer School with the main topic of Technique for Disaster Rapid Mapping Global Change Observation And Data Acquisition, has given me new insights on how to use spatial data for monitoring and supervising the condition of the earth's surface. The importance of spatial data to evaluate an area affected by a disaster was presented in this event. It is needed to see the impact of planning method to overcome the natural disaster. One technique that can be used to obtain spatial data quickly and effectively is by using a UAV (Unmanned Aerial Vehicle) or it is widely known as drone. The UAV can be used to get the data of aerial photographs of the area affected by the disaster quickly. Eventually, the time of processing the data to make decisions about the disaster can be done rapidly.

Additionally, the utilization of existing spatial data can also be used to study and predict disaster-prone areas. For example, the data SAR (Synthetic Aperture Radar) can be used to analyze the trend of disasters by looking at the landform changes that may occur at specific intervals. It will lead the decision-makers to make a proper regulation of the management technique and its utilization in an area to minimize potential future disasters.

Based on my opinion, I think there are some drawbacks of the materials presented in this event. There were several materials that less applicable and the methods were discussed slightly. However, in general much insight that I gained. To date, I can apply in my work location is the use of SAR data to estimate erosion on agricultural land. Furthermore, SAR data can also be used as one of the supporting data to make the use of the potential and development of agriculture in an area.

All in all, I would like to thank you for the great opportunity that has given to me. Hopefully, I would have another opportunity to participate in the next related events organized by the Secretariat Mapin.

INDIVIDUAL EXTENDED REPORT

NAME	:	Cecep Andritela Firdaus
AFFILIATION	:	LSTP MAPIN (*Professional Certification Institution for Remote Sensing and Geographical Information System Indonesian Society for Remote Sensing/PCI ISRS*)
Address	:	Jl. Intisari Raya no. 27, RT 02 RW 09, kel. Kalisari, kec. Pasar Rebo, Jaktim.
T/F	:	+62 878-7811-1716

I was excited and very grateful joining the event as the participant of this Summer School on Rapid Mapping Technique for Disaster Observation and Global Change Data Acquisition. This science is very useful to implement in my country, Indonesia. I would like to express my deep gratitude to Asia-Pacific Network for Global Change Research (APN) and Indonesian Society for Remote Sensing (ISRS).

As we know that, Indonesia is an archipelagic island country in South east Asia, lying between the Indian Ocean and the Pacific Ocean. It is in a strategic location along major sea lanes from Indian Ocean to Pacific Ocean. Most of the larger islands are mountainous, with peaks ranging between 3,000 and 3,800 metres (9,843 and 12,467 ft.) meters above sea level in Sumatra, Java, Bali, Lombok, Sulawesi, and Seram. Tectonically, Indonesia is highly unstable. It lies on the Pacific Ring of Fire where the Indo-Australian Plate and the Pacific Plate are pushed under the Eurasian plate where they melt at about 100 km deep. A string of volcanoes stretches from Sumatra to the Banda Sea. While the volcanic ash has resulted in fertile soils, it makes agricultural conditions unpredictable in some areas. A string of volcanoes runs through Sumatra, Java, Bali and Nusa Tenggara, and then loops around through to the Banda Islands of Maluku to northeastern Sulawesi. Of the 400 volcanoes, approximately 150 are active. Lying along the equator, Indonesia's climate tends to be relatively even year-round. Indonesia has two seasons—a wet season and a dry season—with no extremes of summer or winter. Indonesia's high population and rapid industrialization present serious environmental issues. Issues include large-scale deforestation (much of it illegal) and related wildfires causing heavy smog over parts of western Indonesia, Malaysia and Singapore; over- exploitation of marine resources; and many environmental problems. The geographical resources of the Indonesian archipelago have been exploited in ways that fall into consistent social and historical patterns. One cultural pattern consists of the formerly Indianized, rice-growing peasants in the valleys and plains of Sumatra, Java, and Bali. More marginal sector consists of the upland forest farming communities which exist by means of subsistence Sweden agriculture. To some degree, these patterns can be linked to the geographical resources themselves, with abundant shoreline, generally calm seas, and steady winds favoring the use of sailing vessels, and fertile valleys and plains—at least in the Greater Sunda Islands—permitting irrigated rice farming. The heavily forested, mountainous interior hinders overland communication by road or river, but fosters slash- and-burn agriculture

All of the circumstances imply the disasters in Indonesia. Indonesia has to cope with the constant risk of volcanic eruptions, earthquakes, floods and tsunamis. On several occasions during the last 15 years, Indonesia has made global headlines due to devastating natural disasters that resulted in the deaths of hundreds of thousands of human and animal lives, plus having a destructive effect on the land area (including infrastructure, and thus resulting in economic costs). Lastly, man-made natural disasters (such as forest fires caused by the traditional slash-and-burn culture, particularly on the islands Sumatra and Kalimantan) have far-reaching environmental consequences. One important remark is that the weak infrastructure development in Indonesia - which is the result of mismanagement, the lack of skills or corruption - in fact aggravates the devastating impact of a natural disaster. Meanwhile, in the urban centers of Indonesia, particularly the bigger cities such as Jakarta, Surabaya, Medan and Yogyakarta, there is an extremely high population density. Weak infrastructure and the high population density imply that natural disasters in Indonesia may cause more casualties than they should.

In the event of a natural disaster, remote sensing is a valuable source of spatial information and its utility has been proven on many occasions around the world. Remote sensing has proven useful for a range of applications including the detection of earthquakes, faulting, volcanic activity, landslides, flooding, wildfire, and the damages associated with each. Remote sensing is currently used operationally for some monitoring programs, though there are also difficulties associated with the rapid acquisition of data and provision of a robust product to emergency services as an end user. As the importance of good spatial data is becoming increasingly recognized, remote sensing in the field of hazard assessment and disaster management is likely to grow in the future. New earth observation satellites are continually being launched, recognizing the prospective market in disaster management, but the provision of acquired image data in a rapid response situation remains a challenge both technically and financially. There is also the potential for

INDIVIDUAL EXTENDED REPORT

NAME	:	EDGARDO G. MACATULAD
AFFILIATION	:	UNIVERSITY OF THE PHILIPPINES
Address	:	DILIMAN, QUEZON CITY 1101 PHILIPPINES
T/F	:	+63 2 981 8500 local 3124

The RapMet Summer school was a very good experience for me. I gained new knowledge as well as recalling old knowledge. I was able to learn how to better utilize Remote sensing (RS) technologies, specifically for disaster mapping and management. I learned the basics of UAV mapping and how this can further augment and complement the data obtained from satellite RS. I learned the different capabilities of RTKlib for GNSS processing. Aside from this, I was able to try other tools and software that can utilized for processing RS and UAV data for rapping mapping.

Another takeaway that I got from the summer school is that I was able to meet new people from other countries in Asia. I was able to get a small idea on the conditions of their countries particularly about disaster management through their sharing of experiences. I also got to see part of the culture of Indonesia, especially Yogyakarta. It was a pleasure to learn and meet new friends at the same time.

What I learned from the summer school I hope to apply in our methods for rapid mapping and disaster management. I am also already sharing some of the knowledge learned in one of my undergraduate class. I am hopeful that I will be able to propose researches in my institution that can further implement what I have gained from the summer school.

I am sincerely grateful to Prof. Dewayany Sutrisno, to all of the lecturers and facilitators of the summer school, and to everyone in Mapin ISRS. Thank you very much.

INDIVIDUAL EXTENDED REPORT

NAME	:	Elvira Isir
AFFILIATION	:	Disaster and Climate Change
Address	:	Jl. Jengki Kebon Pala Makassar
T/F	:	

There so many things I have learned from summer school. From all the knowledge that got, which I have made is in operating plane without crew, and transfer field result's data and analyze the data. The other object of the study which I do not understand because when the summer school came was not too good in my healthy. There so many materials that I could not understand, because the tour is too fast in explaining it, but I tried to re-read again the material slowly and finally I can understand. Until this time, the theory that I got did not apply yet because I must finish my work in flood potential mapping in several province and chosen regency. But first, I do apologize for this delays in sending this from and I apologize because I cannot do My paper job well.

INDIVIDUAL EXTENDED REPORT

NAME	:	Iksal Yanuarsyah
AFFILIATION	:	Geoinformatic Ibn Khaldun Unviersity
Address	:	Bogor
T/F	:	+62 813 8096 8113

I am very impressed and proud on the implementation of the summer school held by APN- MAPIN and have been somewhat of a turning point. Not only have I learnt new subjects but I have also acquired the skills to perceive new perspectives and make great friends with individuals from all around Asia.

It has been a motivating experience to learn from inspiring teachers about subjects that correlate to rapid mapping in disaster management. Through obtaining a fraction of their immaculate knowledge, I have been motivated as well as moved by their teaching. Revelation to subjects that I have never been exposed to within the walls of school curriculum have at times been challenging, but to me this emphasized the art of learning. The process of demystification of new subjects have sparked my personal interest and I am eager to learn more about these subjects in the future. Through the implementation of practical as well as intellectual methods of teaching, I have been able to learn more about the course in various stimulating approaches.

External excursions as well as the extensive choices of activities provided adequate time to form strong bonds with fellow students studying at the summer school. From visiting 'Banjarnegara' to fascinating experiences with 'Landslide Occurrences', I look back upon my two weeks in Jogjakarta college and wonder with amazement how even a single day could have been so eventful.

The diversity of different cultures merging together to develop into lifelong friendships, the price-less knowledge obtained through lectures and classroom discussions, and an overwhelming amount of fun that I have had as part of the course is something that I will remember for a long time. Attending the APN-MAPIN Summer School has been an opportunity that I am truly grateful for they catalyzed my own personal development.

I hope, the next summer school agenda could be held sophisticating.

INDIVIDUAL EXTENDED REPORT

NAME	:	Intareeya
AFFILIATION	:	Sutthivanich
Address	:	Suranaree University / Nakhon Ratchasima, Thailand
T/F	:	+66 44 223168//+66 44 223260/+66 92 2508855

I would like to express my profound thanks to Professor Dewayany Sutrino (ISRS/MAPIN) Chairperson, and all those committees and staffs of Summer School, who provided support, enthusiastic work environment and also a warm hospitality during the training program in Yogyakarta, Indonesia. I appreciated and honored the given opportunity to be one of the participants in the summer school training program.

The program provided me in doing a lot of project activities and I had gained more new experiences. The lectures and case studies from professors and specialists from various field of research were valuable and had broaden my knowledge and experience. The training program were well organized and provided meaningful of the field trip and UAVs field practices. I had shared, gained, exchanged and built new networks with participants from other countries in the area of remote sensing, GIS, UAVs, and other related fields. I will implement my new project with UAVs in soon, I really thankful for the knowledge that I obtained from the training program.

I also would like to extend my gratitude to all the participants, who came from different countries, including, Indonesia, Malaysia, Cambodia, Philippines, Myanmar, Brunei, Thailand, and etc. I enjoyed and had a good time with you all, especially warm friendship from Indonesian friends. Thank you so much and look forward to seeing you all again.

Best Regards,

Dr. Intareeya Sutthivanich Su-
ranaree University of Technology
Nakhon Ratchasima, 30000 Thailand

INDIVIDUAL EXTENDED REPORT

NAME	:	Manh Van Nguyen
AFFILIATION	:	Vietnam Academy of Science and technology – Institute of Geography.
Address	:	
T/F	:	

It is my great honor to be selected to join this Summer School 2017, organized by MA-PIN. I have learnt a lot of things during nearly a week training.

MAPIN provided us many experts as well as professor from many countries came to teach us. I am so interested in Radar Remote sensing, Fusion technique and how to use Drone in Applied Remote sensing, it is quite new to me.

After a week training in Indonesia, I know to apply Data Fusion to combine Optical and SAR remotely sensed image to improve the accuracy of the classification techniques, as on the ground, many features have the same reflected characters in Optical but different in Radar images.

Moreover, they showed me how to use Drones in natural hazard research, take to me the field trip to see the real happened hazard. Back to my country, I have presented this lecture again to my colleague. It is very impressive to them as the spatial resolution of the images taken by Drones is super high and its very useful to combine with the ground data.

Finally, I would like to express my sincerely thank to MAPIN and Professor De-wayany to organize this great summer school, thanks Prof. Dewayany to always take care of us very carefully.

I wish Prof. Dewayany and colleague always healthy and successful in life.

Student in summer school

Manh Van Nguyen

INDIVIDUAL EXTENDED REPORT

NAME	:	Mary Ruth Bongon
AFFILIATION	:	Bicol University
Address	:	Legazpi City, Albay, Philippines
T/F	:	(052)742-4234

The summer school basically is about rapid mapping technique for disaster application. It aims to create a rapid mapping tool with the use of near-real time imagery from satellite or UAV (unmanned aerial vehicle) for disaster risk reduction and response. During the summer school, we are taught on how to detect changes like landslide, drought, etc. using SAR. We are also taught how to use RTKLib, and how to use open-source software for the processing of aerial images, and lastly, we learned how to create a flight plan and data acquisition using a drone. To summarize it all, acquisition on near-real time imagery is highly a need most especially to the Asia-pacific region which suffers the most devastation from natural and man-made calamities due to global change.

Quantifying changes, the damages of the disaster and what type of response to the disaster that might happen, a rapid mapping technique is one of the most efficient way to do that using Remote sensing. It will not just save you time but also a lot of money for that. Once the system is developed for rapid mapping, any NGO can use that system to easily acquire information from the data available.

Researches, is one of the way that I can implement it to my home country. Philippines is one of the countries that is greatly affected by storms. With this, rapid mapping technique is a great tool that will benefit not only the government units and NGO's but also the inhabitants as well.

Trainings and seminars, by replicating what I learned from the summer school, can also be done, especially to our department where remote sensing is used as a tool in geodetic engineering profession. By this, not only I will be the one to know about rapid mapping, but also my colleagues as well. And they can also replicate it as well, so some will be aware about this technique.

PS
It was a great experience during the summer school. Looking forward to be part of the summer school again soon. Thank you for the opportunity you have given me. And by the way, Indonesia is a great country. It really looks and felt like my home, Philippines. Everyone is so hospitable and kind and smart. And the food tastes good too.

INDIVIDUAL EXTENDED REPORT

NAME	:	Muhammad Ikhwan Bin Jamaludin
AFFILIATION	:	none
Address	:	No. 9, Taman Tanjong Malim, Jalan Ketoyong, 35900 Tanjong Malim, Perak
T/F	:	

Assalamualaikum,

During the program, I learned about how a remote sensing application can assist in the disaster area management with the used of drone or UAV technology. This technology, which considerably still as a new technology can in monitoring possible disaster area. This also can improve response time for help and rescue team to plan and manage immediate actions.

Personally, I am impressed with the rate of adoption and efforts by MAPIN/ISRS in taking remote sensing and UAV technology up to a certain level, such as the introduction of Rapid Mapping Technique to be implemented in Indonesia. In addition, this technique is a very good technique, especially to be implemented in the ASEAN region, because we shared the same landform and morphology. A very good job I must say. Congratulation.

The best slot during the Summer School program is when we went for a visit to Banjanegara. It is an unforgettable memories and I'm very shocked to see how natural disaster changed the morphology of an area in split seconds, how natural disaster 'eat' hundreds of life at once, and also to learn possible indicators how natural disaster might happen.

For the past 3 to 4 months, as a lecturer (part-time) at the university, I'm always using the experienced that I learned in the Summer School Program as part of my lecture in my daily teaching. The experience that I got in the theoretical classes, site visit at Banjanegara, UAV demonstration and hands-on practical have given me a lot of ideas how to integrate it in my newly explored field, which is Tourism Planning.

Thanks you and Wassalam

INDIVIDUAL EXTENDED REPORT

NAME	:	Muhammad Ikhsan
AFFILIATION	:	Teuku Umar University
Address	:	Meulaboh, West Aceh
T/F	:	085362258099

During the summer school In Jogjakarta, I gain new experience in the science of remote sensing. Previously I studied only learn GIS.
In addition to the experience of remote sensing I also get a very precious thing that has a chance more acquainted with new friends from different countries who did their concentration in the field of remote sensing.

In addition to getting the theories about the application of remote sensing, in the summer school training is also simulated the operation of the drones and retrieval of data, and conducted field visits to locations that have occurred landslides, in Banjarnegara

Knowledge I had acquired in this training is also very beneficial in terms of the concentration of my knowledge, which also sometimes need these tools to collect data and analysis for research purposes in the future in my University, especially in studies related to disaster.

INDIVIDUAL EXTENDED REPORT

NAME	:	Mr. NHIEP Seila
AFFILIATION	:	Parliamentary Institute of Technology
Address	:	Phnom Penh, Cambodia
T/F	:	855 77 929263

Summer school had been provided me with plentiful knowledge such as global positioning system, remote sensing and geographic information system application. I had known how to control drone and use it to acquire the land surface needed in my study area. Furthermore, I am able to use free cloud SAR imagery vital to analyze flood and crop classification during cloudy and raining day.

Since arrived Phnom Penh, I could work with SAR image like sentinel 1A via SNAP software for flood detection. And I had also shared knowledge on drone with my friend working in the ministry of land management, urban planning and construction. Last but not least, I am recently curious to research on draught and flood risk map using SAR imagery which will contribute to food security analysis to some extent.

INDIVIDUAL EXTENDED REPORT

NAME	:	Nguyen Kim Anh
AFFILIATION	:	Researcher Institute of Vietnam Academy of Science and Technology PhD candidate, National Central University, Taiwan
Address	:	18 Hoang Quoc Viet, Cau Giay Hanoi, Vietnam
T/F	:	

Dear Organizer /Sponsors of Summer School,

First of all, thank a lot for organizing a great summer school where I obtained a solid experience about UAV and other remote sensing, GIS techniques of course presentation skills and expand social network with participants from South East Asia countries.

Here are my feel comments about the Summer School:
1. About the teachers, I would like to say they are so experience and very kind to guide us.
2. About the materials, they are so well prepared and distributed to all attendants. I love that.
3. About the organizers, this was the great summer school workshop that I have attended because the quality of food, room, and social activities are really nice.

I hope we will have more chances to attend this kind of workshop.

Thanks a lot.

Best regards
Kim Anh

INDIVIDUAL EXTENDED REPORT

NAME	:	Noordini binti Che'Man
AFFILIATION	:	Universiti Teknologi Malaysia (UTM)
Address	:	Department of Urban and Regional Planning, Faculty of Built Environment, Universiti Teknologi Malaysia, 81310 UTM Johor Bahru, Malaysia
T/F	:	

I'm very delighted because have been accepted to joined the Summer School in Yogyakarta from 10-17 October 2016. This summer school has given me a lot of experience, especially in terms of rapid mapping. This program has given me exposure to the techniques of use Remote Sensing, which can be applied for disaster management in Malaysia. I've enjoy all the presentations and hands-on activities which gave me a new knowledge in handling spatial data. The input form the speaker/lecturer are very beneficial for me to apply and share it with my colleague and students in UTM Malaysia. Other than that, some of the technique and software are freeware and can be applied for my research purposes.

The trip to Banjanegara and Dieng are such a great experience because the chance to see an actual place of disaster and historical area and also the practice of UAVs at site. Lastly, the chance to knowing new people from ASEAN and other country are something could not be missed. This program gave participants to extend their networking and form chance for future collaboration in this field. This summer school is a platform for gaining and sharing knowledge for disaster management in ASEAN. Hopefully I can get involve in other similar activities in the future. Thank you very much.

INDIVIDUAL EXTENDED REPORT

NAME	:	NURHAZWANA JUMAT
AFFILIATION	:	UNIVERSITI BRUNEI DARUSSALAM
Address	:	BRUNEI DARUSSALAM
T/F	:	

Coming from an Earth Sciences/Geology background, it was particularly a very interesting and invaluable experience for me. Prior to the summer school program, the only digital mapping technique I have learnt is the ArcGIS and the more simplified QGIS - generally used to map different bed rock units studied on the field. So being basically equipped with limited knowledge going into the RapMet Summer School, despite my relatively vast knowledge in natural disasters, I had a lot of expectations. There were many new learning points I discovered, and the summer school program taught me the whole concept of remote sensing and rapid mapping technique - from acquisition to processing to model prediction and analyses. Although my home country, Brunei Darussalam, have been blessed and sheltered from natural disasters (the latest disaster was the flash flood in 2009, and it was the first disaster in many years at that time), it was very beneficial for Bruneian youth like myself to learn from the other participants from various countries, particularly ASEAN members, and get involved in discussions with them. As I have touched, because natural disasters have not affected Brunei as much, there is lacking knowledge in disaster prediction and mitigation, and I am hoping to share my knowledge from the summer school program and spread awareness in the importance of being ready in the chance of a natural disaster. I would like to thank the organizers, committee and the great speakers at the RapMet Summer School program for such an indispensable learning experience.

INDIVIDUAL EXTENDED REPORT

NAME	:	RIM REACH
AFFILIATION	:	Spatial Planning at WWF-CAMBODIA
Address	:	#53, St 430, Khan Chamkar Mon, Phnom Penh, Cambodia.
T/F	:	+855 15 55 40 04

Dear Committees,

First of all, I would like to thank to committee for provided me a great chance to join summer school ‘rapid mapping technique for disaster observation and global change data acquisition’ at Indonesia.

This course, is very signification for responded to disaster impacted and global change. After summer school courses, I gain knowledge from summer school such as how to use UAV, generate data from UAV, Remote Sensing for disaster management, Photogrammetric processing, Climate Change, Web GIS, Open Source software etc.…

I used this knowledge for implemented to my home country such as provide a methodology for flood monitoring, processing to download satellite data, shared this knowledge to research thesis student, sharing data through web GIS, propose an idea for UAV flight regulation to municipal hall.

Especially, I had upgrade my knowledge in field GIS and Remote Sensing.

Finally, I felt delighted to join this summer school and many thanks to committees once again for great opportunity moreover I can build network in field GIS and Remote Sensing.

Please let me know if you need further information.

Thank you!!!

INDIVIDUAL EXTENDED REPORT

NAME	:	Tawee Chaipimonplin
AFFILIATION	:	Department of Geography, Faculty of Social Sciences, Chiang Mai University, Thailand
Address	:	
T/F	:	

I have had lots of experiences from this Summer School such as how to get information of GNSS, the processing of UAV images, Data fusion and WebGIS. I also have met many people who work in the same field from many countries and this is a good chance for future contribution of joining research.

In addition, after attending the summer school, I shown my students how to do the UAV's image processing and shared my experience what I had from the summer school also from the field trip of practice using UAV.

In my point of view, as I have been working on Artificial Neural Network Model for flood forecasting since 2010, it may be interesting topic for the next summer school.

INDIVIDUAL EXTENDED REPORT

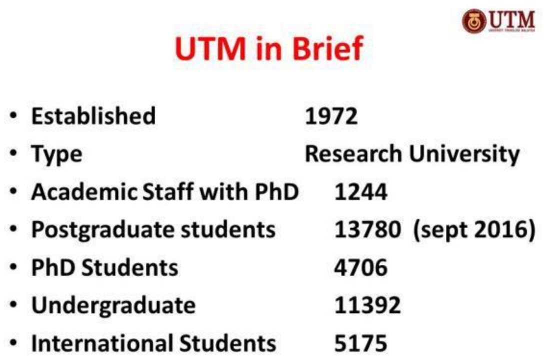
NAME	:	Prima Dinta Rahma Syam
AFFILIATION	:	Gadjah Mada University
Address	:	Widoro Bangunharjo Sewon Bantul Yogyakarta
T/F	:	+6285743211535

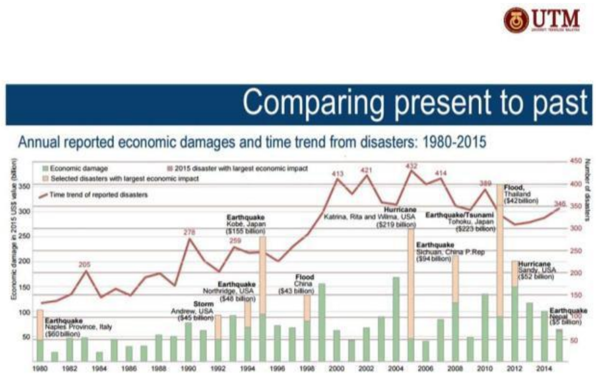
Summer School 2016 was given me so much experiences and knowledge. First of all I want to say thanks to the project team who gave me a very pleasant chance to join the first summer school of rapid mapping in Yogyakarta. Through this event I can learn many things about disaster. That can make me more aware about the condition around me. Where I live, what type of environment, what is the most potential hazards may intimidate our calmness. But it's okay, that's not about how vicious disaster caused people died, leave any psychologic syndrome to the children, ruin the public services, and even almost destroy everything. Not only earth itself, but also environment, people, and happiness. The earth is not always being a suspect when the natural disaster was come. Earth rotate with hazard itself as manifestation of physical condition. Then disaster can happen when hazards meet with high vulnerability and low capacity of the society. After I earn this concept then I am so amazed. After all this consequences of earth activity, as an only human we have to treat earth wisely and be enough firm to having a good capacity and low vulnerability to be broken by hazards, so disaster will not enough able to carry out the happiness of our live.

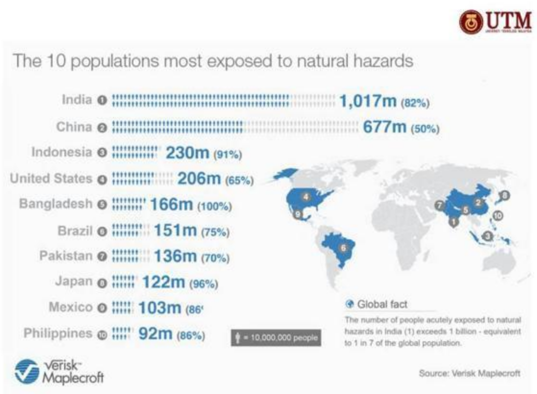
By studying rapid mapping technique in summer school as well, I can get many influences to prevent, encounter, and monitor the disaster, moreover in Indonesia where have so many hazards of natural disaster. Indonesia is just like a beautifully but threatened archipelago. That is why, many rapid methods must to be researched and improved effectively to reducing the risk of disaster. In summer school I began to know that disaster almost happened unexpectedly. Example in Banjarnegara, a huge mass of soil on the top layer of the hill was falling down burry people who live around the downside of the hill. Rainfall is a triggers factor which made the soil increased humidity and be overloaded, so then it slid. The landslide also caused by the slippery rock at the bottom of the soil as a sliding plane. It presented by Mr. Danang, researcher of PSBA UGM and it was very interesting. Another interesting thing that I really appreciate is how the technology evolve quickly. Technology can help people rapidly to observe the disaster situation (pre to post disaster). The real example is drone. Nowadays drone is an effective technique to reach many information rapidly about disaster. The innovation is always growing up, so rapid mapping technique for disaster will continuously revolute as well. Last but not least, in addition to knowledge and experience, I've got another sweet moment with my summer school friends from another country. We such a little happy family who meet rapidly, as the title of summer school. We have enjoyed the series, although in one part we have to disappointed to fail visit at Borobudur temple. But it's okay, as long as I can keep in touch with my dear summer school friend until today and so on. Or maybe if I get another pleasant chance, I can fly to meet them in their country to discuss again.

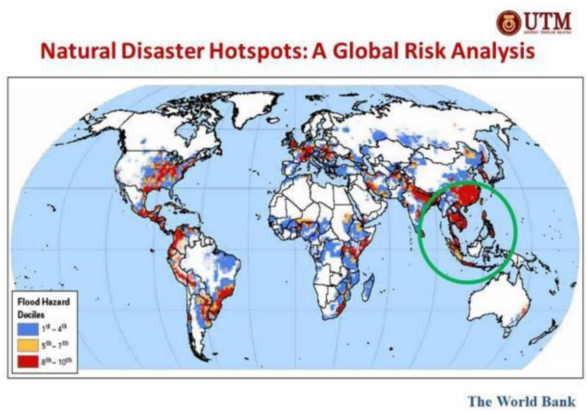
3-5. Lecture materials

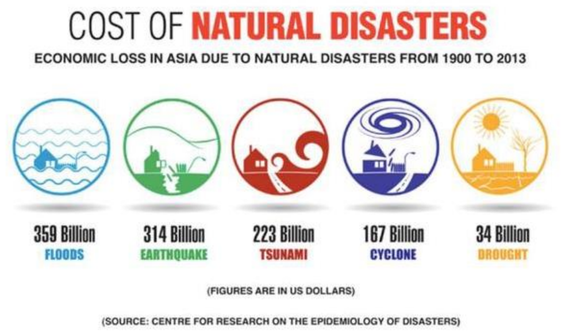
Lecture 1: RS for disaster management, Near real-time RS data for rapid mapping Technique: Prof. Mazlan bin hashim

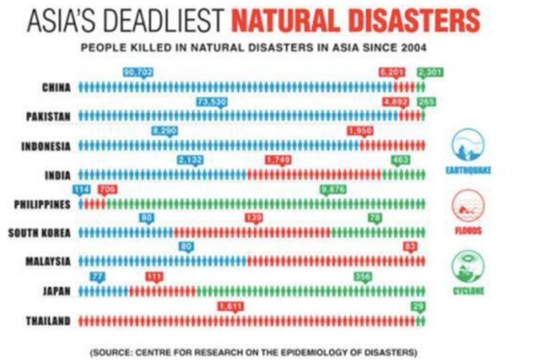












Why use for RS?

- Source of spatial and temporal information
  - land surface, oceans, atmosphere, ice
- Monitoring climate hazards
  - Practical with Satellite-based
- Systematic information - **accurate**, **timely**, **consistent** and **large** (spatial) scale
  - some historical data (60s/70s+) for Aerial photos and RS satellite images

Why use for RS (Cont'd) ?

- move to quantitative applications
  - data for climate (temperature, atmospheric gases, land surface, aerosols….)
- wide 'commercial' applications, and emerging of value-added applications
  - Weather, disaster monitoring, disaster management, Risk/susceptible mapping

But….

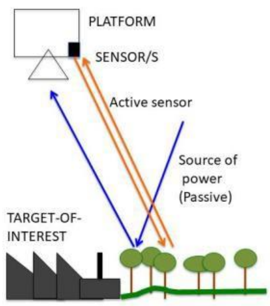
- **Remote sensing has various issues**
  - Can be expensive
  - Can be technically difficult
  - NOT Direct
    - measure surrogate variables
    - e.g. reflectance (%), brightness temperature ($Wm^{-2} \Rightarrow {}^oK$), backscatter (dB)
    - RELATE to other, more direct properties.

CONTENT

1. **Background**
   - Brief Related Theoretical Review
   - Remote Sensing (RS) Theory
   - Theoretical-related RS for disaster detection & management
     - Change Detection
     - Spatial and Spectral Changes
     - Changes Analyses
2. **Background on Natural Disasters, Economical Impacts, Global Risk Hot Spots**
3. **RS in Disaster Risk Management**
4. **Role of RS and GIS in Disaster Risk Management**
5. **Early Warning, Mitigation and Rescue**
6. **Summary**
   - Emerging Technologies and Disaster Lifecycle Phases
   - Emerging Technologies and Disaster Hazard Types
   - Toward Streamlined Intergration of Emerging Earth Science Technologies

Fundamental of Remote Sensing

- Definition - Remote sensing is the acquisition of data, "remotely" acquired without any physical contact
- **RS Process & System:**
  - **Source of Energy (active, passive)**
  - **Platform (satellite, airborne, UAV)**
  - **Sensor**
  - **Interaction of EMR**



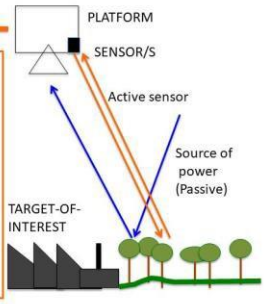
Fundamental of Remote Sensing (cont'd)

INFORMATION EXTRACTION

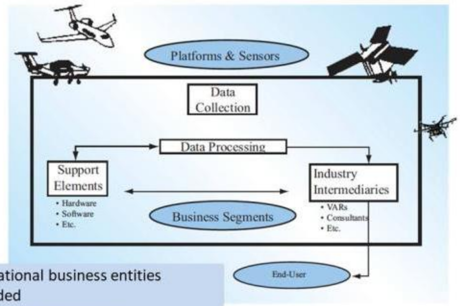
Data Preparation
- **Calibration of sensor/ radiometric**

Data Pre-processing
- **Radiometric Correction**
- **Geometric Correction**

Feature Extraction
- **Spectral features**
- **Spatial features**



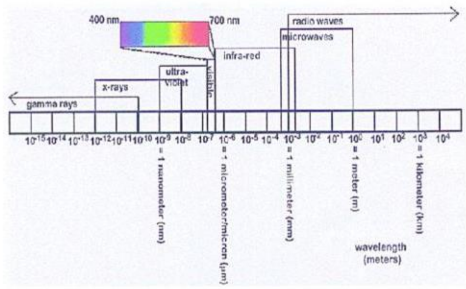
Fundamental RS - Operational



Operational business entities included

Source: mod after ASPRS 2015

Basic Concepts: EM Spectrum



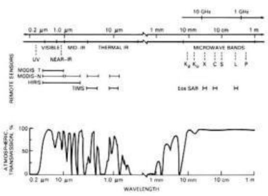
Sometime use frequency, $f=c/\lambda$, where $c=3x10^8$ m/s (speed of light)

λ 1 nm, 1mm, 1m

f $3x10^{17}$ Hz, $3x10^{11}$ Hz, $3x10^8$ Hz,

Basic Concepts: 1

- **Electromagnetic radiation**
- **wavelengths**, atmospheric windows
  - visible / near infrared ('optical') (400-700nm / 700-1500 nm)
  - thermal infrared (8.5-12.5 μm)
  - microwave (1mm-1m)



Basic Concepts: 2

- **Orbits**
  - geostationary (36 000 km altitude)
  - polar orbiting (200-1000 km altitude)
- **Spatial resolution**
  - 10s cm (??) - 100s km
  - determined by altitude of satellite (across track), altitude and speed (along track), viewing angle
- **Temporal Resolution**
  - minutes to days
  - NOAA (AVHRR), 12 hrs, 1km (1978+)
  - MODIS Terra/Aqua, 1-2days, 250m++
  - Landsat TM, 16 days, 30 m (1972+)
  - SPOT, 26(...) days, 10-20 m (1986+)
  - **revisit** depends on
    - latitude
    - sensor FOV, pointing
    - orbit (inclination, altitude)
    - cloud cover (for optical instruments)

Remote Sensing Platforms

- Satellites
  - Various orbits
- Airborne
  - High to low altitude
- Unmanned Vehicles
  - Drones, Heli-type, Roving
- High Platform
- Terrestrial Platform
- Close Range

Eg Satellite Programs

- Geostationary (Met satellites)
  - Meteosat (Europe)
  - GOES (US)
  - GMS (Japan)
  - INSAT (India)
- Polar Orbiting
  - SPOT (France)
  - NOAA (US)
  - ERS-1 & 2, Envisat (Europe)
  - ADEOS, JERS (Japan)
  - Radarsat (Canada)
  - EOS/NPOESS, Landat, NOAA (US)

Physical Basis

- measurement of EM radiation
  - scattered, reflected
- energy sources
  - Sun, Earth
  - artificial
- source properties
  - vary in intensity AND across wavelengths

EM radiation

- emitted, scattered or absorbed
- intrinsic properties (emission, scattering, absorption)
  - vary with wavelength
  - vary with physical / chemical properties
  - can vary with viewing angle

Data Acquisition

- RS instrument measures energy received
  - 3 useful areas of the spectrum:-

1) Visible / near / mid infrared

- **passive**
  - solar energy reflected by the surface
  - determine surface (spectral) reflectance
- **active**
  - LIDAR - active laser pulse
  - time delay (height)
  - induce florescence (chlorophyll)

2) Thermal infrared

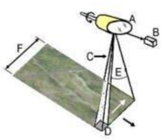
- energy measured - temperature of surface and emissivity

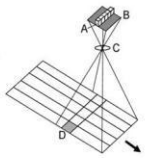
3) Microwave

- **active**
  - microwave pulse transmitted
  - measure amount scattered back
  - infer scattering
- **passive**
  - emitted energy at shorter end of microwave spectrum

Image Formation

- Photographic (visible / NIR, recorded on film, (near) instantaneous)
- *whiskbroom scanner*
  - visible / NIR / MIR / TIR
  - point sensor using rotating mirror, build up image as mirror scans
  - Landsat MSS, TM
- *Pushbroom scanner*
  - mainly visible / NIR
  - array of sensing elements (line) simultaneously, line by line
  - SPOT





Sensors can be flown by UAV

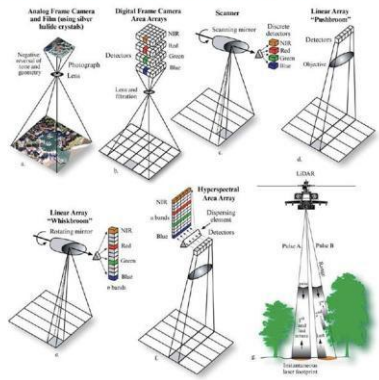
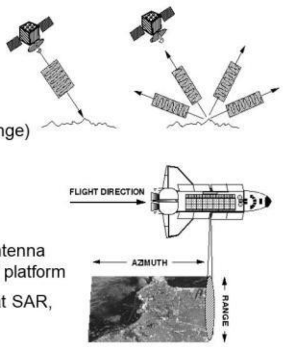


Image Formation: RADAR

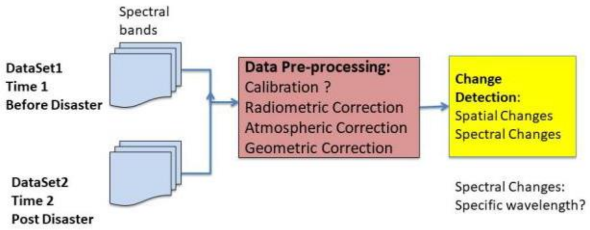
- real aperture radar
  - microwave
  - energy emitted across-track
  - return time measured (slant range)
  - amount of energy (scattering)
- synthetic aperture radar
  - microwave
  - higher resolution - extended antenna simulated by forward motion of platform
  - ERS-1, -2 SAR (AMI), Radarsat SAR, JERS SAR



Quantization: digital data

- received energy is a continuous signal (analogue)
- quantise (split) into discrete levels (digital)
- Recorded levels called digital number (DN)
- downloaded to receiving station when in view
- 'bits'...
  - 0-1 (1 bit), 0-255 (8 bits), 0-1023 (10 bits), 0-4095 (12 bit)...32bit
- quantization between upper and lower limits (dynamic range)
  - not necessarily linear
- DN in image converted back to meaningful energy measure through *calibration*
  - account for atmosphere, geometry, ...
- relate energy measure to intrinsic property (reflectance)

Theory - Remote Sensing for Disaster Applications

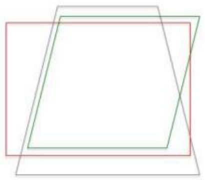


Spectral Changes:
Specific wavelength?

Spatial Changes:
Shape, Texture ?
Spatial Dependencies

Change Analysis (Rapid with UAV)

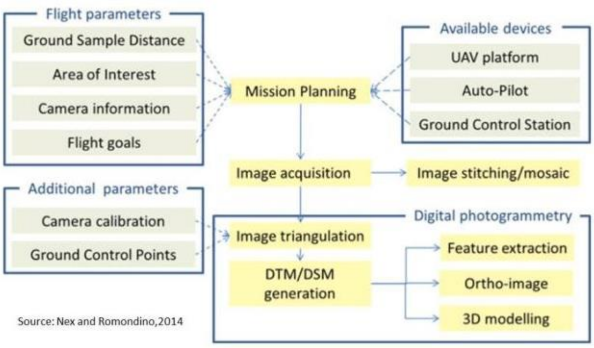
1. Spatial Changes



Minimise all Geometric Distortions
- Shape analysis, etc

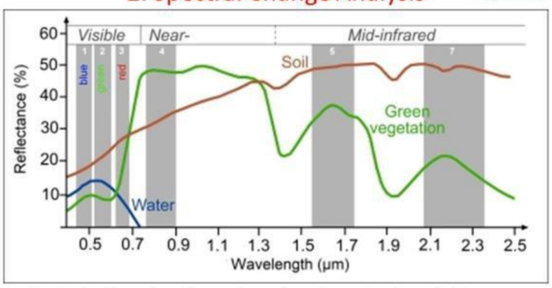
- Good GCP Configuration
- GSD & Flight Planning
- Camera Calibration
- Geometric Corrections
  - Image to map / site
  - Densification
  - Validation of sets
- Change detection
  - Spatial extraction algo ?

Typical data acquisition & related processing



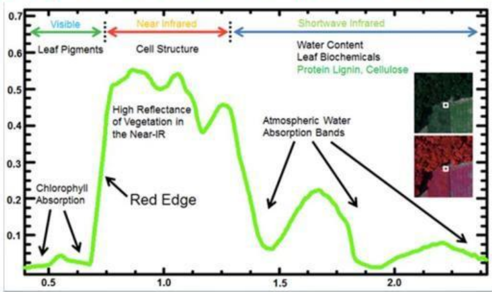
Source: Nex and Romondino, 2014

2. Spectral Change Analysis



- Understand your targets requirements and wavelength available
- Ensure relative and absolute requirement for target analysis
- Fast-approach spectral calibartion

Eg Veg-related classes with spectral responses



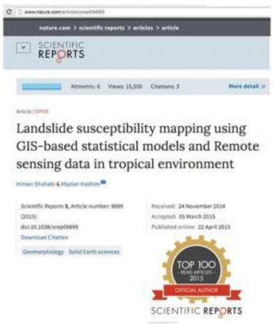
Selection of few bands for appropriate application with input of multiple/few bands pending availability, eg use of Indices

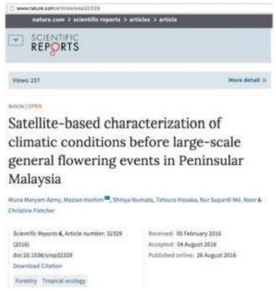
1. Anthocyanin Reflectance Index 1
2. Anthocyanin Reflectance Index 2
3. Atmospherically Resistant Vegetation Index
4. Burn Area Index
5. Carotenoid Reflectance Index 1
6. Carotenoid Reflectance Index 2
7. Cellulose Absorption Index
8. Difference Vegetation Index
9. Enhanced Vegetation Index
10. Global Environmental Monitoring Index
11. Green Atmospherically Resistant Index
12. Green Difference Vegetation Index
13. Green Normalized Difference Vegetation Index
14. Green Ratio Vegetation Index
15. Green Vegetation Index
16. Infrared Percentage Vegetation Index
17. Leaf Area Index
18. Modified Chlorophyll Absorption Ratio Index
19. Modified Chlorophyll Absorption Ratio Index - Improved
20. Modified Non-Linear Index
21. Modified Normalized Difference Water Index
22. Modified Red Edge Normalized Difference Vegetation Index
23. Modified Red Edge Simple Ratio
24. Modified Simple Ratio
25. Modified Triangular Vegetation Index
26. Modified Triangular Vegetation Index - Improved
27. Moisture Stress Index
28. Non-Linear Index
29. Normalized Burn Ratio
30. Normalized Burn Ratio Thermal 1
31. Normalized Difference Built-Up Index
32. Normalized Difference Infrared Index
33. Normalized Difference Lignin Index

31. Normalized Difference Mud Index
32. Normalized Difference Nitrogen Index
33. Normalized Difference Snow Index
34. Normalized Difference Vegetation Index
35. Normalized Difference Water Index
36. Normalized Multiband Drought Index
37. Optimized Soil Adjusted Vegetation Index
38. Photochemical Reflectance Index
39. Plant Senescence Reflectance Index
40. Red Edge Normalized Difference Vegetation Index
41. Red Edge Position Index
42. Red Green Ratio Index
43. Renormalized Difference Vegetation Index
44. Simple Ratio
45. Soil Adjusted Vegetation Index
46. Structure Insensitive Pigment Index
47. Sum Green Index
48. Transformed Chlorophyll Absorption Reflectance Index
49. Transformed Difference Vegetation Index
50. Triangular Vegetation Index
51. Visible Atmospherically Resistant Index
52. Vogelmann Red Edge Index 1
53. Vogelmann Red Edge Index 2
54. Water Band Index
55. WorldView Built-Up Index
56. WorldView Improved Vegetative Index

Eg Previous Experience

Bigger Scientific Output

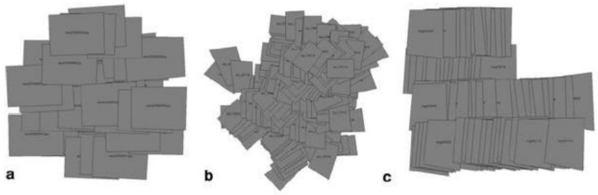




RS for rapid mapping ?

1. Rapid Data Acquisition
   – Use only appropriate sensor
   – Spatial or Spectral or Both?
   – Flight limitation?
2. Previous Available Archived Data
   – Number of historical data sets?
3. **Flight Planning**
   – All site-parameters, external parameters considered
   – Pre-signalised targets?
   – Data requirement/format, etc
4. **Data Calibration**
   – Robust /fast technique
   – Inputs/output, be specifics
5. **Feature Extraction**
   – Operational method/wide-used by end-users for further analysis

Rapid data acquisition with UAV



Different modalities of the flight execution delivering different image block's quality: **a** manual mode and image acquisition with a scheduled interval, **b** low-cost navigation system with possible waypoints but irregular image overlap, and **c** automated flying and acquisition mode achieved with a high quality navigation system

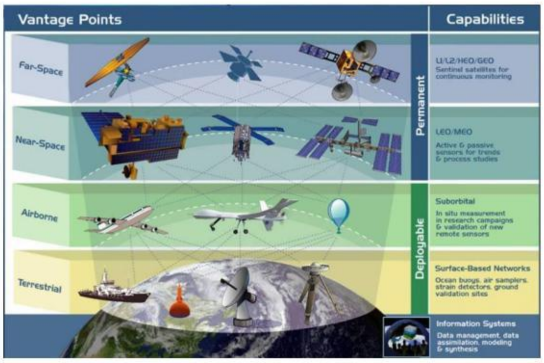
Source: Nex and Romondino,2014

EXAMPLES OF PREVIOUS STUDIES – RS & GIS FOR DISASTER MANAGEMENT

Role of Remote Sensing & GIS in Disaster Management

- During the last decades remote sensing (RS) has become an operational tool in the disaster preparedness and warning phases for cyclones, droughts and floods, due to their speedy reach and coverage.
- RS satellites have different types of sensors on-board, such as, panchromatic, multispectral, infrared and thermal. All these sensors have applications in disaster mitigation, though depending on the electromagnetic characteristics of the objects on Earth and the nature of disaster itself.
- For example, thermal sensors capture fire hazards, infrared sensors are more suitable for floods and microwave sensors can record soil moisture. Nearly all kinds of disasters, such as, earthquake, volcano, tsunami, forest fire, hurricane and floods can be remotely sensed using RS satellites.

Role of Remote Sensing in Disaster Management

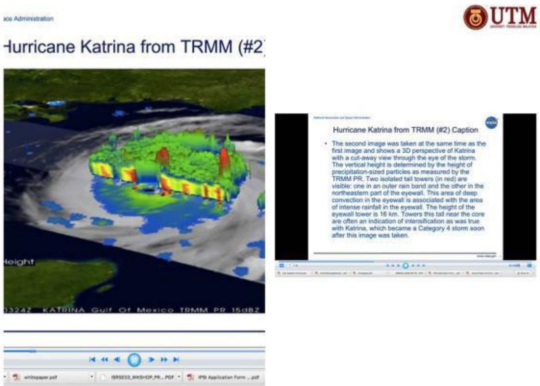


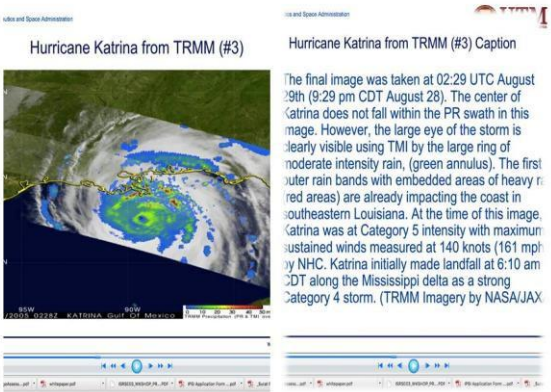
Uses of RS for disaster Management

- Models for Hazard and risk of tsunamis, hurricanes, earthquakes and disease outbreaks
- RS-based early warning systems for natural disasters such as tsunamis, hurricanes, earthquake, floods, etc.
- Satellite and/or airborne and/or UAV observations of extreme natural events in supports of disaster response
- Damage assessment using satellite or other platforms (airborne, UAV).
- Damage and loss estimation

Eg hurricane Katrina 2005

- Began as tropical depression in central Bahamas afternoon of 23 Aug 2005. Made landfall along SE coast of Florida evening of 25th as category 1
- Regained hurricane status emerging in Gulf of Mexico becoming Category 1 in Gulf were favorable for Katrina to Intensity
- Evening 26th, Katrina was Category 2 storm and continued ro move slowly W-SW in southwestern Gulf of Mexico
- Morning of 27th, Katrina become Category 3 storm with maximum sustained winds of 115mph





Uses of RS for Disaster Management

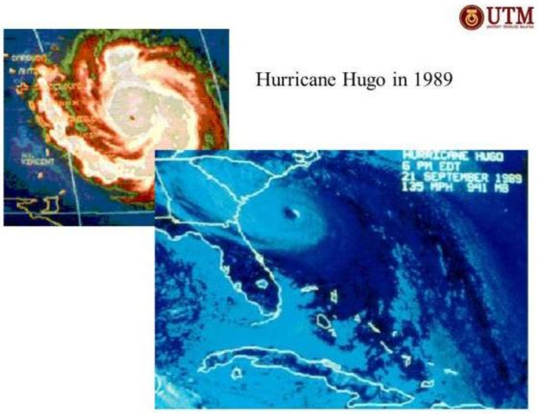
Extreme Weather

Many natural disasters result from extreme weather events such as hurricanes, typhoons and cyclones.

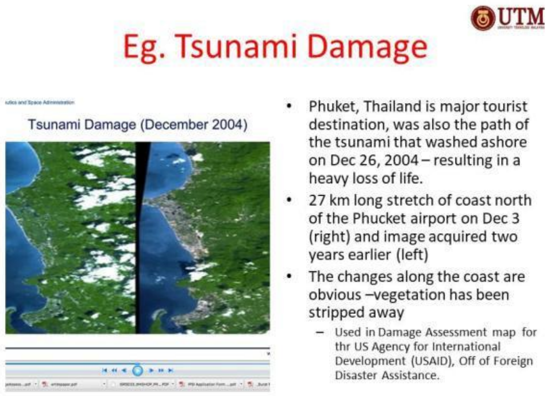
These meteorological phenomena are typically large-scale and can be seen from space.

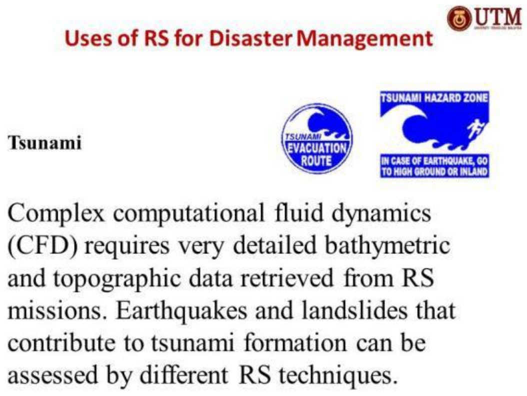
Satellites allow us to track these phenomena, determine the likelihood of them affecting human population and hence undertake mitigation activities.

The role of remote sensing for support of "geoengineering" activities for mitigation is discussed by Bauer *et al*. 1999



Hurricane Hugo in 1989





QuickBird used extensively throughout Asian Tsunami Disaster

QuickBird used extensively throughout Asian Tsunami Disaster

QuickBird used extensively throughout Asian Tsunami Disaster

QuickBird used extensively throughout Asian Tsunami Disaster

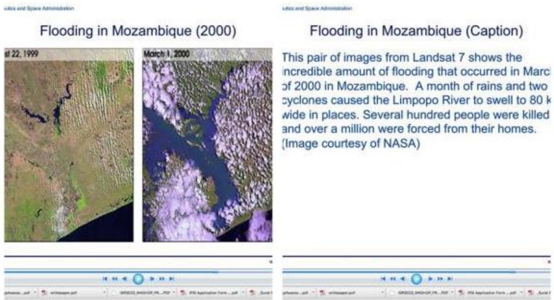
QuickBird used extensively throughout Asian Tsunami Disaster

QuickBird used extensively throughout Asian Tsunami Disaster

Malaria Mapping in Belize

- Landsat TM image of San Pedro, Belize – showing the distribution of malaria cases in the area.
- Yellow and orange dots show where most outbreaks occurred per household.
- Red- vegetation in false IR color composite, surrounding the countryside
- Human settlements and roads are in light blue

Flooding in Mozambique



Role of RS in Disaster Prevention

RS data can be effectively utilized to undertake the following measures for disaster prevention:

- **Floods & Land sliding**
  - ✓ Asses coastal resources including mangrove forests, salt pans
  - ✓ Environmental impact assessment in the fragile ecosystems
  - ✓ Monitor rapid processes of erosion, sedimentation
  - ✓ Map coastal configuration, bathymetry, navigation channels and landforms
  - ✓ Crop area estimation
  - ✓ Crop yield and production forecasting and estimation
  - ✓ Monitor areal extent of snow cover
  - ✓ Estimation of snowmelt & rainfall runoff
  - ✓ Study indicators related to glacial hazards
  - ✓ Development of regional glacier database

Uses of RS for Disaster Management

Flooding

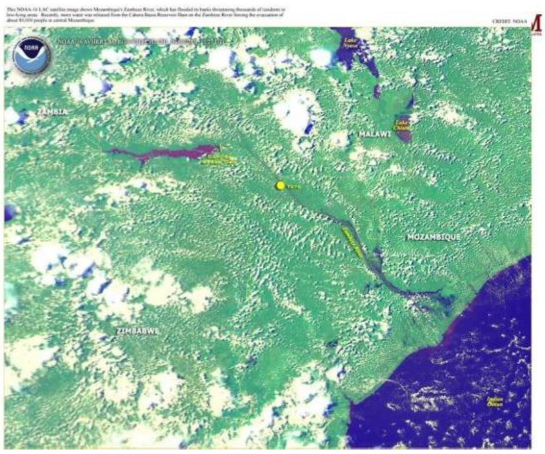
Floods are easily seen from RS platform - particularly over very large areas. Sometimes the view of the ground can be obscured by clouds - not a problem if the flooding was due to a large storm system

Uses of RS for Disaster Management

Flooding

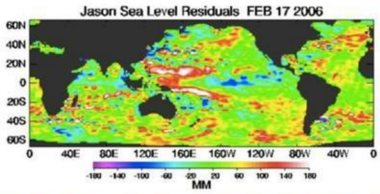
A combination of both optical and radar remote sensing can provide a model for estimating likelihood of floodplain inundation
(Townsend and Walsh, 1998)

Often, detailed hydrological models are as important as the RS data to estimate risk and undertake effective post-disaster management



National Aeronautics and Space Administration

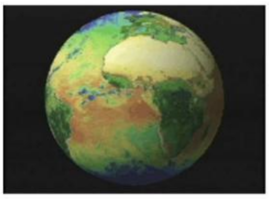
Jason Measurement of Sea Surface Height



Jason-1 continues to provide uninterrupted time-series that originated with TOPEX/Poseidon. Jason is using radar altimetry to collect sea surface height data of the oceans.

Climate-changed Disasters

Sea Surface Temperature



Land: green pixels show where foliage is being produced due to photosynthesis; tan pixels show little or no productivity. Ocean: red pixels show warmer surface temperatures, while yellows and greens are intermediate values, and blue pixels show cold water.

Credit: MODIS Instrument Team, NASA Goddard Space Flight Center. Animation produced using 8-day composite of MODIS data acquired daily over whole globe during first week in April 2000.

Role of RS in Disaster Prevention (cont'd)

- **Earthquake**
  - ✓ Identification of regional structural trends ,folds, major faults, lineaments and fracture zones
  - ✓ Distinguish, classify and analyze landforms of variegated origin at the crust of earth
  - ✓ Study and monitor the modification of landforms
  - ✓ Prepare maps of land forms and terrain for detailed analysis
- **Forest Fire**
  - ✓ Classify forest resources extending to inaccessible areas
- **Drought**
  - ✓ Monitor desert encroachment, overgrazing and depletion in biomass

Role of RS in Disaster Prevention (cont'd)

- **Infrastructure Planning**
  - ✓ Locate appropriate sites for dams, bridges and airfields
  - ✓ Select suitable land corridors for railway, highway and pipeline routes
  - ✓ Identify sites for locating coastal infrastructure, beach development and harbors
  - ✓ Analyze dynamic nature of stream erosion, deposition and course change to design flood protection bunds
  - ✓ Infrastructure mapping through satellite technology

Role of Remote Sensing in Disaster Preparedness

- High resolution satellite data serve to show potential changes that might occur between the acquisition dates before and after disasters. High-resolution satellite imagery offers possibilities for the earthquake damage assessment and, thus, multidisciplinary approach combining remote sensing techniques, spatial analysis and terrain knowledge
- Current, accurate information such as of hospitals and health centers, schools, governmental buildings, police and fire stations, industrial buildings, and gas stations, is important for emergency planning and response measurements. Actual satellite data contribute to this task.

Roads Susceptible to Flooding

Location study: accessibility for ambulance, fire brigade, police etc

Planning of Evacuation Routes

Role of Remote Sensing in Disaster Relief

- **Disaster Relief, Rehabilitation and Reconstruction**
  - ✓ RS technology plays vital role in both the immediate relief and long-term development phases of disaster relief/rehab and Reconstruction.
  - ✓ Satellite imagery assists in estimating the damaged infrastructure and analyzing the severity of vital services required to any community, undertaking detailed damage need assessments and urban development planning.

Uses of RS for Disaster Management

Fires

- Fire detection by RS provides a highly efficient means of detecting and eradicating forest fires without large numbers of ground-based workers
- Thermal infrared imagery shows "hotspots" that may be distinguished from clouds of similar albedo

Uses of RS for Disaster Management

Fires

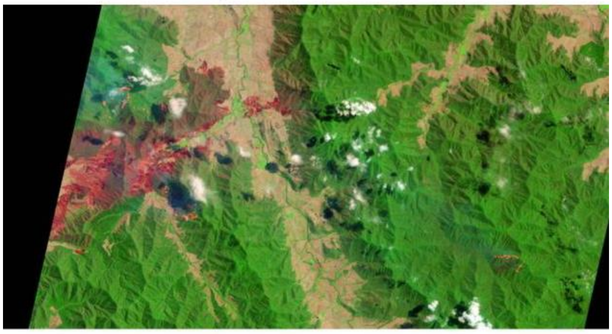
A fire detection and management system should have the following aims:

- A measure of the geographical limits of the fire-front
- An estimate of fire intensity
- Monitoring of burnt area to look for latent fires
- Mapping of burnt areas to aid restoration

(Barducci *et al*. 2002)

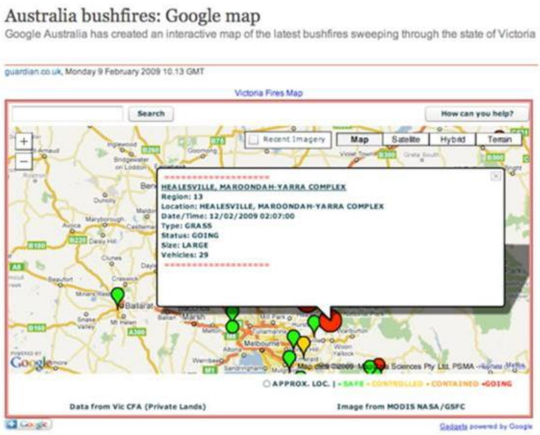
S.E Australian Fires February 2009
NASA Earth Observatory
http://earthobservatory.nasa.gov/NaturalHazards/

S.E Australian Fires (10th February 2009)
NASA Earth Observatory
http://earthobservatory.nasa.gov/NaturalHazards/



From the Advanced Land Imager on NASA's Earth Observing-1 satellite

Thermal Infrared (TIR) analysis of scene showing hot anomalies



Uses of RS for Disaster Management

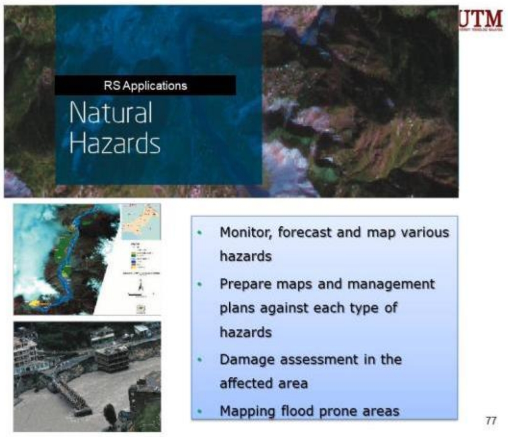
Earthquakes

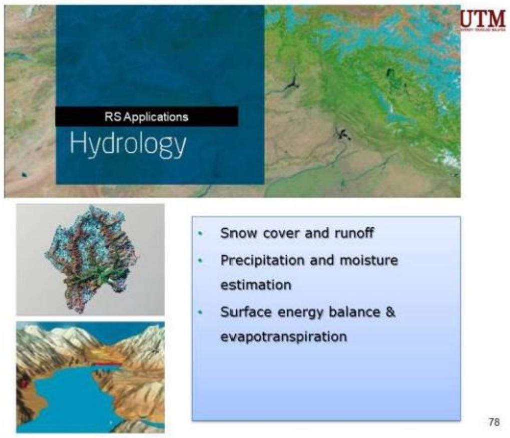
The aftermath of an earthquake is clearly highly visible from space using high resolution satellites and aerial photography

Detailed image analysis can assist ground crews to locations where electrical pylons, ruptured gas/oil pipes or urban fires require immediate attention.

(See Wu *et al*. 2000)

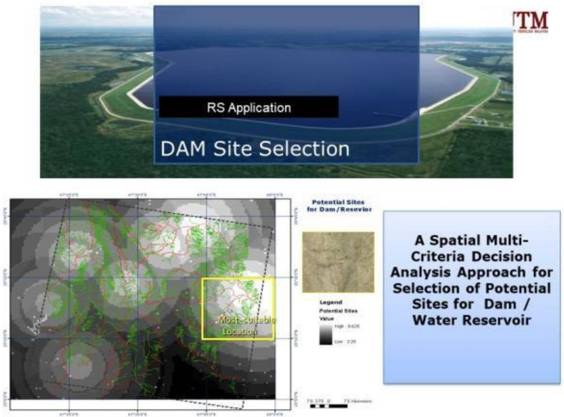
Chernobyl reactor disaster

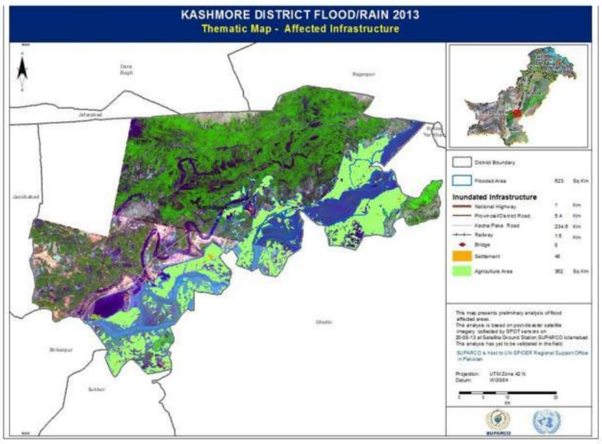

UTM
RS Applications
Natural Hazards
Monitor, forecast and map various hazards
Prepare maps and management plans against each type of hazards
Damage assessment in the affected area
Mapping flood prone areas
77


UTM
RS Applications
Hydrology
Snow cover and runoff
Precipitation and moisture estimation
Surface energy balance & evapotranspiration
78

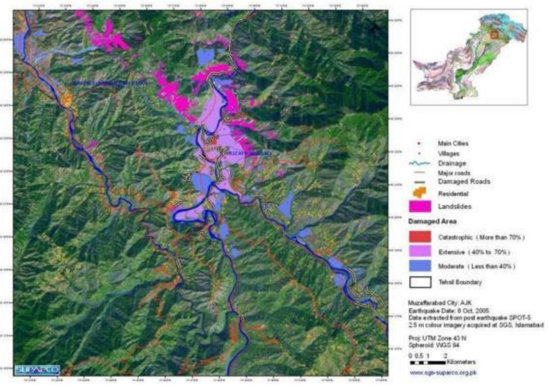

UTM
RS Application
Coastal Zones
Assess coastal resources
Environment impact assessment
Erosion/sedimentation monitoring
Mapping of coastal configuration, navigation channels and landforms
79


UTM
RS Application
Glaciology
Temporal Variations of Batura Glacier
Estimation of variations in glaciers size through historical satellite data
Studying of indicators related to glacial hazards
Development of regional glacier database
80

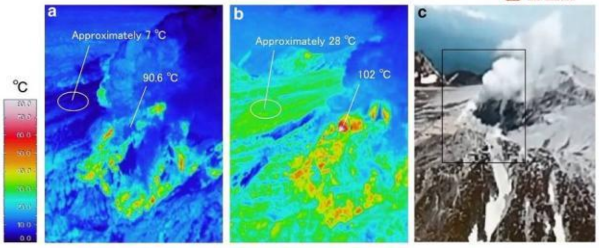

UTM
RS Application
DAM Site Selection
Potential Sites for Dam/Reservoir
A Spatial Multi-Criteria Decision Analysis Approach for Selection of Potential Sites for Dam / Water Reservoir


KASHMORE DISTRICT FLOOD/RAIN 2013
Thematic Map - Affected Infrastructure
Inundated Infrastructure

Rapid Damage Assessment Earthquake 2005



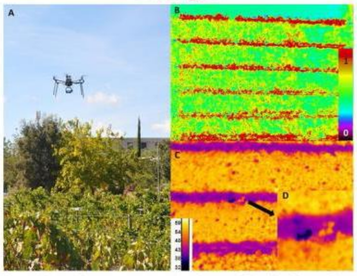
Volcanos



Thermal images of the vent area in Jigokudani observed during the UAV flights on November 21, 2014, (a) and on June 2, 2015 (b). The temperature color scaleis indicated on the left. The white ellipse in (a) and (b) indicates the background temperature of each day. Locations of
the maximum temperatures are also indicated. (c) is a visible image of the summit area. The inset corresponds to the viewing field of the thermal images (a) and (b)

Mori et al. 2016

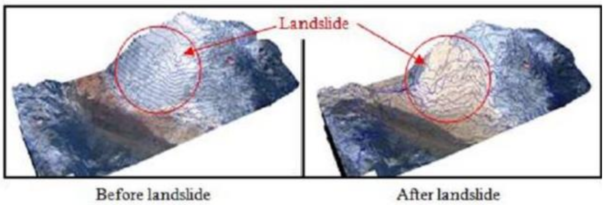
Drought



(A) UAV-AirSci carbon fiber frame customized specifically for scientific purposes by UAVEurope® flying above the experimental
vineyard of the University of Balearic Islands (Spain), (B) index aerial false color image mosaick composition, (C) vineyard false color aerial thermal image composition, (D) detail of the dry and wet artificial leaf references.

Gago et al. 2015

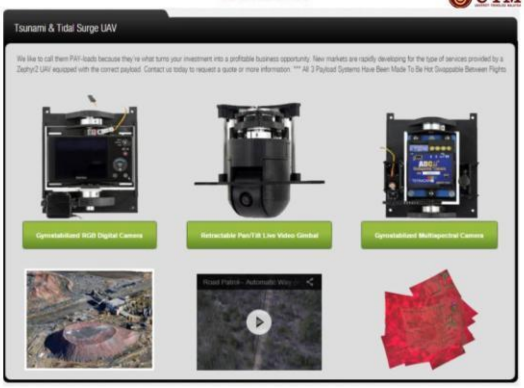
Landslide



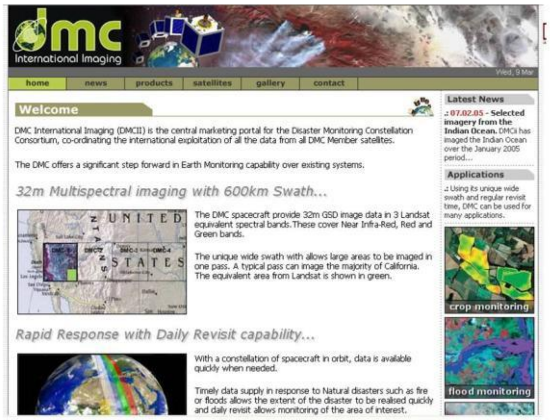
UAV technology for low-cost landslide mapping

Tahar et al. 2011

Tsunamis



http://www.marcusuav.com/tsunami-tidal-surge-monitoring-uav/



NEW Disaster Monitoring Constellation: http://www.dmcii.com/

RS in Disaster Management

RS was used for assist National Disaster Management Agencies during all the phases of disaster cycle.

- ✓ Early warning /Contingency planning
- ✓ Rescue/Relief
- ✓ Early Recovery
- ✓ Reconstruction & Rehabilitation

Disaster Management

Enterprise Viewpoint

- **Scope & purpose based on**
  - Disaster Management Task
  - Country-specific Strategic Targets
- **Consistent with ICT principles**
  - System of Systems
  - Data Sharing Principles
  - Interoperability Arrangements
- **Lifecycle phases**
  - Mitigation • Warning
  - Response • Recovery
- **Hazard types**
  - Flooding • Earthquakes • Volcanoes
  - Drought • Windstorms • Landslides
  - Wildfires • Tsunamis

Uses of RS for Disaster Management

Uses of RS for Disaster Management

PLANNING

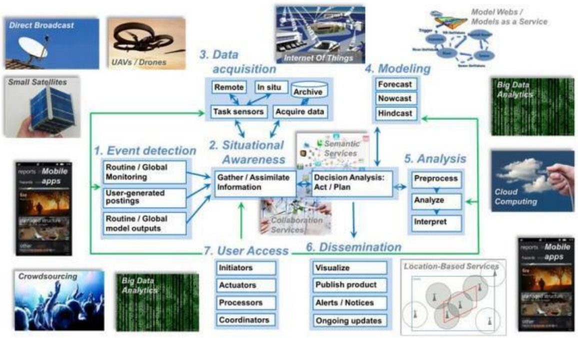
Modelling
Assessment
Prediction
Contingency

MITIGATION

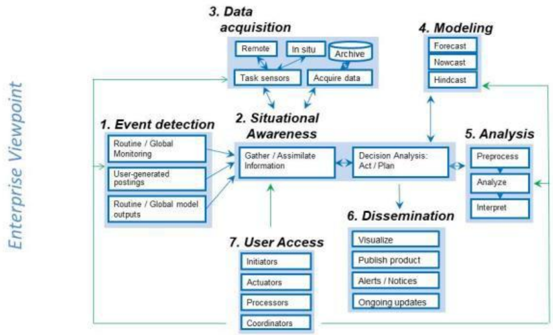
Monitoring situations
Deployment of resources
Decision-making
Public relations

COST EFFECTIVENESS !!!

Disaster Risk Management Activities and RS Technologies



Activities (business processes)



Post Disaster Risk Management

- Planning and execution of response action
- Role of geospatial information
- Disaster mapping
  - Nation-wide mapping: Flood susceptible mapping; landslide risk; tsunami + earthquake.

Natural Disaster Mapping Requirements

- Real time/Rapid processing
- High temporal resolution
- High detail/spatial resolution
- Automated processes

RS in Disaster Management

✓Provision of weather forecasts through Met Depts (weather satellites)

Rainfall estimation, medium and long term forecast for rains, cyclones, Tsunami, etc

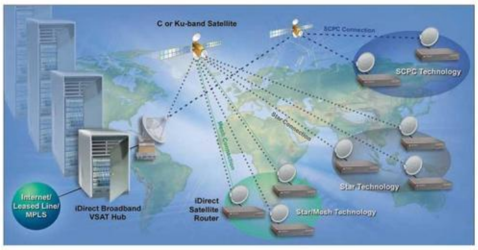
GOES-8 An American Weather Satellite

Space Aid in Disaster Management (cont'd)

- Spatial coverage of disaster events through Earth Observation Satellites.
  - ✓Restrictions / Limitations?
- Monitoring extent of disaster, synoptic and repetitive coverage of disaster stricken areas, estimation of damages and loss assessment and assistance in spatial planning for reconstruction and rehabilitation and hazard risks zonation

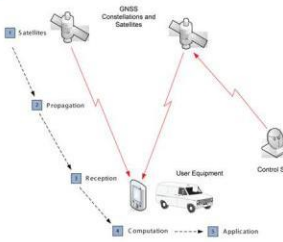
RS in Disaster Management (cont'd)

✓Provide/facilitate emergency communication services during disaster through (communication satellites)



RS in Disaster Management (cont'd)

- Location based services /crowd source mapping through (Constellation of Navigational satellites-GNSS)



RS in Disaster Management (cont'd)

- Develop mechanisms to allow humanitarian agencies to get access to the maps/images for emergency response (Geo-portals etc)

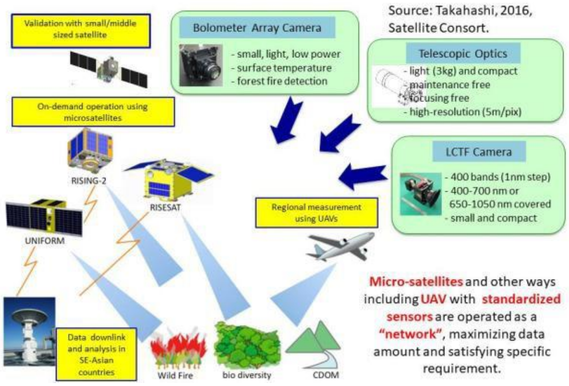
Satellite Aided Search and Rescue Program (COSPAS-SARSAT)

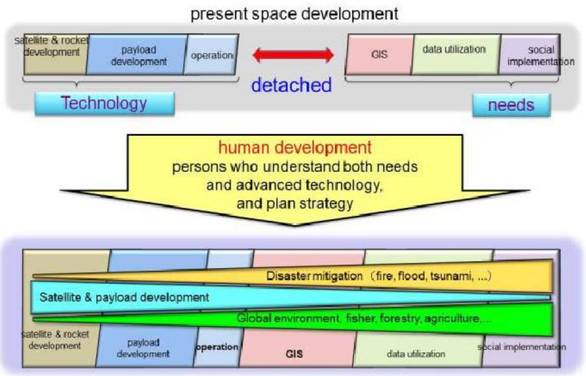
RS in Disaster Management (cont'd)

✓Real time data for research studies on climate change variables using (space based scientific missions)

Megha-Tropiques is a satellite mission to study the water cycle in the tropical atmosphere in the context of climate change[]. A collaborative effort between Indian Space Research Organization (ISRO) and French Centre National d'Etudes Spatiales (CNES), Megha-Tropiques was successfully deployed into orbit by a PSLV rocket in October 2011.

Start-up of "the world first" ***Smart Remote Sensing***





Source: Takahashi, 2016, Satellite Consort.

Asian Micro-satellite Consortium

to maximize the efficiency of space use, sharing data, toward the **super-constellation** realizing real-time monitoring

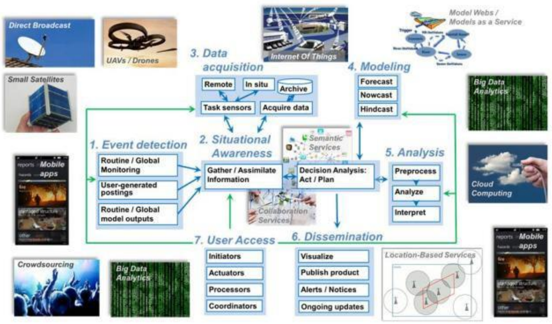
- sharing data, technology, and application
- standardizing sensor and operation system
- establishing ground validation

- involving 9 countries in Asia
- under signing by representatives of 11 institutes

Source: Takahashi, 2016, Satellite Consort.

Way forward

Disaster Risk Management Activities and RS Technologies



Emerging Technologies and Disaster Lifecycle Phases

Technology	Warning	Response	Recovery	Mitigation
SmallSats	•			•
CubeSats	•			•
Drones		•	•	
Internet of Things	•			•
Interoperating Mesonets	•			•
Crowdsourcing	•	•		
Location Based Services	•	•		
Cloud Computing		•	•	
Big Data Analytics	•	•		•
Model Webs / MaaS	•		•	•
Semantic Services	•	•		•
Collaboration Services	•	•	•	
Satellite Direct Broadcast	•	•		
New Sensor types	•	•		•

Emerging Technologies and Hazard types

Technology	Floods	Earth-quakes	Volca-noes	Droughts	Wind-storms	Land-slides	Wild-fires	Tsuna-mis
SmallSats	•		•	•		•	•	•
CubeSats	•		•	•		•	•	•
Drones	•		•		•	•	•	•
Internet of Things		•	•					•
Interop. Mesonets	•			•	•		•	
Crowdsourcing	•	•	•				•	•
Location Based Svcs.	•	•	•		•	•	•	•
Cloud Computing	•	•	•		•	•		•
Big Data Analytics	•	•	•		•	•		•
Model Webs / MaaS	•	•	•		•	•	•	•
Semantic Services								
Collaboration Svcs.								
Sat. Direct Broadcast	•		•		•		•	•
New Sensor types			•					

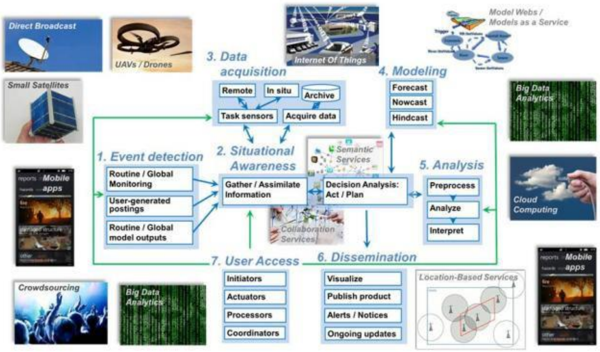
Preliminary sketch

Towards streamlined integration of emerging earth science technologies

- Architectural viewpoints
  - Articulate broadly-defined goals and practices
    - Get beyond *ad hoc* arrangements and current practice
  - Clarify data / analysis / communication needs
    - Semantic content & file / stream formats
    - Behavior & services / system interactions / interfaces
  - Facilitate building flexible, sustainable capability
- Open industry standards
    - E.g., OGC SensorML (StarFL?), SOS, W*S, etc.; also IOOS, etc.
    - E.g., Eucalyptus, OpenStack, MapReduce, …?
  - Alleviate vendor lock-in; allow creative repurposing
  - Pace of tech. adoption > pace of consensus processes

RELATED TECHNOLOGIES TO REMOTE SENSING FOR DISASTER MANAGEMENT

Disaster Risk Management Activities and RS Technologies



CubeSats

- Examples
  - Planet Labs "Dove" constellation
  - Surrey STRaND-1 CubeSat

Unmanned Aerial Systems (drones)

Unmanned Aerial Systems (drones)

Change Mapping	Disaster Risk Management	Disaster Risk Mitigation	Illegal Activity	Monitoring
River erosion	Flooding risk	Map impacted areas	Poaching	Migration patterns
Deforestation	Landslide risk	Broadcast messages	Illegal fishing	Endangered species status
Urban expansion	Volcano eruption risk	Monitor forest fire spread	Illegal trade	Agriculture

"Eco-drone" applications (per UNEP Global Alert Service, May 2013)

Crowdsourcing via mobile devices

- Examples:
  - FEMA Disaster Reporter app: share GPS photo reports
  - SMS in Port-au-Prince earthquake

  - Quake-Catcher network
  - Boston "Street Bump" app

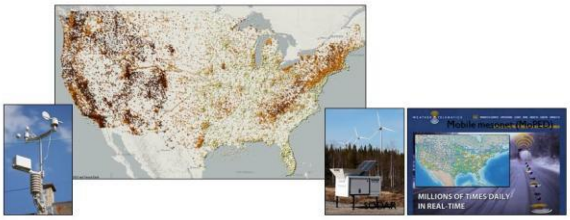
"Internet of Things (IoT)"

- Sensor-based detection of earthquakes, forest fires, oil spills, severe weather, volcanic gas plumes, drought
  - *cf. Sensors*: "*Sensors for Disaster and Emergency Management Decision Making*"
  - *cf. Sensors*: "*An Open Distributed Architecture for Sensor N… Management*"
- Other examples:
  - Smart Grid for household electricity conservation
  - Gunfire locator using acoustic sensors (Washington, DC)
  - Air pollution sensors (Salamanca, Spain)

(from *Wired UK 07/2013*)

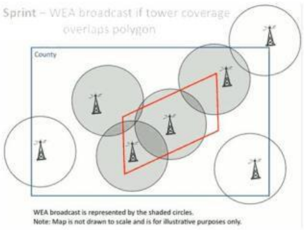
Interoperable mesonets

- National Mesonet / MesoUS
  - 27,000+ weather stations in 137+ networks
  - Near-real-time feed to U.S. National Weather Service Meteorological Assimilation Data Ingest System (MADIS)



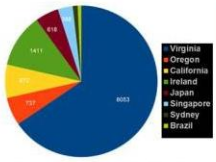
Location-based services

- *e.g.,* Wireless Emergency Alerts



Cloud Computing

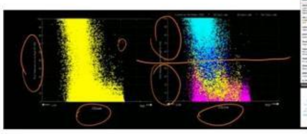
- Detect event => scale up computing & storage capability in minutes
  - Scale back down after crisis
- Examples:
  - Namibia Flood Dashboard and Image processing service hosted on Matsu cloud



Amazon EC2 server racks by region

Big Data analytics

- Detecting patterns & correlations
  - *e.g.,* analyzing Tweets to detect seismic events
    - cf. T. Sakaki *et al.*, in April 2013 *IEEE Transactions on Knowledge and Data Engineering*, doi:10.1109/TKDE.2012.29
  - Landslide susceptibility assessment
- Monte-Carlo ensemble simulations → Risk envelopes
  - *e.g.,* SLOSH *(Sea, Lake, & Overland Surges from Hurricanes)* model from the U.S. National Hurricane Center



WAY FORWARD

UTM

Potential activities

- demonstrate the effectiveness of RS imagery to strengthen regional, national and community level capacity for mitigation, management and coordinated response to natural hazards
- identify specific RS-based products that can be used for disaster mitigation and response on a regional level
- identify capacity building activities that will increase the ability of the region to integrate RS-based information into disaster management initiatives

UTM

Potentially game-changing technologies

- Model Webs / Modeling as a Service
- Semantic Services
- Collaboration services
- Satellite Direct Broadcast / Direct Readout
- New sensor types
- Others?

UTM

How to integrate new technologies well?

- Need to understand / develop / adapt technologies with greatest likely impacts on disaster management
  - Not limit their use to current practices
    - (Or reject them because they don't fit current practices)
  - Not embrace new toys mindlessly
- Need to envision what new analytical or operational capabilities these technologies may enable, and where they will matter
  - Sometimes, new technologies may imply new goals (not just new methods)
- Need to rely on widely-adopted, consensus-based standards
  - Information semantics
  - Data formats
  - Service definitions
  - Software interfaces

UTM

User Issues Brought Forward as Challenges to be Addressed

- **Resolution:** existing satellite-based tools and products mostly utilise imagery at low resolution that is not always useful to local responders, planners or analysts ANS – UAV?
- **Cloud-cover:** most satellite data used is optical imagery and does not provide useful information during periods of cloud cover, which are common during flooding ANS –UAV?
- **Data vs. Products:** most users would like end-products focussed on specific disaster relevant information, not data
- **Capacity:** many countries have limited capacity to work with data and develop products; issue of on-going service provision
- **Mitigation:** most efforts focus on response while limited resources are available for mitigation, which may save more lives and offer greater opportunities to protect property from damage

UTM

Thank you for attention

Mazlan Hashim
Universiti Teknologi Malaysia
Email: mazlanhashim@utm.my
www.utm.my/insteg/

Follow my research articles in

SciVerse, Scopus, ScienceDirect, SciVal Spotlight, ResearchGate, RESEARCHERID THOMSON REUTERS, ORCID Connecting Research and Researchers

Practising-1: From Lecture-1 (Prof. Mazlan bin hashim and Parwati)

RS for disaster: Part 2

Mazlan Hashim [1, 2]
1 Geoscience and Digital Earth Centre (INSTeG),
Research Institure of Sustainable Environment;
2 Faculty of Geoinformation & Real Estate;
Universiti Teknologi Malaysia,
Johor Bahru, Malaysia

Landslide

Pls visit the following URL

http://www.nature.com/articles/srep09899

Drought

Pls visit the following URL

- ://www.mdpi.com/2072-4292/8/8/633

Haze /Smoke

- Pls visit the following URL
- https://www.researchgate.net/publication/235781090_The_use_of_AVHRR_data_to_determine_the_concentration_of_visible_and_invisible_tropospheric_pollutants_originating_from_a_1997_forest_fire_in_Southeast_Asia
- http://www.atmos-chem-phys.net/13/3517/2013/acp-13-3517-2013.pdf

Forest Ecology due to CC

- Pls visit the following URL
- http://www.nature.com/articles/srep32329

Rainfall for Flood Early Warning

- Pls see the following url:
- http://journals.ametsoc.org/doi/abs/10.1175/JHM-D-14-0233.1
- http://www.mdpi.com/2072-4292/7/4/4092

Thank you for attention

Mazlan Hashim
Universiti Teknologi Malaysia
Email: mazlanhashim@utm.my
www.utm.my/insteg/

Follow my research articles in: SciVerse Scopus, ScienceDirect, SciVal Spotlight, ResearchGate, RESEARCHERID THOMSON REUTERS, ORCID Connecting Research and Researchers

Practising-2: from lecture-1 (Prof. Mazlan bin hashim and Parwati)

Part 3
Change Detection for Landslide Impact

PARWATI SOFAN, F
AJAR YULIANTO,
Mazlan Hashim

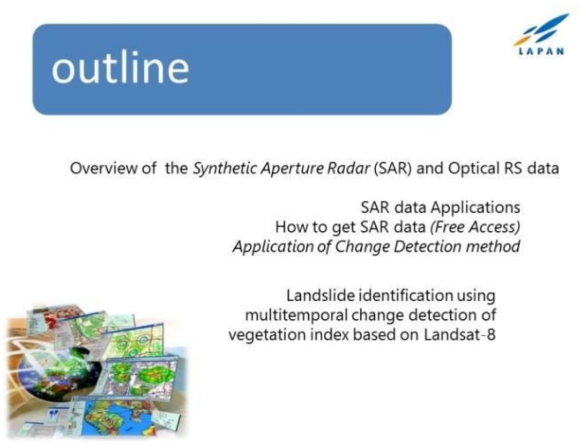
Exercise

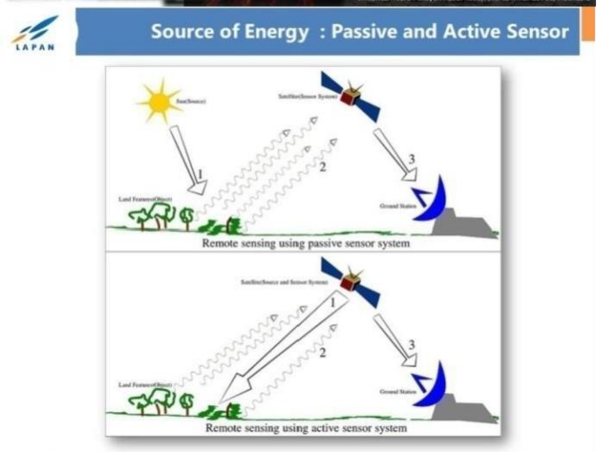
1. Conduct full change detection of selected site using SAR download
2. Write down full report, in point form but concise of all the procedure
3. Infer on your results obtain: validate?
4. Discussion on results contribution
5. Conclusion
6. Submission online to my secretariate's emails

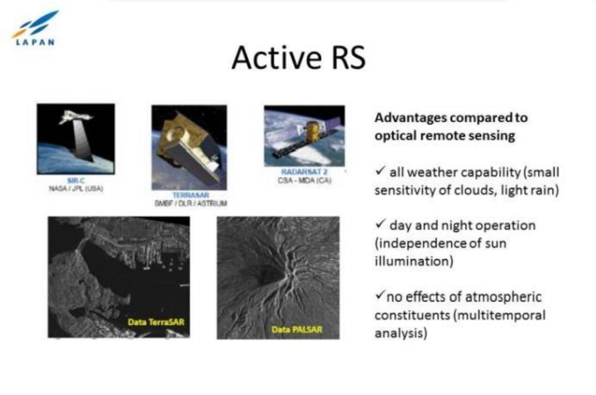
Format of your report

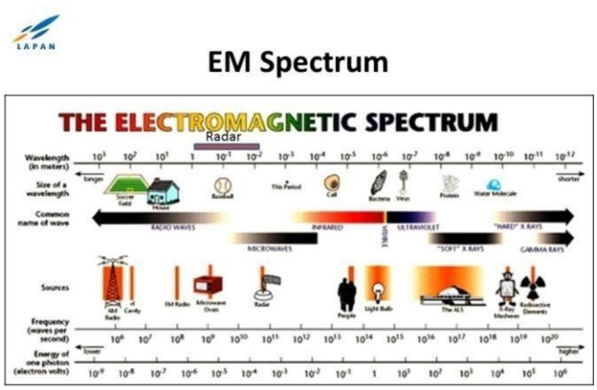
1. Title	(15 words)
2. Abstract	(200 words)
3. Introduction	(1000 w)
4. Material	(500 w)
– Description of area	
– Technical specs and source	
5. Method	(1000w)
6. Results	(500 w + illustrations)
7. Discussion	(1000 w)
8. Conclusion	(200 w)

Lecture-2 and Practicing: Remote sensing Data Processing for Disaster Rapid Mapping (Parwati)









Optical and Radar wavelength

Band	Wavelength (μm)
Visible	0.4 – 0.7
Near IR	0.7 -0.9
Midd IR	0.9 – 3.0
Far IR	3.0 – 12.5

Frequency band	Frequency range (GHz)	Wavelength range (cm)
L band	1–2	15–30
S band	2–4	7.5–15
C band	4–8	3.75–7.5
X band	8–12	2.5–3.75
Ku band	12–18	1.67–2.5
K band	18–27	1.11–1.67
Ka band	27–40	0.75–1.11
V band	40–75	0.4–0.75
W band	75–110	0.27–0.4

SAR data
How to get SAR data *(Free Access)*
Application of Change Detection method

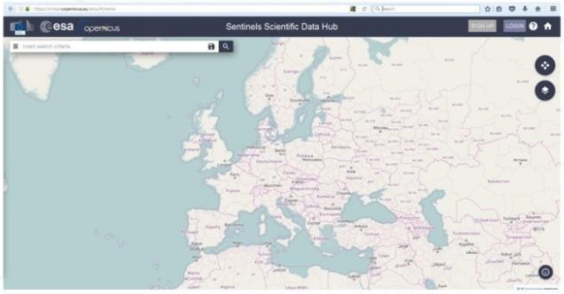
Spaceborne SARs

Satellite	Years	Agency	Frequency-Polarisation	Resolution
ERS-1	1991-2000	ESA	C - VV	25 m
JERS	1992-1998	NASDA	L-HH	25 m
ERS-2	1995 - 2011	ESA	C - VV	25 m
RADARSAT-1	1995	CSA	C - HH	10 -100 m
ENVISAT - ASAR	2002 - 2012	ESA	C - HH/VV/HV	25 - 1000 m
ALOS - PALSAR	2006	JAXA	L -Polarimetric	10 - 100 m
TerraSAR-X Cosmo-Skymed	2007	DLR Italy	X-Polarimetri	1 m – 40 m
RADARSAT 2	2008	CSA	C – Polarimetric	1- 100 m
RISAT-1	2012	ISRO	X – Polarimetric	1 – 8 m
Sentinel-1	2014	ESA	C - Polametric	25 – 800 m
ALOS-2 (PALSAR)	2014	JAXA	L - Polametric	10 – 100 m

How to get SAR data *(Free Access)*

Create a User Account
Go to Sentinels Scientific Data Hub.

https://scihub.copernicus.eu/dhus/#/home



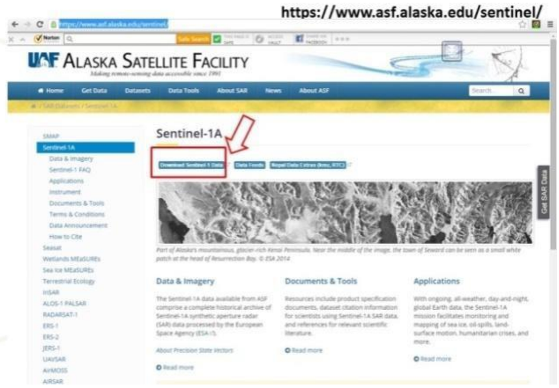
How to get SAR data *(Free Access)*

SIGN UP

https://scihub.copernicus.eu/dhus/#/home

How to get SAR data *(Free Access)*

https://www.asf.alaska.edu/sentinel/



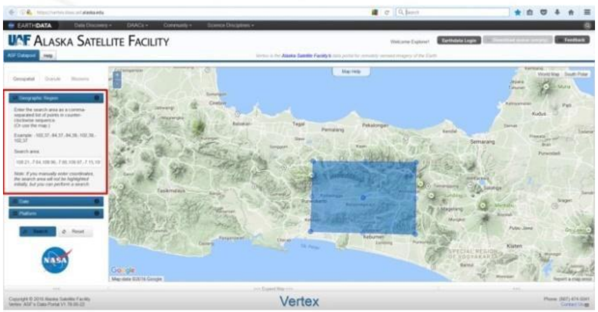
How to get SAR data *(Free Access)*

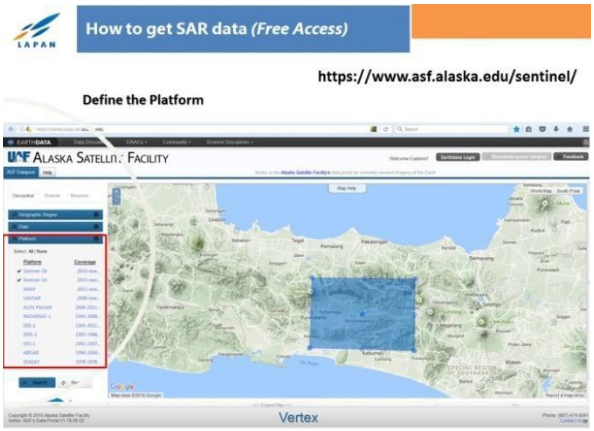
https://www.asf.alaska.edu/sentinel/

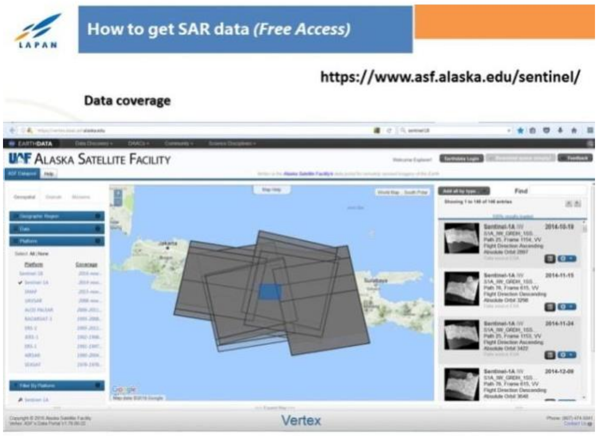
How to get SAR data *(Free Access)*

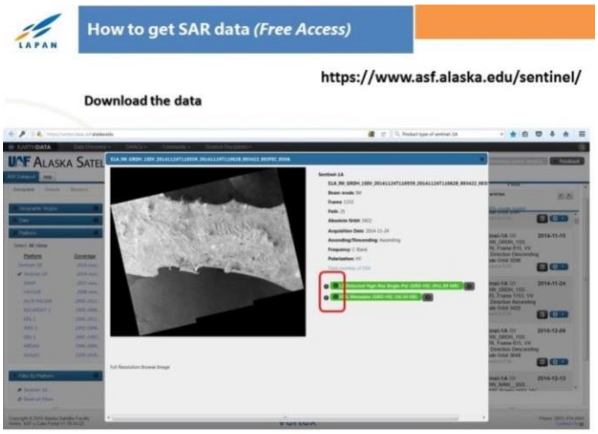
https://www.asf.alaska.edu/sentinel/

Define the area (Geographic Region)





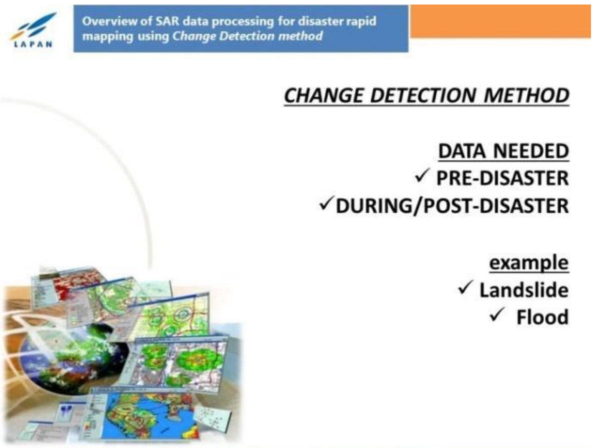


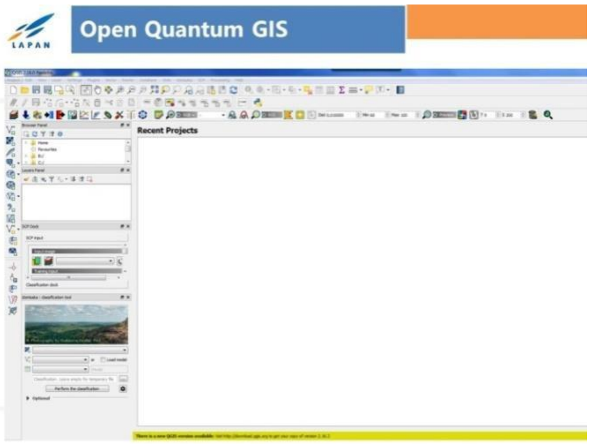


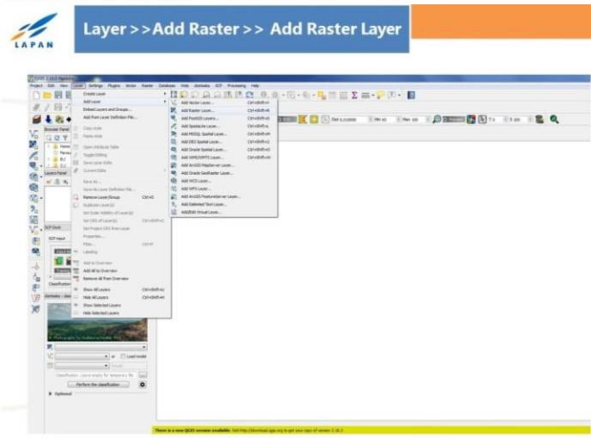
Sentinel-1 SAR Modes

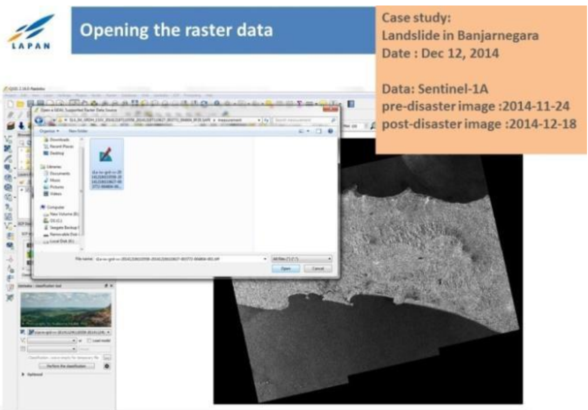
Sentinel-1A and Sentinel-1B satellites carry a C-band SAR instrument to provide an all-weather, day-and-night supply of imagery of Earth's surface every 12 days.

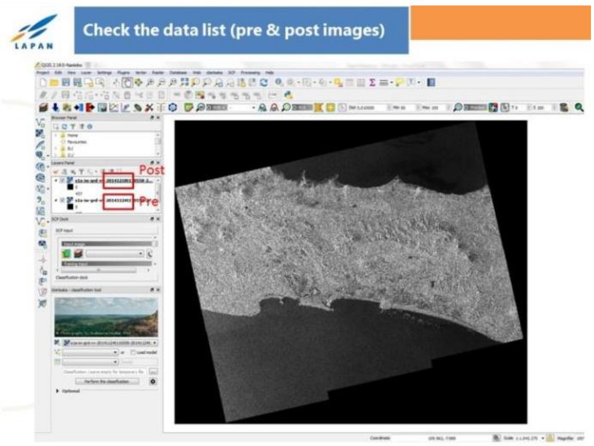
Extra Wide Swath (EW)	Interferometric Wide Swath (IW)	Stripmap (SM)	Wave (WV)
Acquired with TOPSAR using 5 sub-swaths instead of 3, resulting in lower resolution (20m x 40m). Intended for maritime, ice, and polar-zone services requiring wide coverage and short revisit times.	Acquired with TOPSAR. Default mode over land; 250km swath width; 5m-x-20m ground resolution.	Used in rare circumstances to support emergency-management services, 5m-x-5m resolution over an 80km swath width.	Default mode over oceans; VV polarization. Data acquired in 20km-by-20km vignettes, 5m-by-5m resolution, every 100km along the orbit.

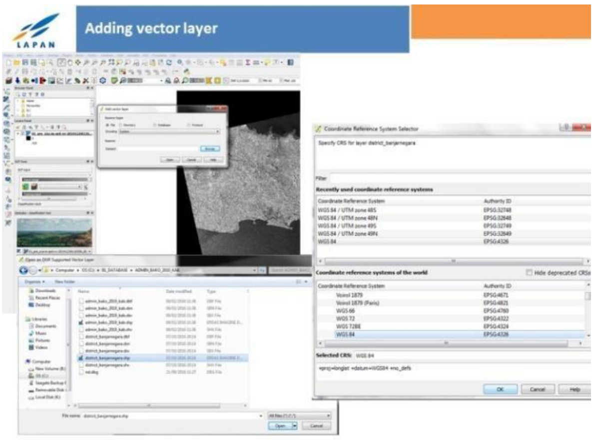

LAPAN
Overview of SAR data processing for disaster rapid mapping using Change Detection method
CHANGE DETECTION METHOD
DATA NEEDED
✓ PRE-DISASTER
✓DURING/POST-DISASTER
example
✓ Landslide
✓ Flood

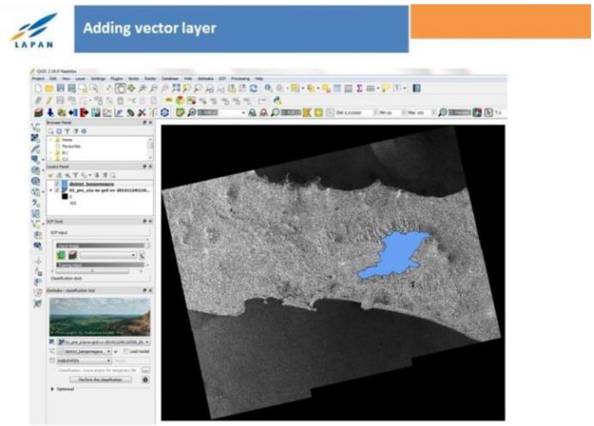

LAPAN
Open Quantum GIS
Recent Projects

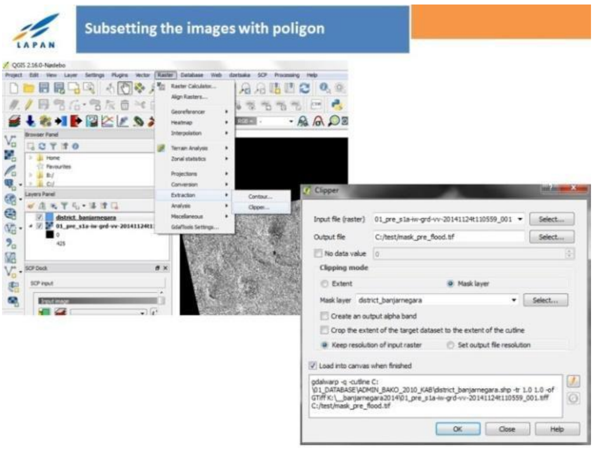

LAPAN
Layer>>Add Raster>> Add Raster Layer


LAPAN
Opening the raster data
Case study:
Landslide in Banjarnegara
Date : Dec 12, 2014
Data: Sentinel-1A
pre-disaster image :2014-11-24
post-disaster image :2014-12-18

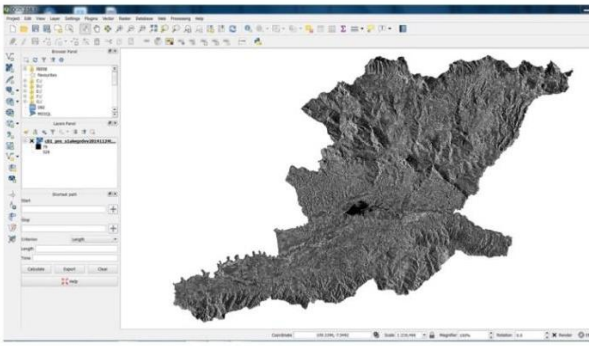

LAPAN
Check the data list (pre & post images)
Post
Pre


LAPAN
Adding vector layer


LAPAN
Adding vector layer

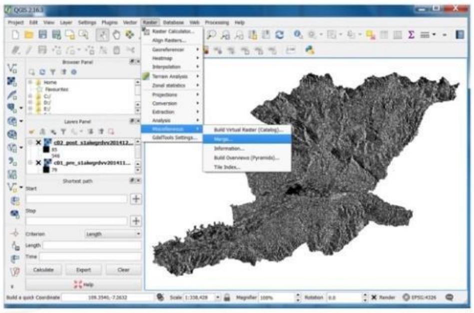

LAPAN
Subsetting the images with poligon
Clipper

Clippered images (Banjarnegara District)

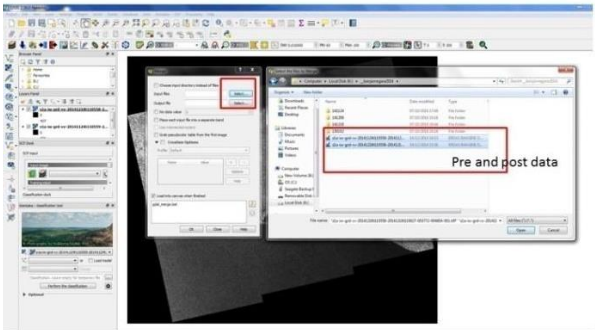


Merging the pre & post images

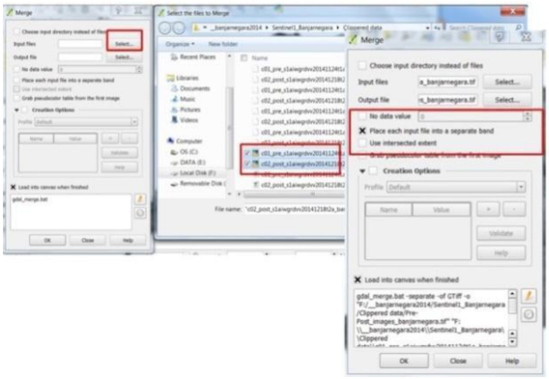
Raster>>Miscellaneous>>Merge



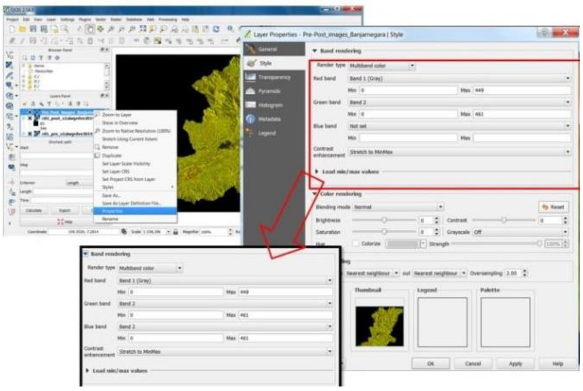
Merging the pre & post images



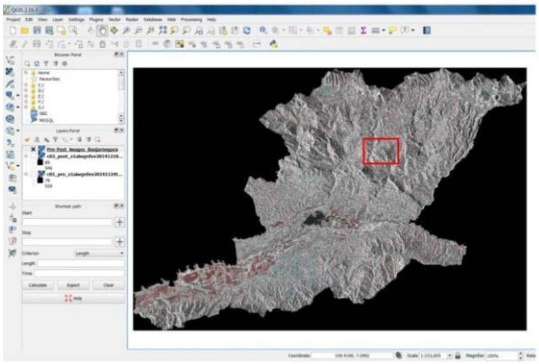
Merging the pre & post images



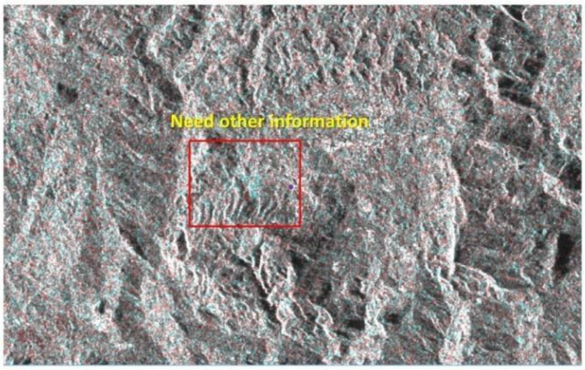
Change detection Image Composite



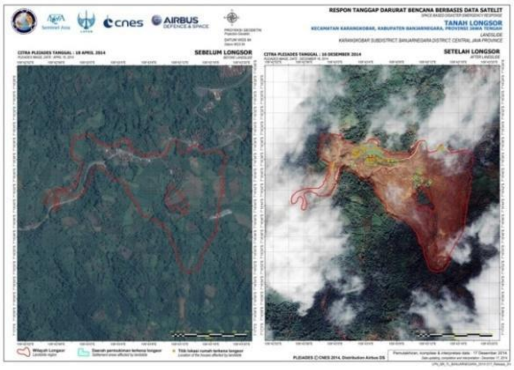
Change detection Image Composite



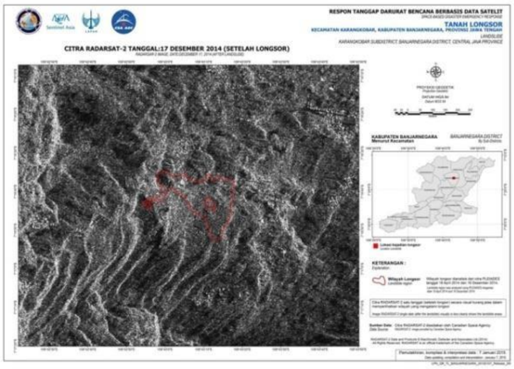
Interpretation of landslide....



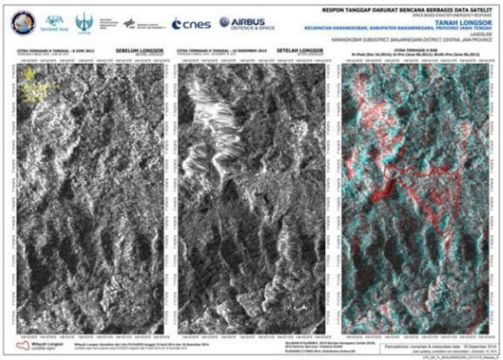
Other information...(optical data)



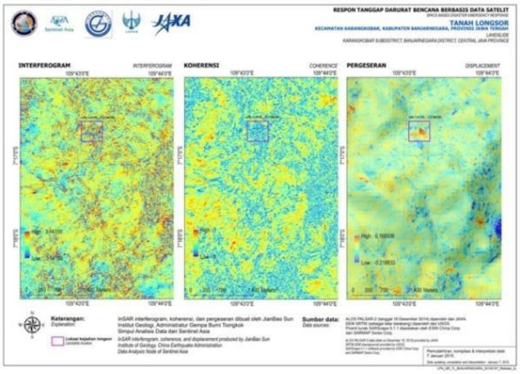
Landslide using Radarsat-2



Landslide using TerraSAR-X



Landslide using ALOS-2 (PALSAR)



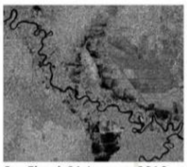
Remarks on using SAR for Landslide detection

It is not easy to interprete the landslide area using change detection method,

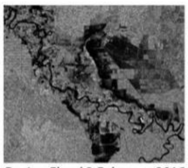
It is needed further analysis i.e. Interferogram, coherent, and displacement

The result should be compared with optical data or verified by ground checking

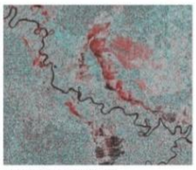
Flood area detection using Sentinel-1 in Riau



Pre Flood, 21 January 2016

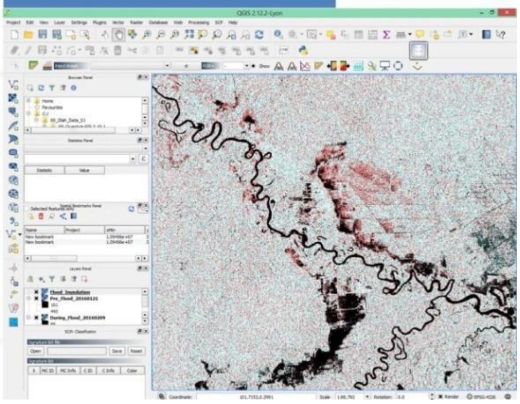


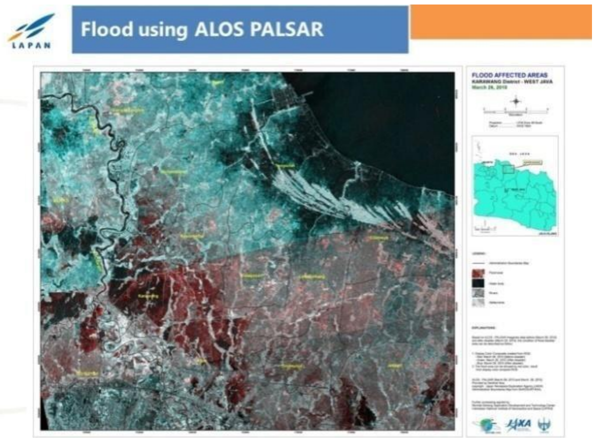
During Flood,9 February 2016

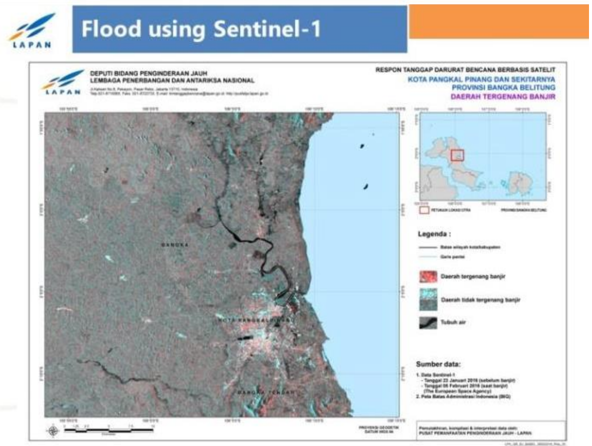


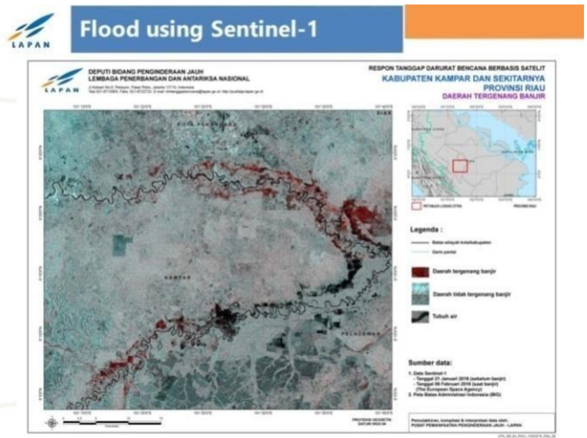
(Flood Inundation)

Flood area detection

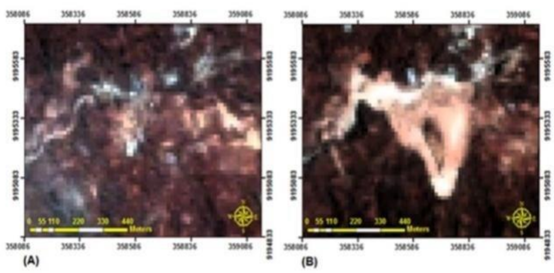








LANDSAT 8 LDCM



(*Pre-T1*)
Tanggal 11 Juni 2014

(*Pre-T2*)
Tanggal 22 Februari 2015

Landslide identification using multitemporal change detection of vegetation index based on Landsat-8

Vegetation Index

Normalized Differencial Vegetation Index (NDVI)

$$NDVI = \frac{(NIR-Red)}{(NIR+Red)}$$

NIR = *near infrared* channel on Landsat 8 LDCM (band 5) (0.845–0.885 µm).
Red = *visible red* channel on Landsat 8 LDCM (band 4) (0.630–0.680 µm).

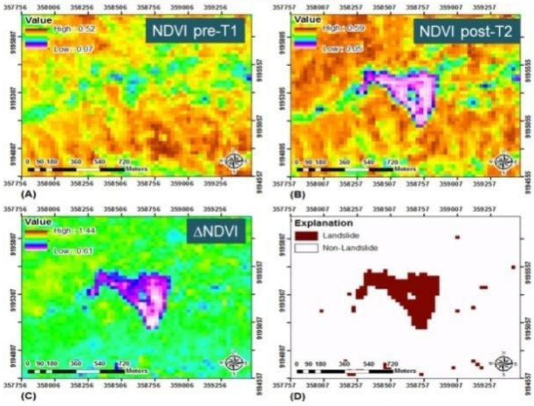
$$\Delta NDVI = NDVI_{Post-T2} - NDVI_{Pre-T1}$$

$\Delta NDVI$ = diff of NDVI pre-T1 and post-T2
$NDVI_{Post-T2}$ = NDVI pre-T1
$NDVI_{Pre-T1}$ = NDVI post-T2

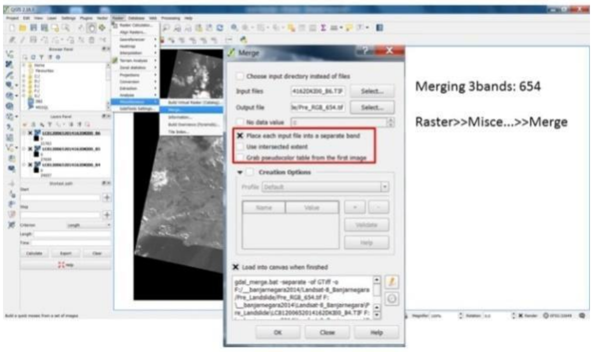
Data reference

Pleiades data

Results : NDVI



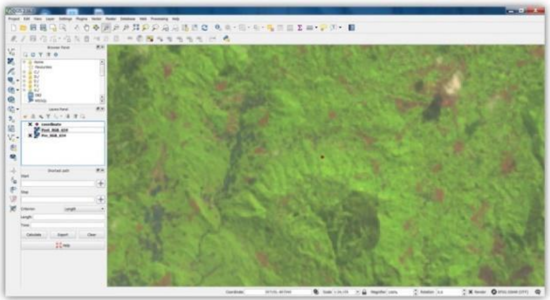
Creating RGB Composite (654)



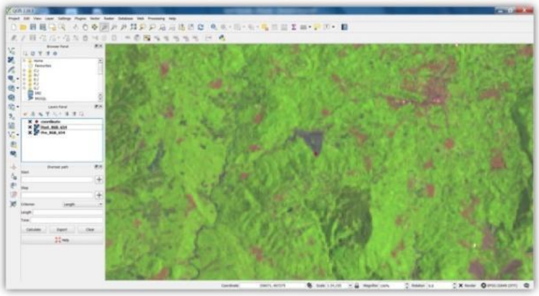
Merging 3bands: 654

Raster>>Misce...>>Merge

Creating RGB Composite (654) – Pre landslide

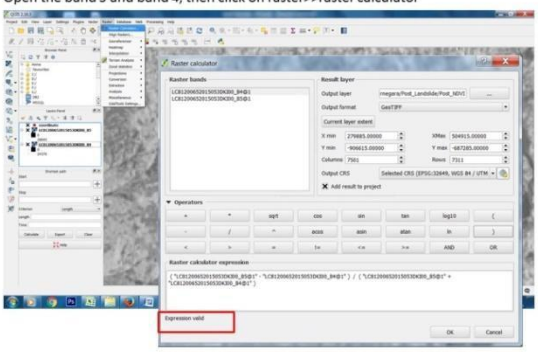


Creating RGB Composite (654) – Post landslide

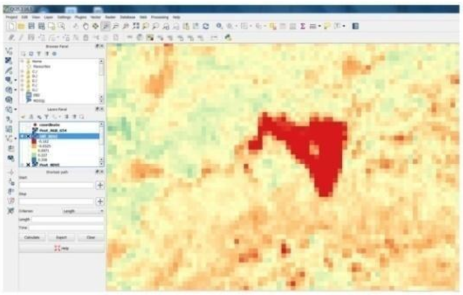


Creating NDVI Pre and Post Landslide band 5 (NIR) & 4 (red)

Open the band 5 and band 4, then click on raster>>raster calculator



Creating the ΔNDVI



Remarks on using Landsat-8 for Landslide detection

Multitemporal of vegetation index change detection can be used as an identification of landslide area, but it should be complemented with the reference data to eliminate the others object that have the same pattern

TERIMA KASIH

GNSS data and processing

Peter T.Y. Shih
Department of Civil Engineering
National Chiao Tung University, Taiwan

國立交通大學, 土木工程學系
National Chiao Tung University, Department of Civil Engineering

Why GNSS?

- Collecting ground control points for aerial triangulation;
- Determining the trajectory of the flight, obtaining the direct observation of the exterior orientation.

2

國立交通大學, 土木工程學系
National Chiao Tung University, Department of Civil Engineering

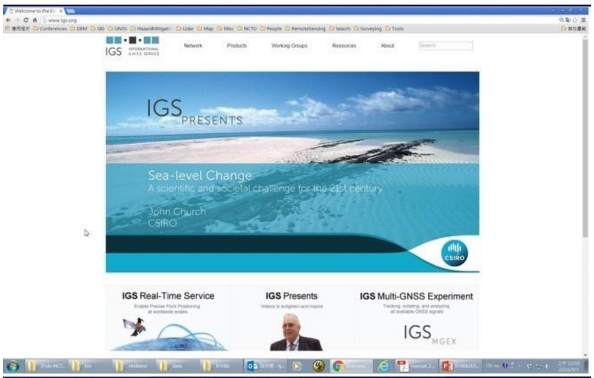
Outline

- The GNSS data, where to get it?
- The GNSS data processing, with RTKLIB

How to get coordinates of GCPs?

3

國立交通大學, 土木工程學系
National Chiao Tung University, Department of Civil Engineering



國立交通大學, 土木工程學系
National Chiao Tung University, Department of Civil Engineering

GNSS related files

- Product
  - GPS Satellite Ephemerides / Satellite & Station Clocks
  - GLONASS Satellite Ephemerides
  - Earth Rotation
  - Atmospheric Parameters
- Data
  - Network observations

5

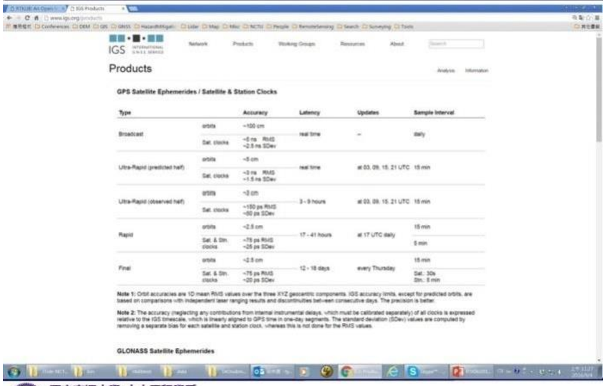
國立交通大學, 土木工程學系
National Chiao Tung University, Department of Civil Engineering

The use of product and data

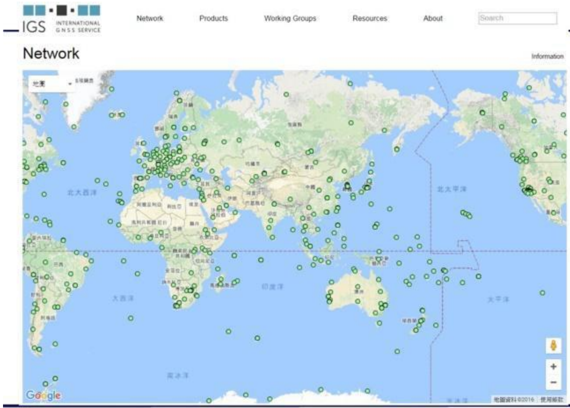
- Product
  - Frequently used for deriving precise positions
  - For PPP (Precise Point Positioning)
  - For PPK (Post Processing Kinematic)
  - For PPS (Post Processing Static)
- Data
  - For PPK and PPS, as reference

6

國立交通大學, 土木工程學系
National Chiao Tung University, Department of Civil Engineering



國立交通大學, 土木工程學系
National Chiao Tung University, Department of Civil Engineering



國立交通大學, 土木工程學系
National Chiao Tung University, Department of Civil Engineering

Obtaining GNSS Data

The 3 major GNSS data deposits online I used.

1. IGS
2. UNAVACO
3. MGM net

國立交通大學, 土木工程學系
National Chiao Tung University, Department of Civil Engineering

For Downloading Observations

- IGS
  ftp://cddis.gsfc.nasa.gov/gnss/data/daily/
- UNAVCO
  ftp://data-out.unavco.org/pub/rinex/obs/
- MGM net
  ftp://mgmds01.tksc.jaxa.jp/data/daily/

國立交通大學, 土木工程學系
National Chiao Tung University, Department of Civil Engineering

ftp://cddis.gsfc.nasa.gov/gnss/data/daily/

國立交通大學, 土木工程學系
National Chiao Tung University, Department of Civil Engineering

國立交通大學, 土木工程學系
National Chiao Tung University, Department of Civil Engineering

Processing GNSS with RTKLIB

- RTKLIB is an open source software
- The latest version is 2.4.2 released on 2013/04/29.

Overview of RTKlib

- RTKLIB is an open source program package for standard and precise positioning with GNSS (global navigation satellite system). RTKLIB consists of a portable program library and several APs (application programs) utilizing the library.

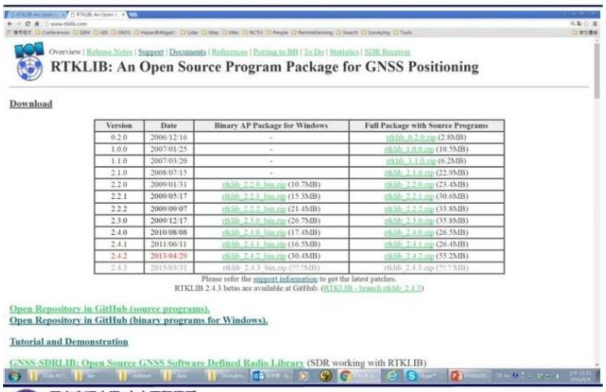
The features of RTKLIB

1. It supports standard and precise positioning algorithms with: GPS, GLONASS, Galileo, QZSS, BeiDou and SBAS
2. It supports various positioning modes with GNSS for both real-time and post-processing: Single, DGPS/DGNSS, Kinematic, Static, Moving-Baseline, Fixed, PPP-Kinematic, PPP-Static and PPP-Fixed

- More to read at, http://www.rtklib.com/

Download RTKLIB

- Using "RTKLIB GNSS" as keyword, the correct link usually would be the top one from most search engine, such as www.google.com
- Download could be made at, http://www.rtklib.com/ , please download the "Full Package with Source Programs", rtklib_2.4.2.zip (55.2MB)
- When only the bin (executables) should be updated, download rtklib_2.4.2_bin.zip



Overview | Release Notes | Support | Documents | References | Porting to BB | To Do | Statistics | SDR Receiver

RTKLIB: An Open Source Program Package for GNSS Positioning

Download

Version	Date	Binary AP Package for Windows	Full Package with Source Programs
0.2.0	2006/12/16	-	rtklib_0.2.0.zip (2.8MB)
1.0.0	2007/01/25	-	rtklib_1.0.0.zip (10.5MB)
1.1.0	2007/03/20	-	rtklib_1.1.0.zip (6.2MB)
2.1.0	2008/07/15	-	rtklib_2.1.0.zip (22.9MB)
2.2.0	2009/01/31	rtklib_2.2.0_bin.zip (10.7MB)	rtklib_2.2.0.zip (23.4MB)
2.2.1	2009/05/17	rtklib_2.2.1_bin.zip (15.3MB)	rtklib_2.2.1.zip (30.6MB)
2.2.2	2009/09/07	rtklib_2.2.2_bin.zip (21.4MB)	rtklib_2.2.2.zip (33.8MB)
2.3.0	2009/12/17	rtklib_2.3.0_bin.zip (26.7MB)	rtklib_2.3.0.zip (35.8MB)
2.4.0	2010/08/08	rtklib_2.4.0_bin.zip (17.4MB)	rtklib_2.4.0.zip (26.5MB)
2.4.1	2011/06/11	rtklib_2.4.1_bin.zip (16.5MB)	rtklib_2.4.1.zip (26.4MB)
2.4.2	2013/04/29	rtklib_2.4.2_bin.zip (30.4MB)	rtklib_2.4.2.zip (55.2MB)
2.4.3	2013/03/31	rtklib_2.4.3_bin.zip (??.?MB)	rtklib_2.4.3.zip (??.? MB)

Please refer the support information to get the latest patches.
RTKLIB 2.4.3 betas are available at GitHub. (RTKLIB - branch rtklib_2.4.3)

Open Repository in GitHub (source programs).
Open Repository in GitHub (binary programs for Windows).

Tutorial and Demonstration

GNSS-SDRLIB: Open Source GNSS Software Defined Radio Library (SDR working with RTKLIB)

File Structure

app	檔案資料夾
bin	檔案資料夾
brd	檔案資料夾
data	檔案資料夾
doc	檔案資料夾
lib	檔案資料夾
src	檔案資料夾
test	檔案資料夾
util	檔案資料夾
readme.txt	UltraEdit Document (.txt)

Functions

	Function	GUI AP	CUI AP	Notes
(a)	AP Launcher	RTKLAUNCH (3.1)	-	
(b)	Real-Time Positioning	RTKNAVI (3.2, 3.3, 3.5)	RTKRCV (3.11, A.1)	
(c)	Communication Server	STRSVR (3.3)	STR2STR (3.11, A.5)	
(d)	Post-Processing Analysis	RTKPOST (3.4, 3.5)	RNX2RTKP (3.11, A.2)	
(e)	RINEX Converter	RTKCONV (3.6)	CONVBIN (3.11, A.4)	
(f)	Plot Solutions and Observation Data	RTKPLOT (3.7, 3.8)	-	
(g)	Downloader for GNSS Products and Data	RTKGET (3.9)	-	
(h)	NTRIP Browser	SRCTBLBROWS (3.10)	-	

Start RTKLIB

- Please use **rtklaunch** to start. Some environment variables will be set.

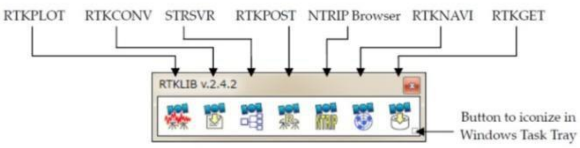
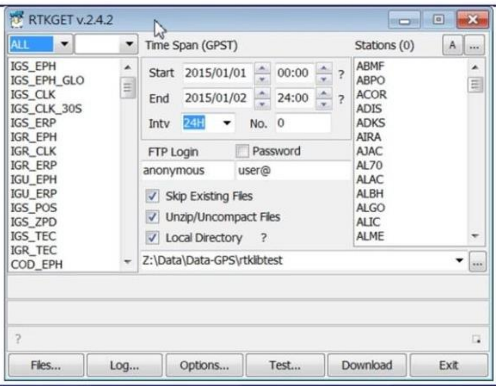


Figure 3.1-1 RTKLAUNCH window and launcher icons for APs

Module 1: RTKGET

Obtaining GNSS related files: rtkget

- Start by click the icon in the launch window
- Related files in the bin directory: rtkget.exe, rtkget.ini, rtkget.trace
- The parameters stored in the .ini file will be loaded at the start. And, the .ini file will be updated after quit rtkget.
- An important parameter file usually stored in the data directory: URL_LIST.txt.



rtkget.ini

- [opt]
- startd=2015/01/01
- starth=00:00
- endd=2015/01/02
- endh=24:00
- timeint=24H
- number=0

rtkget.ini-2

- urlfile=Z:\Prog\Prog-GPS\RTKlib\rtklib_2.4.2Full\data\URL_LISTShih.txt
- logfile=Z:\Prog\Prog-GPS\RTKlib\rtklib_2.4.2Full\data\rtkget2016
- stations=
- proxyaddr=
- login=anonymous
- passwd=user@

rtkget.ini-3

- unzip=1
- skipexist=1
- hidepasswd=0
- holderr=1
- holdlist=1
- ncol=35
- logappend=1
- dateformat=0
- tracelevel=1

rtkget.ini-4

- localdirena=1
- localdir=Z:\Data\Data-GPS\rtklibtest
- datatype=IGS
- [sta]
- station0=ABMF,ABPO,ACOR,ADIS,ADKS,AIRA,AJAC,AL70,ALAC,ALBH,ALGO,ALIC,ALME,ALRT,AMC2,ANG5,ANKR,ANTC,AREQ,ARTU,ASPA,AUCK,AZCN,AZCO,AZRY,AZU1,BAIE,BAKE,BAKU,BAMF,BAR1,BARH,BAYR,BBRY,BDOS,BIS2,BJAB,BJCO,BJFS,BJPA,BLYT,BOGO,BOGT,BOR1,BREW,BRFT,BRMU,BRST,BRUS,BSHM,BUCU,BZRG,CAGL,CAGS,CAGZ,CANT,CAS1,CASC,CAT2,CCJ2,CCJM,CEBR,CEDU,CHAN,CHAT,CHPI,CHTI,CHUM,CHUR,CKIS,CLAR,CNCL,CNMR,COCO,CONT,CONZ,COPO,COT1,COYQ,CPXF,CRAO,CRAR,CRFP,CRO1,CUSV,DAEJ,DARW,DAV1,DGAR,DRAG,DRAO,DUBO,DUBR,DUM1,DUND,DUNT,ELAT,EPRT,ESCU,FAAA,FAIR,FALE,FALK,FLIN,FLRS,FRDN,FUNC,GANP,GENO,GLPS,GLSV,GMAS,GODE,GOLD,GOPE,GRAS,GRAZ,GUAO,GUAT,GUUG,HAMM,HARB,HARV,HELG,HERS,HERT,HIL1,HLFX,HNLC,HNPT,HOB2,HOFN,HOLB,HOLM,HORN,HRAO,HYDE,IBIZ,IDDR,IENG,IISC,ILHA,INEG,INVK,IQAL,IQQE,IRKJ,IRKT,ISBA,ISPA,ISTA,JCT1,JOZ2,JOZE,JPLM,JPLV,KABR,KARA,KARR,KATZ,KELY,KERG,KGNI,KHAJ,KHAR,KIRI,KIRU,KOKB,KOSG,KOUC,KOUR,KR0G,KRTV,KSMV,KUNM,KUUJ,LAMA,LAMP,LAUT,LHAZ,LKHU,LMMF,LPAL,LPGS,LROC,M0SE,MAC1,MADR,MAJU,MAL2,MANA,MAR6,MARS,MAS1,MAT1,MATE,MAUI,MAW1,MCM4,MCN5,MCON,MDO1,MDVJ,MEDI,MERS,METS,METZ,MIG1,MIKL,MIZU,MKEA,MOBJ,MOBN,MOBS,MOIU,MONP,MORP,MQZG,MTJO,MTKA,NAIN,NANO,NAUR,NCG5,NEAH,NETP,NETT,NICO,NIST,NIUM,NKLG,NNOR,NOT1,NOVM,NRC1,NRIL,NRMD,NSSS,NTUS,NVSK,NYA1,NYAL,OBE3,OHI2,OHI3,ONSA,OPMT,OUS2,OUSD,PADO,PALM,PARK,PDEL,PENC,PERT,PETS

27

國立交通大學, 土木工程學系
National Chiao Tung University, Department of Civil Engineering

rtkget.ini-5

- station1=PFA2,PGC5,PICL,PIE1,PIMO,PIN1,PNGM,POHN,POL2,POLV,POTR,POTS,POVE,PRDS,PSU1,PTBB,PUC1,QAQ1,QIKI,QUAR,QUIN,RABT,RAMO,RBAY,RCMN,RECT,REDU,RESO,REUN,REYK,RIGA,RIO2,RIOP,ROAP,ROSA,ROTH,SALU,SAMO,SANT,SASK,SAVO,SCH2,SCOR,SCUB,SEAT,SELD,SELE,SEY1,SFDM,SFER,SHAO,SHE2,SIDN,SIO3,SIO5,SOFI,SPK1,SPMX,SPT0,SRS1,STJ2,STJO,STK2,STR1,STR2,SULP,SUTB,SUTH,SUTM,SUWN,SVTL,SYDN,SYOG,TABL,TAH1,TASH,TCMS,TEHN,TELA,THTI,THU3,TIDB,TIXI,TLSE,TN22,TNML,TONG,TOW2,TRDS,TRO1,TSEA,TSK2,TSKB,TUKT,TWTF,TXES,UCLP,UCLU,UFPR,ULAB,UNBJ,UNIV,UNSA,URUM,USN3,USNO,USUD,UZHL,VAAS,VACS,VALD,VANU,VCIO,VILL,VIS0,VNDP,VTIS,VTSP,WAB2,WES2,WGTN,WGTT,WHIT,WILL,WIND,WLSN,WROC,WSRT,WTZA,WTZR,WTZS,WTZZ,WUHN,XIAN,XMIS,YAKT,YAR1,YAR3,YEBE,YEL2,YELL,YSSK,ZECK,ZIM2,ZIMM,ZWE2
- station2=
- station3=
- station4=
- station5=
- station6=
- station7=
- station8=
- station9=

28

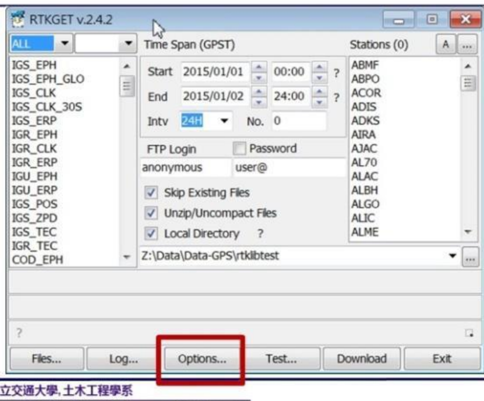
國立交通大學, 土木工程學系
National Chiao Tung University, Department of Civil Engineering

rtkget.ini-6

- [history]
- dir_000=Z:\Data\Data-GPS\rtklibtest
- dir_001=E:\GNSS
- dir_002=C:\ss
- [viewer]
- color1=0
- color2=16777215
- fontname=Courier New
- fontsize=9

29

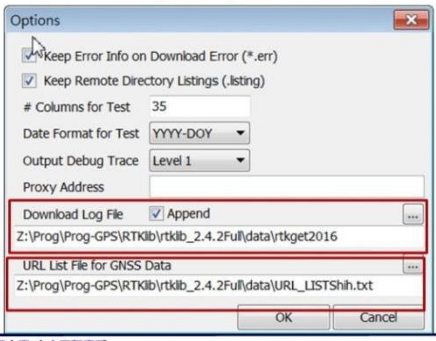
國立交通大學, 土木工程學系
National Chiao Tung University, Department of Civil Engineering



30

國立交通大學, 土木工程學系
National Chiao Tung University, Department of Civil Engineering

rtkget-options



31

國立交通大學, 土木工程學系
National Chiao Tung University, Department of Civil Engineering

To do

- Please assign a Download Log file, a download record will be generated
- Please assign the URLlist file, it could be named with other titles. In which, the URL for download is specified.

32

國立交通大學, 土木工程學系
National Chiao Tung University, Department of Civil Engineering

The URL_List

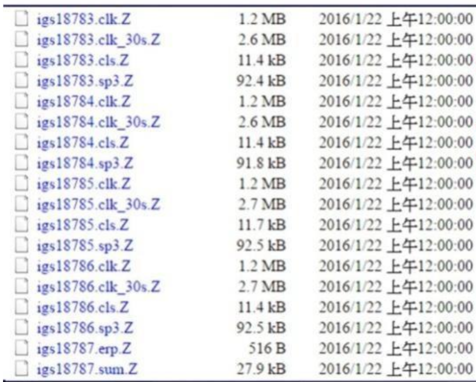
- There is a sample file in the /data directory.
- Please check the URL and make sure it is correct before executing.

Sample:

- IGS_EPH
  ftp://cddis.gsfc.nasa.gov/gps/products/%W/igs%W%D.sp3.Z
  c:\GNSS_DATA\product\%W

33

國立交通大學, 土木工程學系
National Chiao Tung University, Department of Civil Engineering



ftp://cddis.gsfc.nasa.gov/gps/products/1877/

ftp://cddis.gsfc.nasa.gov/gps/products/%W/igs%W%D.sp3.Z

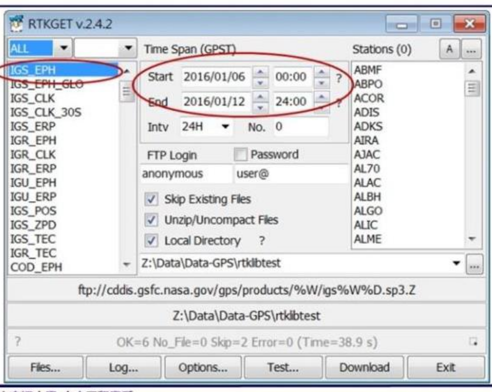
34

國立交通大學, 土木工程學系
National Chiao Tung University, Department of Civil Engineering

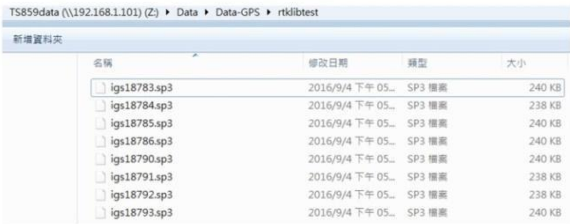
keywords in a url address are replaced as follows

- **# %Y -> yyyy : year (4 digits) (2000-2099)**
- **# %y -> yy : year (2 digits) (00-99)**
- # %m -> mm : month (01-12)
- # %d -> dd : day of month (01-31)
- # %h -> hh : hours (00-23)
- # %H -> a : hour code (a-x)
- # %M -> mm : minutes (00-59)
- **# %n -> ddd : day of year (001-366)**

- # %W -> wwww : gps week (0001-9999)
- # %D -> d : day of gps week (0-6)
- **# %s -> ssss : station name (lower-case)**
- **# %S -> SSSS : station name (upper-case)**
- # %r -> rrrr : station name
- # %{env} -> env : environment variable



File Downloaded



"Interval" parameters in the GUI

- Interval: the time interval of each file, 15 min, 30 min, 1 H, 3 H, 6 H, 12 H, 24H, 7 day
- What will happen if it is specified as 7day in the previous GUI?
- Answer: only the first (igs18783.sp3) and the last (igs18793.sp3) will be downloaded.
- What will happen if it is specified as 15 min?

The Meaning of igs18783.sp3

- sp3 is the precise **GPS Orbit Data**
- Ultra-rapid (iguWWWWD.sp3), 6-hour latency constrained (no-net rotation, no-net translation) 24-hour file – sp3
- Rapid (igrWWWWD.sp3), 13-hour latency constrained (no-net rotation, no-net translation) 24-hour file – sp3
- Final (igsWWWWD.sp3), 12 to 14 day latency, minimally constrained (no-net rotation) 24 hour file - sp3

18783

- GPS Week number (**1878**) and Day of Week (**3**)
- One online utc to gps date converter is located at,

http://sopac.ucsd.edu/convertDate.shtml

- 18783: 2016-01-06
- 18792: 2016-01-12
- Why igs18793.sp3 is downloaded?

Downloading GNSS observations

- IGS, 2016-01-06 is the number 006 of this year
- ftp://cddis.gsfc.nasa.gov/gnss/data/daily/2016/006/16o/

#! DATA (CDDIS)
IGS_OBS
ftp://cddis.gsfc.nasa.gov/**gps**/data/daily/%Y/%n/%yd/%s%n0.%yd.Z
c:\GNSS_DATA\data\%Y\%n
%Y: 2016; %n:006; %yd:16d;

The revision

#! DATA (CDDIS)
IGS_OBS
ftp://cddis.gsfc.nasa.gov/**gps**/data/daily/%Y/%n/%yd/%s%n0.%yd.Z
c:\GNSS_DATA\data\%Y\%n
#! DATA (CDDIS)
IGS_OBS
ftp://cddis.gsfc.nasa.gov/**gnss**/data/daily/%Y/%n /%yo /%s%n0.%yo.Z
c:\GNSS_DATA\data\%Y\%n

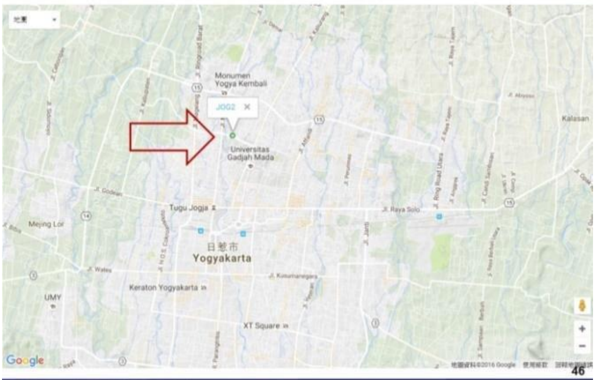
Hatanaka-Compression

- The **.yyd** files are files with Hatanaka-Compression.
- This compression can convert a RINEX observation file into a smaller ASCII format.
- Yuki Hatanaka (hatagsi.go.jp) (GSI) wrote and maintains rnx2crx and crx2rnx, which allows the user to compress/decompress, respectively (https://www.unavco.org/data/gps-gnss/hatanaka/hatanaka.html).

Finding IGS Stations

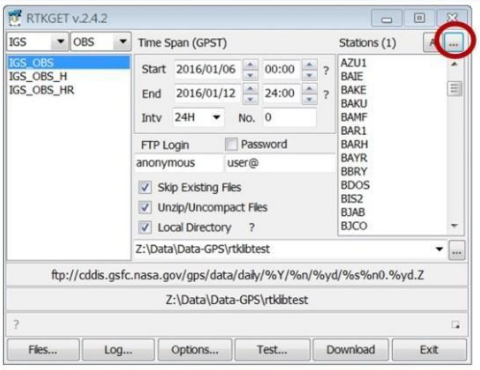
- http://www.igs.org/network

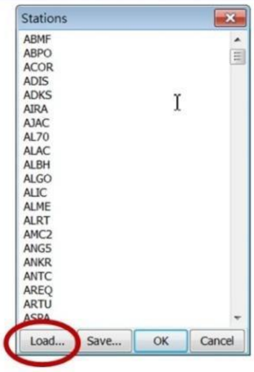
Network



IGS stations-Indonesia

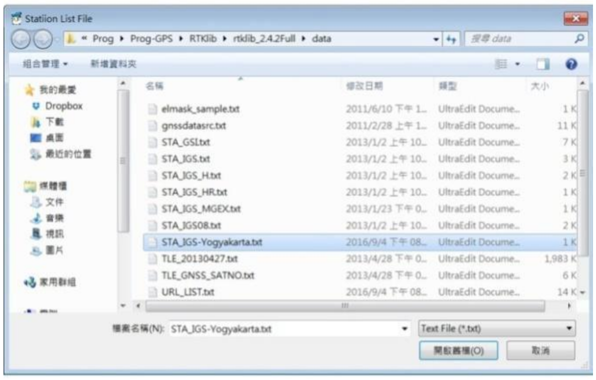
- There are three IGS stations near by: **BAKO, BANO, JOG2**
- But, they are not in the /data/station_igs.txt list.
- Reason? There are only 402 in the list, while igs network has 497 stations.
- What to do? Edit the list and add these stations. Or, make your own list.





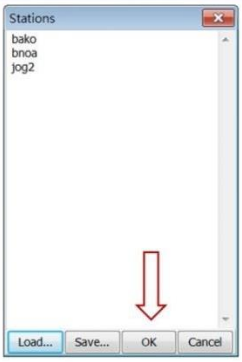
49

國立交通大學, 土木工程學系
National Chiao Tung University, Department of Civil Engineering



50

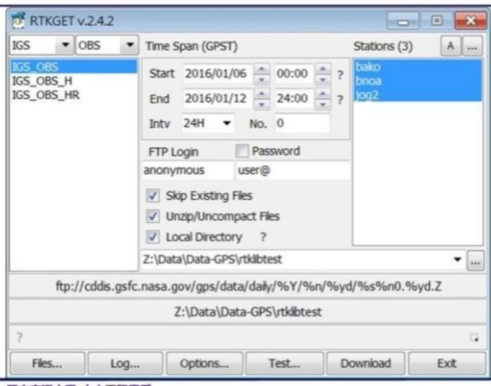
國立交通大學, 土木工程學系
National Chiao Tung University, Department of Civil Engineering



Press OK

51

國立交通大學, 土木工程學系
National Chiao Tung University, Department of Civil Engineering



52

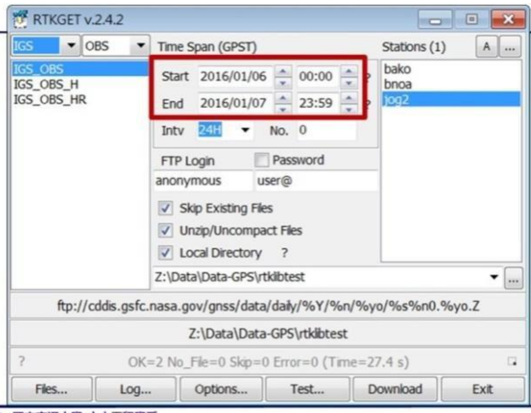
國立交通大學, 土木工程學系
National Chiao Tung University, Department of Civil Engineering

Select Station

- Select at one station
- Click to select one, click+ctrl to add one, use click+shift to select several in sequence 🡐 traditional MS window convention
- Or, press icon A to select all, press icon C to deselect all.

53

國立交通大學, 土木工程學系
National Chiao Tung University, Department of Civil Engineering



54

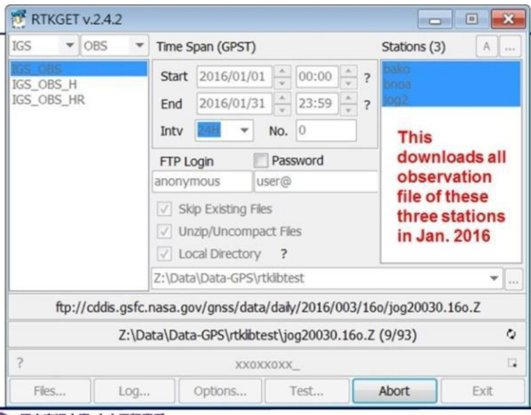
國立交通大學, 土木工程學系
National Chiao Tung University, Department of Civil Engineering

Discussion

- There is no data for stations BAKO and BNOA on these two days.
- This is a quite usual **risk** when data from an IGS station or any other agency operated station is relying on.
- But, an existing CORS (Continuously Operating Reference Station) is always a good resource.

55

國立交通大學,土木工程學系
National Chiao Tung University, Department of Civil Engineering



56

國立交通大學,土木工程學系
National Chiao Tung University, Department of Civil Engineering

Result

- BAKO has observation files from Jan 20 to 31, 2016.
- BNOA has no observation files in Jan. 2016.
- JOG2 has complete data series.

57

國立交通大學,土木工程學系
National Chiao Tung University, Department of Civil Engineering

Navigation File

- For each station, a navigation file should be available. But, not always.
- A general navigation file with station name **brdc** could be used.
- brdc may stand for "**br**oa**dc**ast".
- Please edit the station file and add "brdc".
- Use rtkget to download brdc0060.16n

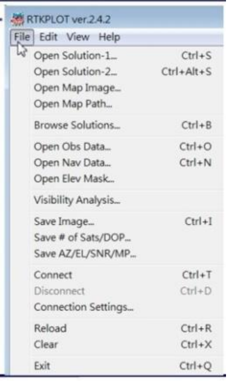
58

國立交通大學,土木工程學系
National Chiao Tung University, Department of Civil Engineering

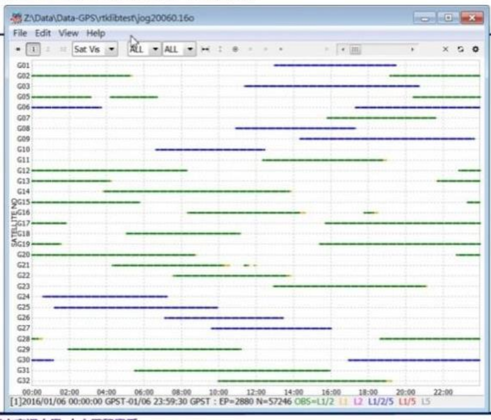
Module 2: RTKPLOT

RTKPLOT

- Start from the rtklaunch GUI, press the most left icon.
- File ➔ Open Obs Data **(jog20060.16o)**
- File ➔ Open Nav Data **(brdc0060.16n)**

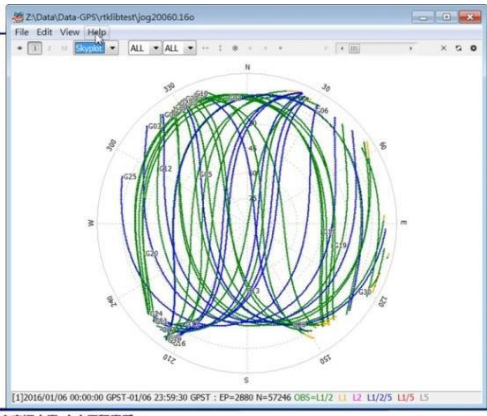


國立交通大學,土木工程學系
National Chiao Tung University, Department of Civil Engineering



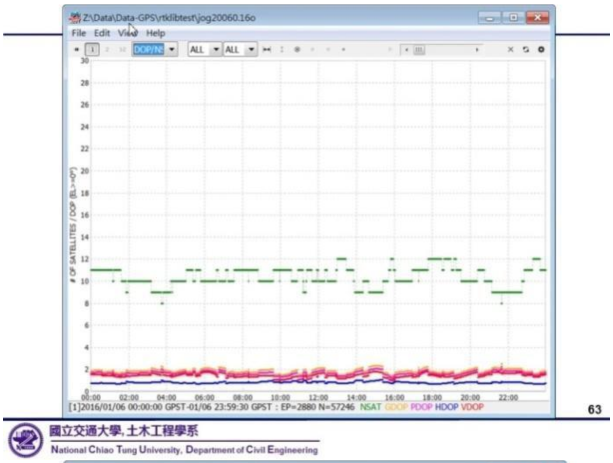
61

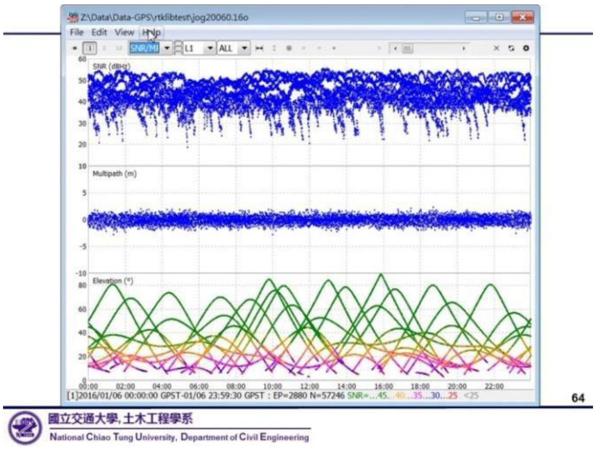
國立交通大學,土木工程學系
National Chiao Tung University, Department of Civil Engineering

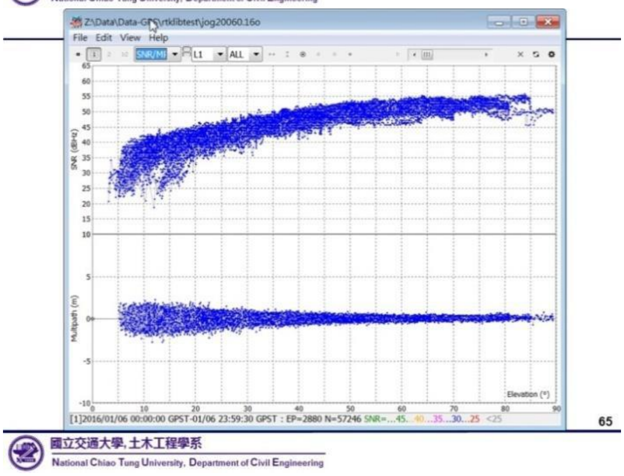


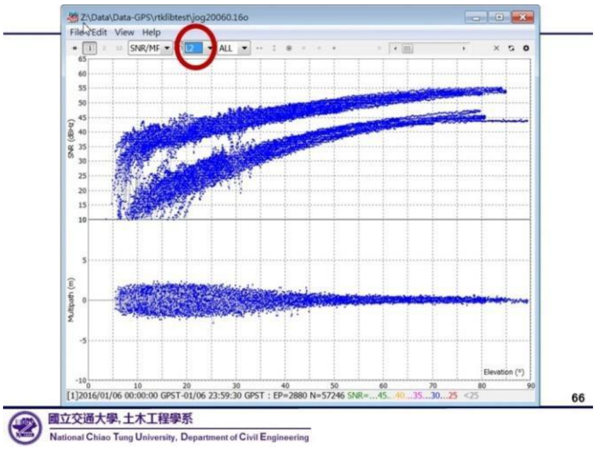
62

國立交通大學,土木工程學系
National Chiao Tung University, Department of Civil Engineering









Lecture 3 part 2: GNSS data and Processing; RTKPOST (Prof Peter T.Y. Shih)

GNSS data and processing: RTKPOST

Peter T.Y. Shih
Department of Civil Engineering
National Chiao Tung University, Taiwan

國立交通大學, 土木工程學系
National Chiao Tung University, Department of Civil Engineering

RTKPOST-Single

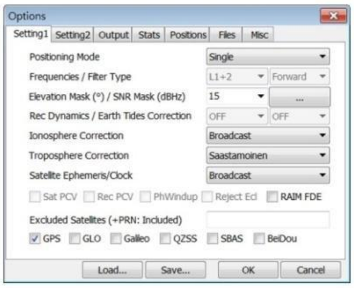
國立交通大學, 土木工程學系
National Chiao Tung University, Department of Civil Engineering

RTKPOST

- Start from the rtklaunch GUI, press the center icon.
- RINEX OBS ➔ Open Obs Data **(jog20060.16o)**
- RINEX NAV ➔ Open Nav Data **(brdc0060.16n)**

3

國立交通大學, 土木工程學系
National Chiao Tung University, Department of Civil Engineering

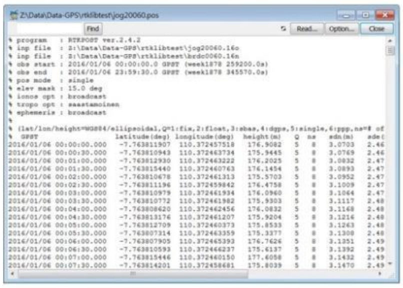


4

國立交通大學, 土木工程學系
National Chiao Tung University, Department of Civil Engineering

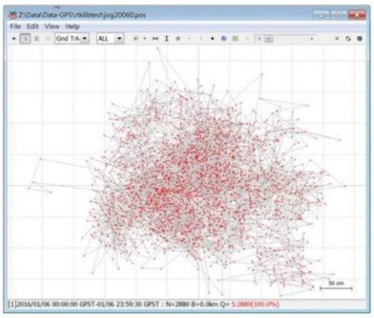
5

國立交通大學, 土木工程學系
National Chiao Tung University, Department of Civil Engineering



6

國立交通大學, 土木工程學系
National Chiao Tung University, Department of Civil Engineering



7

國立交通大學, 土木工程學系
National Chiao Tung University, Department of Civil Engineering

Discussion

- This post processing type is equivalent to GPS "Standard Positioning Service".
- From the ground track plot, the position solutions spread in +/- 2 m.

8

國立交通大學, 土木工程學系
National Chiao Tung University, Department of Civil Engineering

RTKPOST-PPP Kinematic

國立交通大學, 土木工程學系
National Chiao Tung University, Department of Civil Engineering

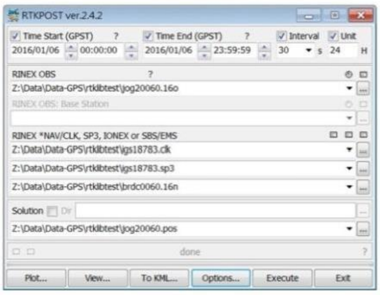
Files needed

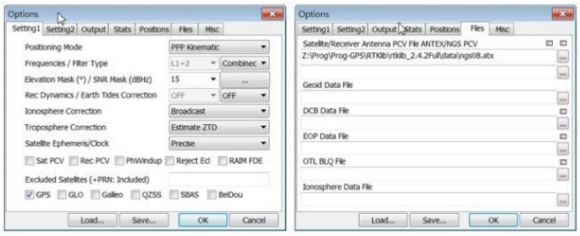
- Download 18783.clk
- Download ngs08.atx
- Station JOG2:

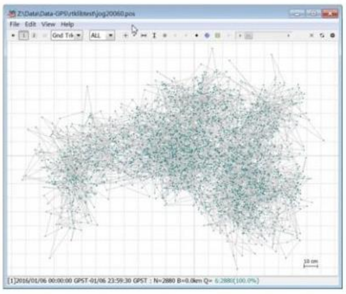
Receiver + Firmware	Antenna
2004-12-08 AOA BENCHMARK ACT - 3.3.32.2N	2004-12-08 AOAD/M_T NONE
2011-05-03 SEPT POLARX2 - 2.7.0	2011-05-03 TPSCR3_GGD NONE
2011-12-03 TPS NETG3 - 3.4p2	2011-12-03 TPSCR.G3 NONE
2013-02-06 JAVAD TRE_G3TH DELTA - 3.4.7	2013-02-06 JAV_RINGANT_G3T NONE
2016-04-20 JAVAD TRE_G3TH DELTA - 3.5.12	Close
Close	

10

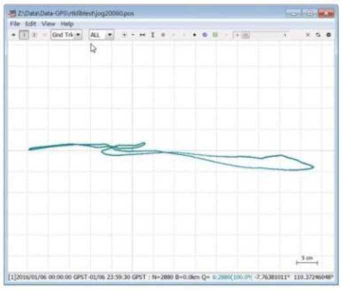
國立交通大學, 土木工程學系
National Chiao Tung University, Department of Civil Engineering







PPP-
Kinematic



PPP-Static

http://itrf.ensg.ign.fr/site_info_and_select/site.php?domesnum=23109M002

Discussion

- This post processing type has improvement in the orbit, the clock, the antenna phase center calibration (atx), and tropospheric correction from estimated.
- From the ground track plot, the position solutions spread in +/- 2 m for E direction and +/- 1.5m for N direction with PPP-Kinematic
- The position solutions spread in +/- 0.35 m for E direction and +/- 0.1 m for N direction with PPP-Static.

Discussion-2

- What is the difference between PPP-Kinematic and PPP-Static?
- The improvement seems quite limited.
- JOG2 is an IGS station, but there is no calculation of the coordinates in the ITRF web site. Is there a way to find the official coordinates of JOG2? Without published coordinates, PPP Fixed could not be exercised.

Published PPP accuracy

IGS基準座標局PPP測位誤差

	RMS誤差			Repeatability		
	East	North	Up	East	North	Up
座標補正無	3.9mm	3.3mm	17.2mm	2.4mm	1.6mm	4.9mm
座標補正有	3.5mm	3.2mm	8.1mm	2.1mm	1.5mm	4.7mm

(GPS Week 1291, IGb00比較)

http://gpspp.sakura.ne.jp/evappp.htm

IGS Reference Frame Station Kinematic PPP Accuracy

RMS Error			Repeatability		
East	North	Up	East	North	Up
1.8cm	1.4cm	3.4cm	1.7cm	1.4cm	3.3cm

GPS Week 1291, Kinematic PPP, Avarage of All Stas, wrt IGb00

http://gpspp.sakura.ne.jp/kinematic/kineigs.htm

Published PPP accuracy

GSI GEONET Stations Static PPP Accuracy

Daily Repeatabilty		
East	North	Up
4.4mm	3.6mm	8.5mm

2004/1/1-12/31, 24H Static PPP, Avarage of All Stas, without Linear Trend

http://gpspp.sakura.ne.jp/ppp/pppgsi.htm

Other References

- Krzan, Grzegorz; Karol Dawidowcz; Krzysztof Swiatek; 2014. Comparison of position determination accuracy conducted by PPP technique using web-based online service and dedicated scientific software, http://leidykla.vgtu.lt/conferences/ENVIRO_2014/Articles/5/226_Krzan.pdf

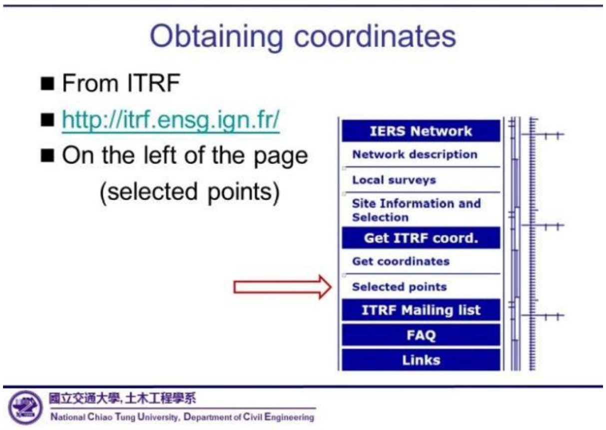
Lecture-3 part 3: GNSS Data and Processing: Obtaining Coordinate

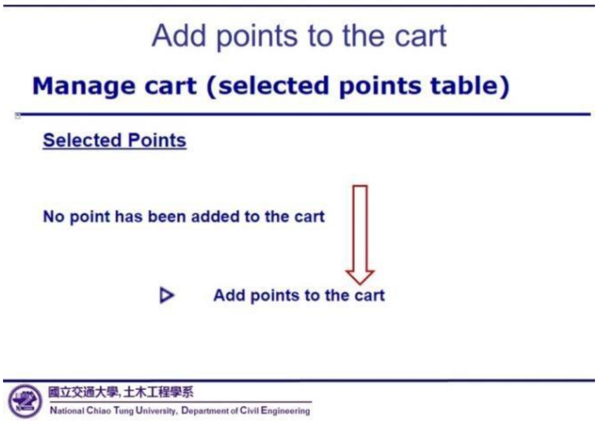
GNSS data and processing: Obtaining Coordinates

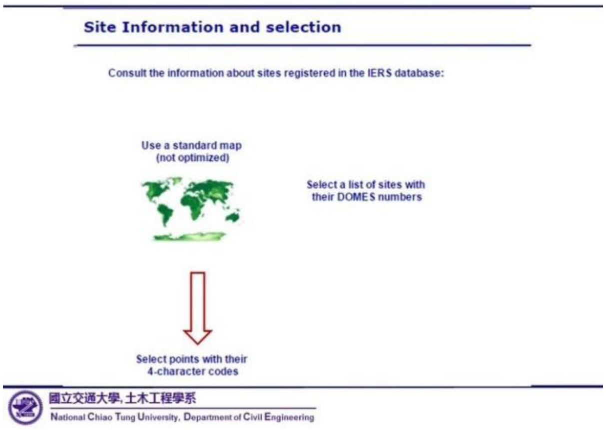
Peter T.Y. Shih
Department of Civil Engineering
National Chiao Tung University, Taiwan

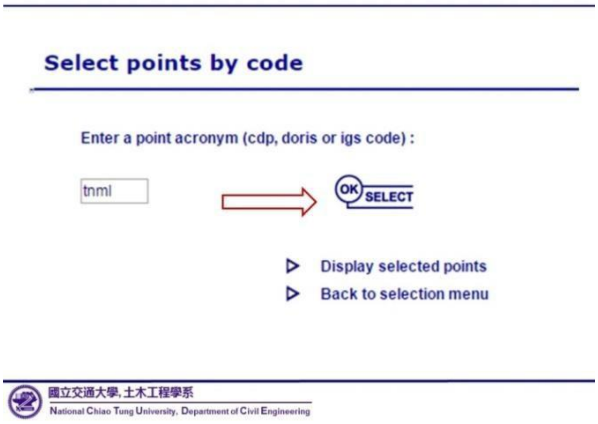
Subjects

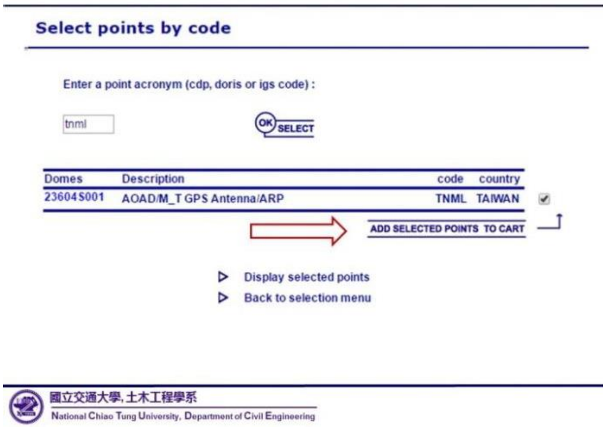
- Obtaining coordinates from ITRF
- Coordinate conversion: MSP GEOTRANS


Obtaining coordinates
From ITRF
http://itrf.ensg.ign.fr/
On the left of the page (selected points)
IERS Network
Network description
Local surveys
Site Information and Selection
Get ITRF coord.
Get coordinates
Selected points
ITRF Mailing list
FAQ
Links
國立交通大學, 土木工程學系
National Chiao Tung University, Department of Civil Engineering


Add points to the cart
Manage cart (selected points table)
Selected Points
No point has been added to the cart
Add points to the cart
國立交通大學, 土木工程學系
National Chiao Tung University, Department of Civil Engineering


Site Information and selection
Consult the information about sites registered in the IERS database:
Use a standard map (not optimized)
Select a list of sites with their DOMES numbers
Select points with their 4-character codes
國立交通大學, 土木工程學系
National Chiao Tung University, Department of Civil Engineering


Select points by code
Enter a point acronym (cdp, doris or igs code) :
tnml
OK SELECT
Display selected points
Back to selection menu
國立交通大學, 土木工程學系
National Chiao Tung University, Department of Civil Engineering


Select points by code
Enter a point acronym (cdp, doris or igs code) :
tnml
OK SELECT
Domes Description code country
23604S001 AOAD/M_T GPS Antenna/ARP TNML TAIWAN
ADD SELECTED POINTS TO CART
Display selected points
Back to selection menu
國立交通大學, 土木工程學系
National Chiao Tung University, Department of Civil Engineering


Select points by code
Enter a point acronym (cdp, doris or igs code) :
tnml
OK SELECT
23604S001 has been added to cart !
Domes Description code country
23604S001 AOAD/M_T GPS Antenna/ARP TNML TAIWAN
ADD SELECTED POINTS TO CART
Display selected points
Back to selection menu
國立交通大學, 土木工程學系
National Chiao Tung University, Department of Civil Engineering

Site Information and Selection

General site information

Site Name : Hsinchu

Country Name : TAIWAN
Longitude : 120°59'
Latitude : 24°48'
Tectonic plate : EURA

Map not available

Local tie information

No ties information available yet.

Point information and selection

▷ View all points

Domes	Description	code	ITRF 93	94	96	97	2000	2005	2008
23604S001	AOAD/M_T GPS Antenna/ARP	TNML	■	■	■	■	■	■	■

ADD SELECTED POINTS TO CART

Caption : ■ Calculated ■ Not Calculated ■ Information not available

(NO) RESELECT CONTINENT (NO) RESELECT COUNTRY (OK) RESELECT SITE

國立交通大學, 土木工程學系
National Chiao Tung University, Department of Civil Engineering

Manage cart (selected points table)

Selected Points

Domes	Description	code	ITRF 93	94	96	97	2000	2005	2008
23604S001	AOAD/M_T GPS Antenna/ARP	TNML	■	■	■	■	■	■	■
23604S002	LEIAT504 (SN:720) GPS antenna/ARP	TCMS	■	■	■	■	■	■	■
23603S002	ASH701945C_M SCIS / CR620012101 / ARP	TWTF	■	■	■	■	■	■	■
23606M001	Top of a forced centering plate fixed on a roof	NCKU	■	■	■	■	■	■	■
23109M002	Top and axis of a steel mast fixed on top of a concrete pillar, anchored in a roof	JOG2	■	■	■	■	■	■	■

REMOVE SELECTED POINTS FROM CART

Caption : ■ Calculated ■ Not Calculated ■ Information not available

▷ Export the list of selected domes numbers
▷ Get ITRF coordinates of these points
▷ Add other points to the cart

國立交通大學, 土木工程學系
National Chiao Tung University, Department of Civil Engineering

ITRF station positions & velocities

This page extracts positions and velocities of the selected points from an ITRF solution at any epoch. Follow the guidelines. If you request a SINEX file, you will be informed by email when the SINEX is ready to be downloaded on the LAREG ftp server.

WARNING : 23606M001, 23109M002 don't belong to ITRF2008. No computation is possible. Remove these points with manage cart if you want to continue

Choose an ITRF: ITRF2008
Choose the epoch: 2016/01/06 format : yyyy/mm/dd
Choose the file format: Table
Your e-mail (only if you order a SINEX file)

(OK) Submit

國立交通大學, 土木工程學系
National Chiao Tung University, Department of Civil Engineering

Manage cart (selected points table)

Selected Points

Domes	Description	code	ITRF 93	94	96	97	2000	2005	2008
23604S001	AOAD/M_T GPS Antenna/ARP	TNML	■	■	■	■	■	■	■
23604S002	LEIAT504 (SN:720) GPS antenna/ARP	TCMS	■	■	■	■	■	■	■
23603S002	ASH701945C_M SCIS / CR620012101 / ARP	TWTF	■	■	■	■	■	■	■

REMOVE SELECTED POINTS FROM CART

Caption : ■ Calculated ■ Not Calculated ■ Information not available

▷ Export the list of selected domes numbers
▷ Get ITRF coordinates of these points
▷ Add other points to the cart

國立交通大學, 土木工程學系
National Chiao Tung University, Department of Civil Engineering

DATA SET EXPRESSED IN ITRF2008 FRAME
STATION POSITIONS AND VELOCITIES AT EPOCH 2016/01/06

DOMES NB	SITE NAME	ID	SOLN	X/Vx	Y/Vy	Z/Vz	SIGMA x/vx	SIGMA y/vy	SIGMA z/vz
				m-m/y	m-m/y	m-m/y	m-m/y	m-m/y	m-m/y
23604S001	Hsinchu	TNML	1	-2982779.428	4966662.497	2658805.617	0.001	0.001	0.001
				-0.0276	-0.0121	-0.0092	0.0001	0.0001	0.0001
23604S002	Hsinchu	TCMS	1	-2982783.245	4966659.961	2658809.349	0.001	0.002	0.001
				-0.0276	-0.0121	-0.0092	0.0001	0.0001	0.0001
23603S002	Taoyuan	TWTF	1	-2994428.509	4951309.156	2674496.751	0.001	0.002	0.001
				-0.0326	-0.0093	-0.0104	0.0001	0.0001	0.0001
23603S002	Taoyuan	TWTF	2	-2994428.501	4951309.139	2674496.734	0.001	0.001	0.001
				-0.0326	-0.0093	-0.0104	0.0001	0.0001	0.0001

國立交通大學, 土木工程學系
National Chiao Tung University, Department of Civil Engineering

Coordinate Conversion

- Geocentric coordinates
  X (m), Y (m), Z (m)
- Geodetic coordinates
  Longitude, Latitude, Height (m)

國立交通大學, 土木工程學系
National Chiao Tung University, Department of Civil Engineering

MSP GEOTRANS

- An USA NGA software
- http://earth-info.nga.mil/GandG/geotrans/
- An application program which allows you to convert geographic coordinates among a wide variety of coordinate systems, map projections, and datums.
- GEOTRANS runs in Microsoft Windows, LINUX, and UNIX environments and starting with MSP GEOTRANS 3.4 an android app is now available.

國立交通大學, 土木工程學系
National Chiao Tung University, Department of Civil Engineering

DOWNLOADING ↑

- **Windows End-User (recommended for most users)**
  The Windows users' version is intended for end-users that operate on a Windows platform. It includes everything necessary to run GEOTRANS (including online help). It does not include the source code. A Windows installer makes the installation easy and it allows the user to create a shortcut to GEOTRANS that can be placed at a specified location. **Windows XP and Windows 7 users:** Download the desired version, double click on the install.exe file, and follow on screen instructions; your computer will be re-booted after installation. **Windows 8 users:** Download the 32-bit version, right click on the install.exe file, select properties → compatibility; on the compatibility tab check "Run this program in compatibility mode for: Windows XP", select "apply" then "OK". Double click on the install.exe and follow on screen instructions; your computer will be re-booted after installation. If you need the 64-bit installation go to Software Developers section and download the Windows Developer.

MSP GeoTrans 32-bit Version for Windows XP, Windows 7, and Windows 8:

Download	File Size	Filename	Top
WINDOWS 32-BIT SELF-INSTALLER	(143 MB)	install.exe	↑

MSP GeoTrans 64-bit version for Windows 7 (not Windows 8):
Before downloading the 64-bit version verify 64-bit java is installed on your system – C:\Program Files\Java.
If you do not have 64-bit java, download and install it prior to downloading MSP GeoTrans or download and install the 32-bit version.

Download	File Size	Filename	Top
WINDOWS 64-BIT SELF-INSTALLER	(143 MB)	install.exe	↑

*From my own experience, 64-bit Installer does not work, even for 64-bit Window 7, by 2016-0916.

國立交通大學, 土木工程學系
National Chiao Tung University, Department of Civil Engineering

JAVA

- Java is needed.
- After installing JAVA, check where it is located.
- You may encounter:
  LaunchAnywhere Error: Windows error 2 occured while loading the Java VM

An Solution

- http://answers.microsoft.com/en-us/windows/forum/windows8_1-update/launchanywhere-error-windows-error-2-occured-while/9853d01d-d85b-41d0-af23-e9965140fc69?auth=1

國立交通大學, 土木工程學系
National Chiao Tung University, Department of Civil Engineering

The Steps

1. From the **Desktop**, right-click the **Computer** icon and select **Properties**. If you don't have a Computer icon on your desktop, click the **Start** button, right-click the **Computer** option in the Start menu, and select **Properties**.
2. Click the **Advanced System Settings** link in the left side.
3. In the **System Properties** window, click on the **Advanced tab**, then click the **Environment Variables** button near the bottom of that tab.

國立交通大學, 土木工程學系
National Chiao Tung University, Department of Civil Engineering

The Steps-2

4. In the **Environment Variables** window, highlight the **Path** variable in the "System variables" section and click the Edit button. Add or modify the path lines with the paths : "**C:\Program files\Java\jre1.8.0_60\bin**" *(You may cross check the right path in your Program files\Java directory)*

*Please note that each different directory is separated with a semicolon (;) so you just need to add a semicolon (;) after the existing path.

5. Relaunch the installer again and you will find it's running !

國立交通大學, 土木工程學系
National Chiao Tung University, Department of Civil Engineering

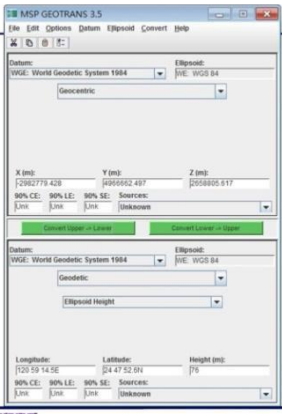
Another Solution

- Download the master file from http://earth-info.nga.mil/GandG/geotrans/

- **Developer MASTER**
  The Master version is for software developers and includes the executables for all platforms a
  difference between the Windows and Unix master is the zip method.

Download	File Size	Filename	Top
WINDOWS MASTER	(149 MB)	master.zip	↥
UNIX MASTER	(148 MB)	master.tgz	↥

國立交通大學, 土木工程學系
National Chiao Tung University, Department of Civil Engineering



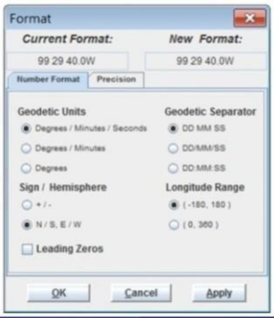
國立交通大學, 土木工程學系
National Chiao Tung University, Department of Civil Engineering

An Exercise

- TNML
  X: -2982779.428
  Y: 4966662.497
  Z: 2658805.617

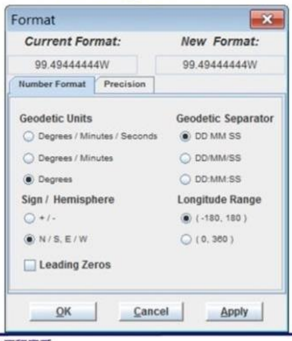
國立交通大學.土木工程學系
National Chiao Tung University, Department of Civil Engineering

Options/Format



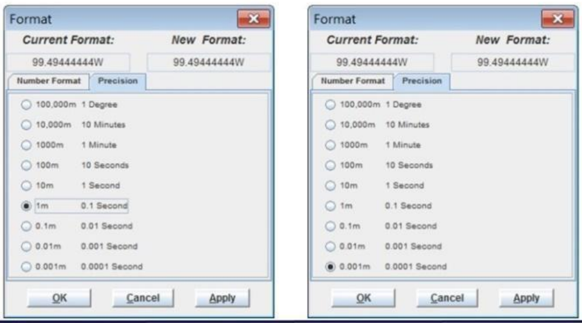
國立交通大學.土木工程學系
National Chiao Tung University, Department of Civil Engineering

Change Format



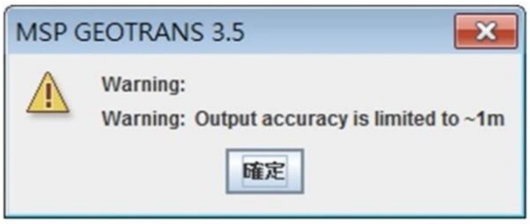
國立交通大學.土木工程學系
National Chiao Tung University, Department of Civil Engineering

Change Precision



國立交通大學.土木工程學系
National Chiao Tung University, Department of Civil Engineering

Limitation



國立交通大學.土木工程學系
National Chiao Tung University, Department of Civil Engineering

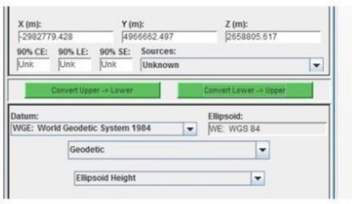
Result

- Longitude: 120.98734816E
- Latitude: 24.79795367N
- Height: 75.867

國立交通大學.土木工程學系
National Chiao Tung University, Department of Civil Engineering

Check the consistency

- TNML (Original)
  X: -2982779.428
  Y: 4966662.497
  Z: 2658805.617
- TNML (Reversed)
  X: -2982779.428
  Y: 4966662.497
  Z: 2658805.617



國立交通大學.土木工程學系
National Chiao Tung University, Department of Civil Engineering

GNSS data and processing: RTKPOST-PPP

Peter T.Y. Shih
Department of Civil Engineering
National Chiao Tung University, Taiwan

國立交通大學, 土木工程學系
National Chiao Tung University, Department of Civil Engineering

Subjects

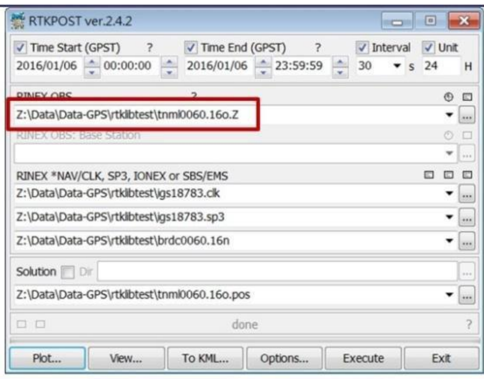
- More experiments with TNML and TCMS
- Coordinate comparison

國立交通大學, 土木工程學系
National Chiao Tung University, Department of Civil Engineering

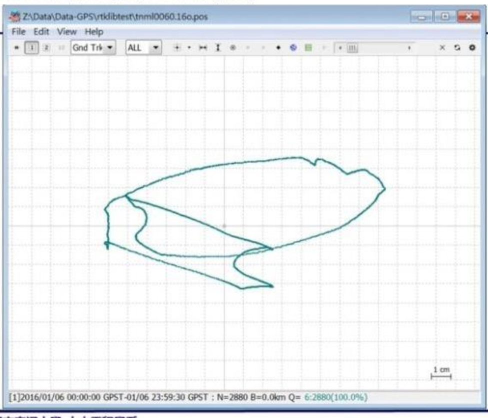
TNML from ITRF

- Geocentric
  -2982779.428 4966662.497 2658805.617
- Geodetic
  120.98734816E 24.79795367N 75.867
- UTM
  296545.709, 2744074.920 (from geocentric)
  296545.709, 2744074.920 (from geodetic)

國立交通大學, 土木工程學系
National Chiao Tung University, Department of Civil Engineering



國立交通大學, 土木工程學系
National Chiao Tung University, Department of Civil Engineering



國立交通大學, 土木工程學系
National Chiao Tung University, Department of Civil Engineering

TNML

From ITRF:

- Longitude: 120.98734816E
- Latitude: 24.79795367N
- Height: 75.867

RTKPOST:

- Mean:
  24.79795381 120.9873487 77.06952135
- Repeatitivity:
  1.84193E-07 4.1625E-07 0.073022207

國立交通大學, 土木工程學系
National Chiao Tung University, Department of Civil Engineering

TNML: Height

- From ITRF, h= 75.867
- From RTKPOST, mean= 77.070

Difference: 1.203m

➔There is a systematic bias (Antenna height?)

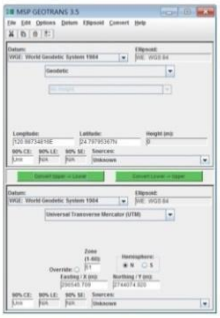
➔The repeativity is 0.073m

國立交通大學, 土木工程學系
National Chiao Tung University, Department of Civil Engineering

TNML: planimetry

- From ITRF, UTM zone 51, 296545.709, 2744074.920
- From RTKPOST, 296545.764, 2744074.935

Difference(m): 0.055, 0.015



國立交通大學, 土木工程學系
National Chiao Tung University, Department of Civil Engineering

TCMS from ITRF

- Geocentric
  -2982783.245 4966659.961 2658809.349
- Geodetic

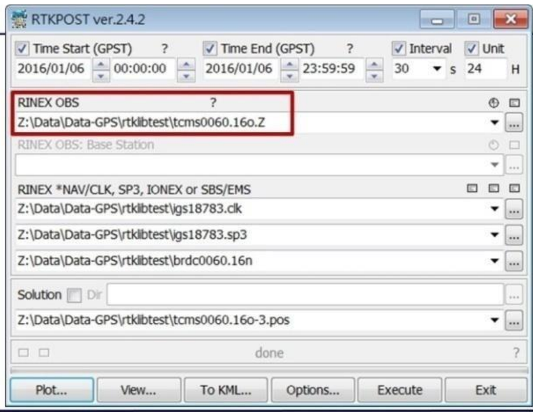
120.98739343E 24.79798504N 77.243

- UTM

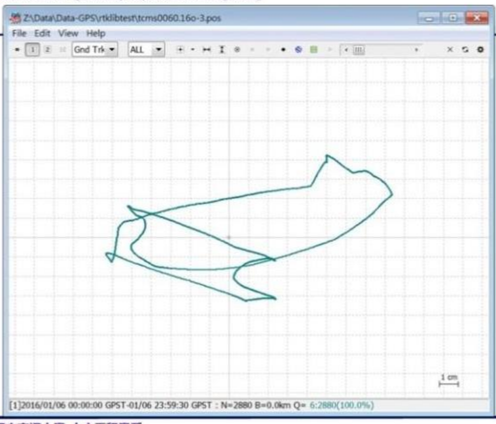
296550.338, 2744078.328 (from geocentric)

296550.338, 2744078.327 (from geodetic)

國立交通大學, 土木工程學系
National Chiao Tung University, Department of Civil Engineering



國立交通大學, 土木工程學系
National Chiao Tung University, Department of Civil Engineering



國立交通大學, 土木工程學系
National Chiao Tung University, Department of Civil Engineering

TCMS

From ITRF:

- Longitude: 120.98739343E
  Latitude: 24.79798504N
  Height: 77.243

RTKPOST:

- Mean:
  24.79798527 120.9873936 76.88012146
- Repeatitivity:
  1.85784E-07 4.15216E-07 0.075129848

國立交通大學, 土木工程學系
National Chiao Tung University, Department of Civil Engineering

TCMS: Height

- From ITRF, h= 77.243
  From RTKPOST, mean= 76.880

Difference: -0.363m

➔There is a systematic bias.

➔The repeativity is 0.075m

國立交通大學, 土木工程學系
National Chiao Tung University, Department of Civil Engineering

TCMS: planimetry

- From ITRF, UTM zone 51, 296550.338, 2744078.327
- From RTKPOST, 296550.355, 2744078.352
- Difference(m): 0.017, 0.025

國立交通大學, 土木工程學系
National Chiao Tung University, Department of Civil Engineering

Discussion

- Coordinate bias:
  TNML: 0.055, 0.015, 1.203m
  TCMS: 0.017, 0.025, -0.363m
- There must be an issue with the height.
- TNML .16o header:
  1.5770 0.0000 0.0000
  ANTENNA: DELTA H/E/N
- TCMS .16o header:
  0.0000 0.0000 0.0000
  ANTENNA: DELTA H/E/N

Lecture 3 part 5 and practice: GNSS and Coordinate (Prof. Peter T.Y. Shih)

GNSS data and processing: RTKPOST-Differential

Peter T.Y. Shih
Department of Civil Engineering
National Chiao Tung University, Taiwan

Subjects

- Differential GNSS, Static
- Differential GNSS, Kinematic
- Coordinate comparison

TNML from ITRF

- Geocentric
  -2982779.428 4966662.497 2658805.617
- Geodetic

120.98734816E 24.79795367N 75.867

- UTM

296545.709, 2744074.920 (from geocentric)
296545.709, 2744074.920 (from geodetic)

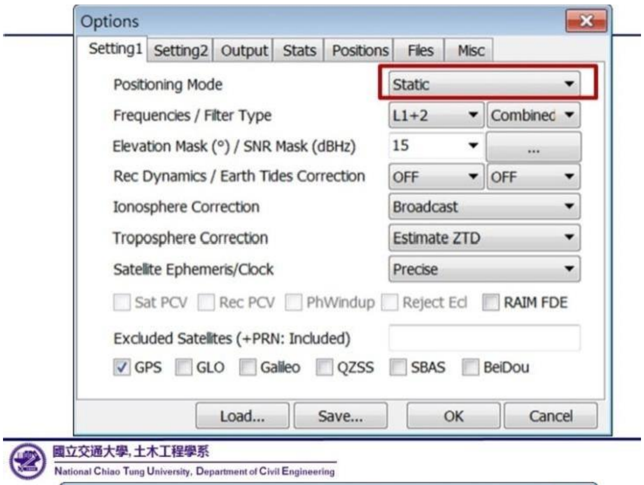
TCMS from ITRF

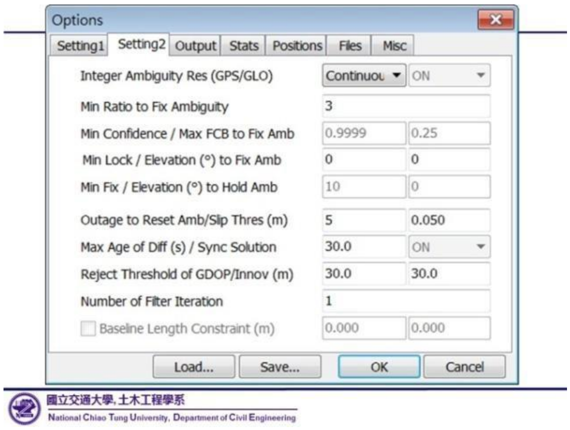
- Geocentric
  -2982783.245 4966659.961 2658809.349
- Geodetic

120.98739343E 24.79798504N 77.243

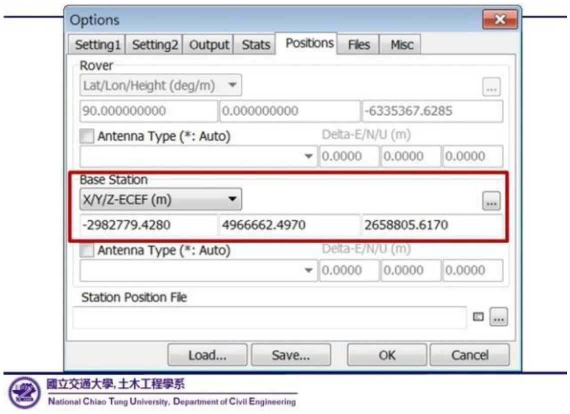
- UTM

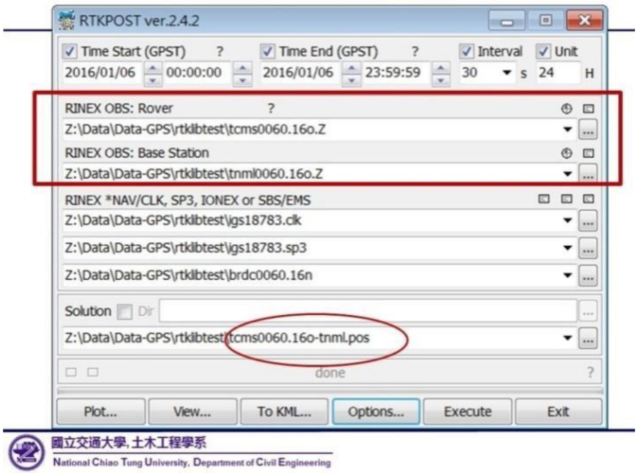
296550.338, 2744078.328 (from geocentric)
296550.338, 2744078.327 (from geodetic)

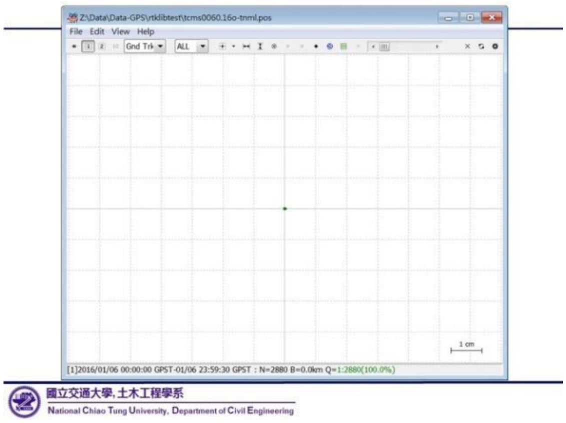

Options
Setting1 Setting2 Output Stats Positions Files Misc
Positioning Mode Static
Frequencies / Filter Type L1+2 Combined
Elevation Mask (°) / SNR Mask (dBHz) 15
Rec Dynamics / Earth Tides Correction OFF OFF
Ionosphere Correction Broadcast
Troposphere Correction Estimate ZTD
Satellite Ephemeris/Clock Precise
Sat PCV Rec PCV PhWindup Reject Ecl RAIM FDE
Excluded Satellites (+PRN: Included)
GPS GLO Galileo QZSS SBAS BeiDou
Load... Save... OK Cancel
國立交通大學, 土木工程學系
National Chiao Tung University, Department of Civil Engineering

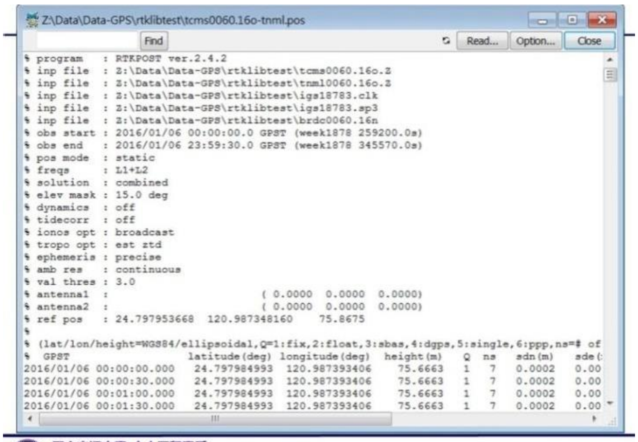

Options
Setting1 Setting2 Output Stats Positions Files Misc
Integer Ambiguity Res (GPS/GLO) Continuous ON
Min Ratio to Fix Ambiguity 3
Min Confidence / Max FCB to Fix Amb 0.9999 0.25
Min Lock / Elevation (°) to Fix Amb 0 0
Min Fix / Elevation (°) to Hold Amb 10 0
Outage to Reset Amb/Slip Thres (m) 5 0.050
Max Age of Diff (s) / Sync Solution 30.0 ON
Reject Threshold of GDOP/Innov (m) 30.0 30.0
Number of Filter Iteration 1
Baseline Length Constraint (m) 0.000 0.000
Load... Save... OK Cancel
國立交通大學, 土木工程學系
National Chiao Tung University, Department of Civil Engineering


Options
Setting1 Setting2 Output Stats Positions Files Misc
Measurement Errors (1-sigma)
Code/Carrier-Phase Error Ratio L1/L2 100.0 100.0
Carrier-Phase Error a+b/sinEl (m) 0.003 0.003
Carrier-Phase Error/Baseline (m/10km) 0.000
Doppler Frequency (Hz) 10.000
Process Noises (1-sigma/sqrt(s))
Receiver Accel Horiz/Vertical (m/s2) 1.00E+01 1.00E+01
Carrier-Phase Bias (cycle) 1.00E-04
Vertical Ionospheric Delay (m/10km) 1.00E-03
Zenith Tropospheric Delay (m) 1.00E-04
Satellite Clock Stability (s/s) 5.00E-12
Load... Save... OK Cancel
國立交通大學, 土木工程學系
National Chiao Tung University, Department of Civil Engineering


Options
Setting1 Setting2 Output Stats Positions Files Misc
Rover
Lat/Lon/Height (deg/m)
90.000000000 0.000000000 -6335367.6285
Antenna Type (*: Auto) Delta-E/N/U (m)
0.0000 0.0000 0.0000
Base Station
X/Y/Z-ECEF (m)
-2982779.4280 4966662.4970 2658805.6170
Antenna Type (*: Auto) Delta-E/N/U (m)
0.0000 0.0000 0.0000
Station Position File
Load... Save... OK Cancel
國立交通大學, 土木工程學系
National Chiao Tung University, Department of Civil Engineering


RTKPOST ver.2.4.2
Time Start (GPST) ? Time End (GPST) ? Interval Unit
2016/01/06 00:00:00 2016/01/06 23:59:59 30 s 24 H
RINEX OBS: Rover ?
Z:\Data\Data-GPS\rtklibtest\tcms0060.16o.Z
RINEX OBS: Base Station
Z:\Data\Data-GPS\rtklibtest\tnml0060.16o.Z
RINEX *NAV/CLK, SP3, IONEX or SBS/EMS
Z:\Data\Data-GPS\rtklibtest\igs18783.clk
Z:\Data\Data-GPS\rtklibtest\igs18783.sp3
Z:\Data\Data-GPS\rtklibtest\brdc0060.16n
Solution Dir
Z:\Data\Data-GPS\rtklibtest\tcms0060.16o-tnml.pos
done
Plot... View... To KML... Options... Execute Exit
國立交通大學, 土木工程學系
National Chiao Tung University, Department of Civil Engineering


國立交通大學, 土木工程學系
National Chiao Tung University, Department of Civil Engineering



TCMS

From ITRF:

- Longitude: 120.98739343E
  Latitude: 24.79798504N
  Height: 77.243

RTKPOST:

- Longitude: 120.9873934 E
  Latitude: 24.79798499 N
  Height: 75.666

7.72158E-10 1.57021E-09 0.000216078

國立交通大學, 土木工程學系
National Chiao Tung University, Department of Civil Engineering

TCMS: Height

- From ITRF, h= 77.243
  From RTKPOST, mean= 75.666

Difference: -1.577m

➔There is a systematic bias, likely from TNML.

➔The repeativity is 0.0002m

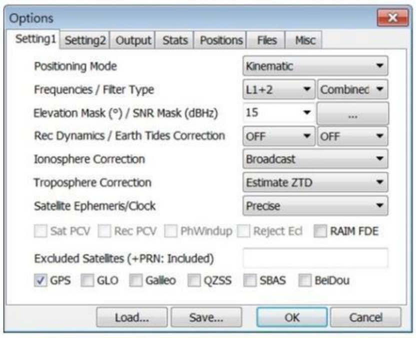
國立交通大學, 土木工程學系
National Chiao Tung University, Department of Civil Engineering

TCMS: planimetry

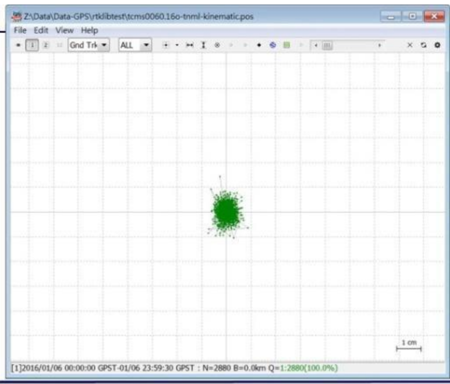
- From ITRF, UTM zone 51, 296550.338, 2744078.327
- From RTKPOST, 296550.334, 2744078.322
- Difference(m): -0.004, -0.005

國立交通大學, 土木工程學系
National Chiao Tung University, Department of Civil Engineering

RTKPOST: Kinematic



國立交通大學, 土木工程學系
National Chiao Tung University, Department of Civil Engineering



國立交通大學, 土木工程學系
National Chiao Tung University, Department of Civil Engineering

TCMS

From ITRF:

- Longitude: 120.98739343E
  Latitude: 24.79798504N
  Height: 77.243

RTKPOST:

- Longitude: 120.9873936 E
  Latitude: 24.79798527N
  Height: 76.880

1.85784E-07 4.15216E-07 0.075129848

國立交通大學,土木工程學系
National Chiao Tung University, Department of Civil Engineering

TCMS: Height

- From ITRF, h= 77.243
  From RTKPOST (Kinematic), mean= 76.880

Difference: -0.363m

→There is a systematic bias.

→The repeativity is 0.075m

國立交通大學,土木工程學系
National Chiao Tung University, Department of Civil Engineering

TCMS: planimetry

- From ITRF, UTM zone 51, 296550.338, 2744078.327
- From RTKPOST (kinematic), 296550.355, 2744078.352
- Difference(m): 0.017, 0.025

國立交通大學,土木工程學系
National Chiao Tung University, Department of Civil Engineering

Discussion

- There is height issue in TNML and TCMS.
- The geodetic heights are 77.243(TCMS) and 75.867 (TNML) from ITRF. Antenna height in rinex file: 0.000 (TCMS), 1.577 (TNML).
- Fix TNML, the height of TCMS is 75.666 for static, 76.880 for kinematic. This is strange too.

國立交通大學,土木工程學系
National Chiao Tung University, Department of Civil Engineering

Validation

- From NML (Dr. M.H. Peng):
  The reference point of TNML is on the ground, 1.577 m lower than the antenna reference surface. And, the reference point of TCMS is the phase center of the antenna.
- This is why, Rinex:ANTENNA: DELTA (TNML: 1.577; TCMS: 0)
- The ITRF coordinates refer to the antenna reference surface for TCMS and ground for TNML.

國立交通大學,土木工程學系
National Chiao Tung University, Department of Civil Engineering

On the Site

TCMS

TNML

國立交通大學,土木工程學系
National Chiao Tung University, Department of Civil Engineering

Confirmation

- 75.666 (TCMS height in Static) +1.577 (TNML antenna height) = 77.243 (The height of TCMS from ITRF)
- Lesson learned:
  There are always possibilities of confusion.

國立交通大學, 土木工程學系
National Chiao Tung University, Department of Civil Engineering

Lecture- 3 part 6 and practice: GNSS data and processing (Prof. Peter T.Y.Shih)

GNSS data and processing: RTKCONV

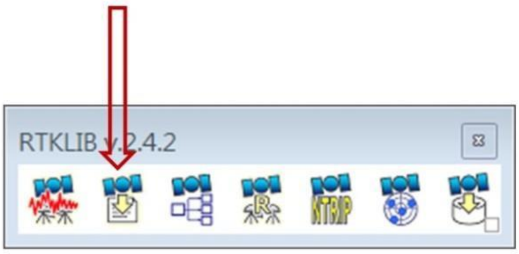
Peter T.Y. Shih
Department of Civil Engineering
National Chiao Tung University, Taiwan

國立交通大學, 土木工程學系
National Chiao Tung University, Department of Civil Engineering

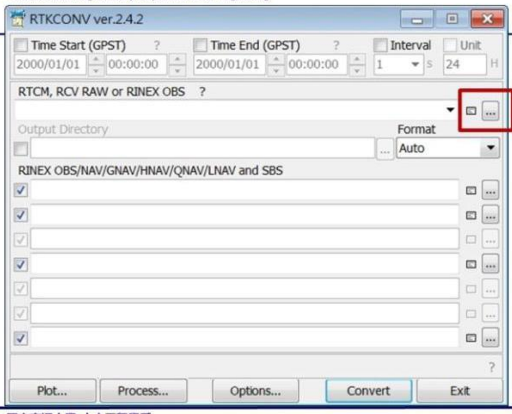
Subjects

- Format conversion
- The other useful software: TEQC (https://www.unavco.org/software/data-processing/teqc/teqc.html)

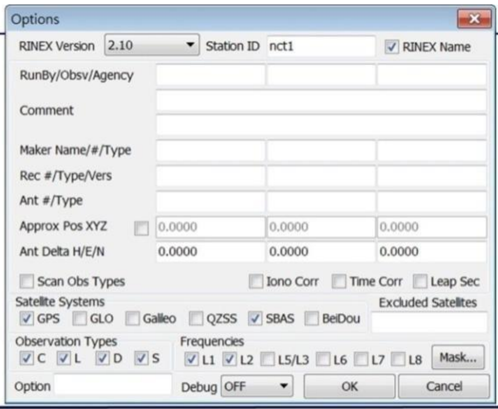
國立交通大學, 土木工程學系
National Chiao Tung University, Department of Civil Engineering

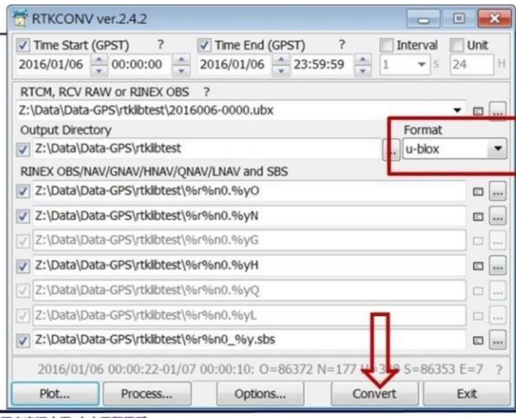


國立交通大學, 土木工程學系
National Chiao Tung University, Department of Civil Engineering

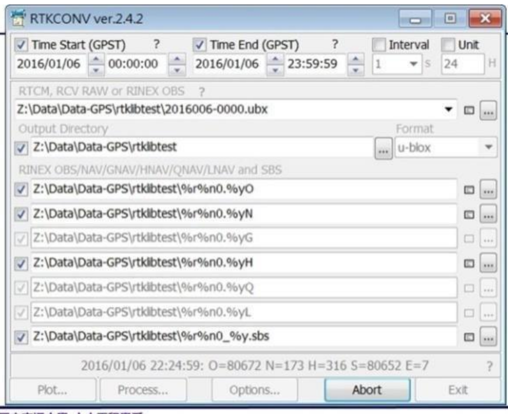


國立交通大學, 土木工程學系
National Chiao Tung University, Department of Civil Engineering





國立交通大學, 土木工程學系
National Chiao Tung University, Department of Civil Engineering

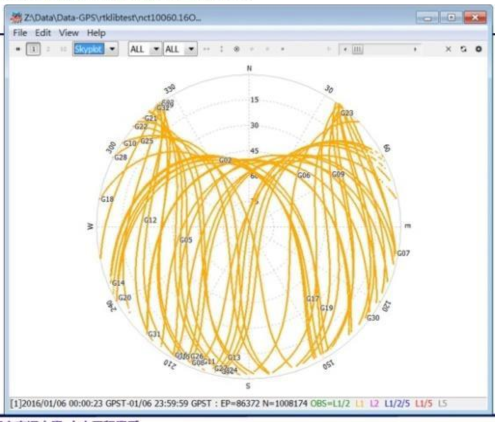


國立交通大學, 土木工程學系
National Chiao Tung University, Department of Civil Engineering

RTKPLOT

- One can use RTKPLOT to view the converted data.

國立交通大學, 土木工程學系
National Chiao Tung University, Department of Civil Engineering



國立交通大學, 土木工程學系
National Chiao Tung University, Department of Civil Engineering

Files Created

nct10060.16H	2016/9/16 下午 0...	16H 檔案	108 KB
nct10060.16N	2016/9/16 下午 0...	16N 檔案	106 KB
nct10060.16O	2016/9/16 下午 0...	16O 檔案	71,312 KB
nct10060_16.sbs	2016/9/16 下午 0...	SBS 檔案	6,831 KB

國立交通大學, 土木工程學系
National Chiao Tung University, Department of Civil Engineering

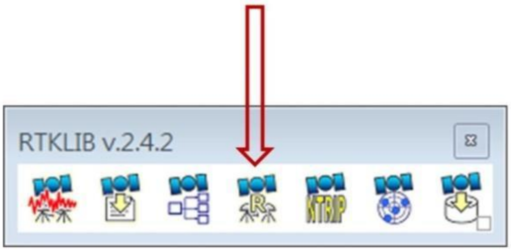
GNSS data and processing: RTKPOST

Peter T.Y. Shih
Department of Civil Engineering
National Chiao Tung University, Taiwan

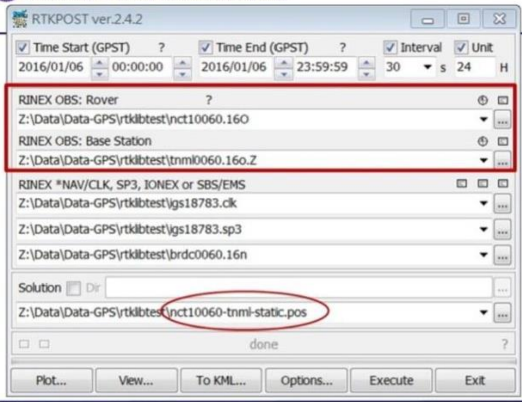
Subjects

- Ublox Differential
- Ublox PPP

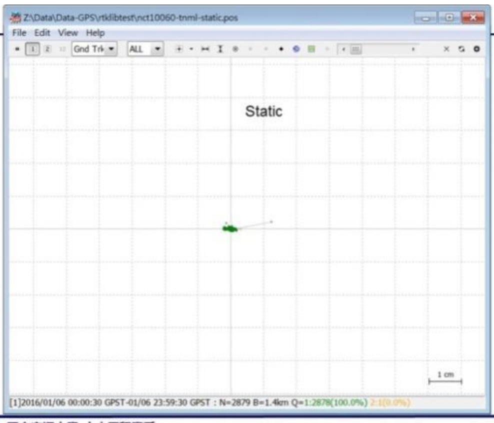
國立交通大學 土木工程學系
National Chiao Tung University, Department of Civil Engineering



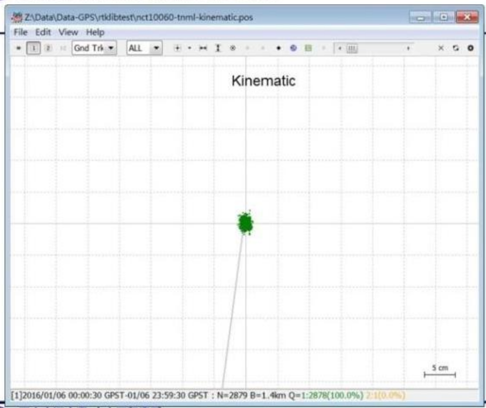
國立交通大學 土木工程學系
National Chiao Tung University, Department of Civil Engineering



國立交通大學 土木工程學系
National Chiao Tung University, Department of Civil Engineering



國立交通大學 土木工程學系
National Chiao Tung University, Department of Civil Engineering



國立交通大學 土木工程學系
National Chiao Tung University, Department of Civil Engineering

國立交通大學 土木工程學系
National Chiao Tung University, Department of Civil Engineering

Lecture-5: UAVs Role in Disaster Management (Rahman Syaifoel)

UAV's role in disaster management

Yogyakarta, 10-17 October 2016

Rahman Syaifoel
Business Development Manager Eurousc-International
www.eurousc.com

This presentation consist of the following:

1. General information about UAV sector
2. Exponential growth of UAV industry
3. UAV and disaster management
4. State of affairs in Europe
5. Regulatory oversight: ASEAN-countries
6. What challenges do ASEAN-countries face?
7. Trainings programs and remote pilot certificates
8. Conclusion
9. Recommendations

Terminology: Drone, UAV, UAS, RPAS; Nirawak?

Source: UVS-International

The key word: Aircraft — RPAS Exist

Aircraft	Lighter than Air	Non power driven	Free balloon		
			Captive balloon		
		Power-driven		Airships	⇦
	Heavier than Air	Non power driven	Glider		
			Kite		
		Power-driven	Aeroplane	Landplane	⇦
				Seaplane	⇦
				Amphibian	⇦
			Rotorcraft	Gyroplane	⇦
				Helicopter	⇦
			Ornithopter *(flapping wing)*		⇦

NOTE: Flying toys & model aircraft are indeed also .... Aircraft !!!

Mini vs Maxi

All kind of RPAS

EUROUSC INTERNATIONAL

All kind of RPAS

EUROUSC INTERNATIONAL

All kind of RPAS

EUROUSC INTERNATIONAL™

Current use
Potential use

EUROUSC INTERNATIONAL™

Governmental	MUTUALIZATION	Military			+	
		Non Military	State Flights *Security related*	Police Customs Border Guards Coast Guard	+ + + +	NON MILITARY RPAS OPS
			Not State Flights *incl. Safety related*	Civil Protection Fire Fighters National Mapping Agencies	+ + +	
Non-Governmental		Public	European Union	Flights on behalf of a public EU agency *(without national oversight ?)*	+	
		Commercial Air Transport *(Transport of Persons & Freight)*		Scheduled Air Service Non-scheduled Revenue Operations Non-revenue Operations	+	
		General Aviation		Corporate Operations Flight Training / Instruction Pleasure		
	➡	Aerial Work / Specialized Operations		Commercial Non-Commercial (incl. Corporate Operations) Training / Instruction Other Miscellaneous	+ + + +	
		Leisure	Model Aircraft Flying Toys		+ +	

Aerial
Professional ops

EUROUSC INTERNATIONAL™

1	Aerial Work - Commercial & Non-Commercial *(Including Corporate Operations)*			
	- Advertising	50%	- Inspection	100%
	- Monitoring	70%	- Observation & Surveillance	70%
	- Patrol & Spotting	40%	- Photography, Video, Cinema, TV	100%
	- Research & Scientific	90%	- Search & Rescue Assistance	50%
	- Spraying & Dispensing	40%	- Survey & Mapping	100%

Inspection: *Examination with the intent to find faults, errors, problems, malfunctions or specific phenomena.*
Monitoring: *Observation on a regular basis over a period of time.*
Observation: *Examination of an activity, person, group, area or phenomena.*
Patrol: *Searching for a specific activity, person, group or phenomena.*
Spotting: *Looking for & noting geographical coordinates of an activity, object, person, group or phenomena.*
Surveillance: *Close observation of an activity, person, group, area or phenomena.*
Survey: *Detailed inspection of a geo-referenced section of the earth's surface (incl. structures) with the purpose to study or measure or restitute altitudes, angles, distances, phenomena & structures flown over.*

Aerial ops

EUROUSC INTERNATIONAL™

2	Flight Training / Instruction *(Private & Commercial)*	- Duo *(student instruction by licensed pilot)* - Solo *(unaided student flight)* - Check *(qualification verification of pilot license holder)*
3	Other Miscellaneous *(Private & Commercial)*	- Test / Experimental - Demonstration - Ferry / Positioning - Air Show / Race
4	Transport (Commercial & Non-Commercial)	

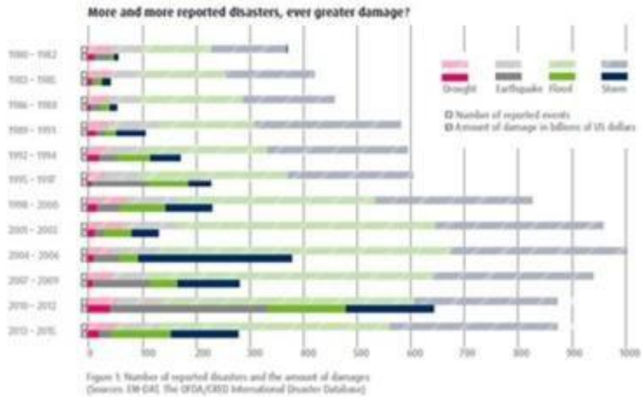
Market sector and Application

Market Sector	Applications		
Agriculture, Fishery, Forestry	Inspection Patrol & Spotting Survey & Mapping	Monitoring Spraying & Dispensing	Observation Surveillance
Audio-Visual & Media	Advertising TV Reporting	Cinema TV Broadcasting	Photography
Construction / Infrastructure	Inspection	Monitoring	Survey & Mapping
Environmental	Inspection Patrol & Spotting	Monitoring Surveillance	Observation Survey & Mapping
Mining & Exploration	Inspection	Survey & Mapping	
Research & Scientific	Inspection Patrol &Spotting	Monitoring Surveillance	Observation Survey & Mapping
Safety	Inspection Patrol & Spotting Survey & Mapping	Monitoring Search & Rescue	Observation Surveillance
Security	Monitoring Surveillance	Observation Survey & Mapping	Patrol & Spotting
Transport	Light	Medium	Heavy

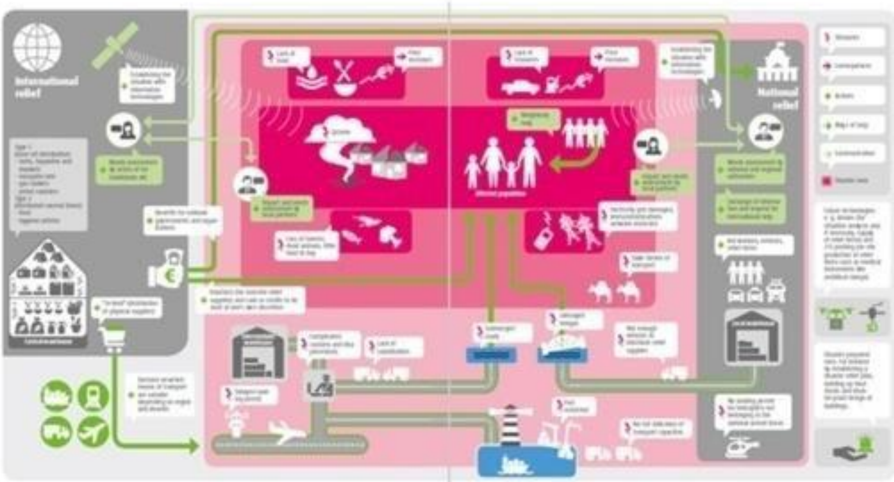
World risk index

Source: WorldRiskReport2016

Increasing of disaster with great damage



Humanitarian Logistics



Using UAV in disaster management

Katrina

https://youtu.be/J9X2K5AijZ0

Nepal

https://youtu.be/TMkRPWv4M8Y

Italy

https://youtu.be/8jV2KxDjRCA

Aerial image by drone

Using drones image for

- situation analysis
- supply of relief items
- Natural and manmade disaster

Banjarnegara Satelite image

Landslide Banjarnegara

Satellite vs Aerial image

Satellite

- Detecting high level of detail in urban area
- Prolonged delivery time due to satellite orbit
- Sensor limitations and cloud cover

Satelite vs
Aerial image

Aerial

- Quick and higher flexibility of deployment
- Advanced technical capacities through payload: FLIR, Infrared
- Superior resolution over VHR satellite image
- Rapid monitor
- Can fly under cloud

Aerial
horizontal image

Explosion Vasilikos Power Plant – July 2011

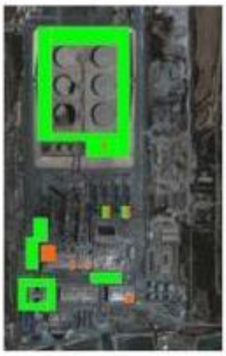
Source: ECHO: Humanitarian Aid and Civil Protection, European Commission

Aerial image by drone

Flight plan

outdoor

indoor



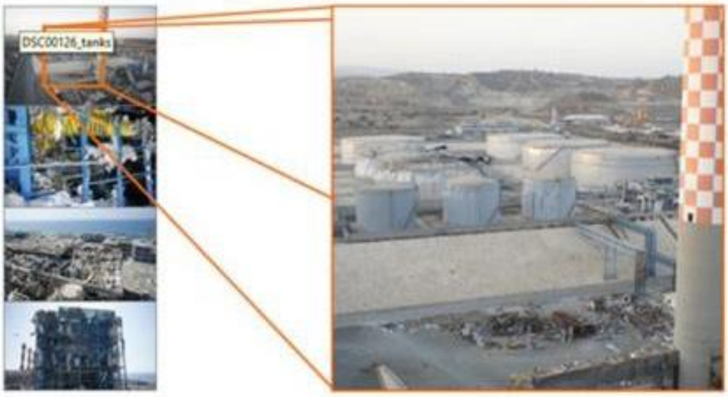
UAS component
Flying Equipment

Two types of UAS were used

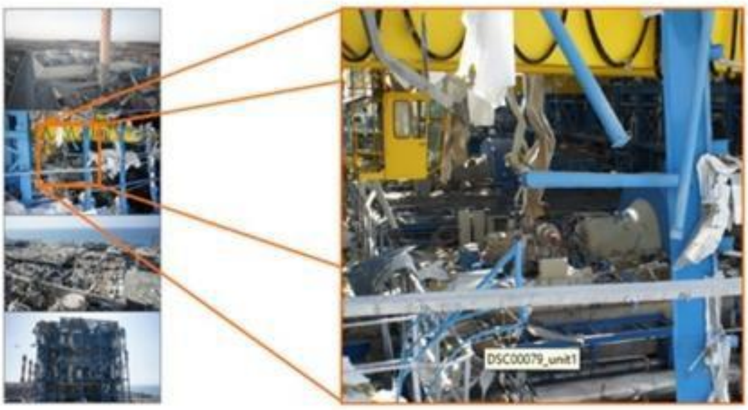
- **Falcon**
  - Octocopter
  - Steerable Camera Sony NEX 5 (Resolution 4592 x 3056)
  - Payload 500g

- **Hummingbird**
  - Quadrocopter
  - Fixed Camera GoPro HD (Resolution 2592 x 1944)
  - Payload 200g

Aerial image by drone



Aerial image by drone



Aerial image by drone

Aerial vertical image

Disaster Management cycles

Critical Isues

• Flight regulation and authorization:
flight permission/exemption + liability

• UAV insurance
Insurance documents for all involved UAV
• Site insurance
Preparation of info material to speed up decision
Critical situation – stop the UAV mission?

National RPAS Regulation

• regulation minister of transport 180/2015
• regulation minister of transport 163/2015; CASR 107
• regulation minister of transport 47/2016

rule all possible drones operation in Indonesia!

CASR 107
Certification: pilot/operator

EUROUSC INTERNATIONAL™

107.13 Registration, certification, and airworthiness directives.

No person may operate a civil small unmanned aircraft system for purposes of flight unless:

(a) That person has an unmanned aircraft operator certificate with a small UAS rating issued pursuant to Subpart C of this part and satisfies the requirements of section 107.65;

(b) The small unmanned aircraft being operated has been registered with the DGCA pursuant to subpart D of this part;

(c) The small unmanned aircraft being operated displays its registration number in the manner specified in subpart D of this part; and

(d) The owner or operator of the small unmanned aircraft system complies with all applicable airworthiness directives.

CASR 107
Type of operation

EUROUSC INTERNATIONAL™

107.31 Visual line of sight aircraft operation.

With vision that is unaided by any device other than corrective lenses, the operator or visual observer must be able to see the unmanned aircraft throughout the entire flight in order to:

(a) Know the unmanned aircraft's location;

(b) Determine the unmanned aircraft's attitude, altitude, and direction;

(c) Observe the airspace for other air traffic or hazards; and

(d) Determine that the unmanned aircraft does not endanger the life or

CASR 107
aircraft registration

EUROUSC INTERNATIONAL™

107.89 Eligibility for Registration.

A small civil unmanned aircraft shall be eligible for registration in Indonesia only when:

(a) Not registered in other country;

(b) Owned by Indonesian citizen or Indonesian legal body;

(c) Applied by Indonesian citizen or Indonesian legal body;

(d) Evidence of ownership have been submitted;

(e) All duties due and payable under the laws of Indonesia in respect of importation of aircraft into Indonesia have been paid;

(f) All insurance required by applicable regulations have been covered; and

(g) Identification have been made according to 107.94.

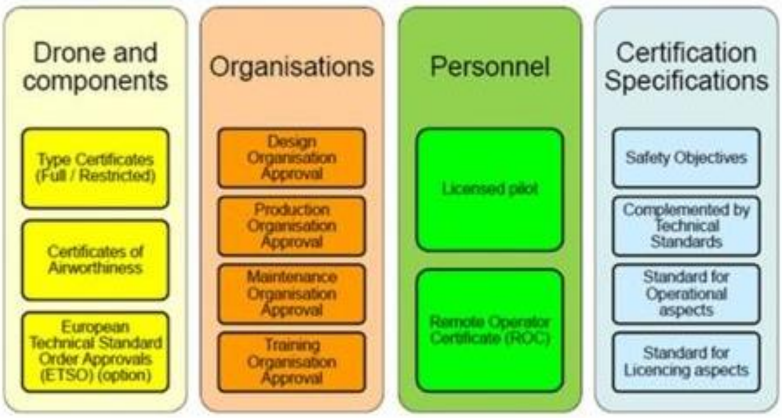
UAV Operations

- human machine interaction very important.
- human factor is often more important than the capacity of the machine itself.
- pilot need to get a robust training by an independent body with standardized training module, as happened in the manned aviation.

UAV Operations according to EASA

UAV Operations according to EASA

Implementing rules included in existing rules for manned aviation



ASEAN RPAS Regulation?

- not all countries have a special rule for drones
- ASEAN Open Sky Agreement/Policy, ASEAN Single Aviation Market (ASAM)
- using this framework for possible deployment of drones within the boundaries of Asean community?
- because disaster knows no boundary lines
- ASEAN Declaration on Mutual Assistance on Natural Disasters Manila, 26 June 1976

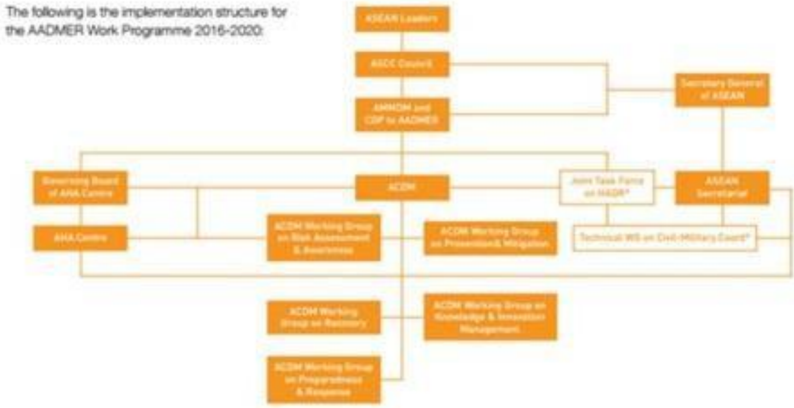
Near future?

VIII. ROADMAP FOR THE TECHNICAL ELEMENTS OF THE ASAM

Subject	Measures	Timeline
Aviation Safety	Align regulatory capability and safety standards with ICAO SARPs.	2012
	Identify priority areas for human resource development and training related to aviation safety.	2012
	Develop a mutual recognition instrument, i.e. Mutual Recognition of Aviation Related Certification Agreement.	2012
	Develop an inventory of standards to facilitate the preparation of Mutual Recognition of Aviation Related Certification Agreement.	2012
	Establish a framework to share ramp inspection information among ASEAN Member States.	2012
	Establish mutually agreed minimum standards and capabilities for the purpose of possible mutual recognition.	2015
	Commence mutual recognition for selected components of the following priority areas of: • air operator certification; • aircraft airworthiness (approved maintenance organisation); and • flight crew/engineer licensing, in accordance with the Mutual Recognition of Aviation Related Certification Agreement instrument.	2015
	Conclude Mutual Recognition of Aviation Related Certification Agreement for remaining safety areas.	Beyond 2020
	Develop and implement a 'common rules' framework, which comprises a common set of ASEAN-wide aviation safety rules.	Beyond 2020
	Establish an appropriate ASEAN aviation safety setup.	Beyond 2020

Timeline Reference

ASEAN cooperation framework



training of remote pilot

- great demand for remote pilot and operator
- standard training module?
- good training institute?
- recognized by DGCA
- Eurousc can help to meet this demand

Other relevant questions

National setting

- who is responsible for coordinating the operation in national level?
- BNPB any authority to operate the UAV in his duties?

ASEAN setting

- cooperation between national disaster fighters in ASEAN context?

Conclussion

- We have so far more questions than answers
- UAV could bring great added value for disaster management:

Overwhelming evidence that deploying as a "support tool" have a positive impact for the emergency services

- Need a clear legislation in national and ASEAN-setting for using uav's

ASEAN Agreement on Disaster Management and Emergency Response (AADMER) ; a step in the right direction

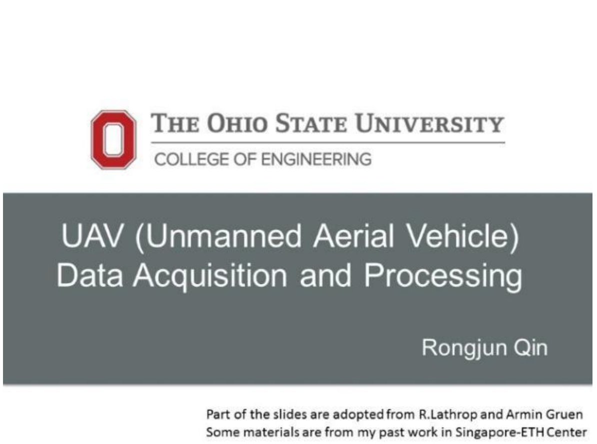
Recommendations

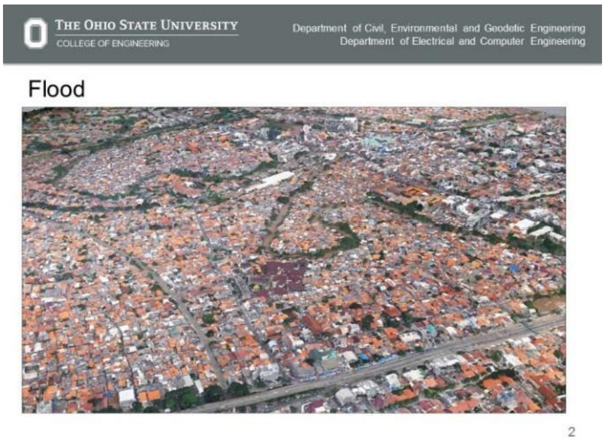
- Framework for integrating UAV ops in disaster preparedness, prevention and response in national setting: national body, province, regional and any other stakeholders
- Framework for integrating UAV ops in natural and manmade disasters inside ASEAN-countries
- Framework for cooperation with ECHO European Commission: background of national co-operation is almost the same. Exchanging experience!

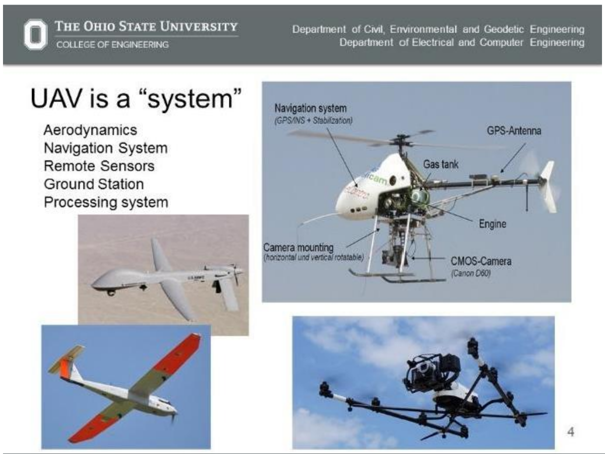
Terima kasih
atas perhatian anda!

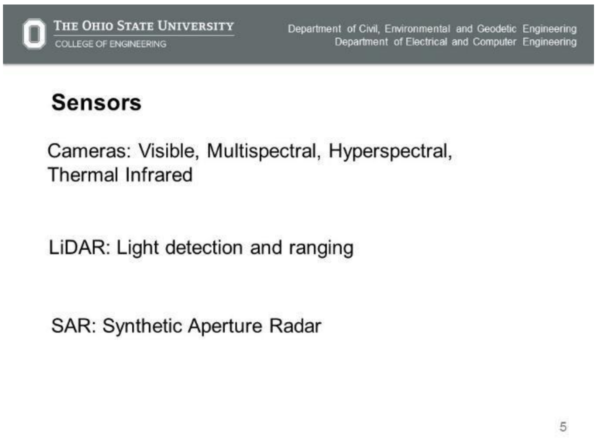
any question?

Lecture 6 and Practice: UAV (Unmanned Aerial Vehicle) Data Acquisition and Processing (assoc. Prof. Rong Jun Qin)



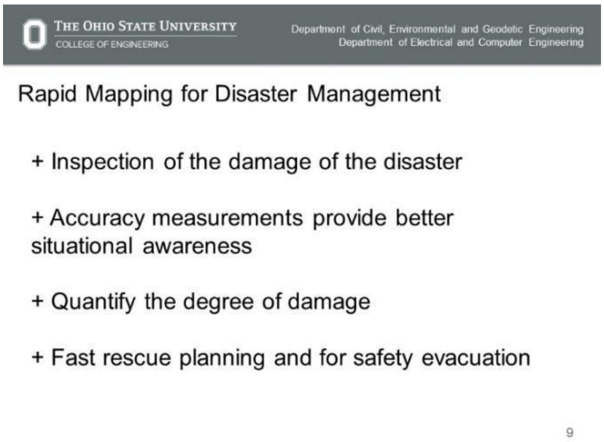


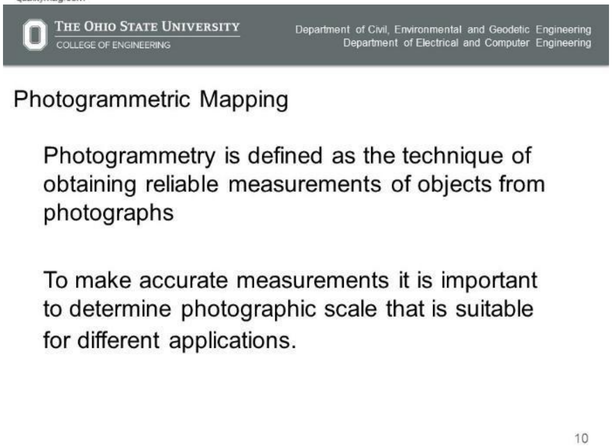




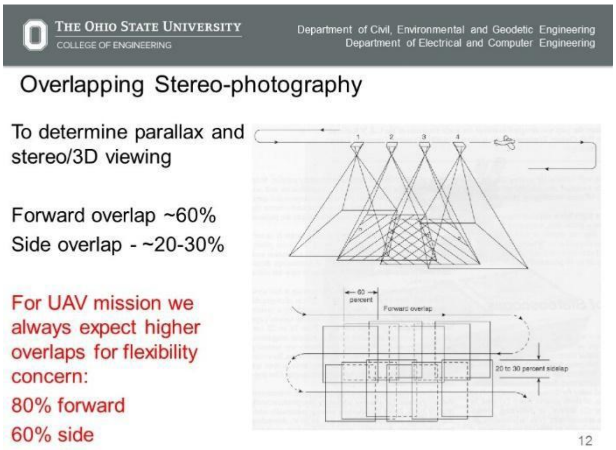

The Ohio State University
College of Engineering
Department of Civil, Environmental and Geodetic Engineering
Department of Electrical and Computer Engineering
Finding the Fire Centers
http://www.theverge.com/2015/12/10/9885746/dji-zenmuse-xt-thermal-imaging-flir
7

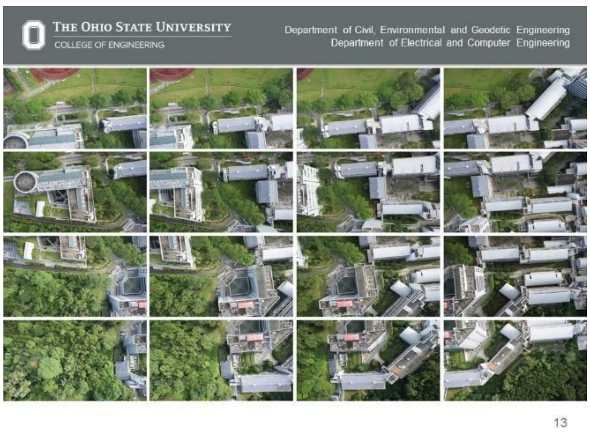

The Ohio State University
College of Engineering
Department of Civil, Environmental and Geodetic Engineering
Department of Electrical and Computer Engineering
Short-wave Infrared
900-1700 nm
Low responses to water
qualitymag.com
8

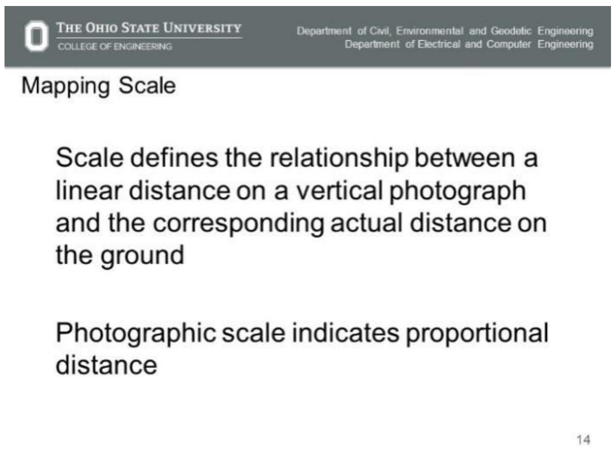

The Ohio State University
College of Engineering
Department of Civil, Environmental and Geodetic Engineering
Department of Electrical and Computer Engineering
Rapid Mapping for Disaster Management
+ Inspection of the damage of the disaster
+ Accuracy measurements provide better situational awareness
+ Quantify the degree of damage
+ Fast rescue planning and for safety evacuation
9


The Ohio State University
College of Engineering
Department of Civil, Environmental and Geodetic Engineering
Department of Electrical and Computer Engineering
Photogrammetric Mapping
Photogrammetry is defined as the technique of obtaining reliable measurements of objects from photographs
To make accurate measurements it is important to determine photographic scale that is suitable for different applications.
10


The Ohio State University
College of Engineering
Department of Civil, Environmental and Geodetic Engineering
Department of Electrical and Computer Engineering
Types of aerial photos
Vertical photos - camera axis vertical
Tilted photos - 1-3° off vertical, virtually all aerial photos are unintentionally tilted
High oblique - intentional inclination, includes horizon
Low oblique - does not include horizon
11


The Ohio State University
College of Engineering
Department of Civil, Environmental and Geodetic Engineering
Department of Electrical and Computer Engineering
Overlapping Stereo-photography
To determine parallax and stereo/3D viewing
Forward overlap ~60%
Side overlap - ~20-30%
For UAV mission we always expect higher overlaps for flexibility concern:
80% forward
60% side
12


The Ohio State University
College of Engineering
Department of Civil, Environmental and Geodetic Engineering
Department of Electrical and Computer Engineering
13


The Ohio State University
College of Engineering
Department of Civil, Environmental and Geodetic Engineering
Department of Electrical and Computer Engineering
Mapping Scale
Scale defines the relationship between a linear distance on a vertical photograph and the corresponding actual distance on the ground
Photographic scale indicates proportional distance
14

THE OHIO STATE UNIVERSITY
COLLEGE OF ENGINEERING
Department of Civil, Environmental and Geodetic Engineering
Department of Electrical and Computer Engineering

Mapping Scale

$$\frac{\textit{Linear distance in the photograph}}{\textit{Actual Distance on the ground}}$$

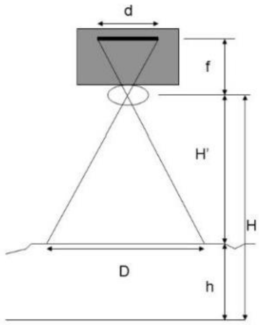
Example: 1/25,000 or 1:25,000 means that a length of 1 unit of measurement on the photo/Map represents 25,000 units of measurement on the ground

15

THE OHIO STATE UNIVERSITY
COLLEGE OF ENGINEERING
Department of Civil, Environmental and Geodetic Engineering
Department of Electrical and Computer Engineering

Photograph Scale

Scale = f /H' = d/D
where
f = focal length
H' = height above terrain
d = image distance
D = ground distance
h = terrain elevation
H = flying height (h + H')



16

THE OHIO STATE UNIVERSITY
COLLEGE OF ENGINEERING
Department of Civil, Environmental and Geodetic Engineering
Department of Electrical and Computer Engineering

Scale Determination

Scale = f / H'   where: f = focal length
H' = flying height above terrain

E.g. f = 20 mm
H = 400 m MSL   ground elevation = 200 m

$$\text{Scale} = \frac{20\text{ mm}}{(400\text{ m} - 200\text{ m})} * \frac{1\text{m}}{1000\text{ mm}} = \frac{20}{200{,}000}$$

$$\text{Scale} = \frac{2}{20{,}000} \quad \text{or} \quad 1{:}10{,}000$$

17

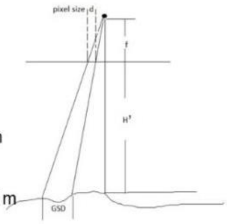
THE OHIO STATE UNIVERSITY
COLLEGE OF ENGINEERING
Department of Civil, Environmental and Geodetic Engineering
Department of Electrical and Computer Engineering

Ground Sampling Distance (GSD)

$$\text{GSD} = \frac{\text{d (pixel size)} * \text{H}}{\text{f (focal length)}}$$

Example: Pixel size = 5 microns = 0.005 mm
f = 20 mm   H' = 200 m

$$\text{GSD(m)} = \frac{0.005\text{mm x } 200\text{ m}}{20\text{ mm}} = 0.05\text{ m}$$

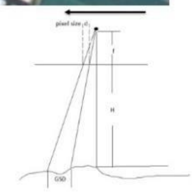


18

THE OHIO STATE UNIVERSITY
COLLEGE OF ENGINEERING
Department of Civil, Environmental and Geodetic Engineering
Department of Electrical and Computer Engineering

Motion Blur

$$\text{Pixel blur} \quad \frac{\textit{Ground Speed} \times \textit{Exposure Time}}{\textit{GSD}}$$



E.g. Ground Speed = 10/s, GSD = 5 cm
Exposure time = 1/200s

$$\text{Pixel blur} = \frac{10 \times 1/100}{5} = 2$$

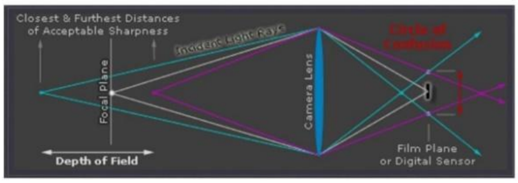
This should be kept within 1 pixel !!!

http://buypanicdisorderpill.com/files8/motion-blur-effect.html

9

THE OHIO STATE UNIVERSITY
COLLEGE OF ENGINEERING
Department of Civil, Environmental and Geodetic Engineering
Department of Electrical and Computer Engineering

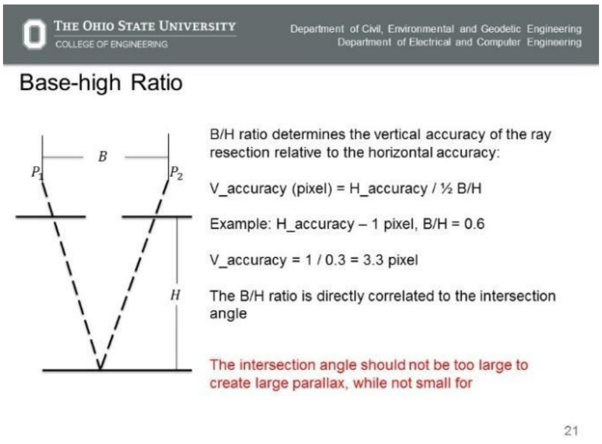
Depth of Field - Aperture

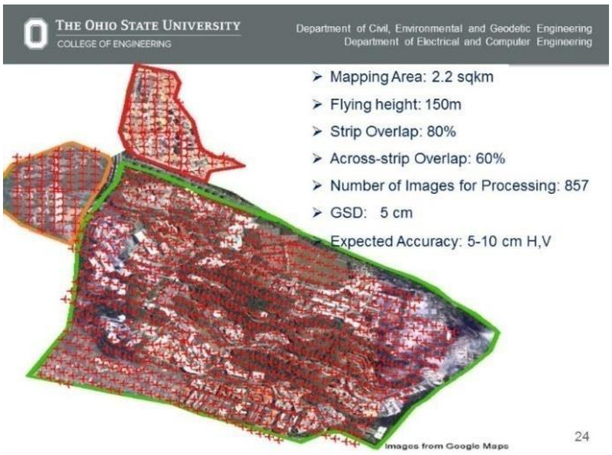


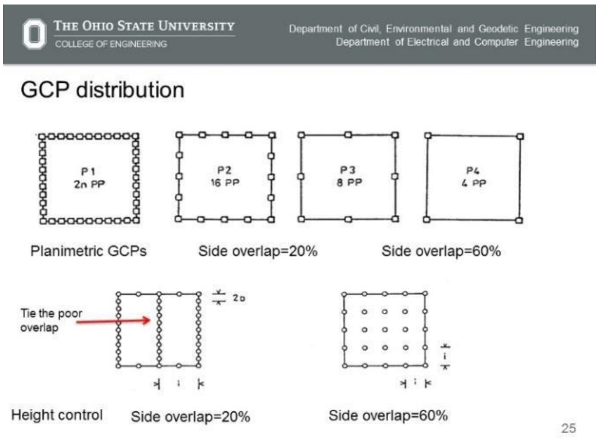
The larger Aperture, the smaller depth of field, but you will get image with good exposure (Note: you need to have short shutter time to avoid motion blur)

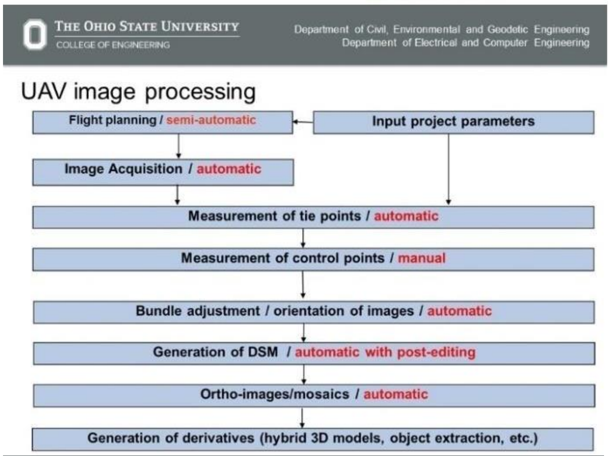
http://www.cambridgeincolour.com/tutorials/depth-of-afield.htm

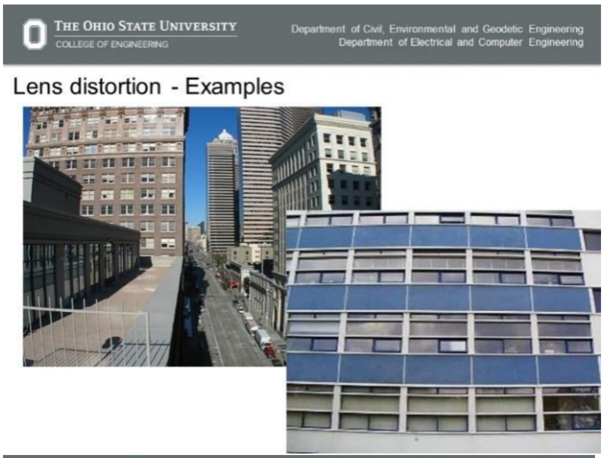
20

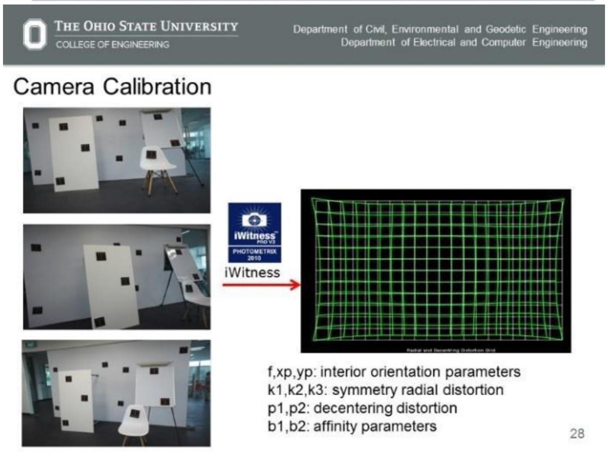

THE OHIO STATE UNIVERSITY
COLLEGE OF ENGINEERING
Department of Civil, Environmental and Geodetic Engineering
Department of Electrical and Computer Engineering
Base-high Ratio
B
P1
P2
H
B/H ratio determines the vertical accuracy of the ray resection relative to the horizontal accuracy:
V_accuracy (pixel) = H_accuracy / ½ B/H
Example: H_accuracy – 1 pixel, B/H = 0.6
V_accuracy = 1 / 0.3 = 3.3 pixel
The B/H ratio is directly correlated to the intersection angle
The intersection angle should not be too large to create large parallax, while not small for
21

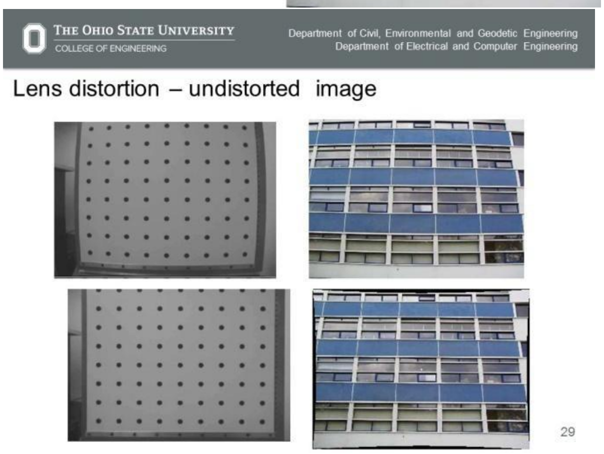

THE OHIO STATE UNIVERSITY
COLLEGE OF ENGINEERING
Department of Civil, Environmental and Geodetic Engineering
Department of Electrical and Computer Engineering
Mapping Area: 2.2 sqkm
Flying height: 150m
Strip Overlap: 80%
Across-strip Overlap: 60%
Number of Images for Processing: 857
GSD: 5 cm
Expected Accuracy: 5-10 cm H,V
Images from Google Maps
24

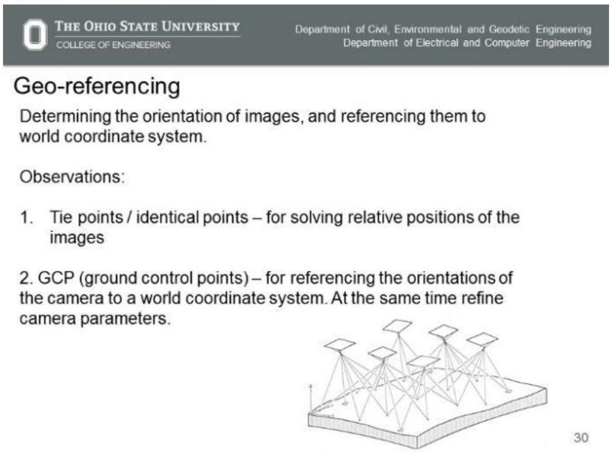

THE OHIO STATE UNIVERSITY
COLLEGE OF ENGINEERING
Department of Civil, Environmental and Geodetic Engineering
Department of Electrical and Computer Engineering
GCP distribution
P1
2n PP
P2
16 PP
P3
8 PP
P4
4 PP
Planimetric GCPs
Side overlap=20%
Side overlap=60%
Tie the poor overlap
2b
Height control
Side overlap=20%
Side overlap=60%
25

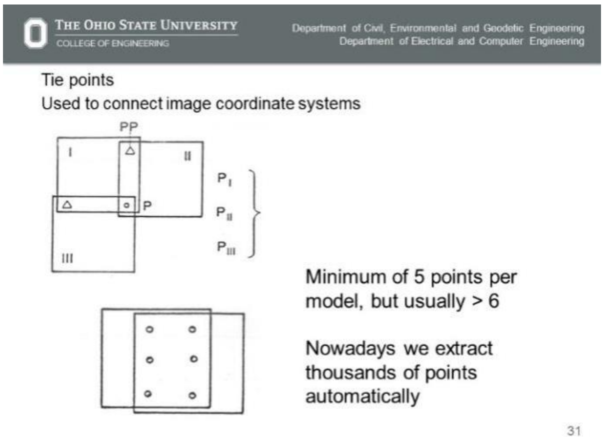

THE OHIO STATE UNIVERSITY
COLLEGE OF ENGINEERING
Department of Civil, Environmental and Geodetic Engineering
Department of Electrical and Computer Engineering
UAV image processing
Flight planning / semi-automatic
Input project parameters
Image Acquisition / automatic
Measurement of tie points / automatic
Measurement of control points / manual
Bundle adjustment / orientation of images / automatic
Generation of DSM / automatic with post-editing
Ortho-images/mosaics / automatic
Generation of derivatives (hybrid 3D models, object extraction, etc.)

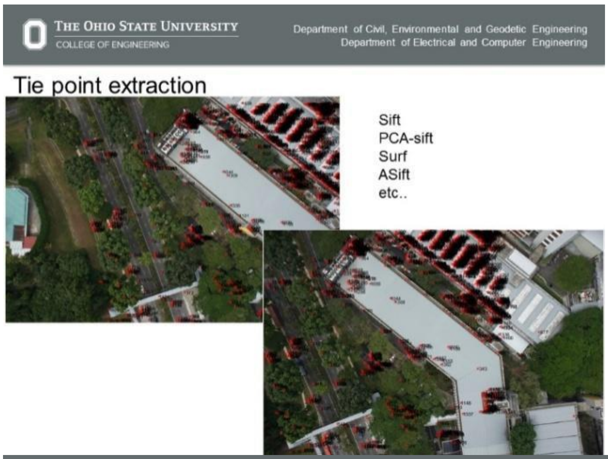

THE OHIO STATE UNIVERSITY
COLLEGE OF ENGINEERING
Department of Civil, Environmental and Geodetic Engineering
Department of Electrical and Computer Engineering
Lens distortion - Examples


THE OHIO STATE UNIVERSITY
COLLEGE OF ENGINEERING
Department of Civil, Environmental and Geodetic Engineering
Department of Electrical and Computer Engineering
Camera Calibration
iWitness
f,xp,yp: interior orientation parameters
k1,k2,k3: symmetry radial distortion
p1,p2: decentering distortion
b1,b2: affinity parameters
28

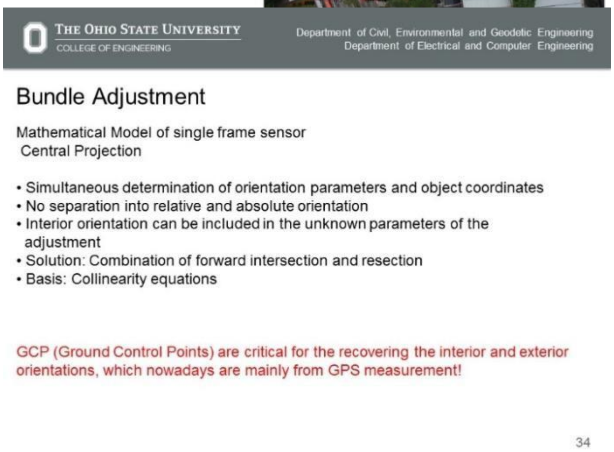

THE OHIO STATE UNIVERSITY
COLLEGE OF ENGINEERING
Department of Civil, Environmental and Geodetic Engineering
Department of Electrical and Computer Engineering
Lens distortion – undistorted image
29

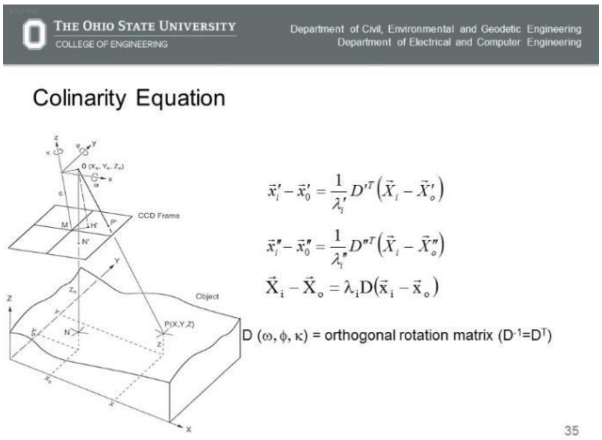

THE OHIO STATE UNIVERSITY
COLLEGE OF ENGINEERING
Department of Civil, Environmental and Geodetic Engineering
Department of Electrical and Computer Engineering
Geo-referencing
Determining the orientation of images, and referencing them to world coordinate system.
Observations:
1. Tie points / identical points – for solving relative positions of the images
2. GCP (ground control points) – for referencing the orientations of the camera to a world coordinate system. At the same time refine camera parameters.
30

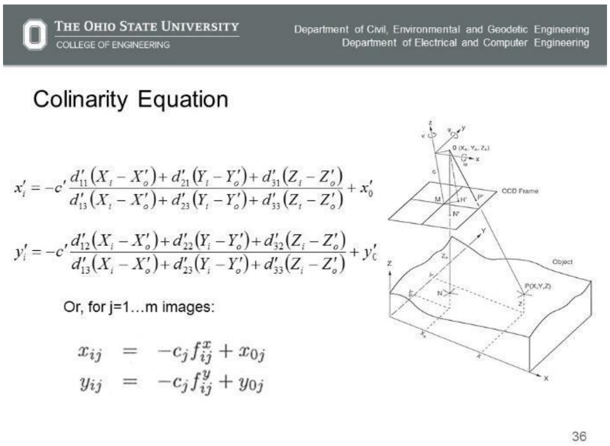

THE OHIO STATE UNIVERSITY
COLLEGE OF ENGINEERING
Department of Civil, Environmental and Geodetic Engineering
Department of Electrical and Computer Engineering
Tie points
Used to connect image coordinate systems
PP
I
II
III
P
P_I
P_{II}
P_{III}
Minimum of 5 points per model, but usually > 6
Nowadays we extract thousands of points automatically
31


THE OHIO STATE UNIVERSITY
COLLEGE OF ENGINEERING
Department of Civil, Environmental and Geodetic Engineering
Department of Electrical and Computer Engineering
Tie point extraction
Sift
PCA-sift
Surf
ASift
etc..


THE OHIO STATE UNIVERSITY
COLLEGE OF ENGINEERING
Department of Civil, Environmental and Geodetic Engineering
Department of Electrical and Computer Engineering
GCP Measurement
Coded Targets
Nature Targets
33
http://www.joewheaton.org/Home/research/tools/low-altitude-blimps-poor-man-s-aerial-photography/blimp-targets


THE OHIO STATE UNIVERSITY
COLLEGE OF ENGINEERING
Department of Civil, Environmental and Geodetic Engineering
Department of Electrical and Computer Engineering
Bundle Adjustment
Mathematical Model of single frame sensor
Central Projection
• Simultaneous determination of orientation parameters and object coordinates
• No separation into relative and absolute orientation
• Interior orientation can be included in the unknown parameters of the adjustment
• Solution: Combination of forward intersection and resection
• Basis: Collinearity equations
GCP (Ground Control Points) are critical for the recovering the interior and exterior orientations, which nowadays are mainly from GPS measurement!
34


THE OHIO STATE UNIVERSITY
COLLEGE OF ENGINEERING
Department of Civil, Environmental and Geodetic Engineering
Department of Electrical and Computer Engineering
Colinarity Equation
CCD Frame
Object
P(X,Y,Z)
$\vec{x}_i' - \vec{x}_0' = \frac{1}{\lambda_i'} D'^T (\vec{X}_i - \vec{X}_o')$
$\vec{x}_i'' - \vec{x}_0'' = \frac{1}{\lambda_i''} D''^T (\vec{X}_i - \vec{X}_o'')$
$\vec{X}_i - \vec{X}_o = \lambda_i D(\vec{x}_i - \vec{x}_o)$
D (ω, ϕ, κ) = orthogonal rotation matrix ($D^{-1}=D^T$)
35


THE OHIO STATE UNIVERSITY
COLLEGE OF ENGINEERING
Department of Civil, Environmental and Geodetic Engineering
Department of Electrical and Computer Engineering
Colinarity Equation
$x_i' = -c' \frac{d_{11}'(X_i - X_o') + d_{21}'(Y_i - Y_o') + d_{31}'(Z_i - Z_o')}{d_{13}'(X_i - X_o') + d_{23}'(Y_i - Y_o') + d_{33}'(Z_i - Z_o')} + x_0'$
$y_i' = -c' \frac{d_{12}'(X_i - X_o') + d_{22}'(Y_i - Y_o') + d_{32}'(Z_i - Z_o')}{d_{13}'(X_i - X_o') + d_{23}'(Y_i - Y_o') + d_{33}'(Z_i - Z_o')} + y_0'$
Or, for j=1…m images:
$x_{ij} = -c_j f_{ij}^x + x_{0j}$
$y_{ij} = -c_j f_{ij}^y + y_{0j}$
CCD Frame
Object
36

THE OHIO STATE UNIVERSITY
COLLEGE OF ENGINEERING
Department of Civil, Environmental and Geodetic Engineering
Department of Electrical and Computer Engineering

3D point determination – Spatial Resection

37

THE OHIO STATE UNIVERSITY
COLLEGE OF ENGINEERING
Department of Civil, Environmental and Geodetic Engineering
Department of Electrical and Computer Engineering

Determination of Camera Orientation

- Observations: image coordinates (x_{ij}, y_{ij})
- Unknowns: X_i, Y_i, Z_i, X_{0j}, Y_{0j}, Z_{0j}, ω_j, ϕ_j, κ_j, (x_{0j}, y_{0j})

Functional Model is non-linear:

$x_{ij} = F^x_{ij}$ (X_i, Y_i, Z_i, X_{0j}, Y_{0j}, y_{0j}, w_j, f_j, k_j, Z_{0j}, x_{0j})
$y_{ij} = F^y_{ij}$ (X_i, Y_i, Z_i, X_{0j}, Y_{0j}, Z_{0j}, w_j, f_j, k_j, x_{0j}, y_{0j})

- Linearization with Taylor

$$x_i^j = \frac{\partial F_i^j}{\partial X_i} dX_i + \frac{\partial F_i^j}{\partial Y_i} dY_i + \frac{\partial F_i^j}{\partial Z_i} dZ_i + \frac{\partial F_i^j}{\partial X_o'} dX_o' + \ldots + \frac{\partial F_i^j}{\partial \kappa''} d\kappa'' + F_{oi}^j$$

=> Approximations for the unknown parameters

38

THE OHIO STATE UNIVERSITY
COLLEGE OF ENGINEERING
Department of Civil, Environmental and Geodetic Engineering
Department of Electrical and Computer Engineering

$$a_1 x + b_1 y + c_1 = 0$$
$$a_2 x + b_2 y + c_2 = 0$$
$$\ldots$$
$$a_n x + b_n y + c_n = 0$$

$$A = \begin{bmatrix} a_1 & b_1 \\ a_2 & b_2 \\ \ldots & \ldots \\ a_n & b_n \end{bmatrix} \quad x = \begin{bmatrix} x \\ y \end{bmatrix} \quad l = \begin{bmatrix} c_1 \\ c_2 \\ \ldots \\ c_n \end{bmatrix}$$

$$Ax - l = 0$$

Design matrix: $\frac{\partial F_i^j}{\partial X_i}$, $\frac{\partial F_i^j}{\partial Y_i}$, $\frac{\partial F_i^j}{\partial \kappa''}$

Unknown vector: X_i, Y_i, Z_i, X_{0j}, Y_{0j}, Z_{0j}, x_{0j}, y_{0j}, ω_j, ϕ_j, κ_j

Observation vector: x_{ij}, y_{ij}

39

THE OHIO STATE UNIVERSITY
COLLEGE OF ENGINEERING
Department of Civil, Environmental and Geodetic Engineering
Department of Electrical and Computer Engineering

Solution (Least Squares Estimation):

$$l = f(x)$$

$$\hat{x} = \left(A^T P A\right)^{-1} A^T P l,$$
$$v = A\hat{x} - l,$$
$$\hat{\sigma}_0^2 = \frac{v^T P v}{r}, \quad r = n - u.$$

x = unknown vector of the parameters
e = error vector for observations

A = design matrix (*no.obs* x *no.unkn*, obs>>unkn

x = solution vector
P = weight matrix for the constant vector l
v = residuals
σ_0= std dev a posteriori of unit weight
r = redundancy

At least 7 informations for the *DATUM DEFINITION* necessary:

a) 7 Parameters of the EO or
b) 7 coordinates of object points (GCP) or
c) free network solution (inner constraints)

40

THE OHIO STATE UNIVERSITY
COLLEGE OF ENGINEERING
Department of Civil, Environmental and Geodetic Engineering
Department of Electrical and Computer Engineering

Precision and reliability of the bundle solution

- Covariance matrix
- Theoretical precision
- Empirical precision

→ Statistical quality of the recovered vector x (unknown parameters)

Precision of the solution vector ⇒ COVARIANCE MATRIX $C_{xx} = \hat{\sigma}_0^2 \left(A^T P A\right)^{-1}$
[no.unkn x no.unkn]
Q_{xx} = cofactor matrix

$\sigma_{x_i} = \hat{\sigma}_0 \sqrt{q_{xx_i}}$ → Standard deviation of the unknown x_i
σ_0 = std dev. a posteriori of unit weight
q_{xx} = i-th element of the diag. of the cofactor matrix

$\sigma_X = \sqrt{\frac{\sum \sigma_{x_i}^2}{n_x}}$ → Average precision of the object coordinates X

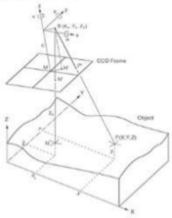
- Reliability → Related to SYSTEMATIC ERRORS
BLUNDERS
WEIGHT ERRORS

41

THE OHIO STATE UNIVERSITY
COLLEGE OF ENGINEERING
Department of Civil, Environmental and Geodetic Engineering
Department of Electrical and Computer Engineering

Bundle adjustment with additional parameters (APs)

Extend the mathematical model (collinearity equations) of the adjustment with additional parameters



$$x_{ij} = -c_j f_{ij}^x + x_{0j} + \Delta x_{ij}$$
$$y_{ij} = -c_j f_{ij}^y + y_{0j} + \Delta y_{ij}$$

$$\Delta x = -\Delta x_0 + \frac{\bar{x}}{c}\Delta c + \bar{x}s_x + \bar{y}a + \bar{x}r^2k_1 + \bar{x}r^4k_2 + \bar{x}r^6k_3 + \left(r^2 + 2\bar{x}^2\right)p_1 + 2\bar{x}\bar{y}p$$
$$\Delta y = -\Delta y_0 + \frac{\bar{y}}{c}\Delta c + 0 + \bar{x}a + \bar{y}r^2k_1 + \bar{y}r^4k_2 + \bar{y}r^6k_3 + 2\bar{x}\bar{y}p_1 + \left(r^2 + 2\bar{y}^2\right)p$$

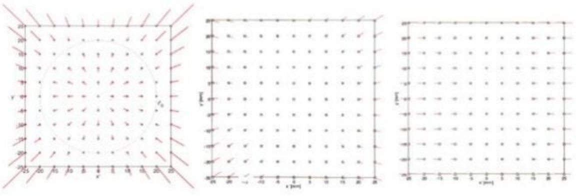
h $\bar{x} = x - x_0$, $\bar{y} = y - y_0$, $r^2 = \bar{x}^2 + \bar{y}^2$

42

THE OHIO STATE UNIVERSITY
COLLEGE OF ENGINEERING
Department of Civil, Environmental and Geodetic Engineering
Department of Electrical and Computer Engineering

Lens distortion modeling

- Δx_0, Δy_0 and Δc to correct interior orientation parameters
- Parameters k → Radial-symmetric distortion
- Parameters p → Radial-asymmetric and tangential distortion
- Parameter s_x → Affinity factor ('Scale in x')
- Parameter a → Shear factor (jointly in x and y)



Radial-symmetric distortion *Decentering distortion* *Affinity*

43

THE OHIO STATE UNIVERSITY
COLLEGE OF ENGINEERING
Department of Civil, Environmental and Geodetic Engineering
Department of Electrical and Computer Engineering

General Bundle Solution

$$l - e = Ax + A_3 z$$

z, A_3 = AP vector and related design matrix

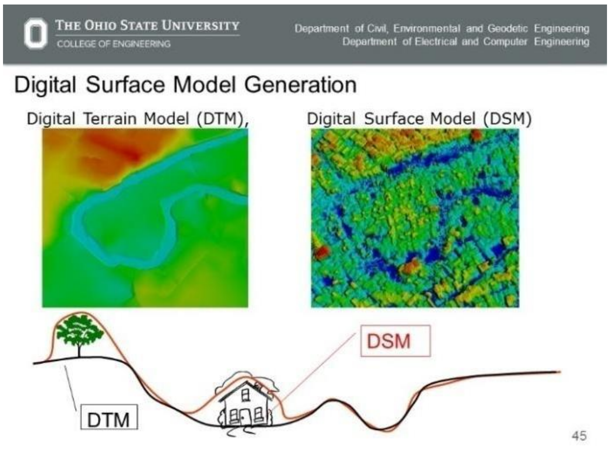
Vector x: x_p for object coord.
t for EO parameters
z for APs

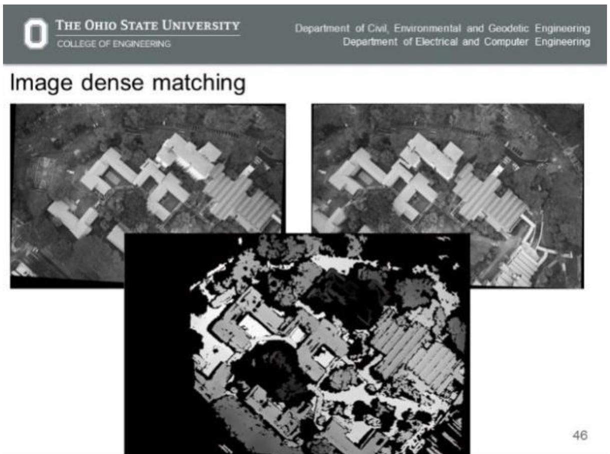
$$\begin{aligned} -e_B &= A_1 x_p + A_2 t + A_3 z - l_B \; ; \; P_B \\ -e_p &= I x_p - l_p \; ; \; P_p \\ -e_t &= I t - l_t \; ; \; P_t \\ -e_z &= I z - l_z \; ; \; P_z \end{aligned}$$

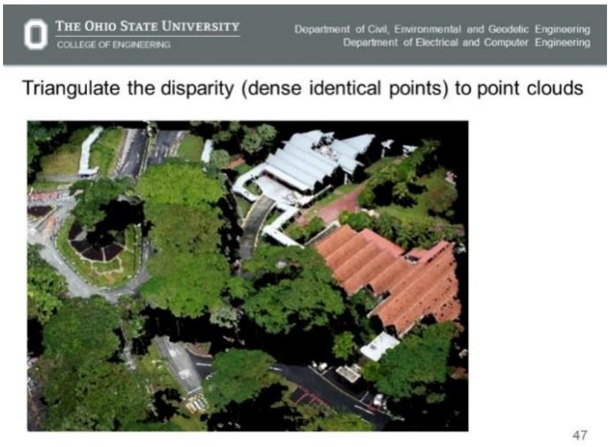
GCP!!

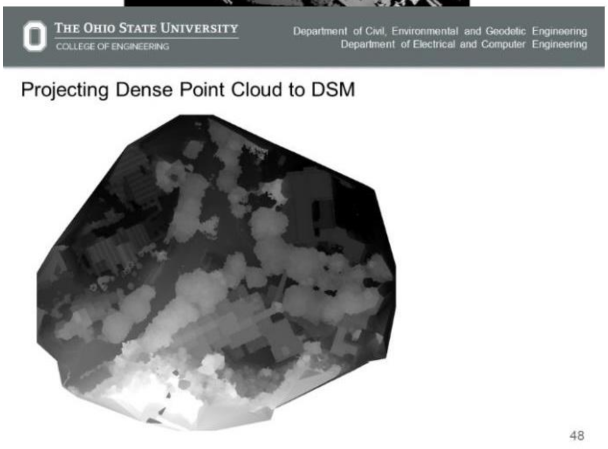
On-board GPS/IMU observation
Can play a role here!

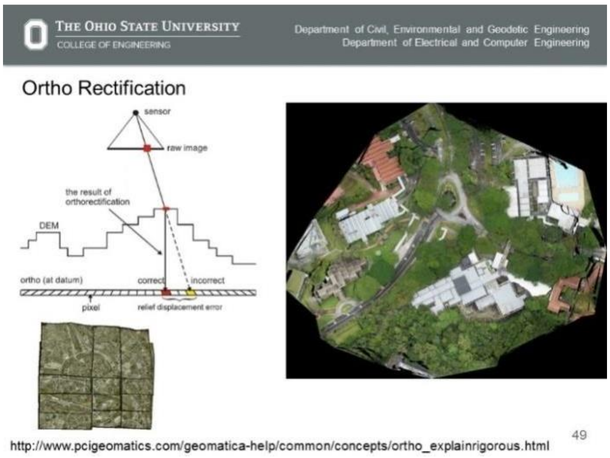
e_B, e_p, e_t, e_z .... Vectors of true errors of image coordinates, object point coordinates, exterior orientation elements, additional parameters
l_B, l_p, l_t, l_z ...... Vectors of observations of image coordinates (minus constant term from Taylor expansion), object point coordinates, exterior orientation elements, additional parameters
P_B, P_p, P_t, P_z ... Associated weight coefficient matrices
$x_p, t, z,$ .... Parameter vectors of object point coordinates, exterior orientation elements, additional parameters
A_1, A_2, A_3 .... Associated design matrices
I .... Identity matrix

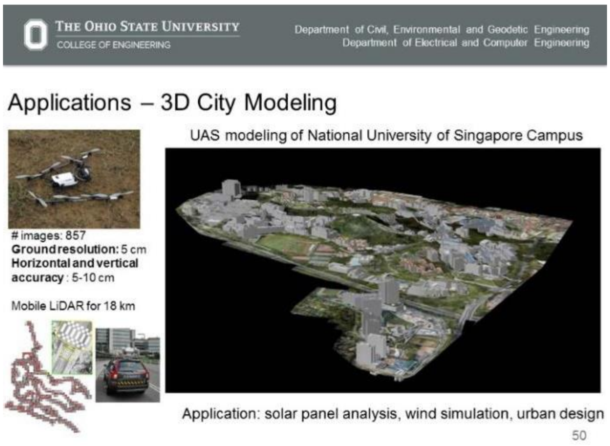

THE OHIO STATE UNIVERSITY
COLLEGE OF ENGINEERING
Department of Civil, Environmental and Geodetic Engineering
Department of Electrical and Computer Engineering
Digital Surface Model Generation
Digital Terrain Model (DTM),
Digital Surface Model (DSM)
DSM
DTM
45

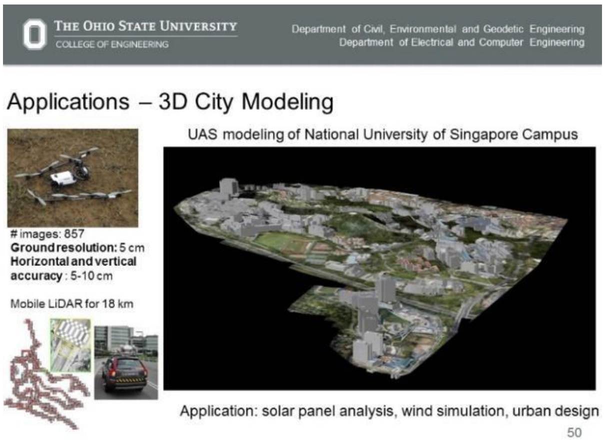

THE OHIO STATE UNIVERSITY
COLLEGE OF ENGINEERING
Department of Civil, Environmental and Geodetic Engineering
Department of Electrical and Computer Engineering
Image dense matching
46

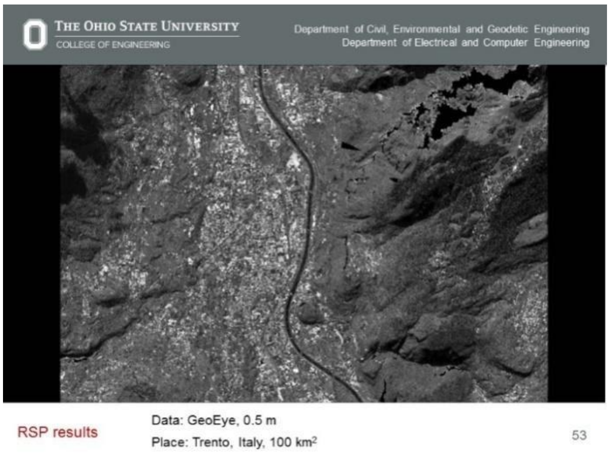

THE OHIO STATE UNIVERSITY
COLLEGE OF ENGINEERING
Department of Civil, Environmental and Geodetic Engineering
Department of Electrical and Computer Engineering
Triangulate the disparity (dense identical points) to point clouds
47


THE OHIO STATE UNIVERSITY
COLLEGE OF ENGINEERING
Department of Civil, Environmental and Geodetic Engineering
Department of Electrical and Computer Engineering
Projecting Dense Point Cloud to DSM
48

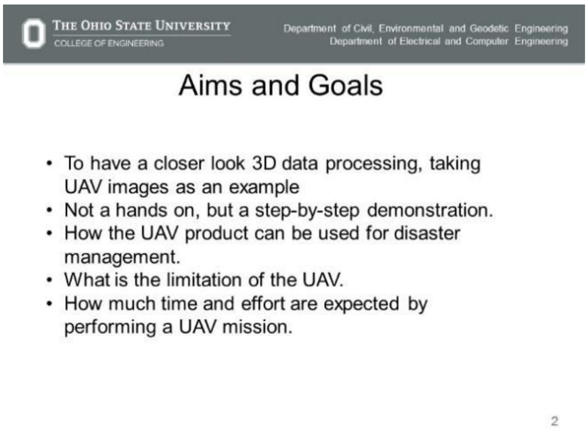

THE OHIO STATE UNIVERSITY
COLLEGE OF ENGINEERING
Department of Civil, Environmental and Geodetic Engineering
Department of Electrical and Computer Engineering
Ortho Rectification
sensor
raw image
the result of orthorectification
DEM
ortho (at datum)
correct
incorrect
pixel
relief displacement error
http://www.pcigeomatics.com/geomatica-help/common/concepts/ortho_explainrigorous.html
49


THE OHIO STATE UNIVERSITY
COLLEGE OF ENGINEERING
Department of Civil, Environmental and Geodetic Engineering
Department of Electrical and Computer Engineering
Applications – 3D City Modeling
UAS modeling of National University of Singapore Campus
images: 857
Ground resolution: 5 cm
Horizontal and vertical accuracy : 5-10 cm
Mobile LiDAR for 18 km
Application: solar panel analysis, wind simulation, urban design
50





Lecture-6: UAV (Unmanned Aerial Vehicle) Data Acquisition and Processing



The Ohio State University
COLLEGE OF ENGINEERING
Department of Civil, Environmental and Geodetic Engineering
Department of Electrical and Computer Engineering

Software availability

Commercial Product:
INPHO – Stuttgart
VITUROSO – WuHan University
PixelGrid – CASM (Chinese Academy of Surveying and Mapping)
Pixel4UAV- EPFL (École polytechnique fédérale de Lausanne)
APS – Menci software
Drone Mapper
LPS - Leica

Photomodeler, PhotoScan -- (close – range)

Open Source:
Apero – IGN
Bundler – Noah Snavely (computer vision)
OpenMVG (computer vision)
ArcheOs

Not Inclusive !!!

3

The Ohio State University
COLLEGE OF ENGINEERING
Department of Civil, Environmental and Geodetic Engineering
Department of Electrical and Computer Engineering

Software

- Iwitness for camera calibration
- Pix4UAV for Aerial triangulation and Orthophoto generation
- Quick Terrain Modeler for flood analysis.
- SURE software for Image matching and point clouds generation

Alternatives:

Open Source Solutions: Apero
SURE Software
DSM Generation.

4

The Ohio State University
COLLEGE OF ENGINEERING
Department of Civil, Environmental and Geodetic Engineering
Department of Electrical and Computer Engineering

5

The Ohio State University
COLLEGE OF ENGINEERING
Department of Civil, Environmental and Geodetic Engineering
Department of Electrical and Computer Engineering

UAV Take-off CREATE Tower

6

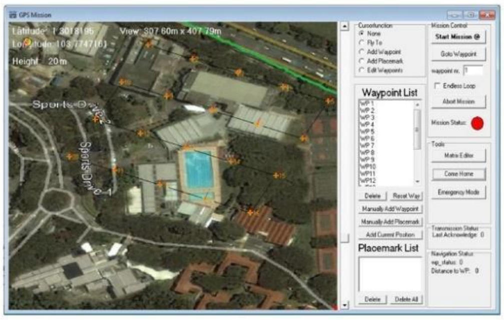
The Ohio State University
COLLEGE OF ENGINEERING
Department of Civil, Environmental and Geodetic Engineering
Department of Electrical and Computer Engineering

Flight Planning – parameters

- Focal length: 16 mm
- Pixel size: 5 microns
- Image size: 4592 X 3056 -> 22.96 mm X 15.28 mm
- Flying height: ? Higher – fewer images, lower resolution – minimal height = $\frac{16\ mm \times 50\ mm}{5\ microns}$ = 160 m
- Wanted GSD: 5 cm
- Overlap: 80% forward, 60% side

7

The Ohio State University
COLLEGE OF ENGINEERING
Department of Civil, Environmental and Geodetic Engineering
Department of Electrical and Computer Engineering



8

THE OHIO STATE UNIVERSITY
COLLEGE OF ENGINEERING
Department of Civil, Environmental and Geodetic Engineering
Department of Electrical and Computer Engineering

Camera Pre-calibration

It is always good to calibrate your camera systematically, instead of the replying on self-calibration, for the reason:

- Self-calibration is designed for compensate minor distortion induced by the unpredictable parameters such as humidity and temperature of the air. It might face risk of failure caused by unreliable network and over-parameterization.
- Different bundle system includes different self-calibration parameters, it may not be sufficient enough to model the calibration parameters.
- Signalized targets are more accurate to locate tie points.

9

THE OHIO STATE UNIVERSITY
COLLEGE OF ENGINEERING
Department of Civil, Environmental and Geodetic Engineering
Department of Electrical and Computer Engineering

Aerial Triangulation – Bundle Adjustment

Aerial triangulation is a process of determining the geo-location and orientation of the camera.

Input: Images, GPS observation

The use of the GPS observation can be used in different ways:

1) Purely for tie points matching, neighborhood Searching.
2) As the initial parameters for bundle solution.
3) As the observation for bundle solution.

10

THE OHIO STATE UNIVERSITY
COLLEGE OF ENGINEERING
Department of Civil, Environmental and Geodetic Engineering
Department of Electrical and Computer Engineering

An Alternative solution – Open source

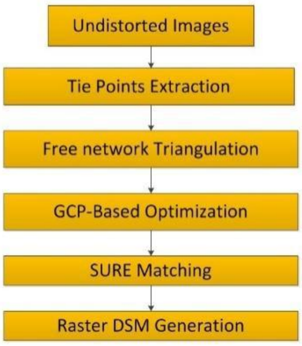
Apero software – Aérotriangulation Photogrammétrique Expérimentale Relativement Opérationnelle

Windows, Linux, MacOS

11

THE OHIO STATE UNIVERSITY
COLLEGE OF ENGINEERING
Department of Civil, Environmental and Geodetic Engineering
Department of Electrical and Computer Engineering

Open Source Solution with Apero-GUI



12

THE OHIO STATE UNIVERSITY
COLLEGE OF ENGINEERING
Department of Civil, Environmental and Geodetic Engineering
Department of Electrical and Computer Engineering

Tie point extraction

GPS information is purely used for pair-wise tie points matching.

1) Automatic determination of the pair-wise matching – 3 times average neighboring distance are used for searching neighborhood.
2) Line based extraction mode
3) Multi-scale based exhaustive search.

13

THE OHIO STATE UNIVERSITY
COLLEGE OF ENGINEERING
Department of Civil, Environmental and Geodetic Engineering
Department of Electrical and Computer Engineering

Demonstration of the Apero

RES:[IMG_5588.tif] ER2 0.124029 Nn 99.9769 Of 4335 Mul 0 Mul-NN 0 Time 0.160253

[IMG 5588.tif] is obviously the name of the image;
[ER2 0.143439] is the square root of the weighted average of quadratic residuals;
[Nn 99.9769] is the percentage of residuals that are under EcartMax; it should be over 95%, or else it may signify that you have got residuals just because you have thrown away high residuals!
Of 4327 is the number of tie points;
Mul 0 is the number of multiple points;
Mul-NN 0 is the number of multiple points having residuals under EcartMax;

14

THE OHIO STATE UNIVERSITY
COLLEGE OF ENGINEERING
Department of Civil, Environmental and Geodetic Engineering
Department of Electrical and Computer Engineering

DSM and Ortho-Image Generation

15

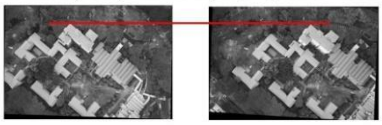
THE OHIO STATE UNIVERSITY
COLLEGE OF ENGINEERING
Department of Civil, Environmental and Geodetic Engineering
Department of Electrical and Computer Engineering

Introduction to SGM matcher

Hierarchical Semi-global matching, developed by the University of Stuttgart

Original algorithm from Heiko Hirschmueller

Stereo matching: Computation of disparity map between rectified images



16

THE OHIO STATE UNIVERSITY
COLLEGE OF ENGINEERING
Department of Civil, Environmental and Geodetic Engineering
Department of Electrical and Computer Engineering

$$C(p, D_p) = L(p) - R(p - D_p) \quad (1)$$

Pixel-wise matching is not unique. Therefore add additional cost (penalty) on the disparity steps (discontinuity):

$$E(D) = \sum C(p, D_p) + \sum_{q \in N(p)} PT[D_p \neq D_q] \quad (2)$$

17

THE OHIO STATE UNIVERSITY
COLLEGE OF ENGINEERING
Department of Civil, Environmental and Geodetic Engineering
Department of Electrical and Computer Engineering

Hierarchical Semi-global Matching

Traditional Semi-Global matching: require large memory storage computation time on normal computer. For UAV images, the disparity level easily goes up to more than 1000, which require memory for M X N X D for computation.

Wenzel et al: Perform it hierarchically, from a coarse level to a finer level, the disparity searching ranges comes from the former level.

18

THE OHIO STATE UNIVERSITY
COLLEGE OF ENGINEERING
Department of Civil, Environmental and Geodetic Engineering
Department of Electrical and Computer Engineering

$$C(p, D_p) = L(p) - R(p - D_p) \quad (1)$$

Pixel-wise matching is not unique. Therefore add additional cost (penalty) on the disparity steps (discontinuity):

$$E(D) = \sum C(p, D_p) + \sum_{q \in N(p)} PT[D_p \neq D_q] \quad (2)$$

19

THE OHIO STATE UNIVERSITY
COLLEGE OF ENGINEERING
Department of Civil, Environmental and Geodetic Engineering
Department of Electrical and Computer Engineering

It is a stereo-matching algorithm, point clouds are generated for every stereo model, the result of the multiple models are fused as a post step.

Multi-stereo Processor Demonstration

20

Lecture-7: Integration of Near Real-Time RS data with UAV-Derive data (Dr. Pramaditya Wickasono)

Email: prama.wicaksono@geo.ugm.ac.id

Integration of Near Real Time RS data with UAV-derived Data

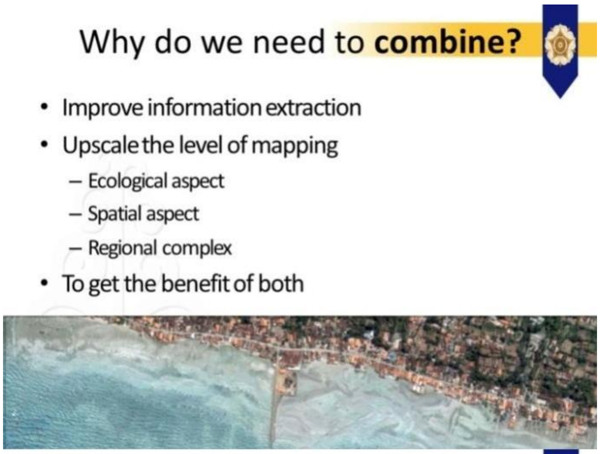
Pramaditya Wicaksono
Cartography and Remote Sensing, Faculty of Geography, Universitas Gadjah Mada

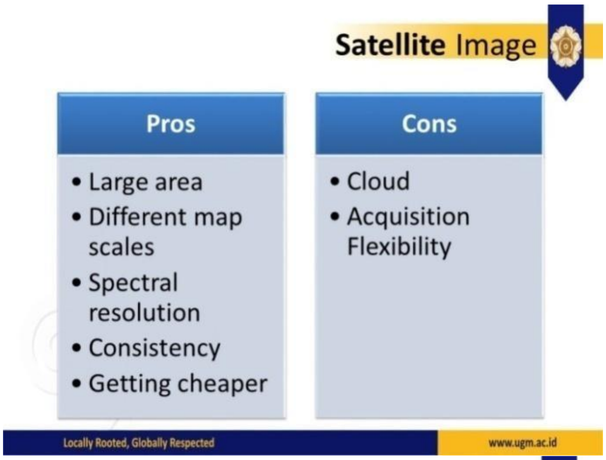
Locally Rooted, Globally Respected   www.ugm.ac.id

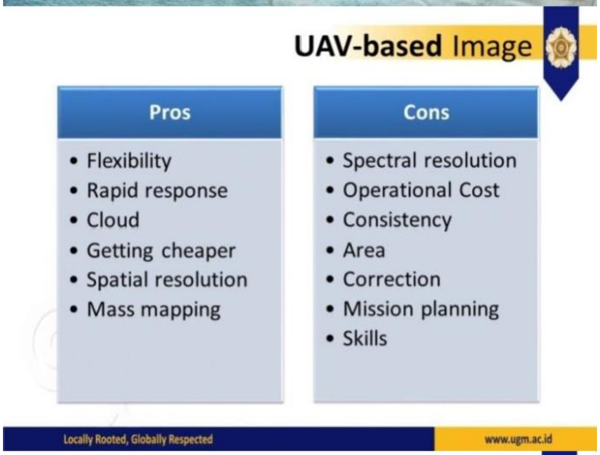
Short **introduction**

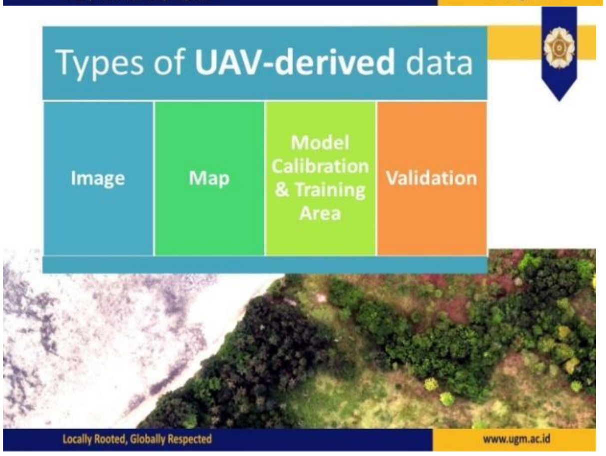
- Name: Dr. Pramaditya Wicaksono, M.Sc.
- Affiliation:
  - Cartography and Remote Sensing, Faculty of Geography Universitas Gadjah Mada, Indonesia
  - ITT, TH Koeln, Germany
- Major: Remote Sensing
- Research interest: Seagrass, coral reefs, macro algae, mangrove, water quality

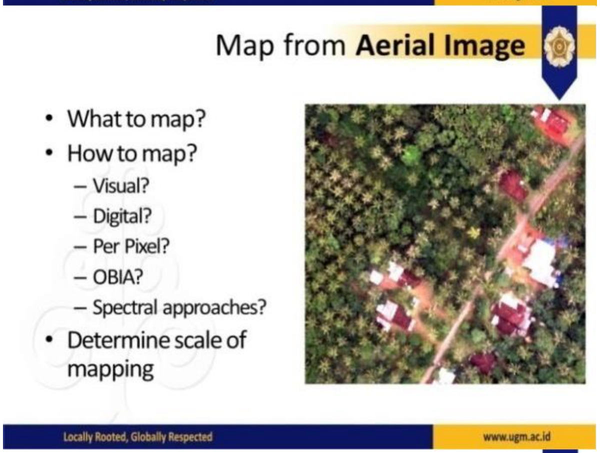
Locally Rooted, Globally Respected   www.ugm.ac.id

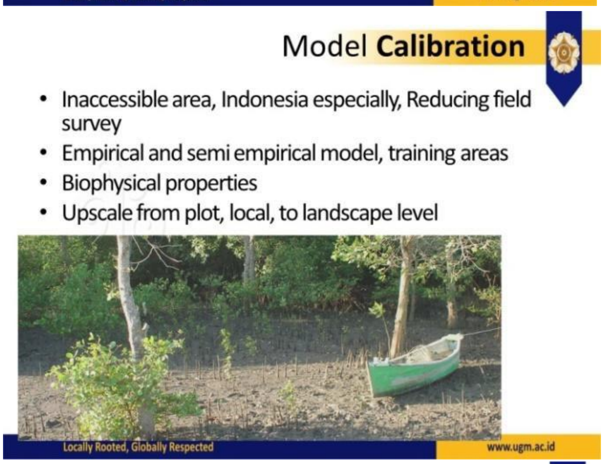

Why do we need to combine?
Improve information extraction
Upscale the level of mapping
– Ecological aspect
– Spatial aspect
– Regional complex
To get the benefit of both

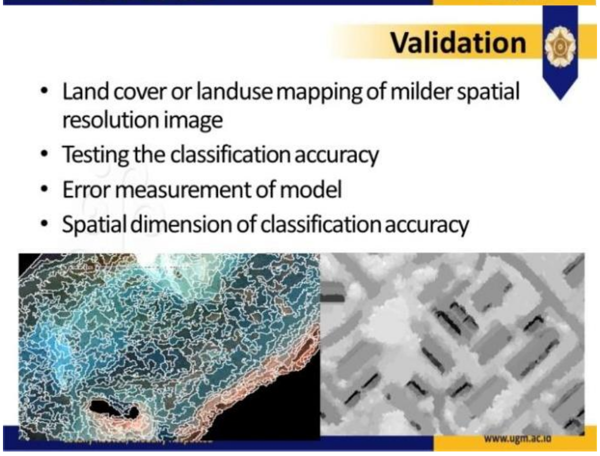

Satellite Image
Pros
Large area
Different map scales
Spectral resolution
Consistency
Getting cheaper
Cons
Cloud
Acquisition Flexibility
Locally Rooted, Globally Respected
www.ugm.ac.id

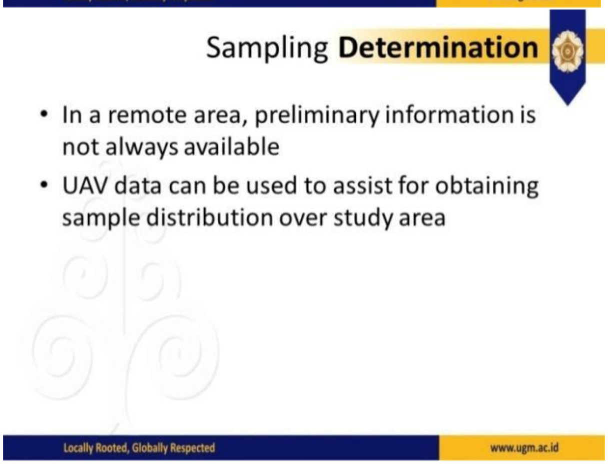

UAV-based Image
Pros
Flexibility
Rapid response
Cloud
Getting cheaper
Spatial resolution
Mass mapping
Cons
Spectral resolution
Operational Cost
Consistency
Area
Correction
Mission planning
Skills
Locally Rooted, Globally Respected
www.ugm.ac.id


Types of UAV-derived data
Image
Map
Model Calibration & Training Area
Validation
Locally Rooted, Globally Respected
www.ugm.ac.id

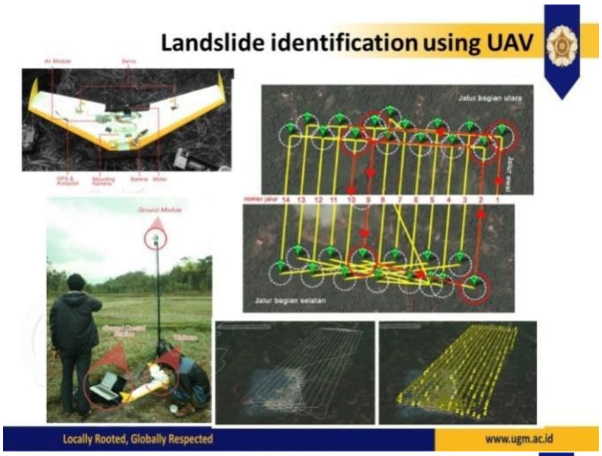

Map from Aerial Image
What to map?
How to map?
– Visual?
– Digital?
– Per Pixel?
– OBIA?
– Spectral approaches?
Determine scale of mapping
Locally Rooted, Globally Respected
www.ugm.ac.id

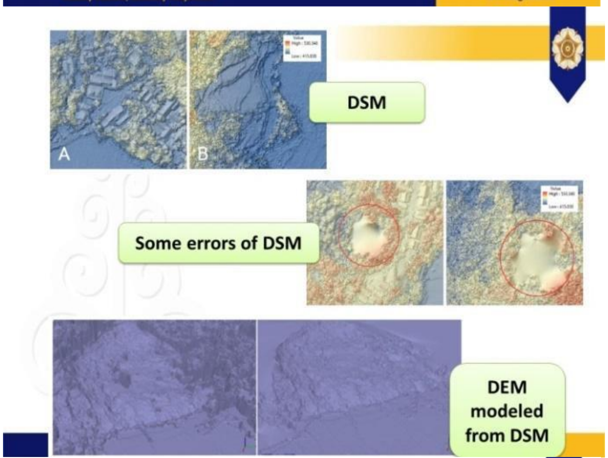

Model Calibration
Inaccessible area, Indonesia especially, Reducing field survey
Empirical and semi empirical model, training areas
Biophysical properties
Upscale from plot, local, to landscape level
Locally Rooted, Globally Respected
www.ugm.ac.id

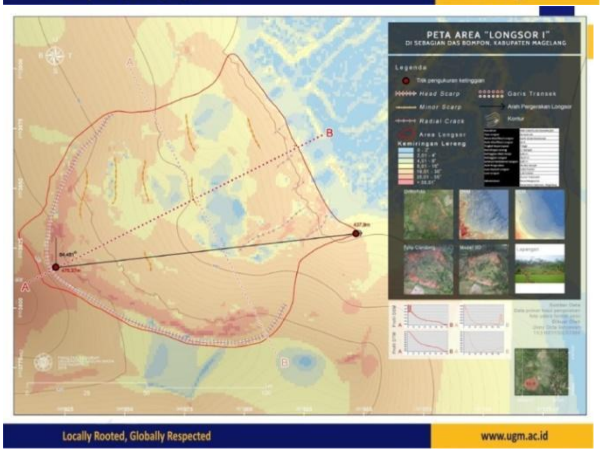

Validation
Land cover or landuse mapping of milder spatial resolution image
Testing the classification accuracy
Error measurement of model
Spatial dimension of classification accuracy

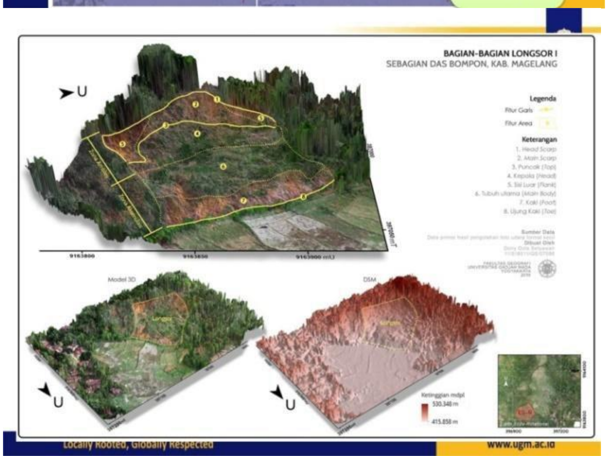

Sampling Determination
In a remote area, preliminary information is not always available
UAV data can be used to assist for obtaining sample distribution over study area
Locally Rooted, Globally Respected
www.ugm.ac.id

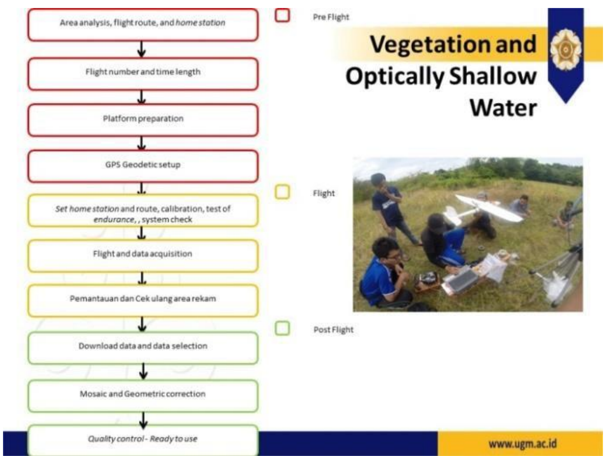

Some Works
Locally Rooted, Globally Respected
www.ugm.ac.id


Landslide identification using UAV
Locally Rooted, Globally Respected
www.ugm.ac.id


DSM
A
B
Some errors of DSM
DEM modeled from DSM

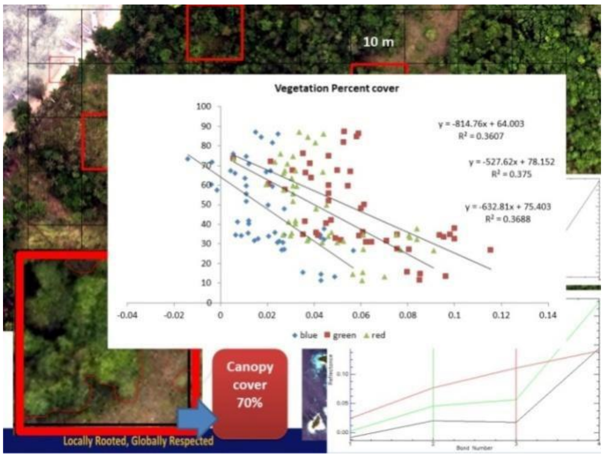

PETA AREA "LONGSOR I"
DI SEBAGIAN DAS BOMPON, KABUPATEN MAGELANG
Legenda
Locally Rooted, Globally Respected
www.ugm.ac.id


BAGIAN-BAGIAN LONGSOR I
SEBAGIAN DAS BOMPON, KAB. MAGELANG
Legenda
Keterangan
U
Locally Rooted, Globally Respected
www.ugm.ac.id

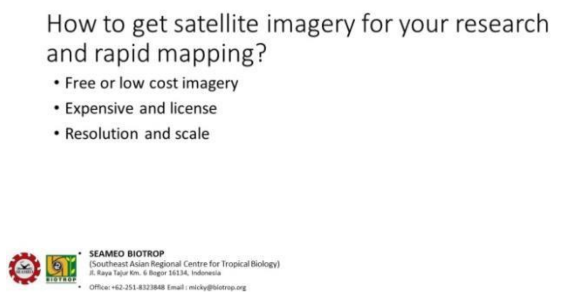

Area analysis, flight route, and home station
Flight number and time length
Platform preparation
GPS Geodetic setup
Set home station and route, calibration, test of endurance, , system check
Flight and data acquisition
Pemantauan dan Cek ulang area rekam
Download data and data selection
Mosaic and Geometric correction
Quality control - Ready to use
Pre Flight
Flight
Post Flight
Vegetation and Optically Shallow Water
www.ugm.ac.id

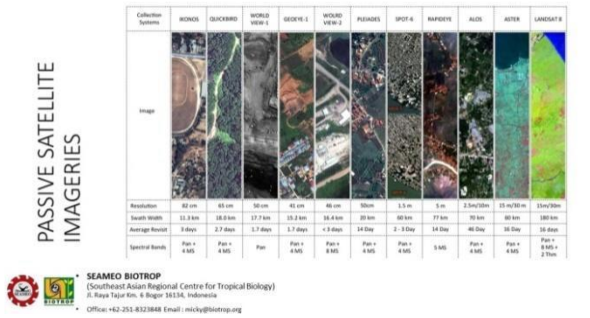

Vegetation Land Cover
Locally Rooted, Globally

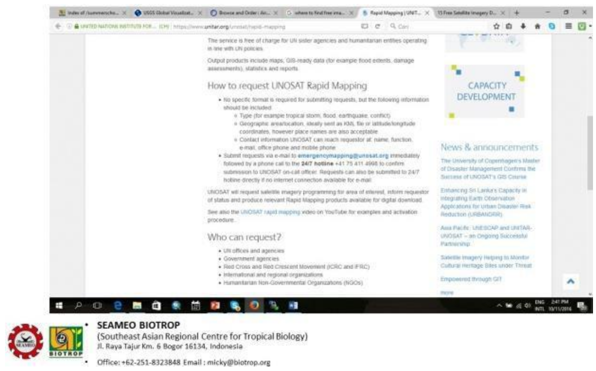

Optically Shallow Water
Locally Rooted, Globally Respected
www.ugm.ac.id



Lecture-8: Data Collecting and Fusion (Armaiki Yusmur)

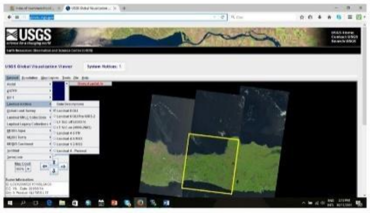






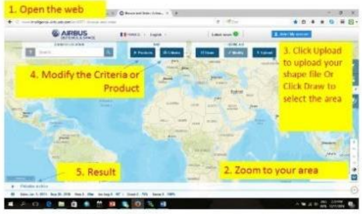
How to get Imageries?

- For LANDSAT 8, ASTER, SENTINEL, MODIS for free
- Aerial, EO-1
- Go to http://glovis.usgs.gov/



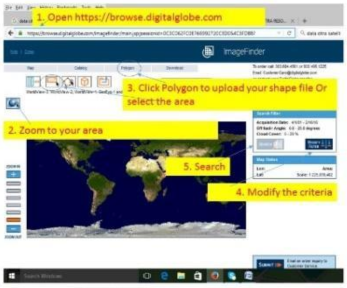
SEAMEO BIOTROP
(Southeast Asian Regional Centre for Tropical Biology)
Jl. Raya Tajur Km. 6 Bogor 16134, Indonesia
- Office: +62-251-8323848 Email : micky@biotrop.org

How to get Imageries?



- To get high resolution imagery data from AIRBUS, such as : SPOT 5, SPOT 6, SPOT 7, Pleiades, Terrasar x
- Open your browser and type http://www.intelligence-airbusds.com/en/4871-browse-and-order.
- You will see the main interface to find the image

SEAMEO BIOTROP
(Southeast Asian Regional Centre for Tropical Biology)
Jl. Raya Tajur Km. 6 Bogor 16134, Indonesia
- Office: +62-251-8323848 Email : micky@biotrop.org



How to get Imageries?

- To get high resolution imagery data from DIGITALGLOBE, such as : Ikonos, Geoeye, Worldview01, Worldview02, Worldview03
- Open your browser and type https://browse.digitalglobe.com in address.
- You will see the main interface to find the image

SEAMEO BIOTROP
(Southeast Asian Regional Centre for Tropical Biology)
Jl. Raya Tajur Km. 6 Bogor 16134, Indonesia
- Office: +62-251-8323848 Email : micky@biotrop.org

IMAGE FUSSION

SEAMEO BIOTROP
(Southeast Asian Regional Centre for Tropical Biology)
Jl. Raya Tajur Km. 6 Bogor 16134, Indonesia
- Office: +62-251-8323848 Email : micky@biotrop.org

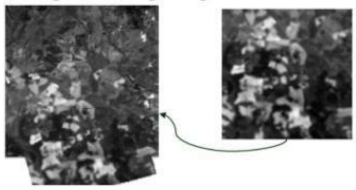
Empirical observation

- **One image is not enough**
- **We need**
  - **more images**
  - **the techniques how to combine them**

SEAMEO BIOTROP
(Southeast Asian Regional Centre for Tropical Biology)
Jl. Raya Tajur Km. 6 Bogor 16134, Indonesia
- Office: +62-251-8323848 Email : micky@biotrop.org

Basic fusion strategy

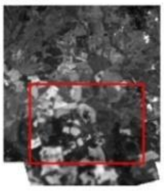
- **Acquisition of different images**
- **Image-to-image registration**



SEAMEO BIOTROP
(Southeast Asian Regional Centre for Tropical Biology)
Jl. Raya Tajur Km. 6 Bogor 16134, Indonesia
- Office: +62-251-8323848 Email : micky@biotrop.org

Basic fusion strategy

- **Acquisition of different images**
- **Image-to-image registration**
- **The fusion itself (combining the images together)**



SEAMEO BIOTROP
(Southeast Asian Regional Centre for Tropical Biology)
Jl. Raya Tajur Km. 6 Bogor 16134, Indonesia
- Office: +62-251-8323848 Email : micky@biotrop.org

Background

- Satellite sensors present an important diversity in terms of characteristics. Some provide a high spatial resolution while other focus on providing several spectral bands.
- Satellite sensor produces :Single band/Panchromatic band, Multispectral band, Hyperspectral and thermal band
- Now, Panchromatic band and Multispectral band can be obtain in bundle product
- The fusion process brings the information from different sensors with different characteristics together to get the best of both worlds.

SEAMEO BIOTROP
(Southeast Asian Regional Centre for Tropical Biology)
Jl. Raya Tajur Km. 6 Bogor 16134, Indonesia
- Office: +62-251-8323848 Email : micky@biotrop.org

SATELLITE IMAGERIES SENSOR

Collection Systems	IKONOS	QUICKBIRD	WORLD VIEW-1	GEOEYE-1	WOLRD VIEW-2	PLEIADES	SPOT-6	RAPIDEYE	ALOS	ASTER	LANDSAT 8
Image											
Resolution	82 cm	65 cm	50 cm	41 cm	46 cm	50cm	1.5 m	5 m	2.5m/10m	15 m/30 m	15m/30m
Swath Width	11.3 km	18.0 km	17.7 km	15.2 km	16.4 km	20 km	60 km	77 km	70 km	60 km	180 km
Average Revisit	3 days	2.7 days	1.7 days	1.7 days	< 3 days	14 Day	2 - 3 Day	14 Day	46 Day	16 Day	16 days
Spectral Bands	Pan + 4 MS	Pan + 4 MS	Pan	Pan + 4 MS	Pan + 8 MS	Pan + 4 MS	Pan + 4 MS	5 MS	Pan + 4 MS	Pan + 4 MS	Pan + 8 MS + 2 Thm
Accuracy*	15 m CE90	23 m CE90	< 4.0 m CE90	5.0 m CE90	< 3.5 m CE90	15 m CE90	15 m CE90	15 m CE90	15 m CE90	15 m CE90	15 m CE90

* Specification at nadir on flat terrain

SEAMEO B
(Southeast A
Jl. Raya Tajur K
Office: +62-251-8323848 Email : micky@biotrop.org

IMAGE FUSION

- The fusion methods in the remote sensing community deal with the pansharpening technique.
- This fusion combines the image from the Panchromatic sensor (PAN) of one satellite (high spatial resolution data) with the multispectral (MS) data (lower resolution in several spectral bands) to generate images with a high resolution and several spectral bands.

SEAMEO BIOTROP
(Southeast Asian Regional Centre for Tropical Biology)
Jl. Raya Tajur Km. 6 Bogor 16134, Indonesia
Office: +62-251-8323848 Email : micky@biotrop.org

IMAGE FUSION

- **Pan Sharpening** is an image fusion method in which high-resolution panchromatic data is fused with lower resolution multispectral data to create a colorized high-resolution dataset.
- The resulting product should only serve as an aid to literal analysis and not for further spectral analysis.

SEAMEO BIOTROP
(Southeast Asian Regional Centre for Tropical Biology)
Jl. Raya Tajur Km. 6 Bogor 16134, Indonesia
Office: +62-251-8323848 Email : micky@biotrop.org

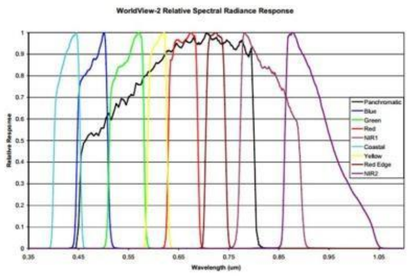


Figure 1. The relative spectral responses of the WV-2 satellite.

SEAMEO BIOTROP
(Southeast Asian Regional Centre for Tropical Biology)
Jl. Raya Tajur Km. 6 Bogor 16134, Indonesia
Office: +62-251-8323848 Email : micky@biotrop.org

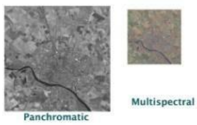
FUSION CATEGORIES

- *Multiview fusion* of images from the same modality and taken at the same time but from different view-points.
- *Multimodal fusion* of images coming from different sensors (visible and infrared, CT and NMR, or panchromatic and multispectral satellite images).
- *Multitemporal fusion* of images taken at different times in order to detect changes between them or to synthesize realistic images of objects which were not photographed in a desired time.
- *Multifocus fusion* of images of a 3D scene taken repeatedly with various focal length.
- *Fusion for image restoration.* Fusion two or more images of the same scene and modality, each of them blurred and noisy, may lead to a deblurred and denoised image. Multichannel deconvolution is a typical representative of this category. This approach can be extended to superresolution fusion, where input blurred images of low spatial resolution are fused to provide us a high-resolution image.

SEAMEO BIOTROP
(Southeast Asian Regional Centre for Tropical Biology)
Jl. Raya Tajur Km. 6 Bogor 16134, Indonesia
Office: +62-251-8323848 Email : micky@biotrop.org

Multimodal fusion with different resolution

- One image with high spatial resolution, the other one with low spatial but higher spectral resolution.
- Goal: An image with high spatial and spectral resolution
- Method: Replacing bands in DWT



SEAMEO BIOTROP
(Southeast Asian Regional Centre for Tropical Biology)
Jl. Raya Tajur Km. 6 Bogor 16134, Indonesia
Office: +62-251-8323848 Email : micky@biotrop.org

Multitemporal Fusion

- Images of the same scene taken at different times (usually of the same modality)
- Goal: Detection of changes
- Method: Subtraction

SEAMEO BIOTROP
(Southeast Asian Regional Centre for Tropical Biology)
Jl. Raya Tajur Km. 6 Bogor 16134, Indonesia
Office: +62-251-8323848 Email : micky@biotrop.org

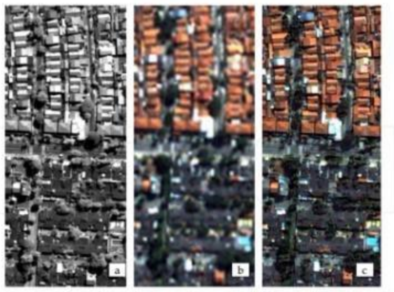
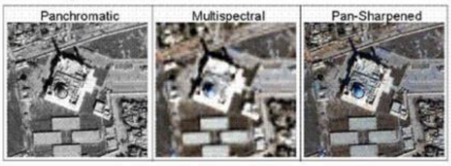


Fig. 14. A small region of the (a) panchromatic image (0.6 m), (b) multispectral image (2.4 m), and (c) fused image (0.6 m).

SEAMEO BIOTROP
(Southeast Asian Regional Centre for Tropical Biology)
Jl. Raya Tajur Km. 6 Bogor 16134, Indonesia
Office: +62-251-8323848 Email : micky@biotrop.org

IMAGE FUSION PROCESS

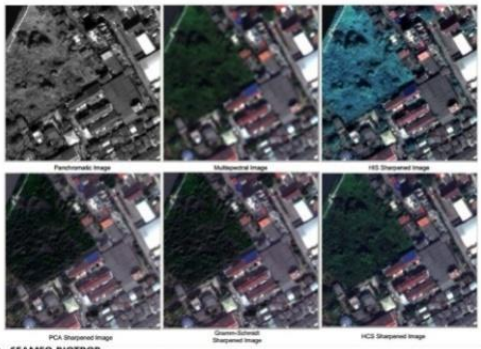
Source:
http://www.harrisgeospatial.com/docs/SpearTools.html



PANCHROMATIC + MULTISPECTRAL = PAN-SHARPENED

- Gram-Schmidt
- Principal Components
- Hue, Saturation, Value (HSV)
- Color Normalized (Brovey)

• SEAMEO BIOTROP
(Southeast Asian Regional Centre for Tropical Biology)
Jl. Raya Tajur Km. 6 Bogor 16134, Indonesia
• Office: +62-251-8323848 Email : micky@biotrop.org



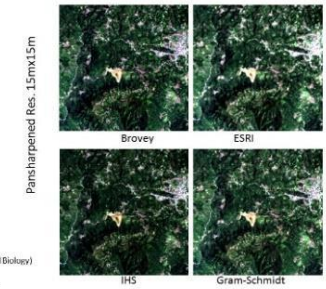
• SEAMEO BIOTROP
(Southeast Asian Regional Centre for Tropical Biology)
Jl. Raya Tajur Km. 6 Bogor 16134, Indonesia
• Office: +62-251-8323848 Email : micky@biotrop.org

- EXP: MS image interpolation, using a polynomial kernel with 23 coefficients [64].
- IHS: *Fast Intensity-Hue-Saturation* (GIHS) image fusion [44].
- BT: *Brovey transform* [48].
- PCA: *Principal Component Analysis* [10].
- BDSD: *Band-Dependent Spatial-Detail* with local parameter estimation [49].
- GS: *Gram Schmidt* (Mode 1) [14].
- GSA: *Gram Schmidt Adaptive* [43].
- PRACS: *Partial Replacement Adaptive Component Substitution* [47].
- HPF: *High-Pass Filtering* with 5 × 5 box filter for 1:4 fusion [10].
- SFIM: *High-Pass Modulation* with 5 × 5 box filter [55], a.k.a. *Smoothing Filter-based Intensity Modulation (SFIM)* [59], [60].
- Indusion: Decimated Wavelet Transform using an *additive* injection model [61].
- MTF-GLP: *Generalized Laplacian Pyramid* (GLP) [64] with MTF-matched filter [62] with unitary injection model.
- MTF-GLP-HPM: GLP with MTF-matched filter [62] and *multiplicative* injection model [57].
- MTF-GLP-HPM-PP: GLP with MTF-matched filter [62], *multiplicative* injection model and Post-Processing [65].
- MTF-GLP-CBD: GLP [64] with MTF-matched filter [62] and regression based injection model [8].
- ATWT: Additive A Trous Wavelet Transform with unitary injection model [56].
- ATWT-M2: A Trous Wavelet Transform using the Model 2 proposed in [54].

• SEAMEO BIOTROP
(Southeast Asian Regional Centre for Tropical Biology)
Jl. Raya Tajur Km. 6 Bogor 16134, Indonesia
• Office: +62-251-8323848 Email : micky@biotrop.org

Different OUTPUT for DIFFERENT METHODS

Original Res. 30mx30m



• SEAMEO BIOTROP
(Southeast Asian Regional Centre for Tropical Biology)
Jl. Raya Tajur Km. 6 Bogor 16134, Indonesia
• Office: +62-251-8323848 Email : micky@biotrop.org

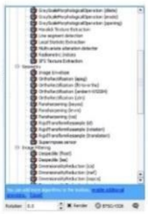
HOW TO DO IT

- There are a lot of software for Pansharpen Processing including image processing software and gis software
- Open source : QGIS,
- Remote sensing software : Er Mapper, ERDAS, ENVI, PCI, etc
- GIS Software : ARCGIS, etc
- Data can download from https://www.biotrop.org/summerschool/02_Data/02_Landsat-8/03_Image_Fusion/

• SEAMEO BIOTROP
(Southeast Asian Regional Centre for Tropical Biology)
Jl. Raya Tajur Km. 6 Bogor 16134, Indonesia
• Office: +62-251-8323848 Email : micky@biotrop.org

Image Fusion in QGIS

Orfeo Toolbox
http://www.orfeo-toolbox.org

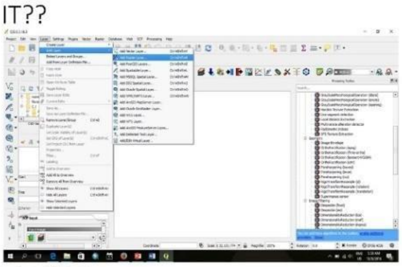


Monteverdi

• SEAMEO BIOTROP
(Southeast Asian Regional Centre for Tropical Biology)
Jl. Raya Tajur Km. 6 Bogor 16134, Indonesia
• Office: +62-251-8323848 Email : micky@biotrop.org

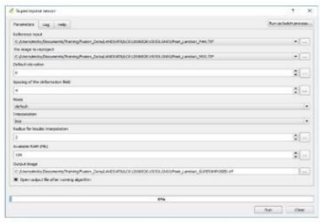
HOW TO DO IT??

- Open QGIS and go to **Layer ‣ Add Layer - Add Raster Layer**.
- Browse to the directory with the individual images. Hold down the Ctrl key and click on the image files to make a multiple selection. Click **Open**.



• SEAMEO BIOTROP
(Southeast Asian Regional Centre for Tropical Biology)
Jl. Raya Tajur Km. 6 Bogor 16134, Indonesia
• Office: +62-251-8323848 Email : micky@biotrop.org

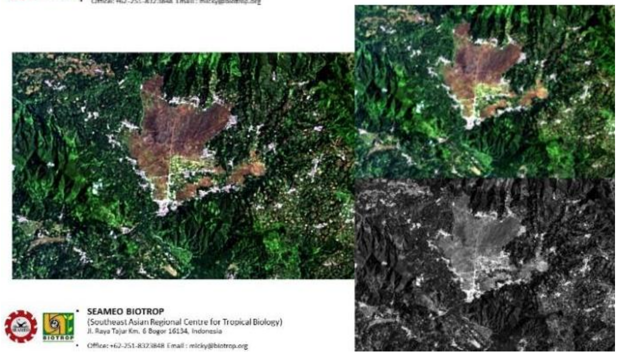
- Open **Orfeo toolbox** group – **Geometry – Superimpose Sensor.** Click … in **Reference Input** to insert Panchromatic file. Click … in **The Image to Reproject** to insert Multispectral image file. And Click … in **Output Image**, save as Superimposed.TIF. Then click **Run**!
- The Output File will be input file for pansharpening process.



• SEAMEO BIOTROP
(Southeast Asian Regional Centre for Tropical Biology)
Jl. Raya Tajur Km. 6 Bogor 16134, Indonesia
• Office: +62-251-8323848 Email : micky@biotrop.org


• Click **Pansharpening (bayes)** tool
• In Pansharpening (bayes) tool dialog, click ... **Input Pan Image** ...insert the Panchromatic image.
• Click ... **Input XS Image** and insert the multispectral image. Let all option in Weight, 5 coefficient and available RAM as default.
• Click ... **Output image file** and insert the pansharpen file name. Then Click **Run**.
SEAMEO BIOTROP
(Southeast Asian Regional Centre for Tropical Biology)
Jl. Raya Tajur Km. 6 Bogor 16134, Indonesia
Office: +62-251-8323848 Email : micky@biotrop.org


• Now you have a nice pansharpened image that you can use in your project as a background layer or do further analysis on.
SEAMEO BIOTROP
(Southeast Asian Regional Centre for Tropical Biology)
Jl. Raya Tajur Km. 6 Bogor 16134, Indonesia
Office: +62-251-8323848 Email : micky@biotrop.org


SEAMEO BIOTROP
(Southeast Asian Regional Centre for Tropical Biology)
Jl. Raya Tajur Km. 6 Bogor 16134, Indonesia
Office: +62-251-8323848 Email : micky@biotrop.org

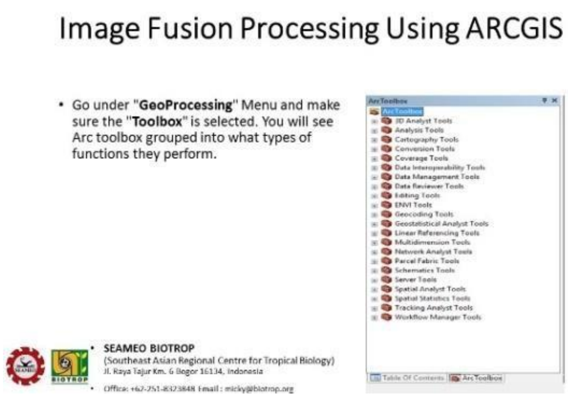
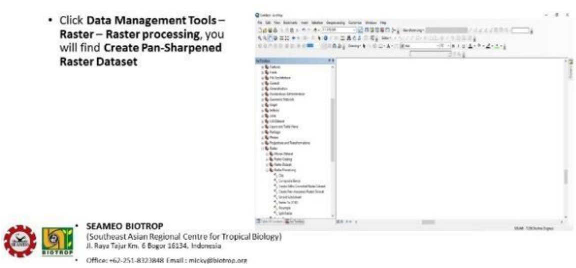
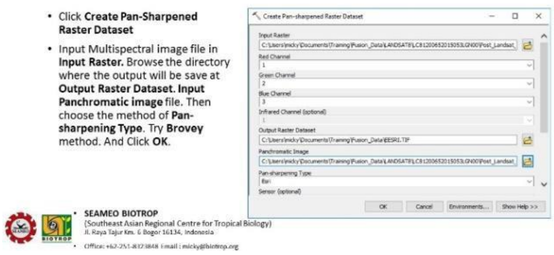


Image Fusion Processing Using ARCGIS
• Go under "**GeoProcessing**" Menu and make sure the "**Toolbox**" is selected. You will see Arc toolbox grouped into what types of functions they perform.
Arc Toolbox
3D Analyst Tools
Analysis Tools
Cartography Tools
Conversion Tools
Coverage Tools
Data Interoperability Tools
Data Management Tools
Data Reviewer Tools
Editing Tools
ENVI Tools
Geocoding Tools
Geostatistical Analyst Tools
Linear Referencing Tools
Multidimension Tools
Network Analyst Tools
Parcel Fabric Tools
Schematics Tools
Server Tools
Spatial Analyst Tools
Spatial Statistics Tools
Tracking Analyst Tools
Workflow Manager Tools
SEAMEO BIOTROP
(Southeast Asian Regional Centre for Tropical Biology)
Jl. Raya Tajur Km. 6 Bogor 16134, Indonesia
Office: +62-251-8323848 Email : micky@biotrop.org


• Click **Data Management Tools – Raster – Raster processing**, you will find **Create Pan-Sharpened Raster Dataset**
SEAMEO BIOTROP
(Southeast Asian Regional Centre for Tropical Biology)
Jl. Raya Tajur Km. 6 Bogor 16134, Indonesia
Office: +62-251-8323848 Email : micky@biotrop.org


• Click **Create Pan-Sharpened Raster Dataset**
• Input Multispectral image file in **Input Raster.** Browse the directory where the output will be save at **Output Raster Dataset. Input Panchromatic image** file. Then choose the method of **Pan-sharpening Type**. Try **Brovey** method. And Click **OK**.
Create Pan-sharpened Raster Dataset
Input Raster
Red Channel
Green Channel
Blue Channel
Infrared Channel (optional)
Output Raster Dataset
Panchromatic Image
Pan-sharpening Type
Sensor (optional)
OK
Cancel
Environments...
Show Help >>
SEAMEO BIOTROP
(Southeast Asian Regional Centre for Tropical Biology)
Jl. Raya Tajur Km. 6 Bogor 16134, Indonesia
Office: +62-251-8323848 Email : micky@biotrop.org


BIOTROP
TERIMA KASIH
SEAMEO BIOTROP
(Southeast Asian Regional Centre for Tropical Biology)
Jl. Raya Tajur Km. 6 Bogor 16134, Indonesia
Office: +62-251-8323848 Email : micky@biotrop.org

PRACTICE: IMAGE FUSION PROCESSING IN QGIS AND ARCGIS

Armaiki Yusmur

Southeast Asian Regional Centre for Tropical Biology (SEAMEO BIOTROP)

Image Fusion Processing Using Orfeo Toolbox in QGIS

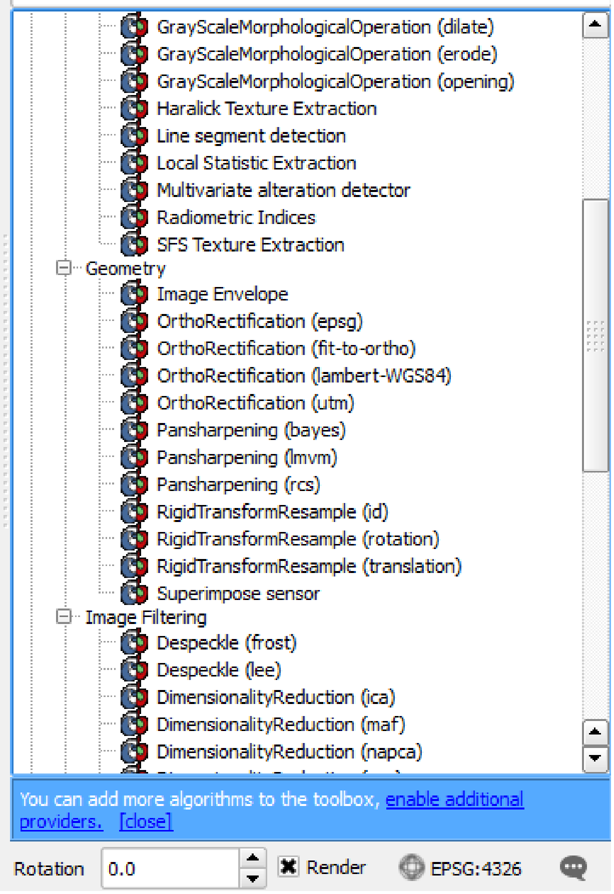
Satellite and aerial images are more than pretty pictures. Each image contains a wealth of data that can be queried, modified, extracted, and visualized through simple and advanced techniques. This manual will cover a few basic tools in the Orfeo Toolbox in QGIS. Instructions for installing Orfeo Toolbox in the QGIS processing toolbox : http://wiki.orfeo-toolbox.org/index.php/Quantum_GIS_access_to_OTB_applications

Quick Background on Orfeo Toolbox

The toolbox, often abbreviated OTB, was created to promote the use of several French satellites. Like many programs, the algorithms are geared towards popular satellites. For more on its creation, visit: http://www.orfeo-toolbox.org/otb/about-otb.html.

In QGIS

After following the instructions above, go under "Processing" and make sure the "Toolbox" is selected. You will see Orfeo's tools grouped into what types of functions they perform.

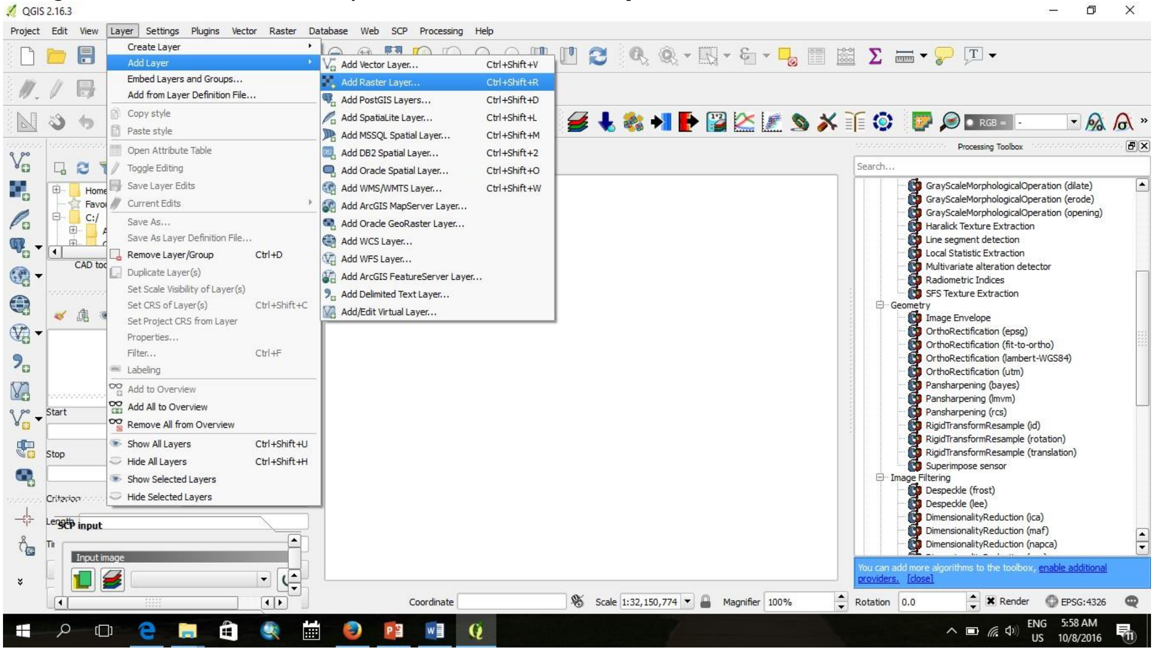


Screenshot of Orfeo Toolbox in QGIS's Processing Toolbox

PROCEDURE

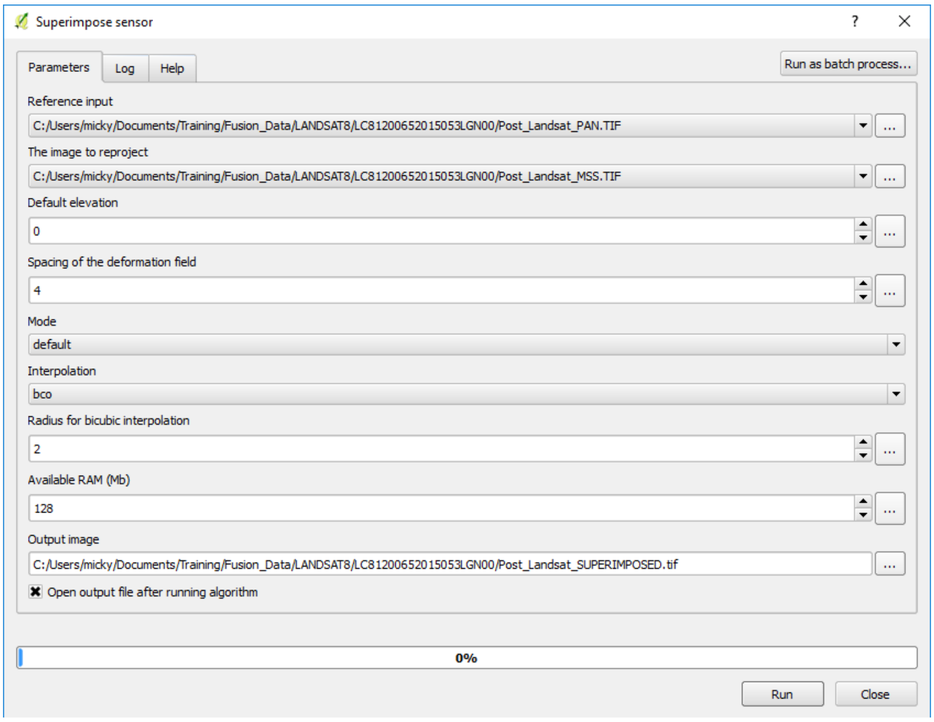
Open QGIS and go to **Layer › Add Layer** - **Add Raster Layer**.

Browse to the directory with the individual images. Hold down the Ctrl key and click on the image files to make a multiple selection. Click **Open**.



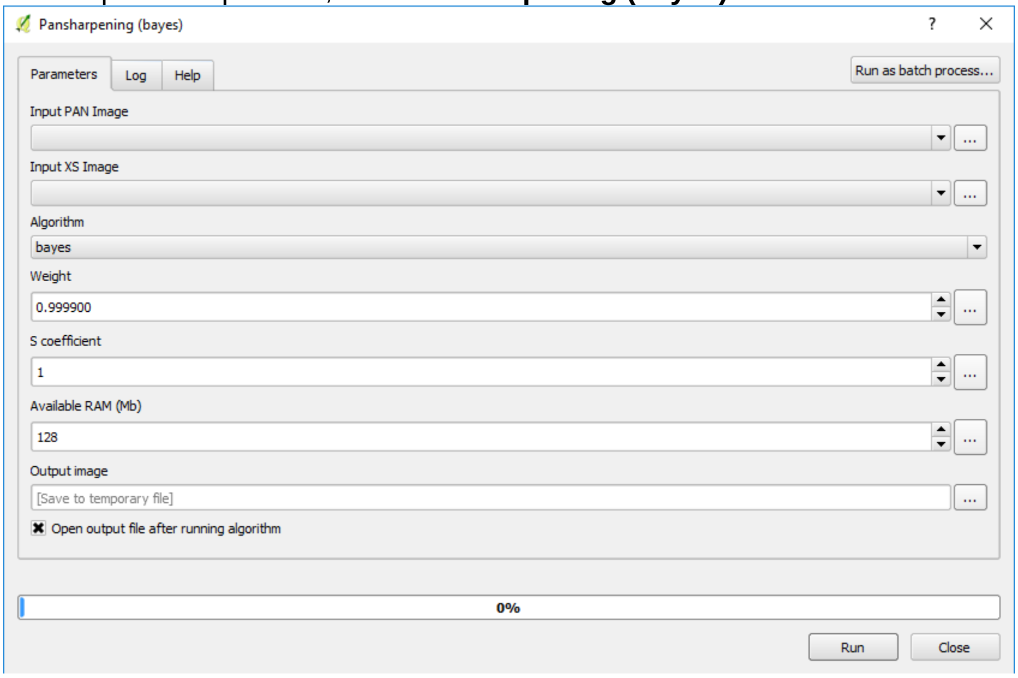
You will see the images load up in the layer panel.

Open **Orfeo toolbox** group – **Geometry – Superimpose Sensor**. Click … in **Reference Input** to insert Panchromatic file. Click … in **The Image to Reproject** to insert Multispectral image file. And Click … in **Output Image**, save as Superimposed.TIF. Then click **Run**!

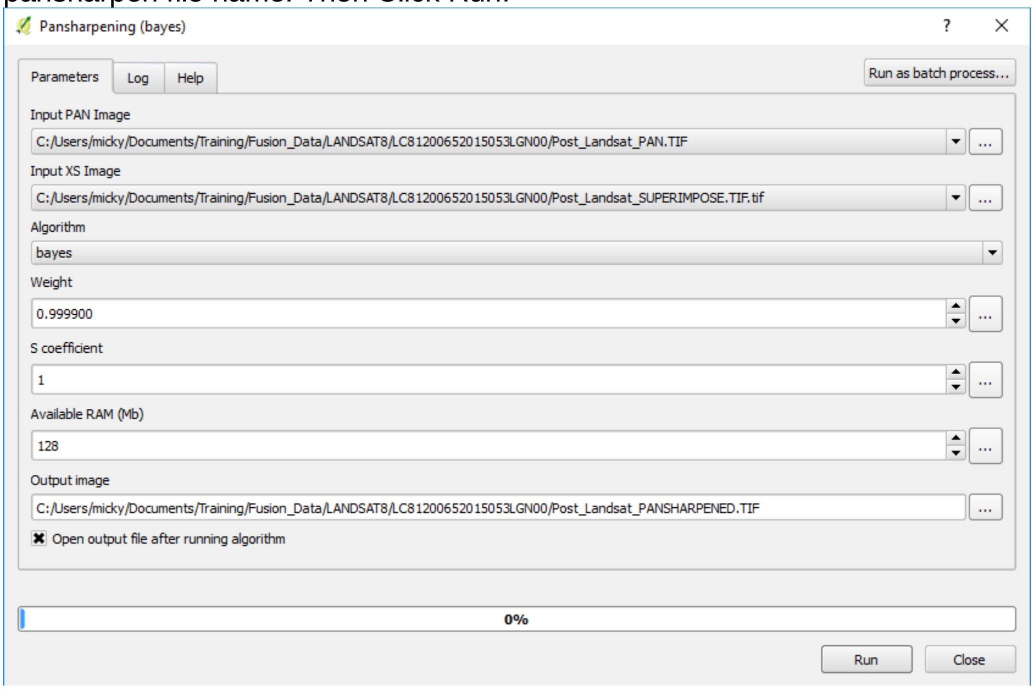


The Output File will be input file for pansharpening process.

To complete the process, click **Pansharpening (bayes)** tool



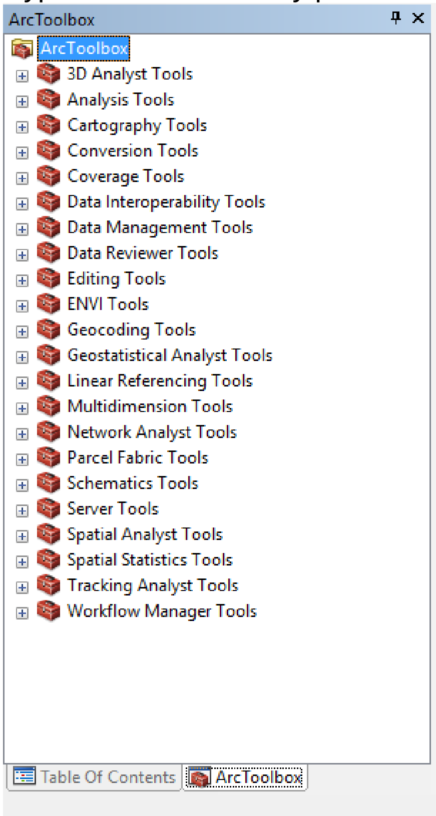
In Pansharpening (bayes) tool dialog, click … **Input Pan Image** ...insert the Panchromatic image. Click … **Input XS Image** and insert the multispectral image. Let all option in Weight, S coefficient and available RAM as default. Click … **Output image file** and insert the pansharpen file name. Then Click Run.



Now you have a nice pansharpened image that you can use in your project as a background layer or do further analysis on.

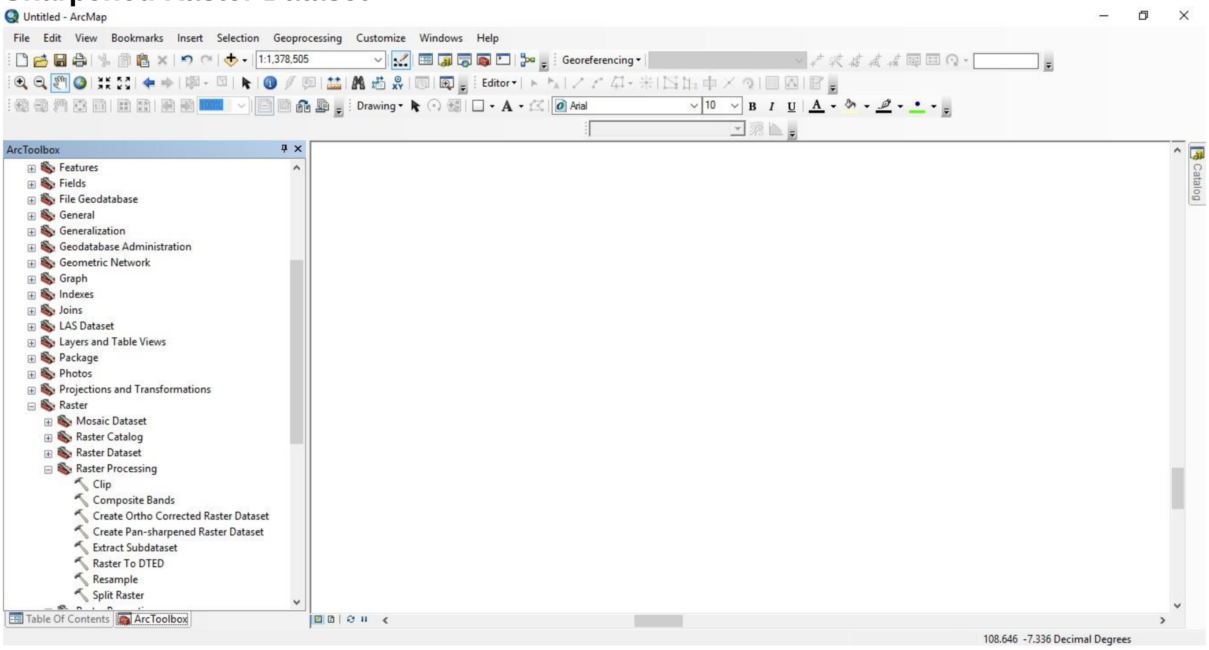
Image Fusion Processing Using ARCGIS

Go under "**GeoProcessing**" Menu and make sure the "**Toolbox**" is selected. You will see Arc toolbox grouped into what types of functions they perform.

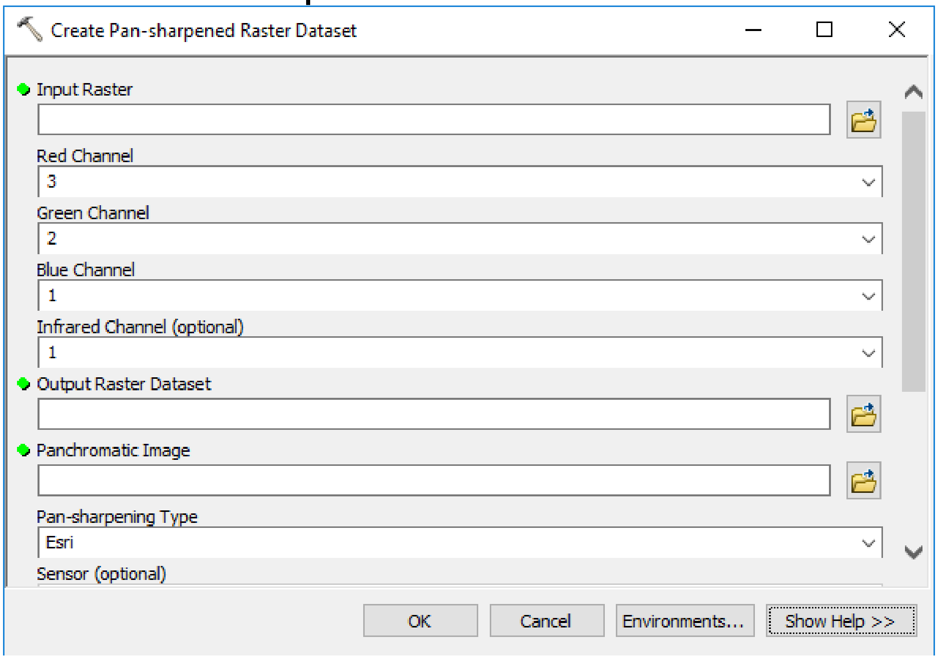


Screenshot of ArcToolbox in ARCGIS's Processing Toolbox

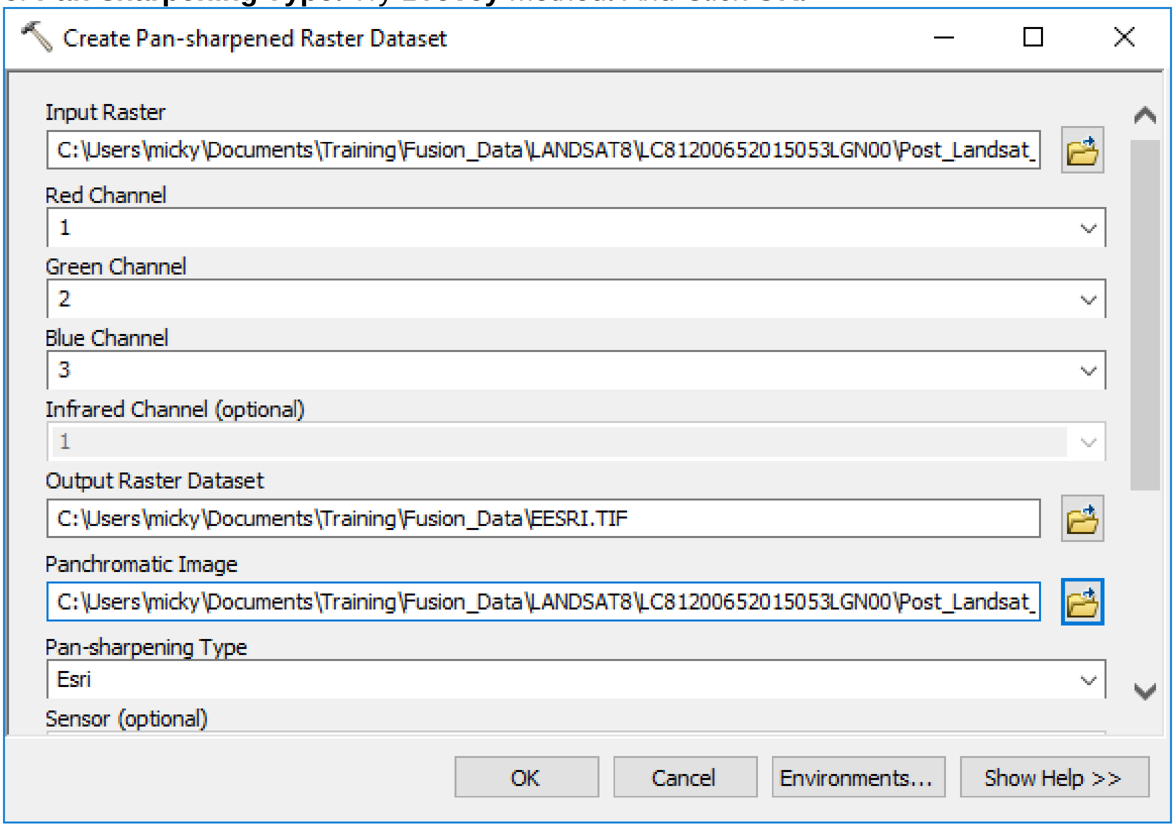
Click **Data Management Tools – Raster – Raster processing**, you will find **Create Pan-Sharpened Raster Dataset**



Click **Create Pan-Sharpened Raster Dataset**



Input Multispectral image file in **Input Raster.** Browse the directory where the output will be save at **Output Raster Dataset**. **Input Panchromatic image** file. Then choose the method of **Pan-sharpening Type**. Try **Brovey** method. And Click **OK**.



Use another methods (IHS, Simple-Mean, ESRI and Gram-Schmidt), What do you think?

Brovey

ESRI

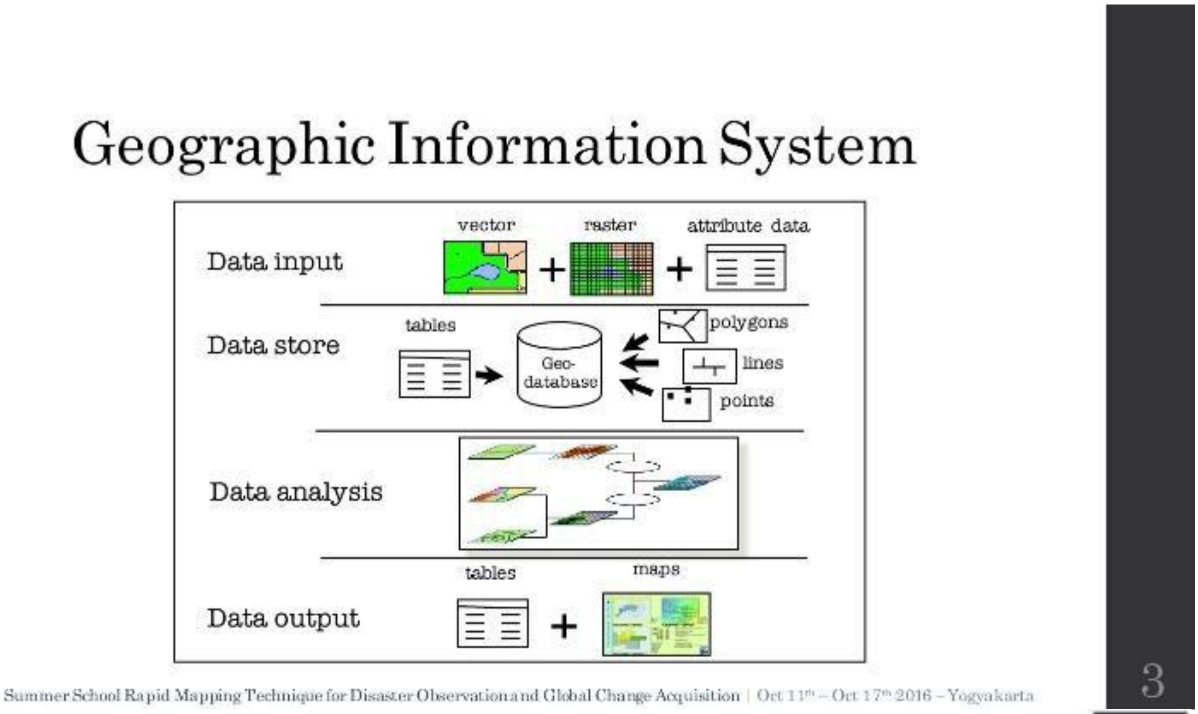
IHS

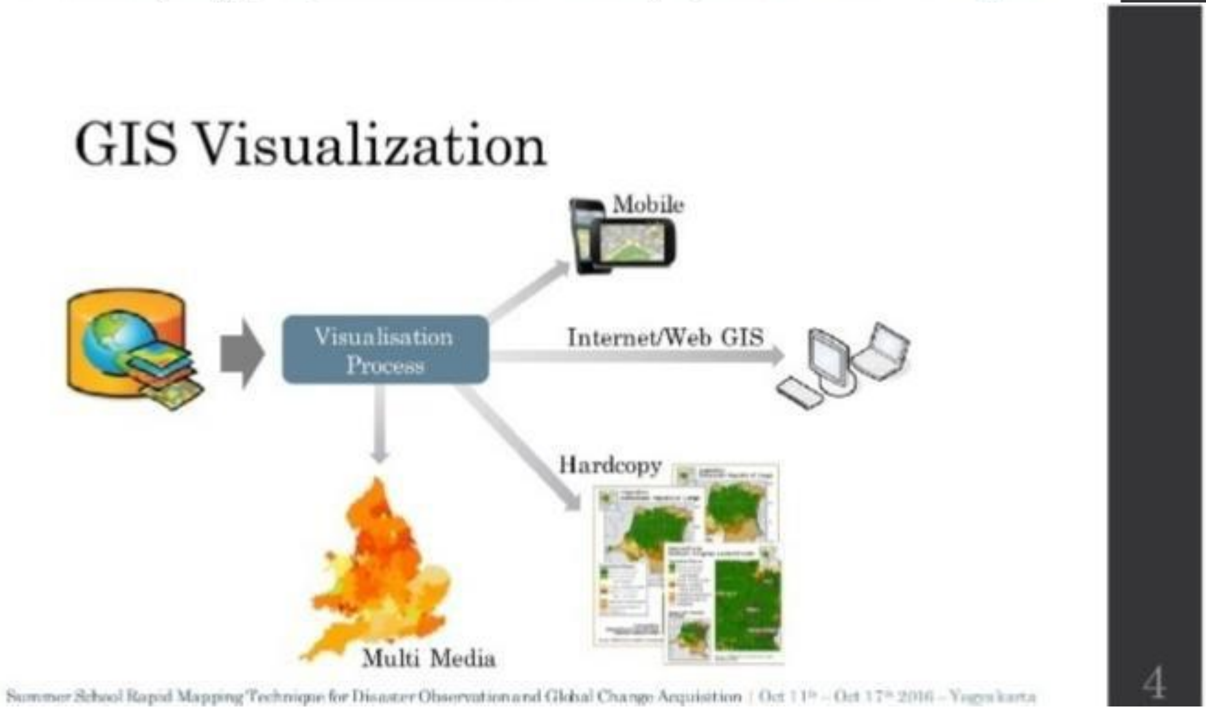
Gram-Schmidt

Simple-Mean

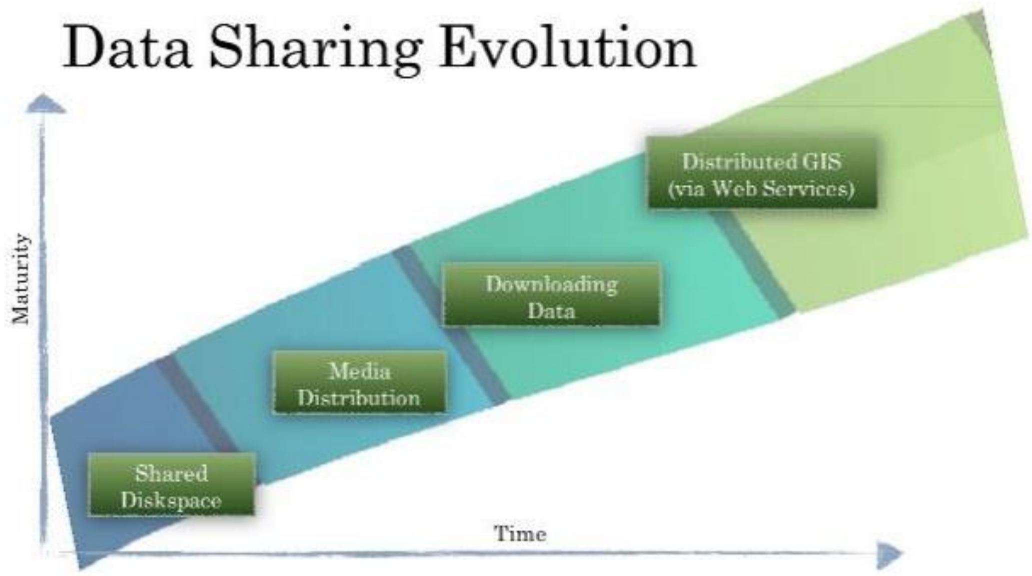
Landsat-Multispectral without Panchromatic

Lecture 8: Web GIS: Introduction and Practice (Iwan Setyawan)


Geographic Information System
Data input
vector
raster
attribute data
Data store
tables
Geo-database
polygons
lines
points
Data analysis
tables
maps
Data output
Summer School Rapid Mapping Technique for Disaster Observation and Global Change Acquisition | Oct 11th – Oct 17th 2016 – Yogyakarta
3


GIS Visualization
Mobile
Visualisation Process
Internet/Web GIS
Hardcopy
Multi Media
4

Data Sharing Evolution



Standards for Geospatial Data Distribution

i. **Data delivery standards**: Web Mapping Service (WMS), Web Feature Service (WFS) and its transactional equivalent (WFS-T), and the Web Coverage Service (WCS);

ii. **Data format standards**: Simple Feature Standard (SFS), Geography Markup Language (GML), Keyhole Markup Language (KML);

iii. **Data search standards**: Catalogue Service (CSW), Gazetteer Service (WFS-G); and

iv. **Other standards**: Web Processing Service (WPS), Coordinate Transformation Service (CTS), Web Terrain Service (WTS), Styled Layer Descriptor (SLD), Symbology Encoding (SE), Web Map Context (WMC)

Geospatial Web Services & Formats

Type	Acronym	Name	Purpose
Services	WMS	Web Map Service	Provides maps as dynamic images, which may correspond to the superposition of several spatial layers.
	CSW	Catalog Service	Allows the publication of metadata and search catalogs.
	WFS	Web Feature Service	Provides vector geographical features (geometry and attributes).
	WCS	Web Coverage Service	Supports retrieval of geospatial data as "coverages": information representing space/time-varying phenomena (Raster data, TIN…).
	WPS	Web Processing Service	For geoprocessing services.
Formats	SLD	Style Layer Descriptor	Allows users to define symbology and styles for spatial layers (for WMS or WFS data).
	GML	Geography Markup Language	Exchange format for vector geographical data.
	KML	Keyhole Markup Language	A format for displaying geospatial data.

Summer School Rapid Mapping Technique for Disaster Observation and Global Change Acquisition | Oct 11th – Oct 17th 2016 – Yogyakarta

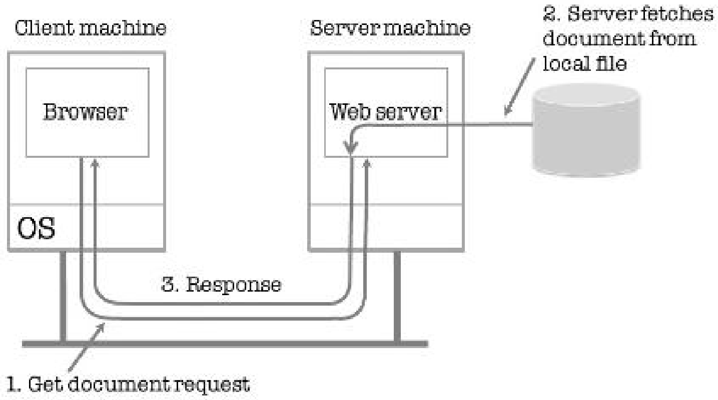
7

Web GIS Application

Summer School Rapid Mapping Technique for Disaster Observation and Global Change Acquisition | Oct 11th – Oct 17th 2016 – Yogyakarta

8

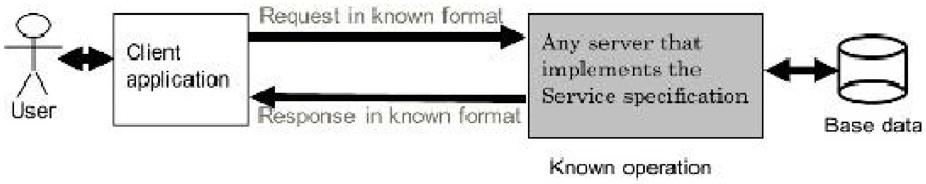
Web Server & Web Browser



Summer School Rapid Mapping Technique for Disaster Observation and Global Change Acquisition | Oct 11th – Oct 17th 2016 – Yogyakarta

9

Basic Open Web Services

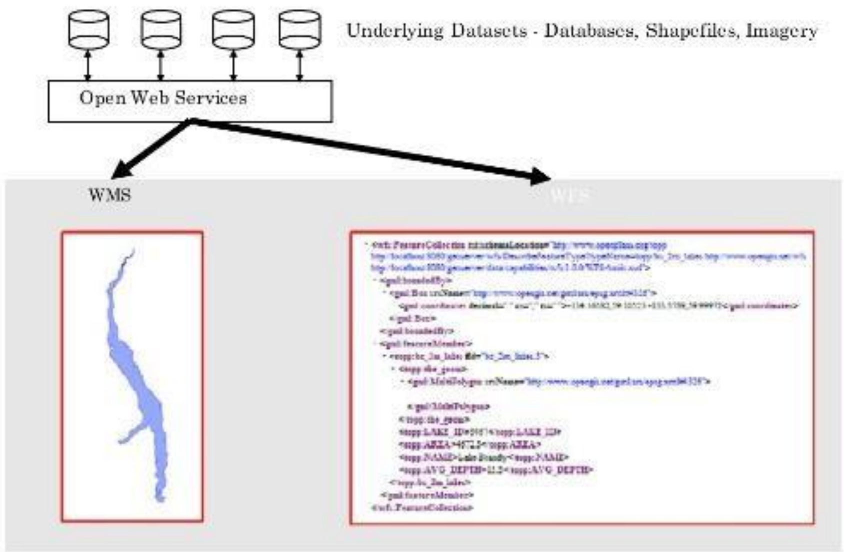


An Open Web Service is a Web Services that:

- has a well known format for what the request looks like
- has a well defined meaning for how to execute the request
- has a well known format for the what the response looks like
- the definition is codified in a Specification Document

Summer School Rapid Mapping Technique for Disaster Observation and Global Change Acquisition | Oct 11th – Oct 17th 2016 – Yogyakarta

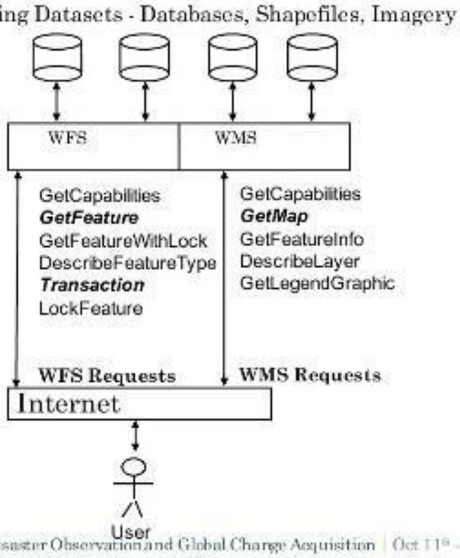
10



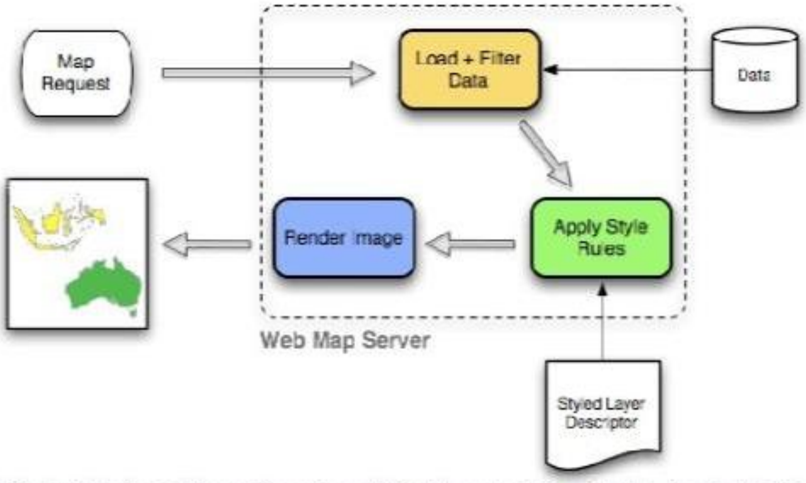
The WMS is concerned with rendering maps

The WFS is concerned with accessing and updating the underlying datasets

The OGC Services - WFS and WMS



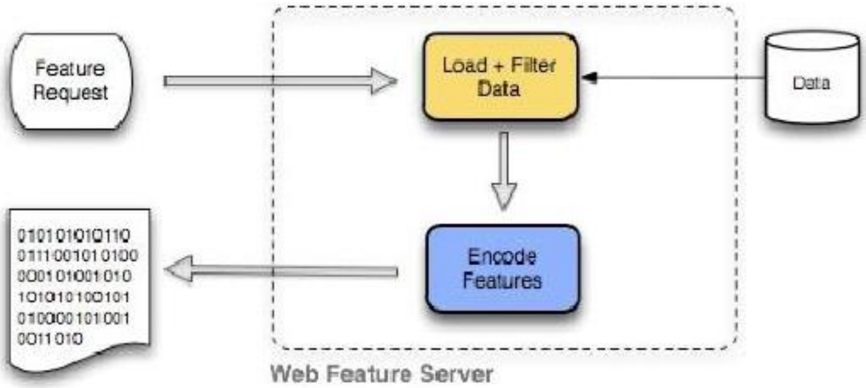
Web Map Service (WMS)



Summer School Rapid Mapping Technique for Disaster Observation and Global Change Acquisition | Oct 11th – Oct 17th 2016 – Yogyakarta

13

Web Feature Service (WFS)



Summer School Rapid Mapping Technique for Disaster Observation and Global Change Acquisition | Oct 11th – Oct 17th 2016 – Yogyakarta

14

WFS and WMS: when to use

What to use the WFS services for

A WFS allows uniform direct access to the features stored on a server. Use a WFS when you want to perform actions such as:

- query a dataset and retrieve the features
- find the feature definition (feature's property names and types)
- add features to dataset
- delete feature from a dataset
- update feature in a dataset
- lock features to prevent modification

What to use the WMS services for

A WMS allows for uniform rendering access to features stored on a server. Use a WMS when you want to perform actions such as:

- producing maps
- very simple querying of data

Summer School Rapid Mapping Technique for Disaster Observation and Global Change Acquisition | Oct 11th – Oct 17th 2016 – Yogyakarta

15

WMS Capabilities

http://geoportal.agrisoftcb.com:8080/geoserver/wms?request=getCapabilities

Summer School Rapid Mapping Technique for Disaster Observation and Global Change Acquisition | Oct 11th – Oct 17th 2016 – Yogyakarta

16

WMS Request

```
http://geoportal.agrisoft-cb.com:8080/geoserver/wms?
service=WMS&
version=1.1.0&
request=GetMap&
layers=usa:states&
srs=EPSG:4326&
bbox=-130,24,-66,50&
format=image/png&
width=550&
height=250
```

Server details

Request type
Layer name
Projection
Bounding box
Image properties

WFS Request

```
http://suite.opengeo.org/geoserver/wfs?
service=wfs&
version=1.1.0&
request=GetFeature&
typename=usa:states&
featureid=states.39
```

Server details

Request type
Layer name
Feature ID

GetMap

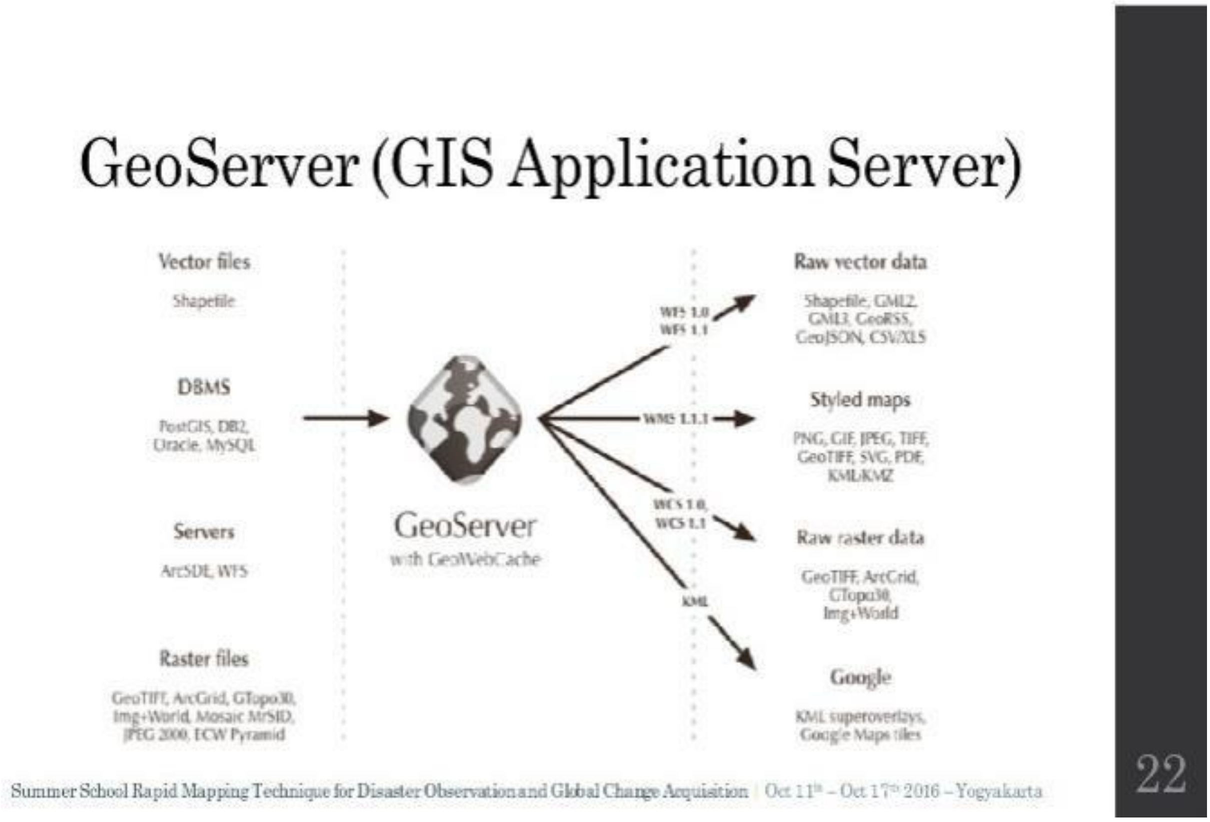
Summer School Rapid Mapping Technique for Disaster Observation and Global Change Acquisition | Oct 11th – Oct 17th 2016 – Yogyakarta

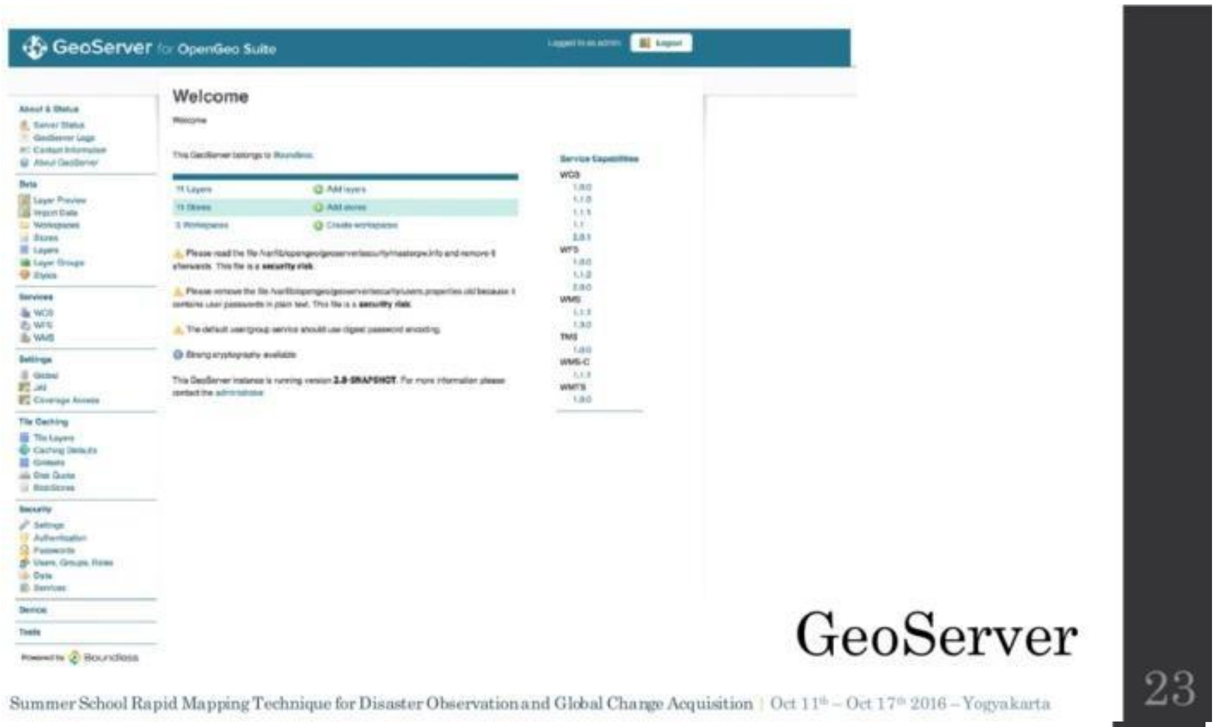
19

OpenGeo Suite

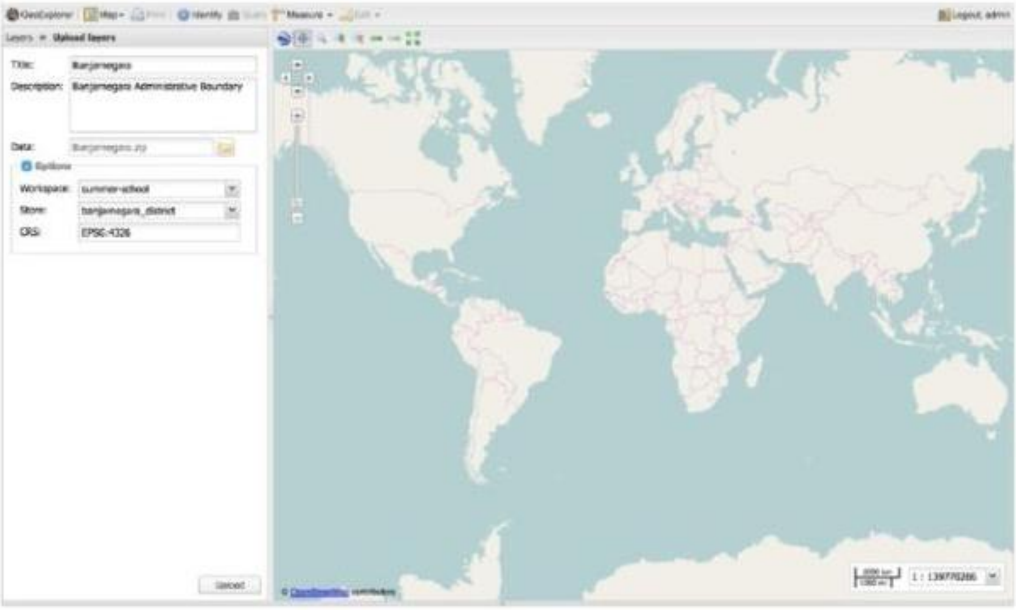
Using GeoExplorer


OpenGeo Suite
http://boundlessgeo.com/products/downloads/
OpenGeo Suite
PostGIS
GeoServer
QGIS
GeoWebCache
OpenLayers 2 & 3
Boundless SDK
GeoExplorer
GeoExt/
OpenLayers
User Interface
Application
Interface
IMG/HTTP
XML/HTTP
GeoWebCache
HTTP
GeoServer
Database
SQL/JDBC
PostGIS
http://geoportal.agrisoft-cb.com:8080/dashboard/
Summer School Rapid Mapping Technique for Disaster Observation and Global Change Acquisition | Oct 11th – Oct 17th 2016 – Yogyakarta
21


GeoServer (GIS Application Server)
Vector files
Shapefile
DBMS
PostGIS, DB2,
Oracle, MySQL
Servers
ArcSDE, WFS
Raster files
GeoTIFF, ArcGrid, GTopo30,
Img+World, Mosaic MrSID,
JPEG 2000, ECW Pyramid
GeoServer
with GeoWebCache
WFS 1.0
WFS 1.1
WMS 1.1.1
WCS 1.0
WCS 1.1
KML
Raw vector data
Shapefile, GML2,
GML3, GeoRSS,
GeoJSON, CSV/XLS
Styled maps
PNG, GIF, JPEG, TIFF,
GeoTIFF, SVG, PDF,
KML/KMZ
Raw raster data
GeoTIFF, ArcGrid,
GTopo30,
Img+World
Google
KML superoverlays,
Google Maps tiles
Summer School Rapid Mapping Technique for Disaster Observation and Global Change Acquisition | Oct 11th – Oct 17th 2016 – Yogyakarta
22

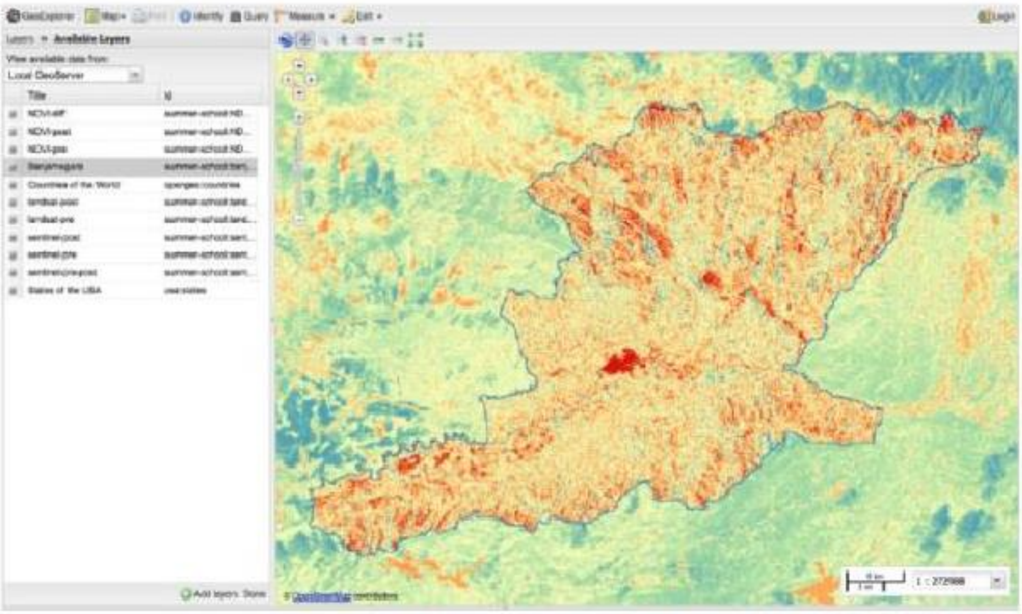

GeoServer for OpenGeo Suite
Welcome
GeoServer
Summer School Rapid Mapping Technique for Disaster Observation and Global Change Acquisition | Oct 11th – Oct 17th 2016 – Yogyakarta
23


GeoExplorer
Summer School Rapid Mapping Technique for Disaster Observation and Global Change Acquisition | Oct 11th – Oct 17th 2016 – Yogyakarta
24



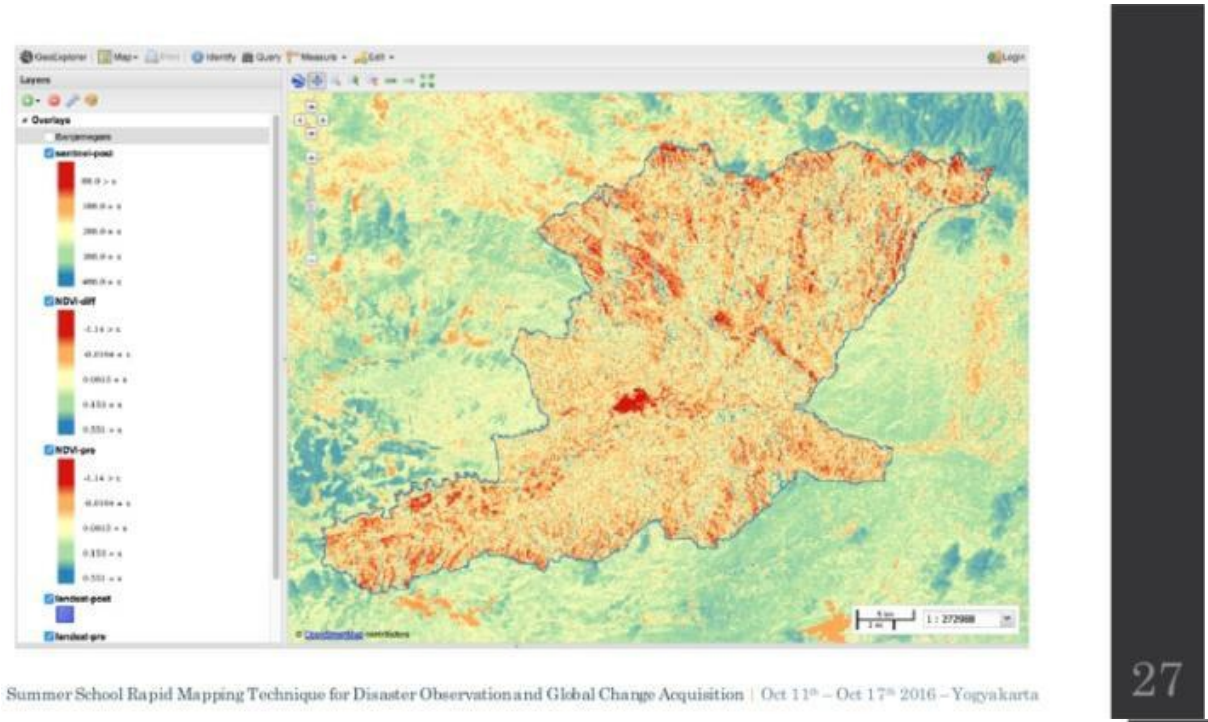
Summer School Rapid Mapping Technique for Disaster Observation and Global Change Acquisition | Oct 11th – Oct 17th 2016 – Yogyakarta

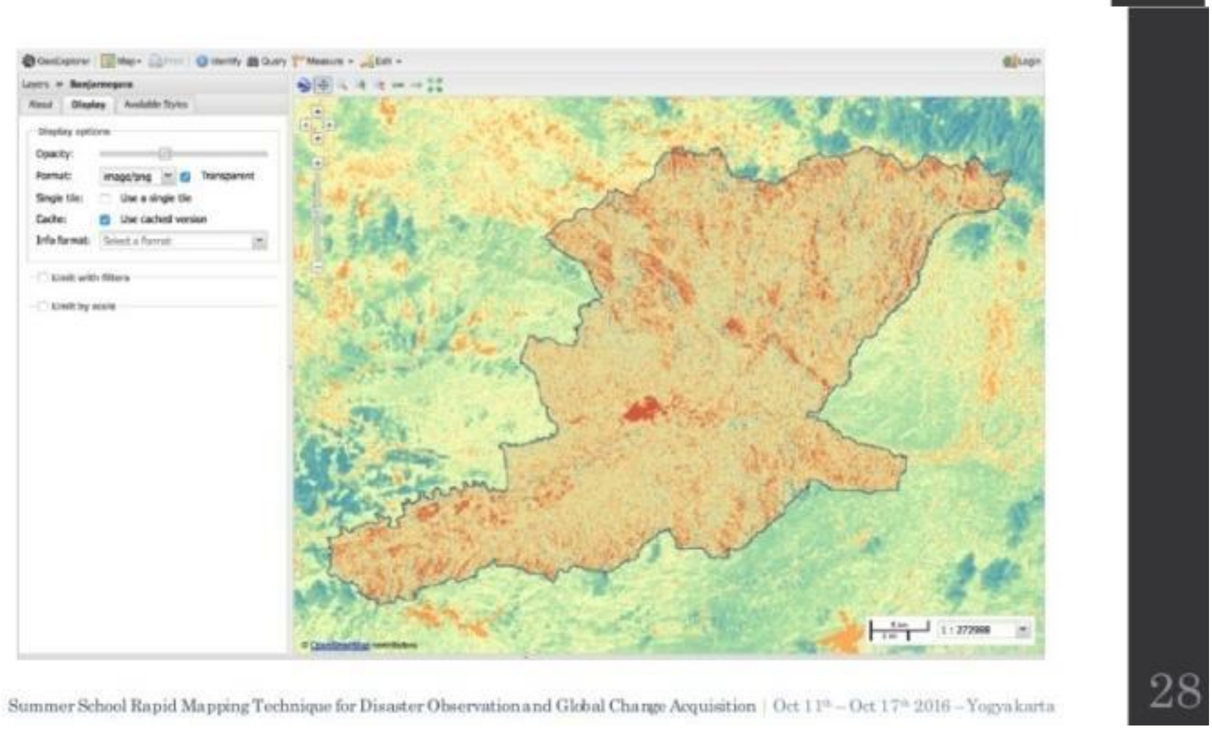
25



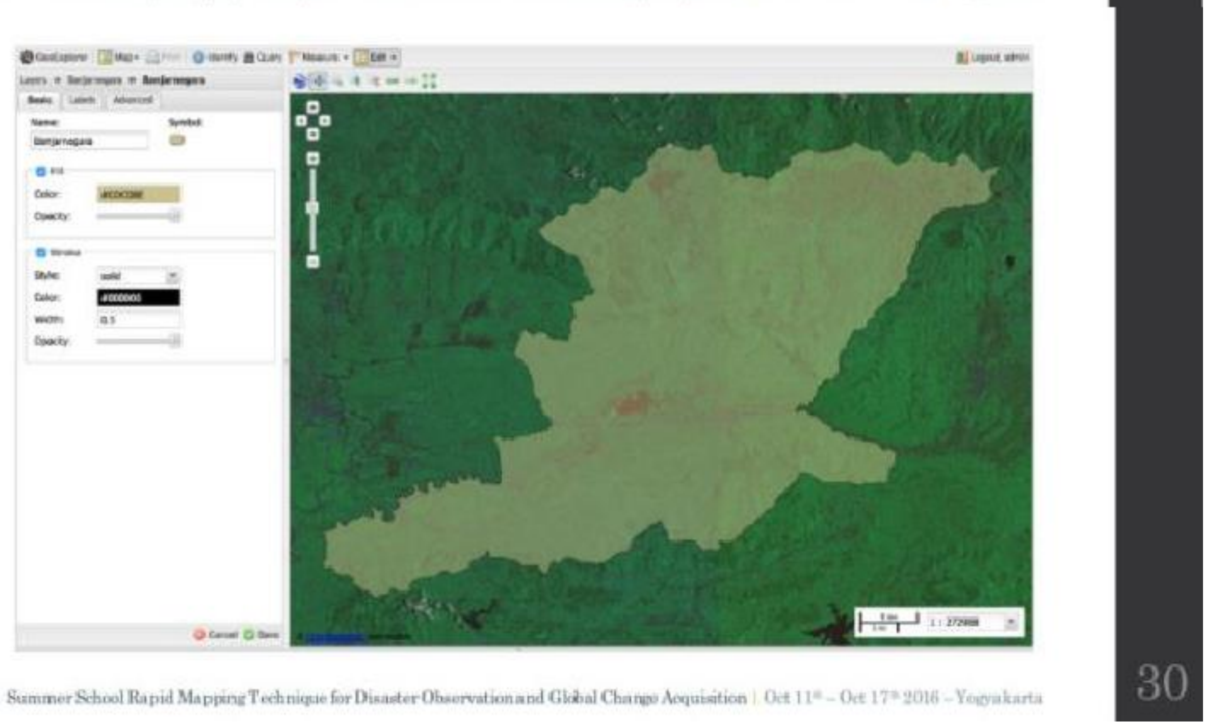
Summer School Rapid Mapping Technique for Disaster Observation and Global Change Acquisition | Oct 11th – Oct 17th 2016 – Yogyakarta

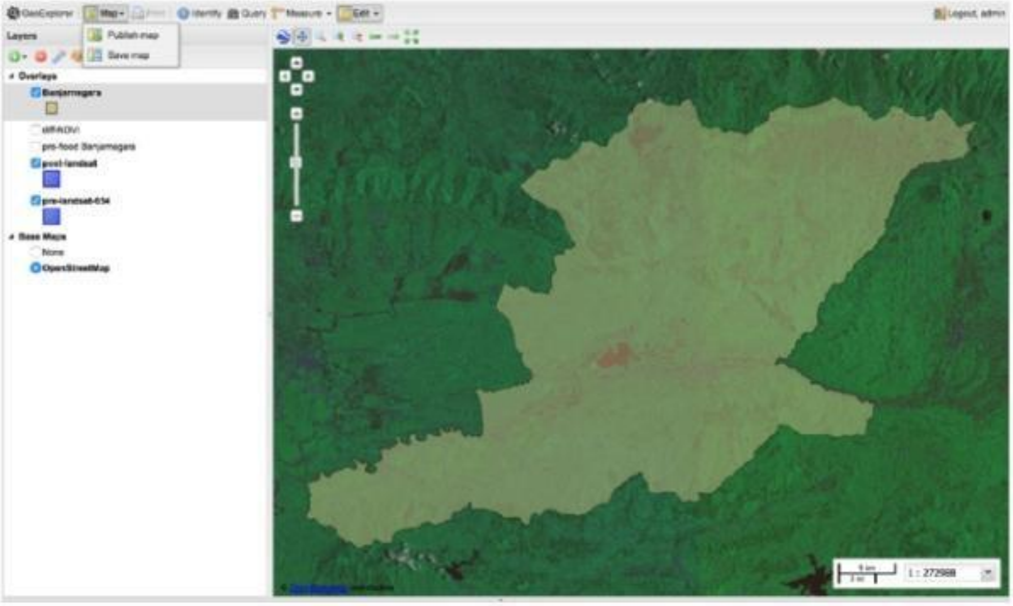
26


Layers
Overlays
NDVI-diff
NDVI-pre
landsat-post
landsat-pre
Summer School Rapid Mapping Technique for Disaster Observation and Global Change Acquisition | Oct 11th – Oct 17th 2016 – Yogyakarta
27


Display
Available Styles
Display options
Opacity:
Format:
image/png
Transparent
Single tile:
Use a single tile
Cache:
Use cached version
Info format:
Select a format
Limit with filters
Limit by scale
Summer School Rapid Mapping Technique for Disaster Observation and Global Change Acquisition | Oct 11th – Oct 17th 2016 – Yogyakarta
28

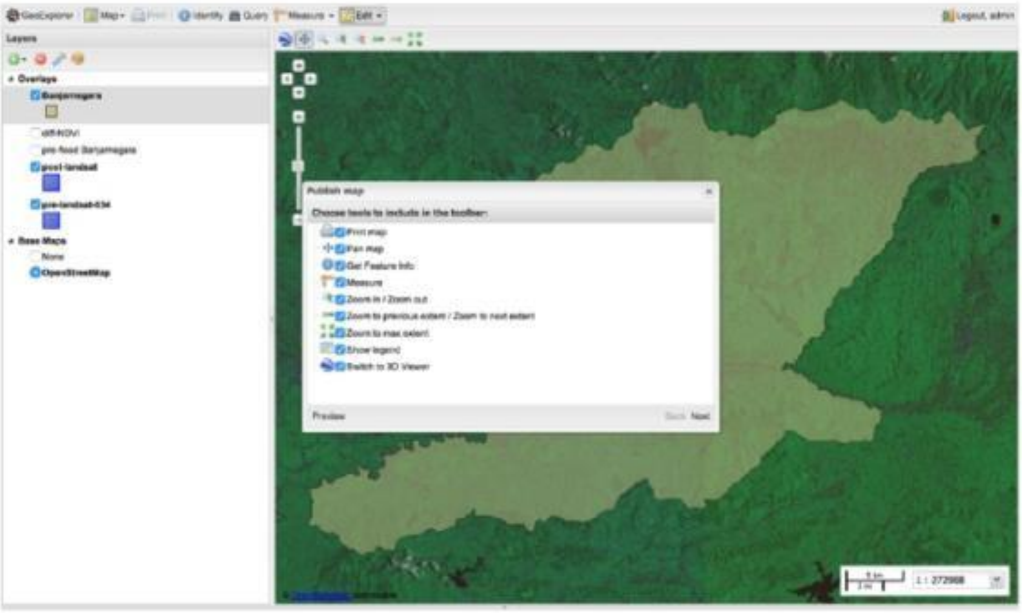

Summer School Rapid Mapping Technique for Disaster Observation and Global Change Acquisition | Oct 11th – Oct 17th 2016 – Yogyakarta
29


Summer School Rapid Mapping Technique for Disaster Observation and Global Change Acquisition | Oct 11th – Oct 17th 2016 – Yogyakarta
30



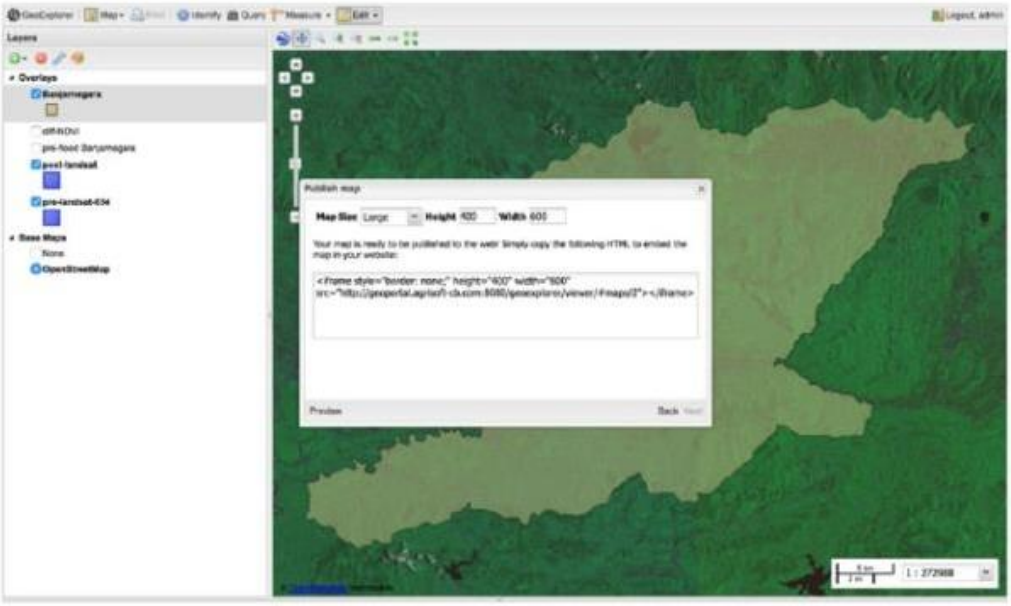
Summer School Rapid Mapping Technique for Disaster Observation and Global Change Acquisition | Oct 11th – Oct 17th 2016 – Yogyakarta

31



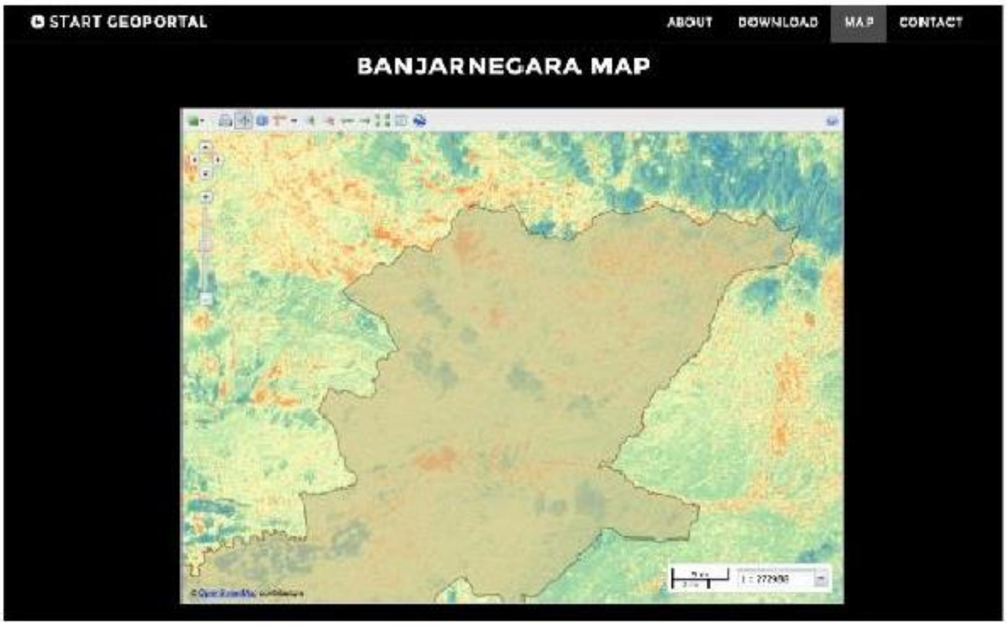
Summer School Rapid Mapping Technique for Disaster Observation and Global Change Acquisition | Oct 11th – Oct 17th 2016 – Yogyakarta

32



Summer School Rapid Mapping Technique for Disaster Observation and Global Change Acquisition | Oct 11th – Oct 17th 2016 – Yogyakarta

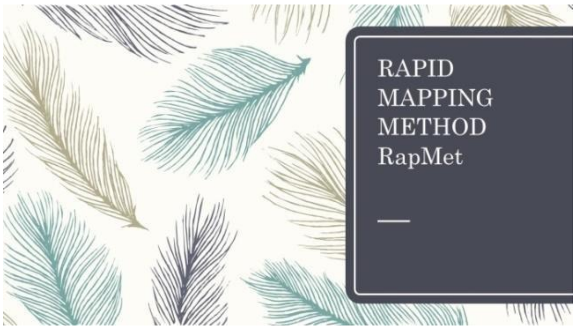
33

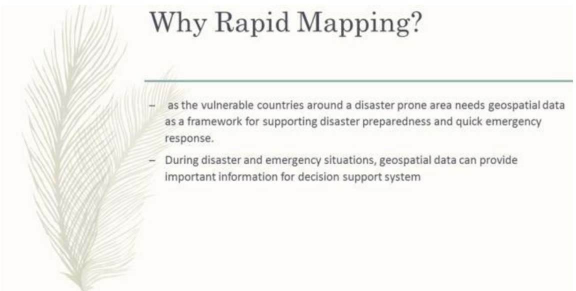


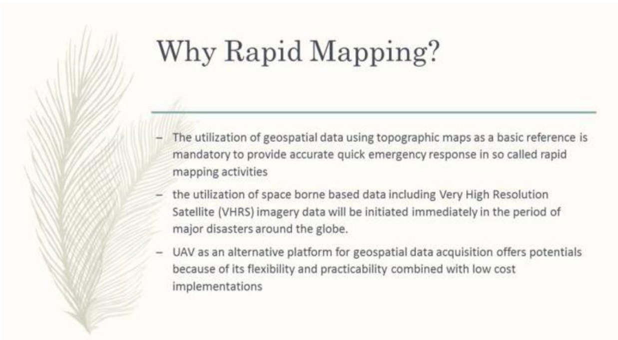
Summer School Rapid Mapping Technique for Disaster Observation and Global Change Acquisition | Oct 11th – Oct 17th 2016 – Yogyakarta

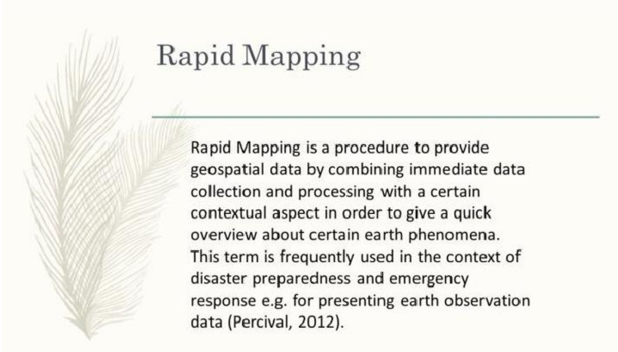
34

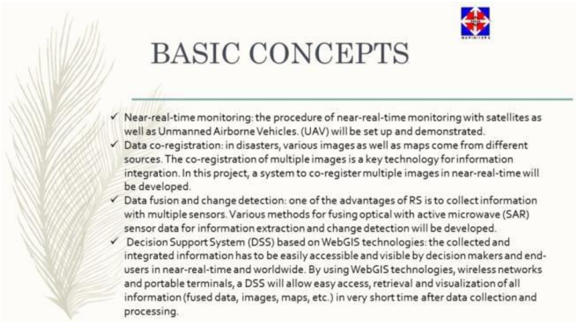
Lecture -8 : Rapid Mapping Method (Prof. Dewayany Sutrisno)

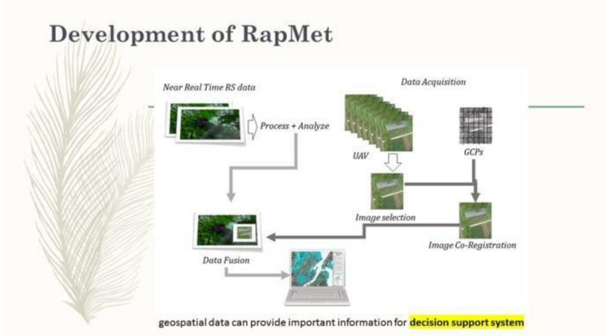


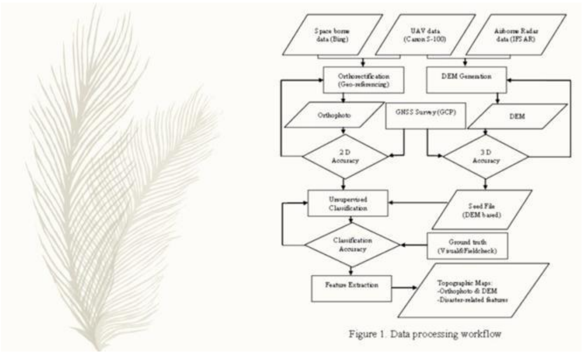


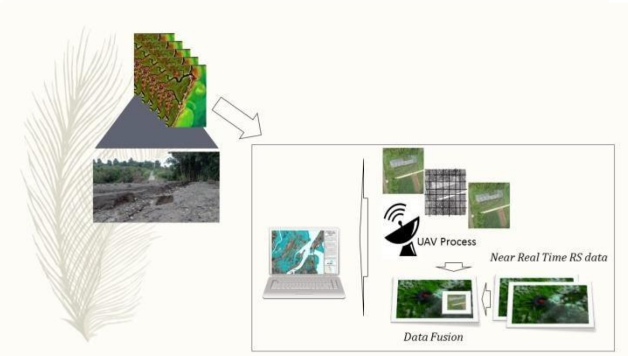


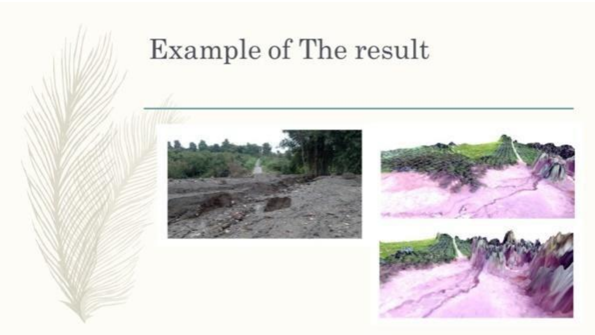


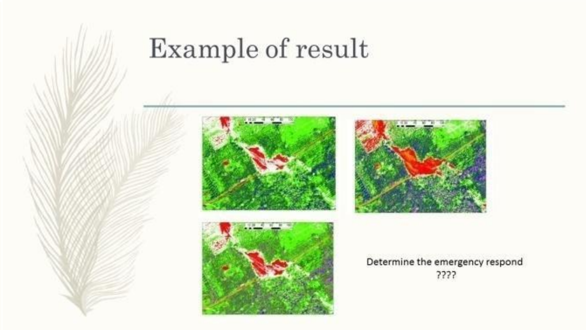

BASIC CONCEPTS
Near-real-time monitoring: the procedure of near-real-time monitoring with satellites as well as Unmanned Airborne Vehicles. (UAV) will be set up and demonstrated.
Data co-registration: in disasters, various images as well as maps come from different sources. The co-registration of multiple images is a key technology for information integration. In this project, a system to co-register multiple images in near-real-time will be developed.
Data fusion and change detection: one of the advantages of RS is to collect information with multiple sensors. Various methods for fusing optical with active microwave (SAR) sensor data for information extraction and change detection will be developed.
Decision Support System (DSS) based on WebGIS technologies: the collected and integrated information has to be easily accessible and visible by decision makers and end-users in near-real-time and worldwide. By using WebGIS technologies, wireless networks and portable terminals, a DSS will allow easy access, retrieval and visualization of all information (fused data, images, maps, etc.) in very short time after data collection and processing.


Development of RapMet
Near Real Time RS data
Data Acquisition
Process + Analyze
UAV
GCPs
Image selection
Image Co-Registration
Data Fusion
geospatial data can provide important information for decision support system


Space borne data (Bing)
UAV data (Canon S-100)
Airborne Radar data (IFSAR)
Orthorectification (Geo-referencing)
DEM Generation
Orthophoto
GNSS Survey (GCP)
DEM
2 D Accuracy
3 D Accuracy
Unsupervised Classification
Seed File (DEM based)
Classification Accuracy
Ground truth (Visual&Fieldcheck)
Feature Extraction
Topographic Maps:
-Orthophoto & DEM
-Disaster-related features
Figure 1. Data processing workflow


UAV Process
Near Real Time RS data
Data Fusion


Example of The result


Example of result
Determine the emergency respond
????

APPENDIX 4. Seminar

Date: May, 4th 2017
Venue: University of Pakuan, Bogor – Indonesia
Funding: ISRS (in cash of 2000 USD) and university of Pakuan (administrative staff and equipment facilities)

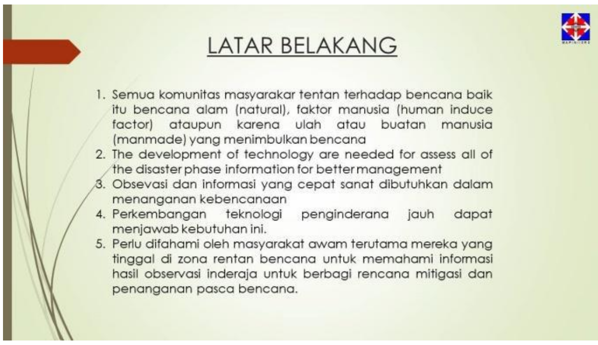
4-1 Seminar Agenda

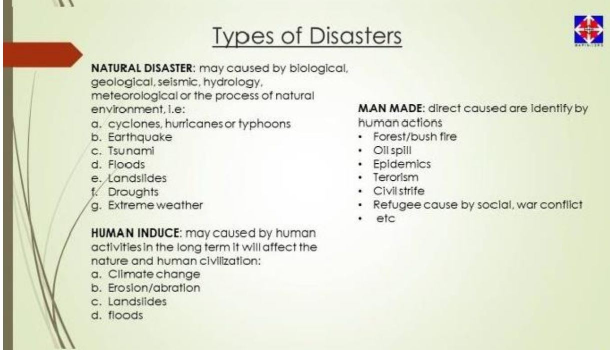
SEMINAR NASIONAL REMOTE SENSING UNTUK MANAGEMENT KEBENCANAAN
Remote Sensing for Disaster Management

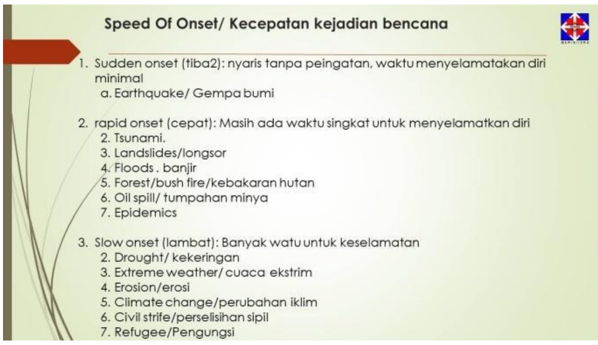
08.00 – 09.00	Registration	
09.00 – 09.30	Opening ceremony	
	Remarks from ISRS	ISRS chairperson
	Remarks Opening	Chair of the Seminar committee
	Remarks and opening	The dean of Faculty of Technology – Pakuan University
09.30 – 10.00	RapMet Technique For Disaster observation and Global Change Dara Acquisition	ISRS chairperson
10.00 - 10.15	Coffee Break	
10.15 - 10.45	Peranan Penginderaan Jauh dan mitigasi Bencana (The Role of Remote sensing for disaster mitigation)	Dr. Wikanti Asriningrum
10.45 - 11.15	Participatory Mapping untuk Tata Ruang dan Kebencanaan (Participatory Mapping For Spatial Planning and Disaster)	Dr. Janthy T. Hidayat
11.15 - 12.00	Discussion - 1	Committee
12.00 – 13.30	Lunch and Pray	
13.30 – 14.00	Model Deteksi Dini Pemetaan Cepat untuk Zona Kerentanan Longsor Menggunakan Citra Multi Sensor (*Early Detection Model Of Rapid Mapping For Landslide Prone Area By Using Multi Sensor Im-ages*)	Iksal Yanuarsyah
14.00 – 14.30	Discussion -2	Committee
14.30 – 15.00	Formulation meeting	Committee
15. 00 – 15.15	Closing Ceremony	Committee

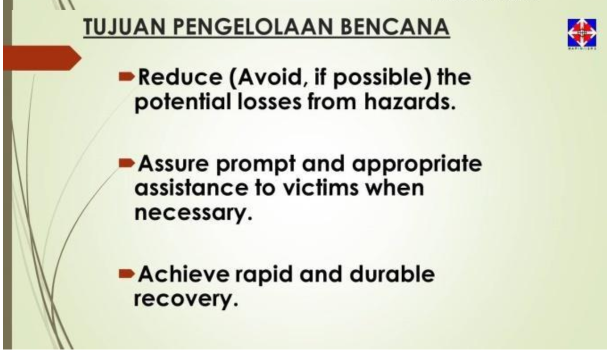
4-2 Presentation

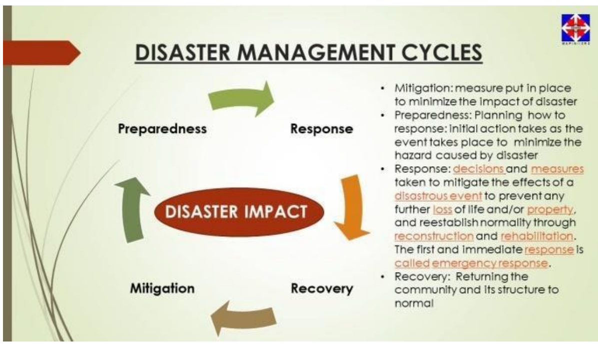
Presentation-1: RapMet Technique for Disaster observation and Global Change Data Acquisition



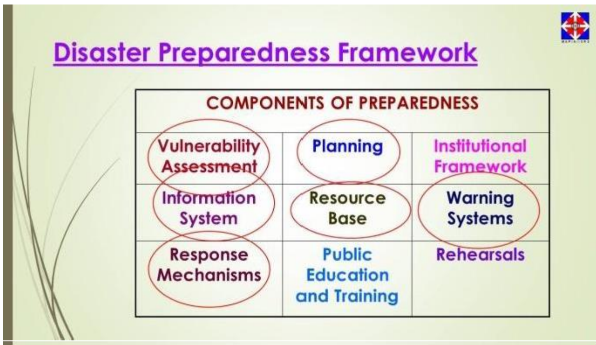




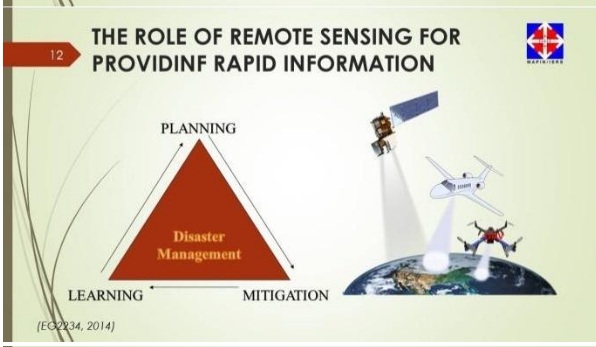


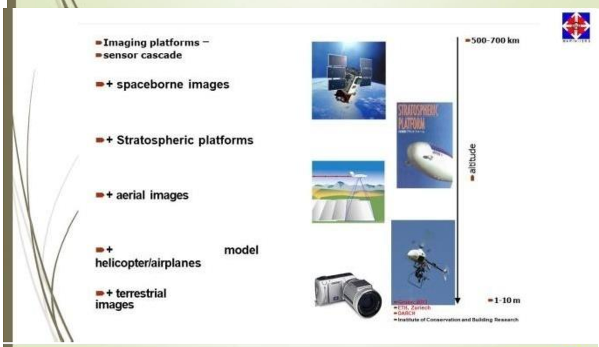



PREPAREDNESS
Vulnerability Analysis and Mapping to include Resources.
Assess strengthening requirements and execute.
Funding for preparedness must be arranged.
Peoples' cooperation through Political leaders, elders, Volunteers and NGOs
Create lead time by interpreting Warnings
Plan to include movement of resources with time frame.
Aim to reduce the destructive potential of disaster, timely & appropriate relief to victims and quick & durable recovery
Thomas D. Kirsch, 2014

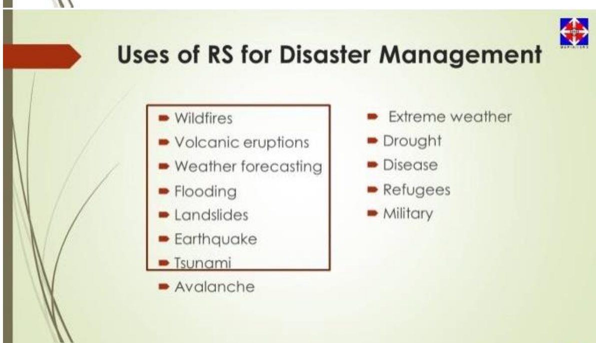

Disaster Preparedness Framework
COMPONENTS OF PREPAREDNESS
Vulnerability Assessment
Planning
Institutional Framework
Information System
Resource Base
Warning Systems
Response Mechanisms
Public Education and Training
Rehearsals

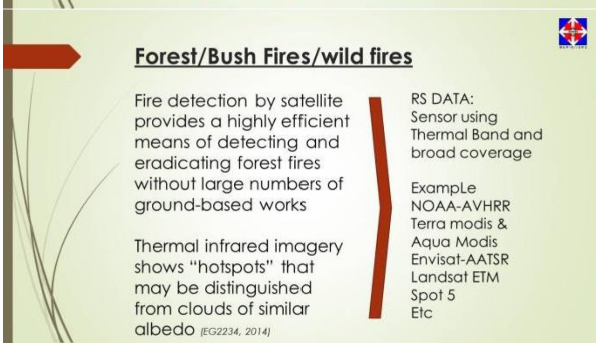

Disaster Response Activities
Warning
Evacuation/Mitigation
Search and Rescue
Assessment
Emergency Relief
Logistics and Supply
Communication and information Management
Survivor Response and coping
Security
EOC & coordination
Expedite rehabilitation and reconstruction.
Thomas D. Kirsch, 2014

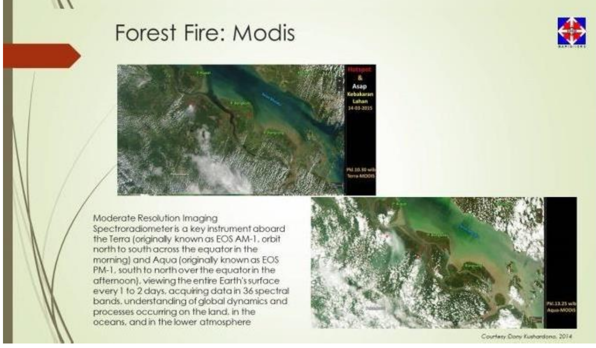

12
THE ROLE OF REMOTE SENSING FOR PROVIDINF RAPID INFORMATION
PLANNING
Disaster Management
LEARNING
MITIGATION
(EG2234, 2014)


Imaging platforms – sensor cascade
+ spaceborne images
+ Stratospheric platforms
+ aerial images
+ model helicopter/airplanes
+ terrestrial images
500-700 km
altitude
1-10 m

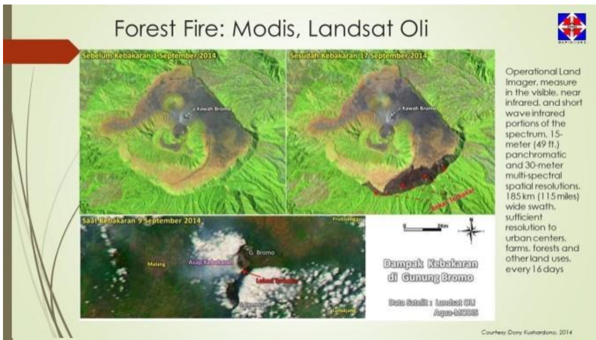

Uses of RS for Disaster Management
PLANNING
Modelling
Assessment
Prediction
Contingency
MITIGATION
Monitoring situations
Deployment of resources
Decision-making
Public relations
COST EFFECTIVENESS !!!
(EG2234, 2014)

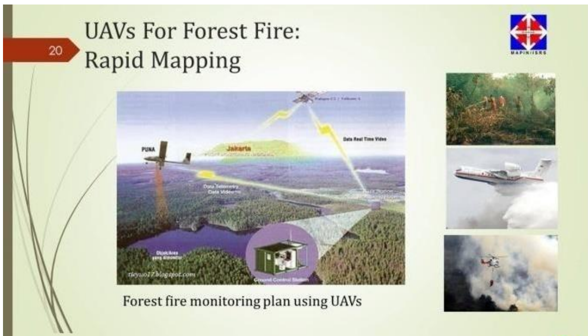

Uses of RS for Disaster Management
Wildfires
Volcanic eruptions
Weather forecasting
Flooding
Landslides
Earthquake
Tsunami
Avalanche
Extreme weather
Drought
Disease
Refugees
Military

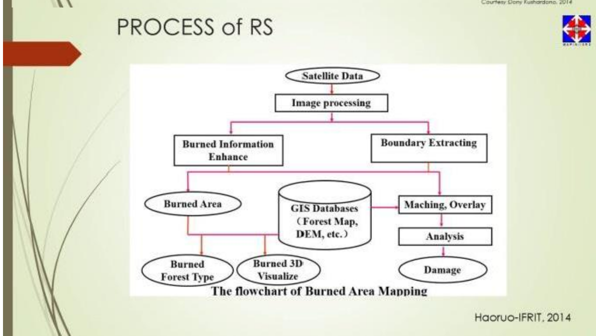

Forest/Bush Fires/wild fires
Fire detection by satellite provides a highly efficient means of detecting and eradicating forest fires without large numbers of ground-based works
Thermal infrared imagery shows "hotspots" that may be distinguished from clouds of similar albedo (EG2234, 2014)
RS DATA:
Sensor using Thermal Band and broad coverage
ExampLe
NOAA-AVHRR
Terra modis &
Aqua Modis
Envisat-AATSR
Landsat ETM
Spot 5
Etc

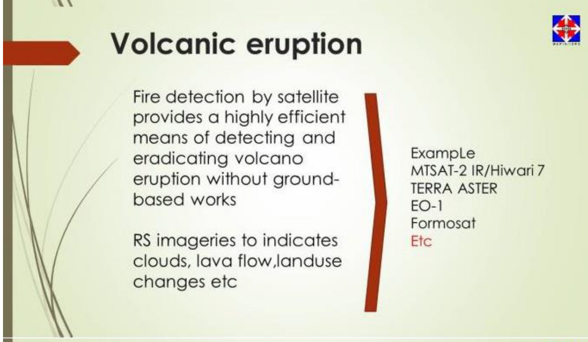

Forest Fire: Modis
Moderate Resolution Imaging Spectroradiometer is a key instrument aboard the Terra (originally known as EOS AM-1, orbit north to south across the equator in the morning) and Aqua (originally known as EOS PM-1, south to north over the equator in the afternoon), viewing the entire Earth's surface every 1 to 2 days, acquiring data in 36 spectral bands, understanding of global dynamics and processes occurring on the land, in the oceans, and in the lower atmosphere

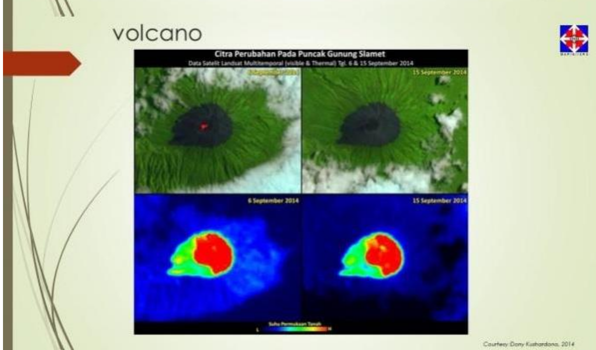

Forest Fire: Modis
Distribusi Sebaran Hotspot & Asap Kebakaran Lahan di Wilayah Indonesia dan Sekitarnya 28 September 2014
Citra Satelit Terra MODIS & Aqua MODIS


Forest Fire: Modis, Landsat Oli
Sebelum Kebakaran 1 September 2014
Sesudah Kebakaran 17 September 2014
Saat Kebakaran 9 September 2014
Operational Land Imager, measure in the visible, near infrared, and short wave infrared portions of the spectrum. 15-meter (49 ft.) panchromatic and 30-meter multi-spectral spatial resolutions. 185 km (115 miles) wide swath, sufficient resolution to urban centers, farms, forests and other land uses. every 16 days
Dampak Kebakaran di Gunung Bromo
Data Satelit : Landsat OLI Aqua-MODIS
Courtesy Dony Kushardono, 2014


20
UAVs For Forest Fire:
Rapid Mapping
Jakarta
Forest fire monitoring plan using UAVs

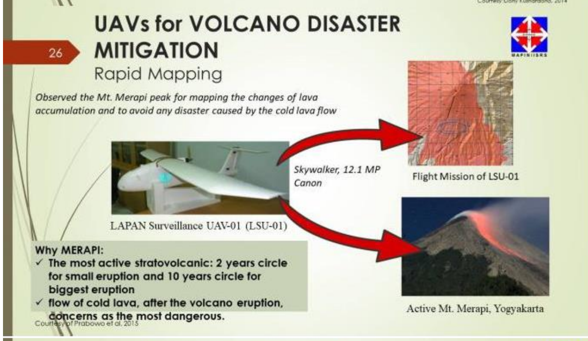

PROCESS of RS
Satellite Data
Image processing
Burned Information Enhance
Boundary Extracting
Burned Area
GIS Databases (Forest Map, DEM, etc.)
Maching, Overlay
Analysis
Burned Forest Type
Burned 3D Visualize
Damage
The flowchart of Burned Area Mapping
Haoruo-IFRIT, 2014

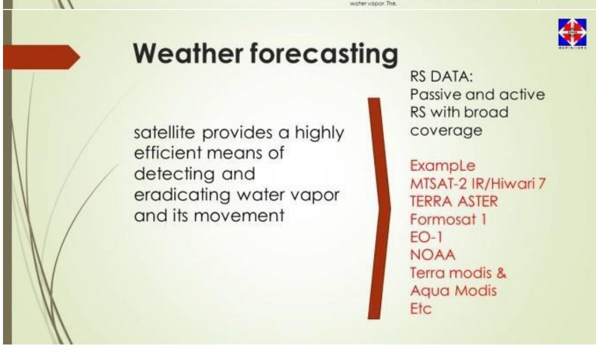

Volcanic eruption
Fire detection by satellite provides a highly efficient means of detecting and eradicating volcano eruption without ground-based works
RS imageries to indicates clouds, lava flow,landuse changes etc
ExampLe
MTSAT-2 IR/Hiwari 7
TERRA ASTER
EO-1
Formosat
Etc

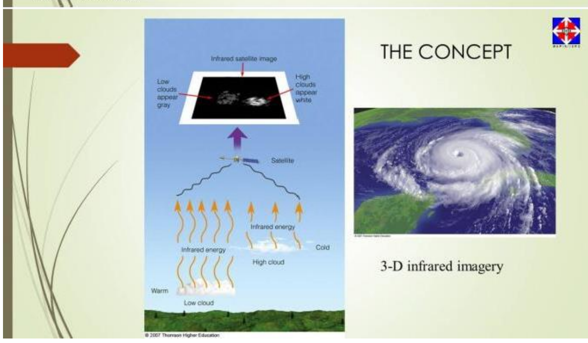

volcano
Citra Perubahan Pada Puncak Gunung Slamet
6 September 2014
15 September 2014
Courtesy Dony Kushardono, 2014

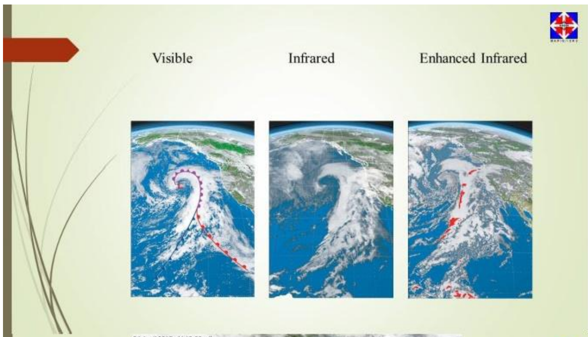

VOLCANO
Courtesy Dony Kushardono, 2014

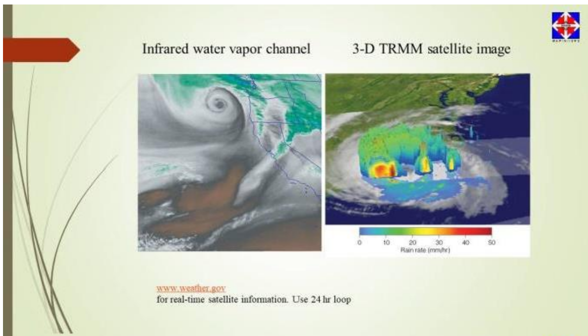

Volcano
Sesudah Letusan
Sebelum Letusan

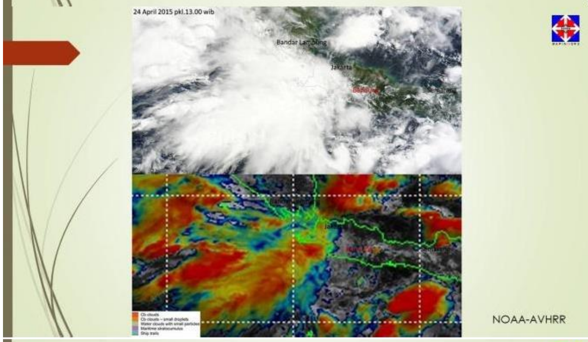

26
UAVs for VOLCANO DISASTER MITIGATION
Rapid Mapping
Observed the Mt. Merapi peak for mapping the changes of lava accumulation and to avoid any disaster caused by the cold lava flow
Skywalker, 12.1 MP Canon
Flight Mission of LSU-01
LAPAN Surveillance UAV-01 (LSU-01)
Why MERAPI:
✓ The most active stratovolcanic: 2 years circle for small eruption and 10 years circle for biggest eruption
✓ flow of cold lava, after the volcano eruption, concerns as the most dangerous.
Courtesy of Prabowo et al, 2015
Active Mt. Merapi, Yogyakarta

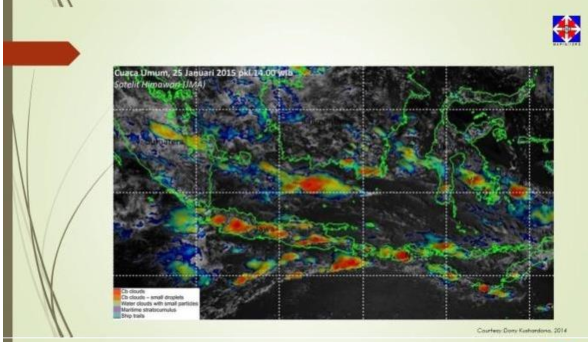

Weather forecasting
satellite provides a highly efficient means of detecting and eradicating water vapor and its movement
RS DATA:
Passive and active RS with broad coverage
ExampLe
MTSAT-2 IR/Hiwari 7
TERRA ASTER
Formosat 1
EO-1
NOAA
Terra modis &
Aqua Modis
Etc

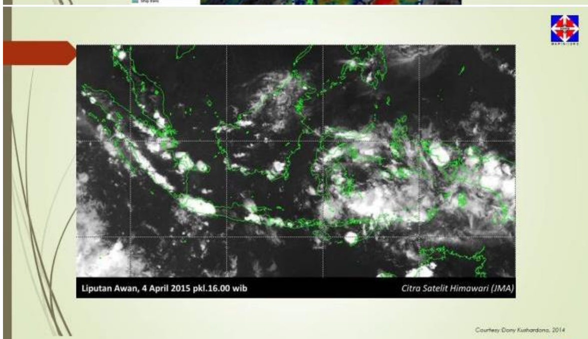

THE CONCEPT
Infrared satellite image
Satellite
Infrared energy
Cold
Warm
High cloud
Low cloud
3-D infrared imagery

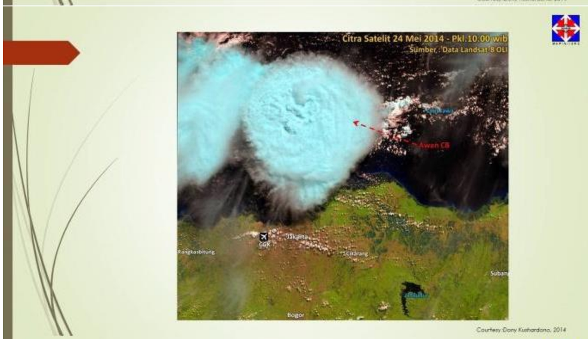

Visible
Infrared
Enhanced Infrared

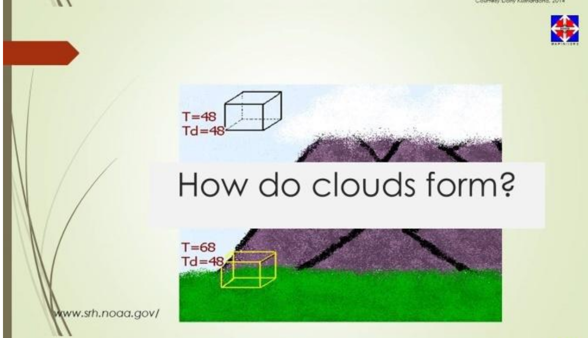

Infrared water vapor channel
3-D TRMM satellite image
www.weather.gov
for real-time satellite information. Use 24 hr loop

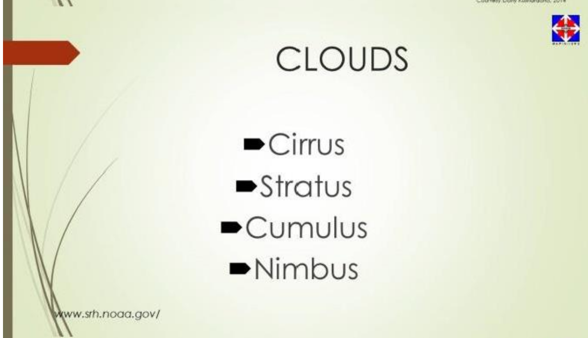

24 April 2015 pkl.13.00 wib
NOAA-AVHRR

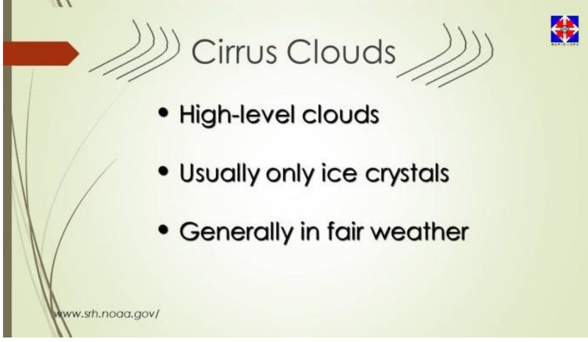

Cuaca Umum, 25 Januari 2015 pkl.14.00 wib
Satelit Himawari (JMA)

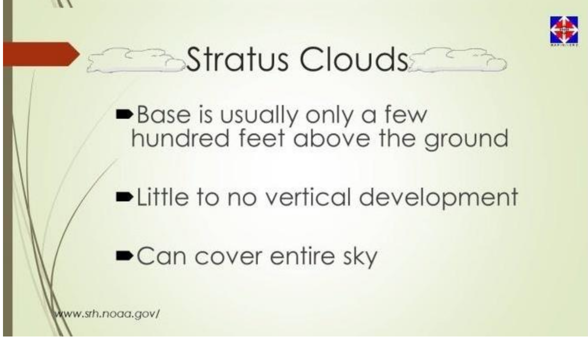

Liputan Awan, 4 April 2015 pkl.16.00 wib
Citra Satelit Himawari (JMA)


Citra Satelit 24 Mei 2014 - Pkl.10.00 wib


T=48
Td=48
How do clouds form?
T=68
Td=48
www.srh.noaa.gov/


CLOUDS
Cirrus
Stratus
Cumulus
Nimbus
www.srh.noaa.gov/


Cirrus Clouds
High-level clouds
Usually only ice crystals
Generally in fair weather
www.srh.noaa.gov/


Stratus Clouds
Base is usually only a few hundred feet above the ground
Little to no vertical development
Can cover entire sky
www.srh.noaa.gov/

Cumulus Clouds

- Base is at low level, but tops can reach 60,000 feet (11 miles) high
- Made of both ice and water droplets
- Puffy like cotton balls

www.srh.noaa.gov/

PRECIPITATION

Two basic ways precipitation forms:

- **"Collision" process (warm clouds)**
- **"Ice Crystal" process (cold clouds)**

www.srh.noaa.gov/

"Ice Crystal" Process

Easier for water vapor to deposit directly onto ice crystals. Crystals then grow heavy enough to start falling.

www.srh.noaa.gov/

INSTABILITY

- If air is stable, it will try to go back to where it was
- If air is unstable, it will continue in the direction it was pushed

www.srh.noaa.gov/

The three stages in a thunderstorm's life:

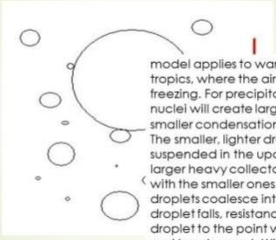
www.srh.noaa.gov/

Nimbus Clouds

- Generally form 7,000 to 15,000 feet (1 to 3 miles) above ground
- Steady precipitation

www.srh.noaa.gov/

"Collision" Process



model applies to warm clouds that form in the tropics, where the air temperature is above freezing. For precipitation Large condensation nuclei will create large water droplets while smaller condensation nuclei create small ones. The smaller, lighter droplets are easily suspended in the updrafts of air, while the larger heavy collector droplets fall and collide with the smaller ones. Upon collision, the droplets coalesce into a bigger droplet. As the droplet falls, resistance by the air flattens the droplet to the point where it becomes unstable and breaks apart. With enough collisions, the droplet achieves a size sufficient to fall all the way to the surface.

www.srh.noaa.gov/

THUNDERSTORMS

In order to form, thunderstorms need:

- Moisture
- Instability
- Lifting

www.srh.noaa.gov/

LIFT

- Differences in heating
- Terrain
- Fronts, boundaries, drylines

www.srh.noaa.gov/

Thunderstorm Hazards

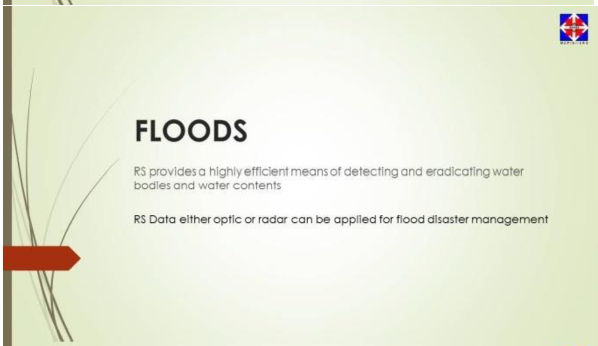
- Hail
- Damaging Winds
- Tornados
- Flash Floods

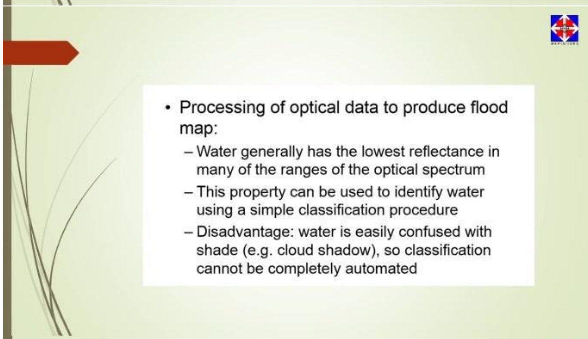
www.srh.noaa.gov/

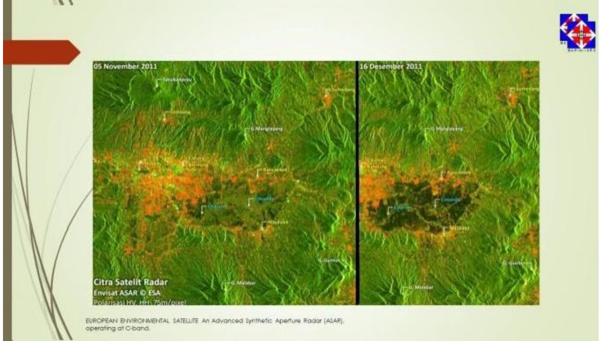

HAIL
05/08/2005
www.srh.noaa.gov/

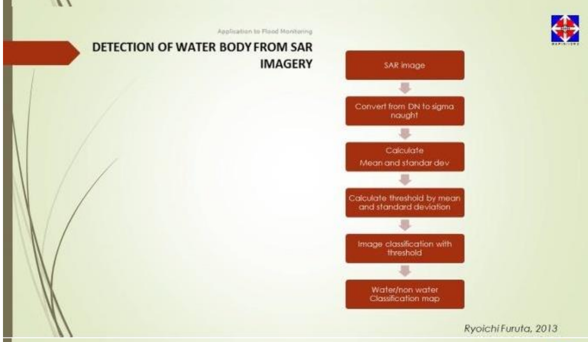

DAMAGING WINDS
www.srh.noaa.gov/
Damage from a downburst
Damage from a tornado

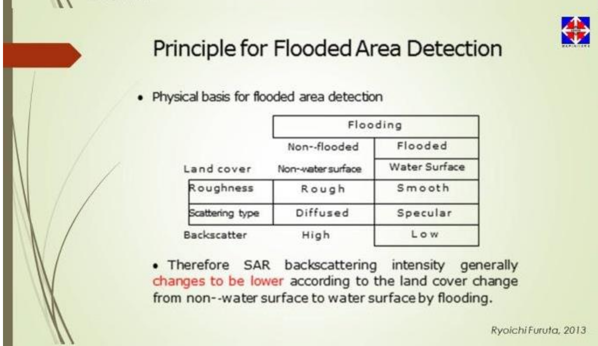

High Wave

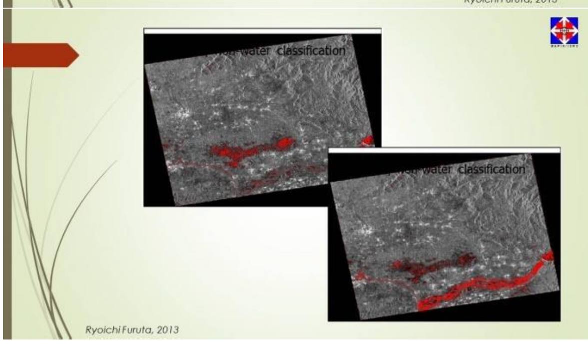

FLOODS
RS provides a highly efficient means of detecting and eradicating water bodies and water contents
RS Data either optic or radar can be applied for flood disaster management


• Processing of optical data to produce flood map:
– Water generally has the lowest reflectance in many of the ranges of the optical spectrum
– This property can be used to identify water using a simple classification procedure
– Disadvantage: water is easily confused with shade (e.g. cloud shadow), so classification cannot be completely automated

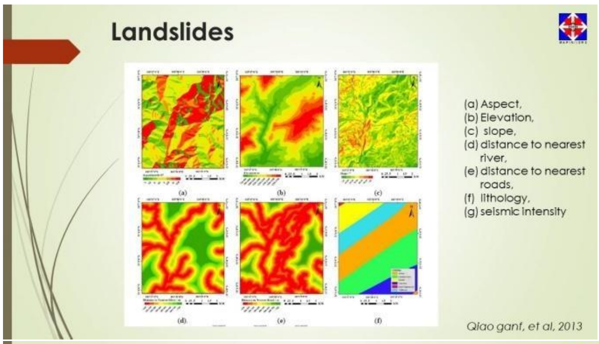

05 November 2011
16 Desember 2011
Citra Satelit Radar
Envisat ASAR © ESA
EUROPEAN ENVIRONMENTAL SATELLITE An Advanced Synthetic Aperture Radar (ASAR), operating at C-band.

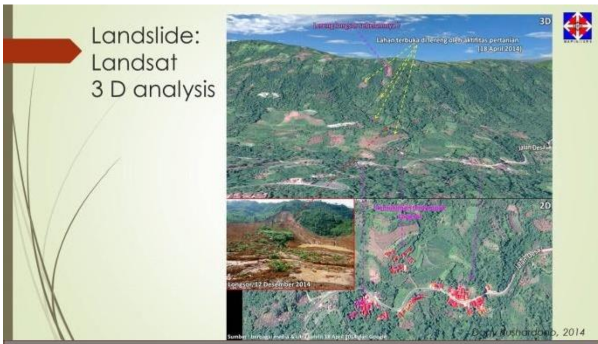

DETECTION OF WATER BODY FROM SAR IMAGERY
SAR image
Convert from DN to sigma naught
Calculate Mean and standar dev
Calculate threshold by mean and standard deviation
Image classification with threshold
Water/non water Classification map
Ryoichi Furuta, 2013

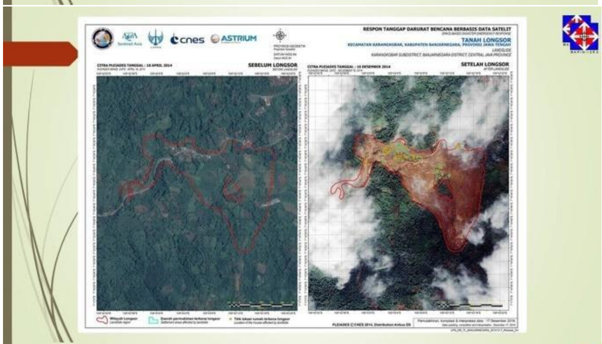

Principle for Flooded Area Detection
• Physical basis for flooded area detection
Flooding
Non--flooded
Flooded
Land cover
Non-water surface
Water Surface
Roughness
Rough
Smooth
Scattering type
Diffused
Specular
Backscatter
High
Low
• Therefore SAR backscattering intensity generally changes to be lower according to the land cover change from non--water surface to water surface by flooding.
Ryoichi Furuta, 2013

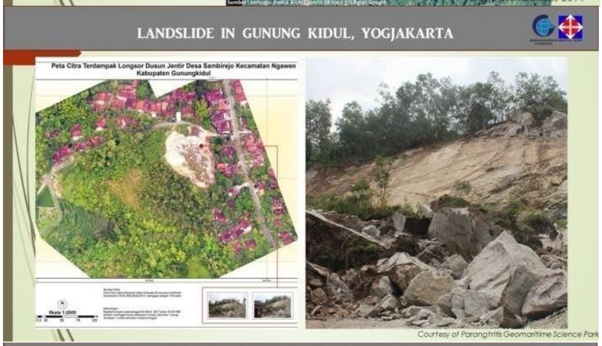

water classification
water classification
Ryoichi Furuta, 2013

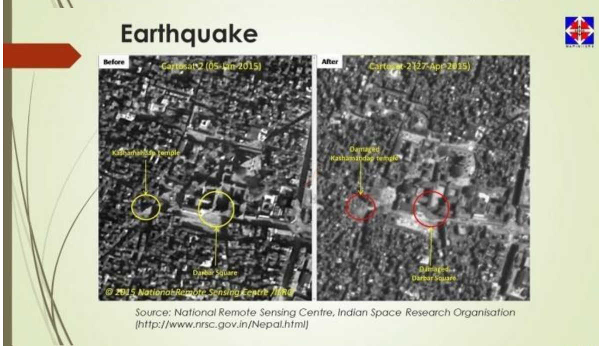

UAVs FOR FLOOD MONITORING
58
UAV has been widely used for flood monitoring, emergency respond , save and rescue, evacuation and determining the temporary evacuation sites

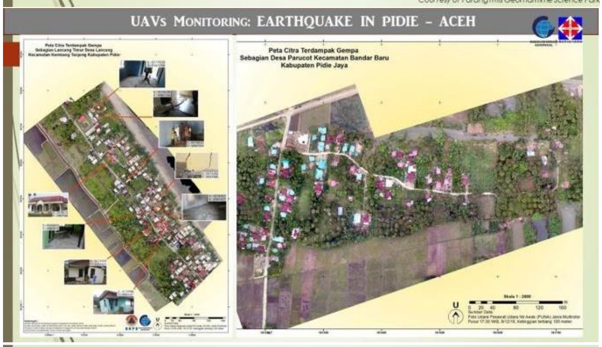

Landslides
(a) Aspect,
(b) Elevation,
(c) slope,
(d) distance to nearest river,
(e) distance to nearest roads,
(f) lithology,
(g) seismic intensity
Qiao ganf, et al, 2013

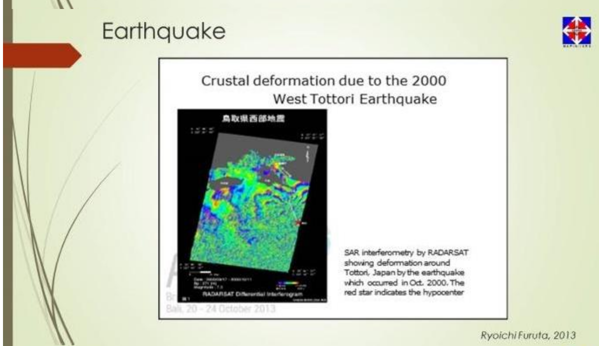

Landslide:
Landsat
3 D analysis
3D
2D


cnes
ASTRIUM
TANAH LONGSOR
SEBELUM LONGSOR
SETELAH LONGSOR

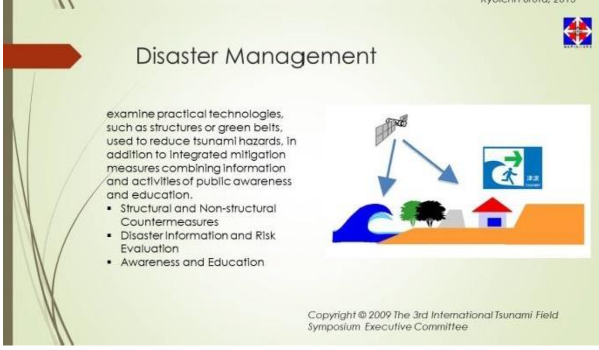

LANDSLIDE IN GUNUNG KIDUL, YOGJAKARTA
Peta Citra Terdampak Longsor Dusun Jentir Desa Sambirejo Kecamatan Ngawen Kabupaten Gunungkidul
Courtesy of Parangtritis Geomaritime Science Park


Earthquake
Before
After
Dabar Square
© 2015 National Remote Sensing Centre, ISRO
Source: National Remote Sensing Centre, Indian Space Research Organisation
(http://www.nrsc.gov.in/Nepal.html)

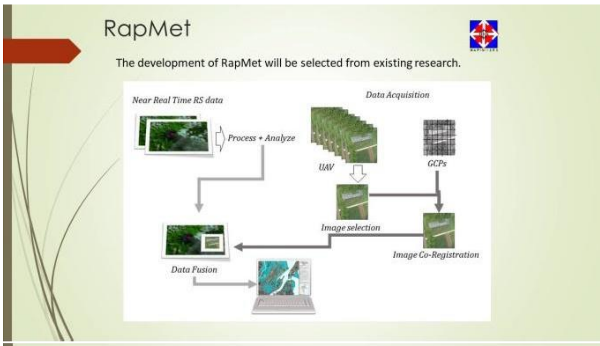

UAVs Monitoring: EARTHQUAKE IN PIDIE – ACEH
Peta Citra Terdampak Gempa
Sebagian Desa Parucot Kecamatan Bandar Baru
Kabupaten Pidie Jaya

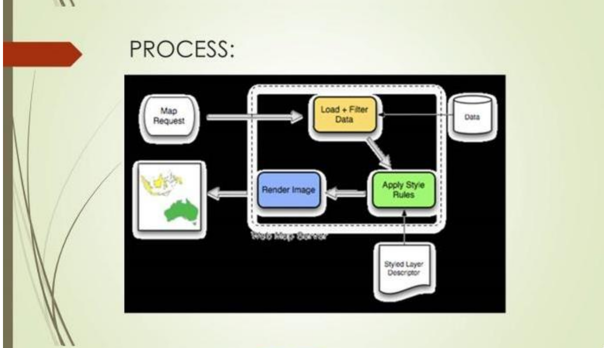

Earthquake
Crustal deformation due to the 2000
West Tottori Earthquake
鳥取県西部地震
RADARSAT Differential Interferogram
SAR interferometry by RADARSAT
showing deformation around
Tottori, Japan by the earthquake
which occurred in Oct. 2000. The
red star indicates the hypocenter
Bali, 20 - 24 October 2013
Ryoichi Furuta, 2013

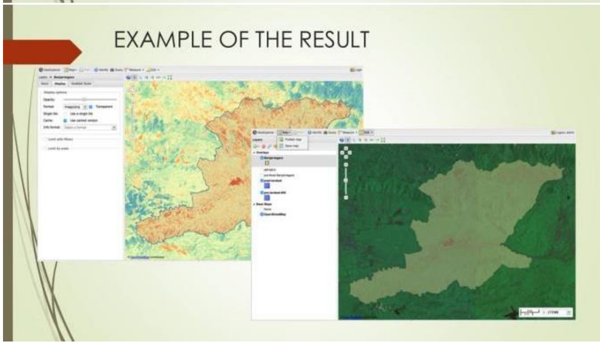

Tsunami
A new approach for inundation area estimation
•Combination use of Hyper-Spectral Sensor and Synthetic Aperture Radar
•SAR imagery has classified based on the analysis of Hyper-Spectral imagery
• Proposed method has availability of improvement of SAR image classification accuracy
Lok Nga: Ikonos Image


Disaster Management
examine practical technologies, such as structures or green belts, used to reduce tsunami hazards, in addition to integrated mitigation measures combining information and activities of public awareness and education.
• Structural and Non-structural Countermeasures
• Disaster Information and Risk Evaluation
• Awareness and Education
Copyright © 2009 The 3rd International Tsunami Field Symposium Executive Committee


Disaster management: Rehabilitation
N
500 m
A
B
C
Rehabilitation in Aceh - A: before tsunami, B- after tsunami; C: new coast after rehabilitation process
GEOPANGEA RESEARCH GROUP, 2014







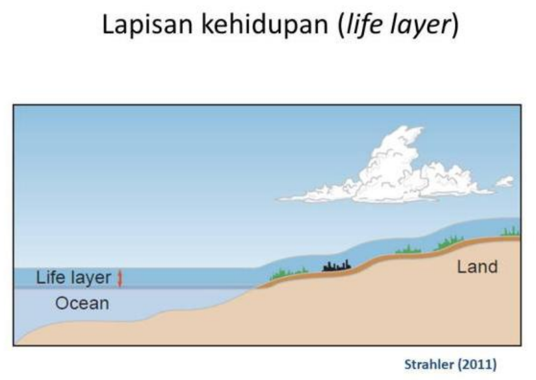
Presentation-2: The Role Of Remote Sensing & Disaster Mitigation

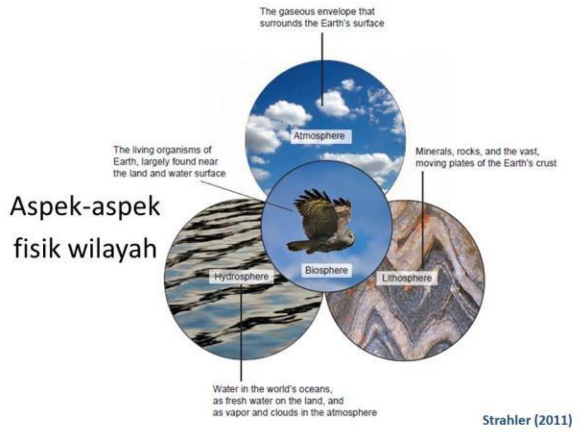
Peranan Penginderaan Jauh & Mitigasi bencana

Dr. Wikanti Asriningrum, M.Si.
Peneliti Utama Madya, IVd

Pusat Pemanfaatan Penginderaan Jauh
Deputi Penginderaan Jauh
Lembaga Penerbangan dan Antariksa Nasional (LAPAN)

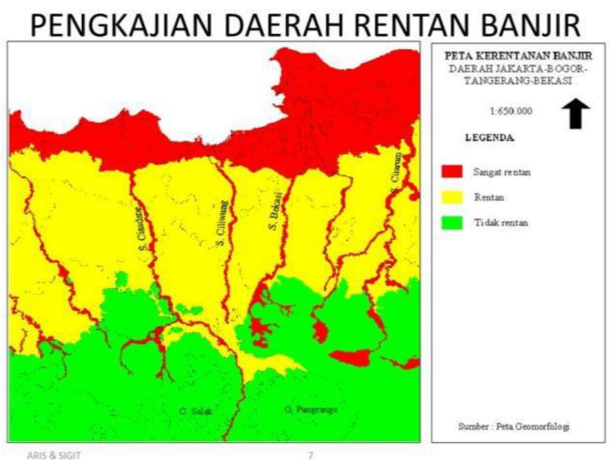
Indonesia

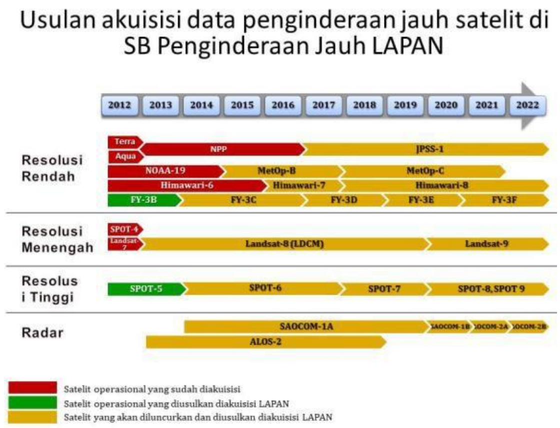

Lapisan kehidupan (*life layer*)
Life layer
Ocean
Land
Strahler (2011)


Aspek-aspek
fisik wilayah
The gaseous envelope that surrounds the Earth's surface
Atmosphere
The living organisms of Earth, largely found near the land and water surface
Minerals, rocks, and the vast, moving plates of the Earth's crust
Hydrosphere
Biosphere
Lithosphere
Water in the world's oceans, as fresh water on the land, and as vapor and clouds in the atmosphere
Strahler (2011)


Penginderaan jauh
3 karakteristik utama spektral
Air
Lahan darat
Perairan laut dangkal
Air
Lahan kosong
Vegetasi
Substrat
Habitat
Bentik
(Seagrass,
Macroalgae, Coral
reef)

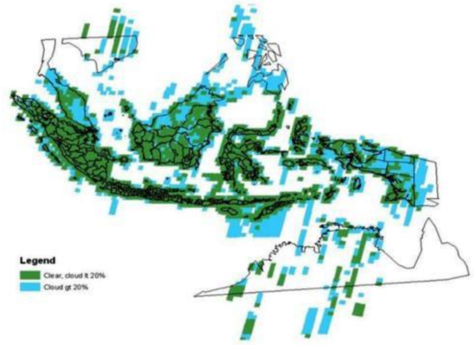

Peranan penginderaan jauh
dan mitigasi bencana
Optik
Geologi
Pengolahan Citra
Koreksi radiometrik
Koreksi geometrik
Fusi kanal
Komposit warna
Penajaman citra
Interpretasi Citra
VISUAL
DIJITAL
Klimatologi
Biologi
Deteksi
parameter
geo-bio-
fisik
Radar
DEM
Batimetri


PENGKAJIAN DAERAH RENTAN BANJIR
PETA KERENTANAN BANJIR
DAERAH JAKARTA-BOGOR-TANGERANG-BEKASI
1:650.000
LEGENDA
Sangat rentan
Rentan
Tidak rentan
Sumber : Peta Geomorfologi
ARIS & SIGIT
7

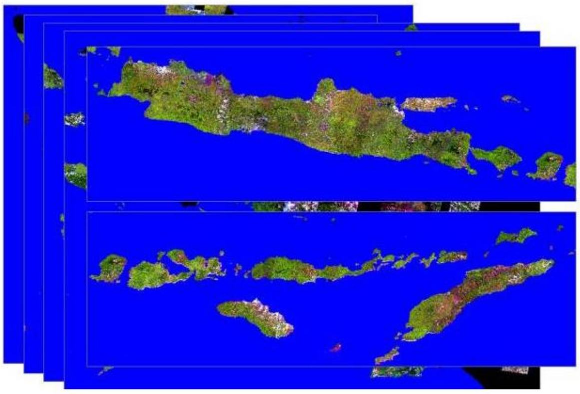

Usulan akuisisi data penginderaan jauh satelit di
SB Penginderaan Jauh LAPAN
2012
2013
2014
2015
2016
2017
2018
2019
2020
2021
2022
Resolusi
Rendah
Terra
Aqua
NPP
JPSS-1
NOAA-19
MetOp-B
MetOp-C
Himawari-6
Himawari-7
Himawari-8
FY-3B
FY-3C
FY-3D
FY-3E
FY-3F
Resolusi
Menengah
SPOT-4
Landsat-8 (LDCM)
Landsat-9
Resolus
i Tinggi
SPOT-5
SPOT-6
SPOT-7
SPOT-8, SPOT 9
Radar
SAOCOM-1A
ALOS-2
Satelit operasional yang sudah diakuisisi
Satelit operasional yang diusulkan diakuisisi LAPAN
Satelit yang akan diluncurkan dan diusulkan diakuisisi LAPAN

Ketersediaan data Landsat-7 (2012) hasil akuisisi SB Penginderaan Jauh Parepare

Ketersediaan data SPOT-4 (2006-2012) hasil akuisisi SB Penginderaan Jauh Parepare

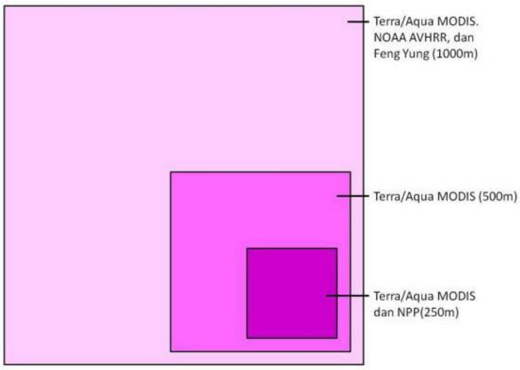


Mosaik citra SPOT-4 (Apr 2006-Des 2011)

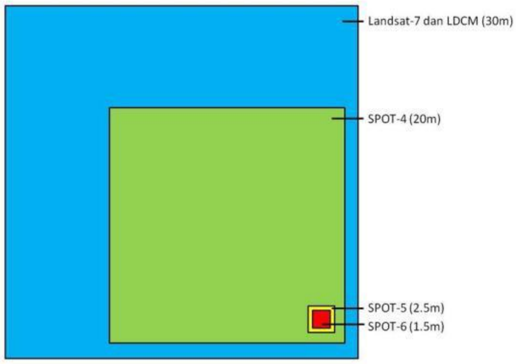


Ketersediaan data Terra/Aqua MODIS hasil akuisisi SB Penginderaan Jauh Parepare

Data resolusi rendah



Data resolusi menengah dan tinggi



Karakteristik Spektral Landsat 7 & 8

		Panjang gelombang (µm)	
Band	**Resolusi spasial (m)**	**Landsat- 7 ETM+**	**Landsat-8 OLI/TIRS**
Coastal/Aerosol	30 m		0.433 – 0.453
Blue	30 m	0.450 – 0.515	0.450 – 0.515
Green	30 m	0.525 – 0.605	0.525 – 0.600
Red,	30 m	0.630 – 0.690	0.630 – 0.680
NIR	30 m	0.775 – 0.900	0.845 – 0.885
SWIR 1	30 m	1.550 – 1.750	1.560 – 1.660
SWIR 2	30 m	2.090 – 2.350	2.100 – 2.300
Pan	15 m	0.520 – 0.900	0.500 – 0.680
Cirrus	30 m		1.360 – 1.390
LWIR 1	100 m	10.00– 12.50	10.3 – 11.3
LWIR 2	100 m		11.5 – 12.5

Peranan Citra

1. Prinsip Dasar Interpretasi Citra
2. Elemen Interpretasi Citra
3. Pengenalan Karakter Data Citra
4. Unsur-unsur Interpretasi Citra
5. Pendekatan Interpretasi Citra

Lembaga Penerbangan dan Antariksa Nasional
Deputi Bidang Penginderaan Jauh

1. Prinsip Dasar Interpretasi Citra

- Pengamatan terhadap citra
- Identifikasi obyek
- Menilai obyek

(Estes, J.H. & Simonet, D.H. 1975 dan Sutanto 1979)

Lembaga Penerbangan dan Antariksa Nasional
Deputi Bidang Penginderaan Jauh

1. Prinsip Dasar Interpretasi Citra (samb 1)

- Pengenalan
- Analisis
- Kombinasi: pengambilan keputusan & penentuan

(Zee v.d., 1990)

Lembaga Penerbangan dan Antariksa Nasional
Deputi Bidang Penginderaan Jauh

2. Elemen Interpretasi Citra

- Pertama: obyek secara langsung dapat dikenali
- Kedua: obyek tidak tampak, tapi keberadaannya dapat diketahui
- Ketiga: obyek yang ditentukan berdasarkan analisis atau investigasi dari obyek yang dikenali melalui elemen pertama dan kedua

Lembaga Penerbangan dan Antariksa Nasional
Deputi Bidang Penginderaan Jauh

2. Elemen Interpretasi Citra (samb 1)

- Pertama: obyek secara langsung dapat dikenali

contoh: jalan, pohon, sungai, rumah, hutan

Lembaga Penerbangan dan Antariksa Nasional
Deputi Bidang Penginderaan Jauh

jalan, pohon, sungai, rumah

4. Unsur-unsur Interpretasi Citra

- rona/warna
- bentuk
- ukuran
- bayangan
- tekstur
- pola
- lokasi
- asosiasi
- resolusi

Lembaga Penerbangan dan Antariksa Nasional
Deputi Bidang Penginderaan Jauh

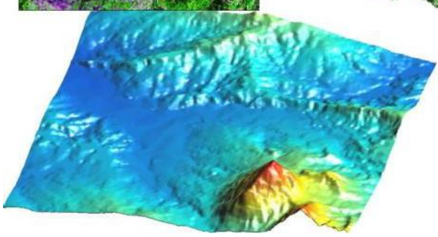
4. Unsur-unsur Interpretasi Citra (samb 1)

- rona/warna

RGB 743

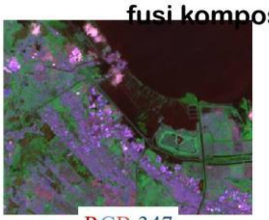
RGB 734

Lembaga Penerbangan dan Antariksa Nasional
Deputi Bidang Penginderaan Jauh

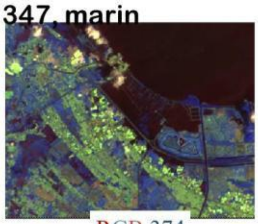


- bentuk
- ukuran
- bayangan
- tekstur

fusi komposit 347, marin

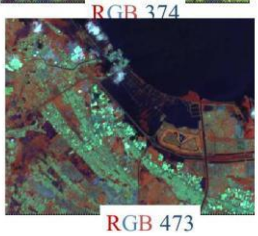


RGB 347

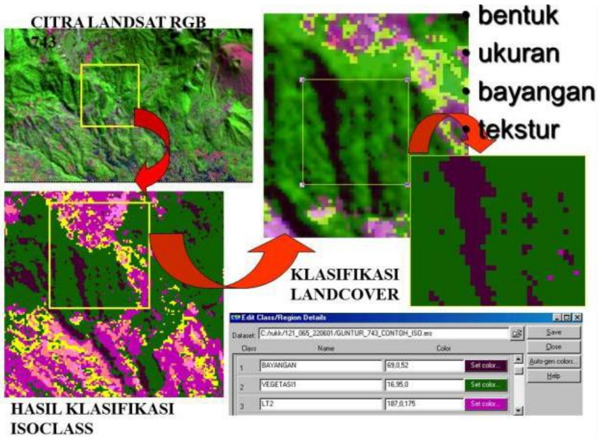


RGB 374

RGB 437

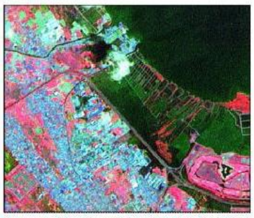


RGB 473



- bentuk
- ukuran
- bayangan
- tekstur

4. Unsur-unsur Interpretasi Citra (samb 2)



- pola:
- lokasi:
- asosiasi:
- resolusi

Permukiman, tambak, mangrove

4. Unsur-unsur Interpretasi Citra (samb 3)

- lokasi
- asosiasi:
- resolusi

CONTOH OBYEK PESISIR

Abrasi Pantai Kuta akibat perpanjangan *Runway* Ngurah Rai

5. Pendekatan Interpretasi Citra

Ekologi:

Darat:
- dataran
- perbukitan
- pegunungan

Laut:
- kedalaman

Udara:
- jenis awan
- uap air

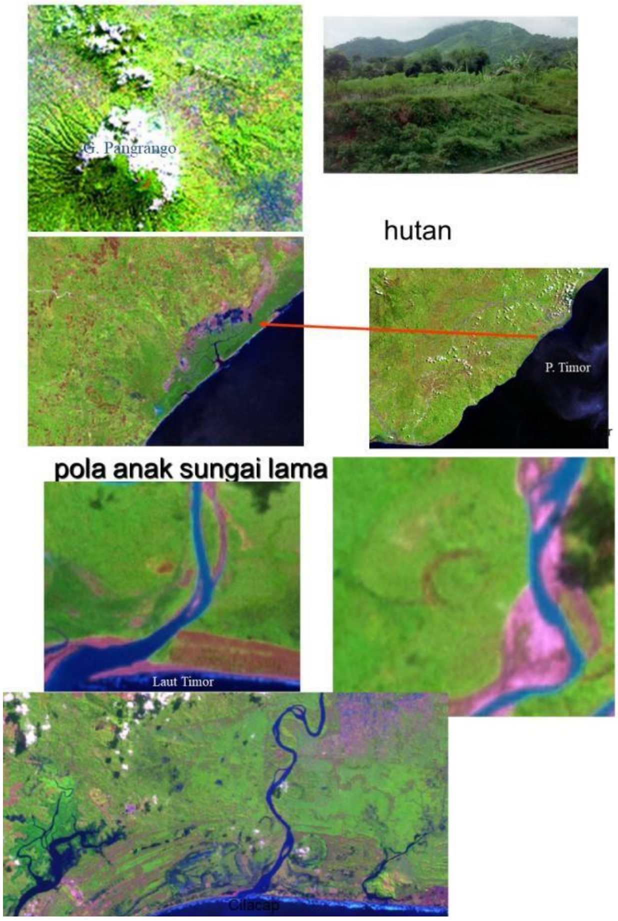
Lembaga Penerbangan dan Antariksa Nasional
Deputi Bidang Penginderaan Jauh

5. Pendekatan Interpretasi Citra

Geomorfologi:

1. struktural
2. vulkanik
3. denudasional
4. fluvial
5. solusional
6. marin
7. angin
8. glasial
9. organik

Lembaga Penerbangan dan Antariksa Nasional
Deputi Bidang Penginderaan Jauh



2. Elemen Interpretasi Citra (samb 2)

• Kedua: obyek tidak tampak,
tapi keberadaannya dapat diketahui.

contoh: - pola anak sungai lama
- kenampakan arkeologis

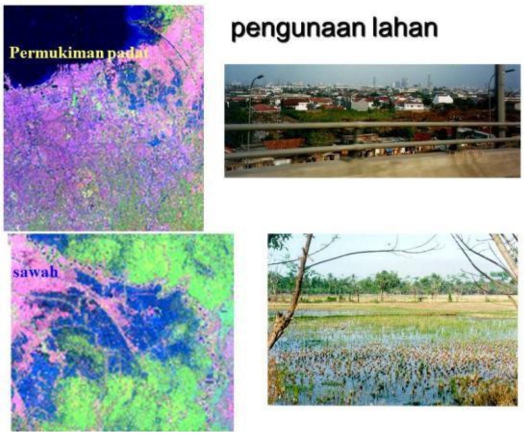
Lembaga Penerbangan dan Antariksa Nasional
Deputi Bidang Penginderaan Jauh

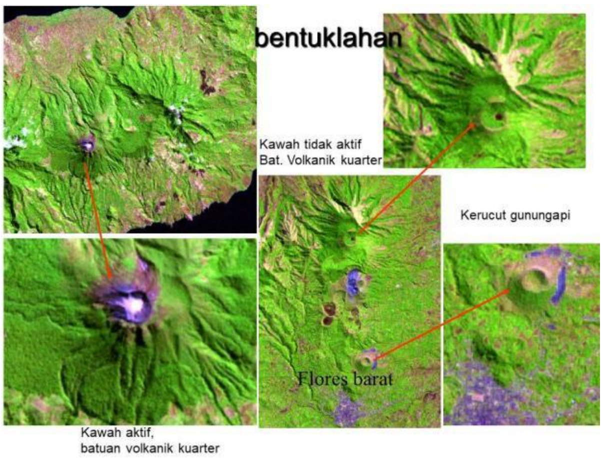
2. Elemen Interpretasi Citra (samb 3)

• Ketiga: obyek yang ditentukan berdasarkan analisis atau investigasi dari obyek yang dikenali melalui elemen pertama dan kedua

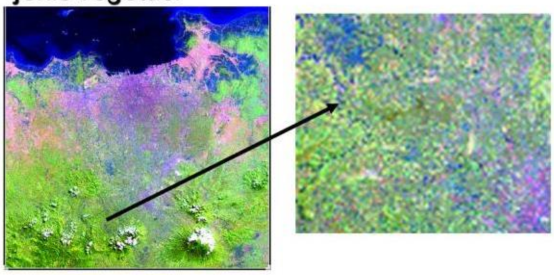
contoh: pengunaan lahan
bentuklahan (*landform*)
jenis vegetasi
batas jenis tanah

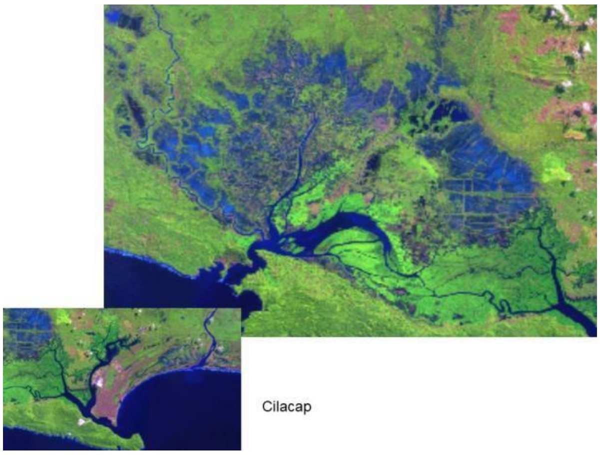
Lembaga Penerbangan dan Antariksa Nasional
Deputi Bidang Penginderaan Jauh





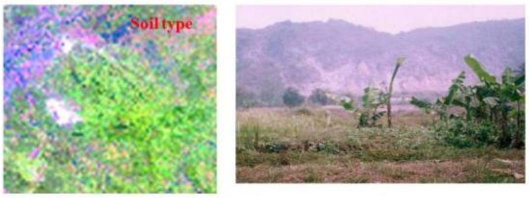
jenis vegetasi



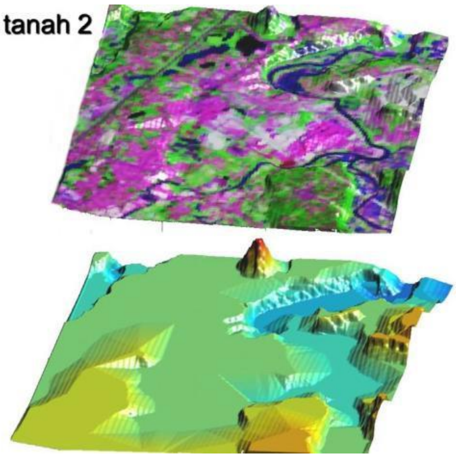


Cilacap

batas jenis tanah 1



batas jenis tanah 2



3. Pengenalan Karakter Data Citra

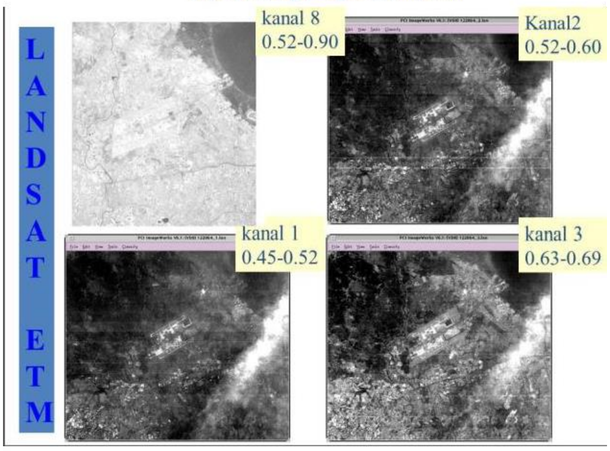
- resolusi spektral
- resolusi spasial
- resolusi temporal
- resolusi radiometrik

3.Pengenalan Karakter Data Citra (samb 1)

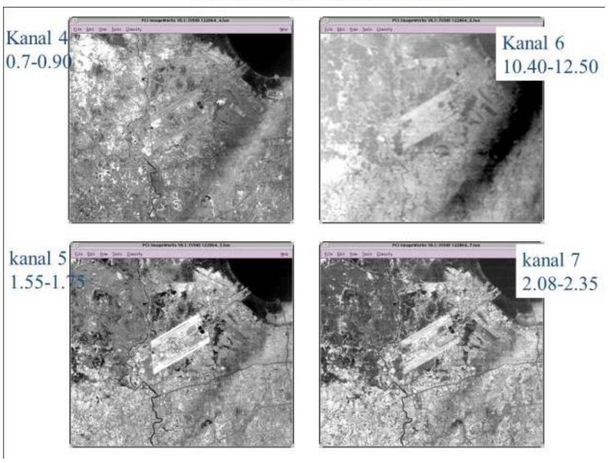
resolusi spektral

kenali: - kisaran panjang gelombang data citra
- jenis citra

Lembaga Penerbangan dan Antariksa Nasional
Deputi Bidang Penginderaan Jauh

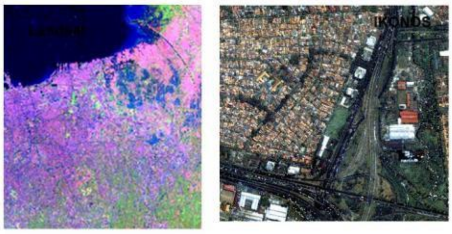


Lembaga Penerbangan dan Antariksa Nasional
Deputi Bidang Penginderaan Jauh



3.Pengenalan Karakter Data Citra (samb 2)

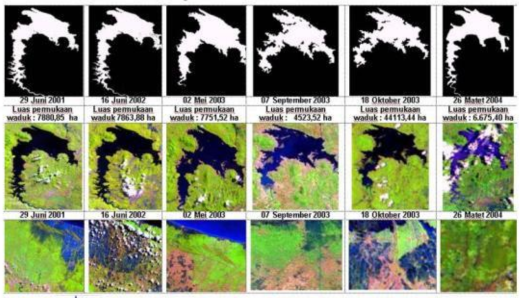
resolusi spasial



3.Pengenalan Karakter Data Citra (samb 3)

resolusi temporal

Waduk Jatiluhur, Jabar

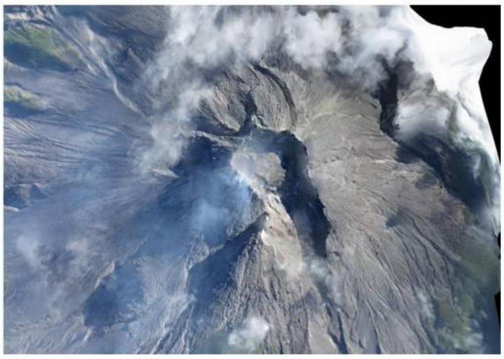


Lembaga Penerbangan dan Antariksa Nasional
Deputi Bidang Penginderaan Jauh

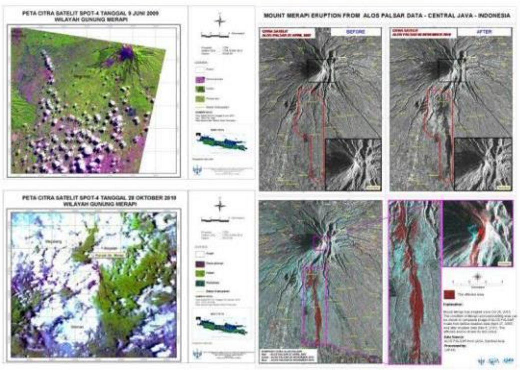
Kegiatan Litbang

- Pengembangan model zona bahaya dan risiko bencana (banjir, gunung api, kebakaran hutan)
- Pemodelan evakuasi tsunami
- Deteksi daerah bekas kebakaran
- Deteksi potensi kekeringan
- Deteksi cepat daerah terkena banjir

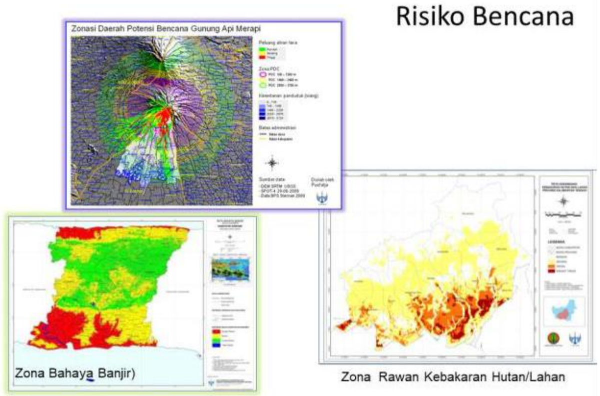
Hasil Potret UAV (Kubah Merapi)



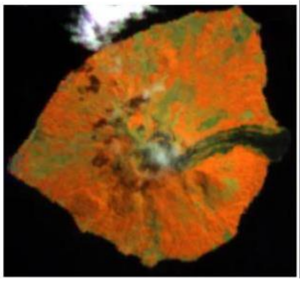
Contoh Tanggap Darurat (Letusan Gunung Merapi)



Pengembangan Model Zona Bahaya dan Risiko Bencana



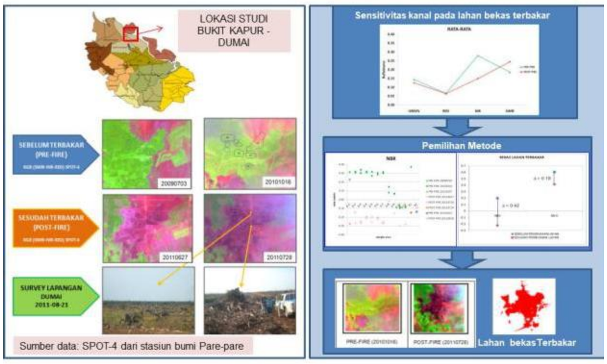
Citra Pulau Ruang



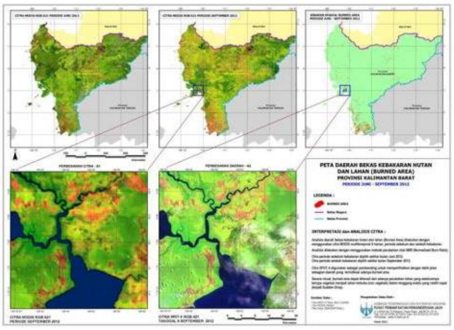
Landsat RGB 453,
7 September 2002

QuickBird RGB 321,
2 Agustus 2005

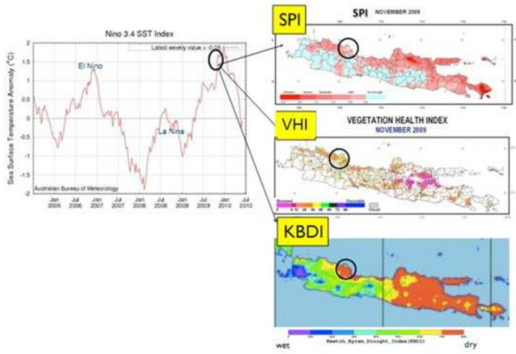
Deteksi Daerah Bekas Kebakaran



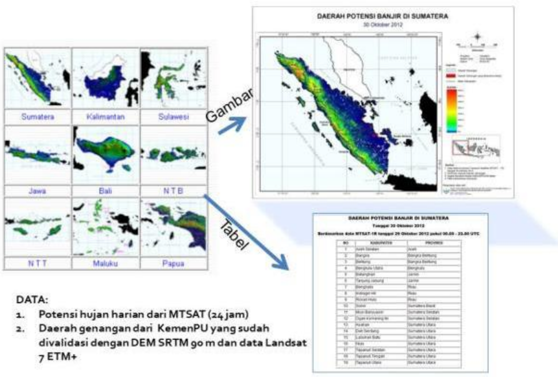
Daerah Bekas Kebakaran di Kalbar



Deteksi Potensi Kekeringan

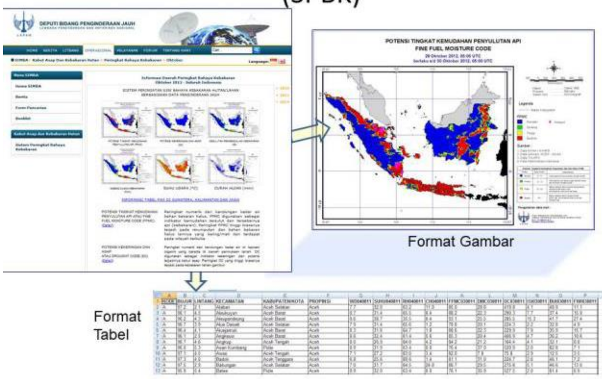


Pemantauan Potensi Banjir



DATA:
1. Potensi hujan harian dari MTSAT (24 jam)
2. Daerah genangan dari KemenPU yang sudah divalidasi dengan DEM SRTM 90 m dan data Landsat 7 ETM+

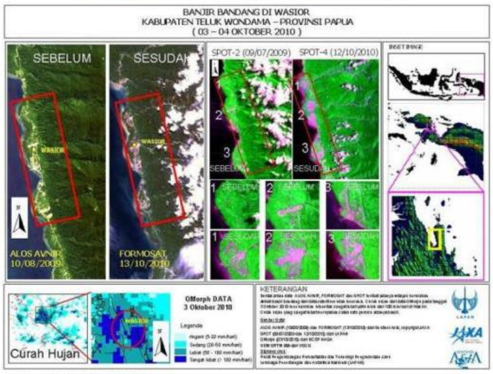
Sistem Peringkat Bahaya Kebakaran (SPBK)



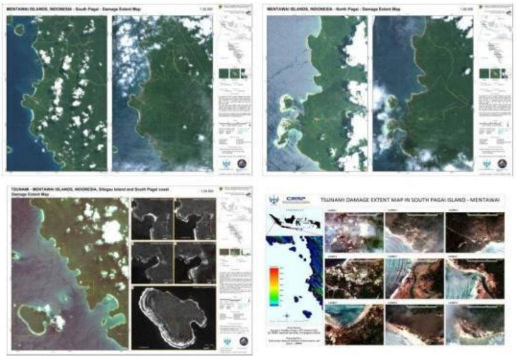
Pemantauan Titik Panas (Hotspot)

Pemantauan Titik Panas (Hotspot)

Contoh Tanggap Darurat
(Banjir Bandang di Wasior)

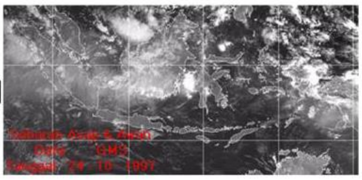


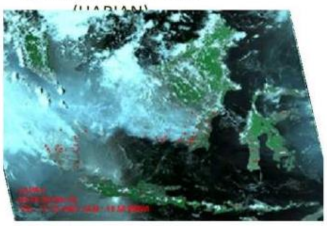
Contoh Tanggap Darurat
(Tsunami Mentawai)



MONITORING KEBAKARAN HUTAN/LAHAN

(HOT SPOT)
DENGAN DATA
NOAA AVHRR & GMS
(HARIAN)

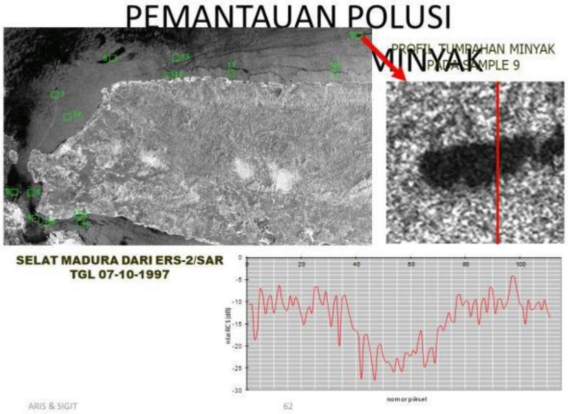




Keterangan :
Abu-abu : Asap
Putih : Awan

ARIS & SIGIT 61

PEMANTAUAN POLUSI MINYAK



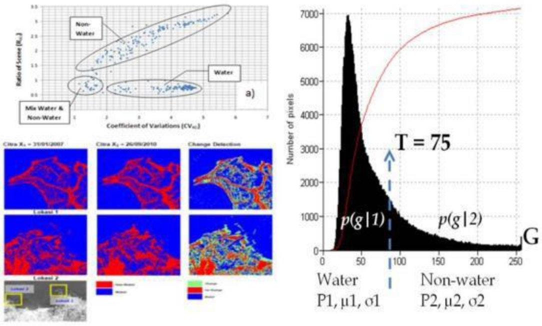
ARIS & SIGIT 62

Terima Kasih

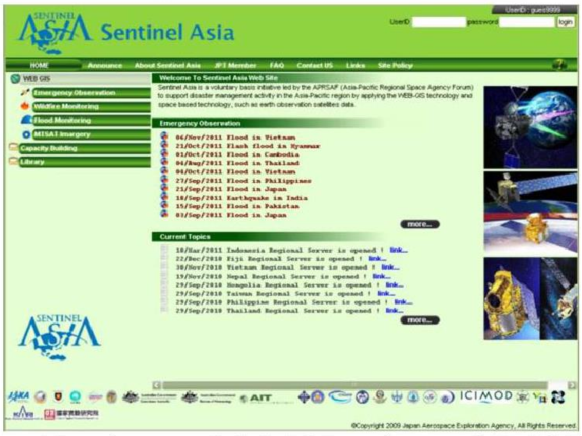
Pemodelan Evakuasi Tsunami

Meliputi 23 Wilayah Kabupaten

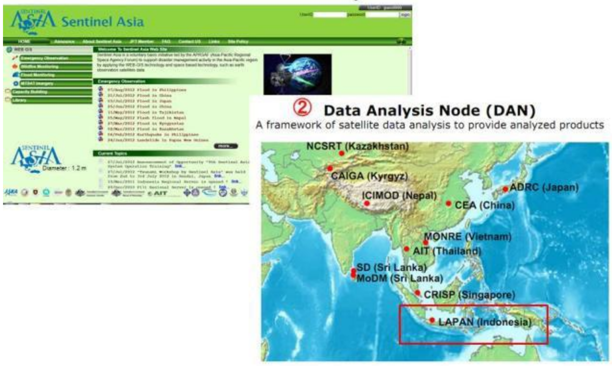
Deteksi Daerah Terkena Banjir



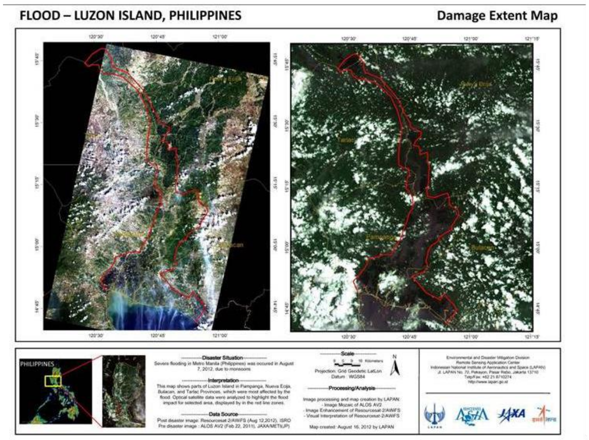
Jejaring Regional (Sentinel Asia)



Data Analysis Node (Sentinel Asia)

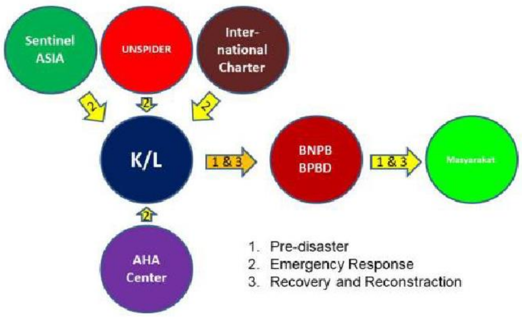


Kegiatan LAPAN sebagai DAN

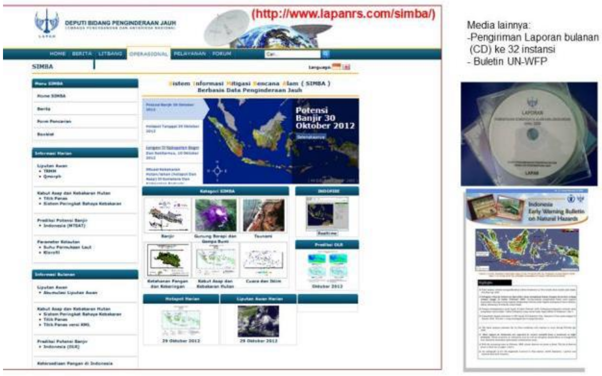


Jejaring Global

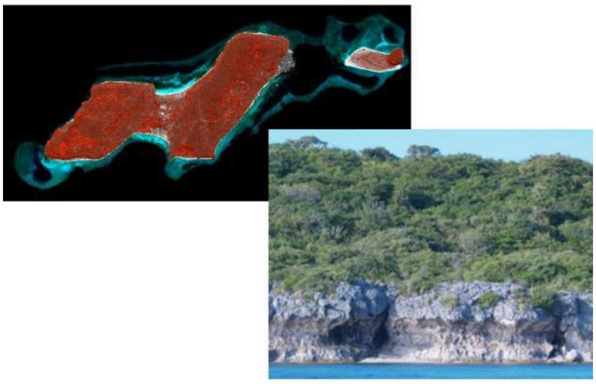
Jejaring Nasional



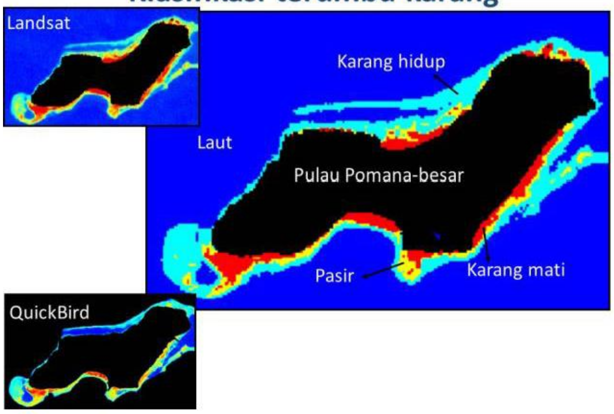
Diseminasi Informasi



Pulau kecil tipe terumbu

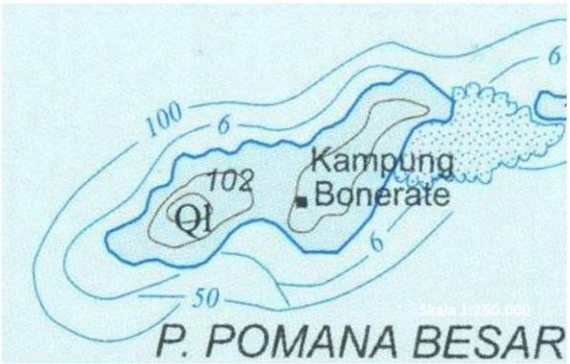


Klasifikasi terumbu karang

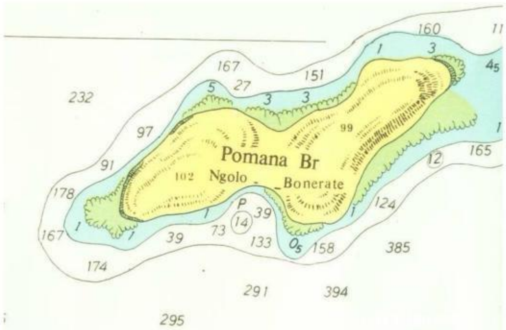


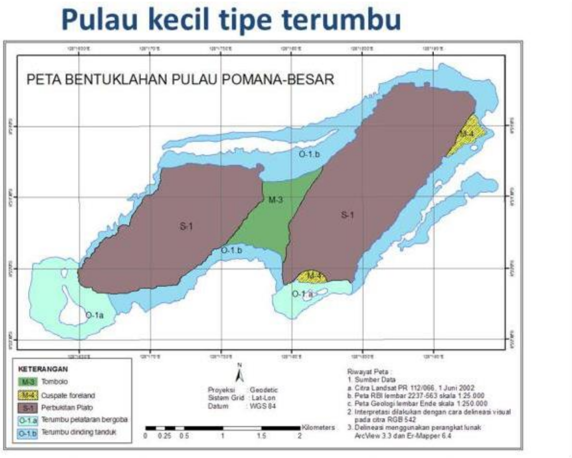
Peta rupa bumi Indonesia

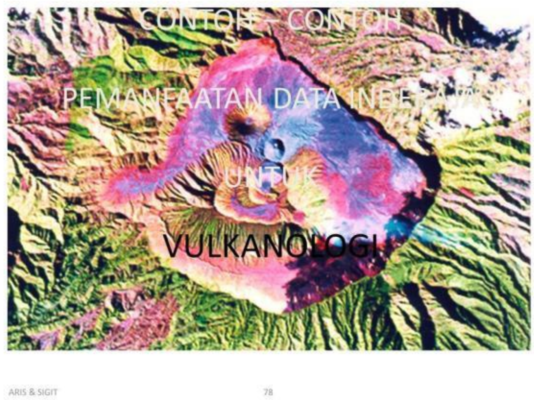
Peta geologi

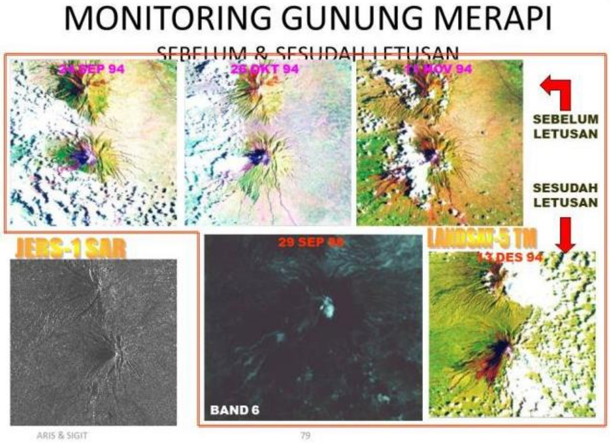


Peta batimetri

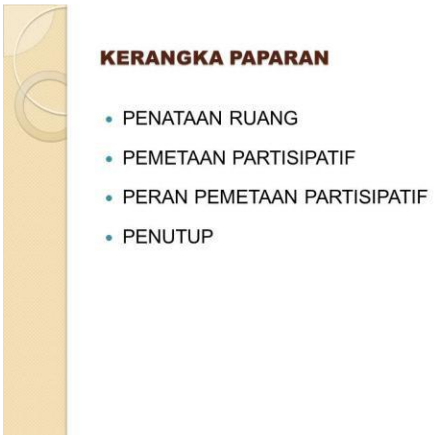








Presentation-3: Participatory Mapping For Spatial Planning and Disaster



PENATAAN RUANG

Pertimbangan perlunya penataan ruang

- *Ruang yang terbatas* dan *pemahaman masyarakat* yang telah berkembang menuntut adanya penyelenggaraan penataan ruang yang *transparan*, *efektif*, dan *partisipatif* agar terwujud ruang yang *aman*, *nyaman*, *produktif*, dan *berkelanjutan*.
- NKRI berada pada kawasan *rawan bencana* menuntut adanya penataan ruang yang *berbasis mitigasi bencana*.

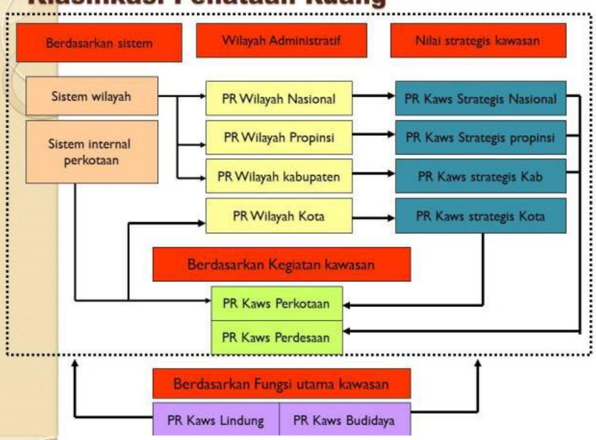
PENATAAN RUANG

Pasal 1 (3) UU No. 26 Tahun 2007 tentang Penataan Ruang (UUPR)
Penataan Ruang adalah suatu sistem proses perencanaan tata ruang, pemanfaatan ruang, dan pengendalian pemanfaatan ruang

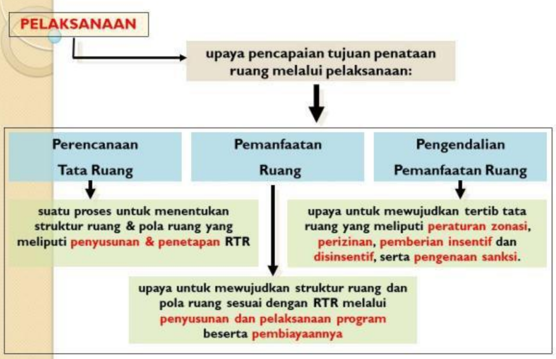
Pasal 1 (11) UUPR
Pelaksanaan penataan ruang adalah upaya pencapaian tujuan penatan ruang melalui pelaksanaan perencanaan tata ruang, pemanfaatan ruang, dan pengendalian pemanfaatan ruang.

Pasal 1 (16) UUPR
Rencana Tata Ruang adalah Hasil Perencanaan Tata Ruang UU No. 26 Tahun 2007 tentang Penataan Ruang (UUPR)

Klasifikasi Penataan Ruang



PELAKSANAAN PENATAAN RUANG



RENCANA TATA RUANG

Rencana Umum Tata Ruang	Rencana Rinci Tata Ruang
• RTRWN • RTRW Provinsi • RTRW Kabupaten • RTRW Kota	• RTR Pulau/Kepulauan • RTR KSN • RTR KSP • RTR KS Kab/Kota • RDTR Wilayah Kabupaten/Kota

Rencana umum tata ruang disusun berdasarkan pendekatan wilayah administratif dengan muatan substansi mencakup rencana struktur ruang dan rencana pola ruang.
Rencana rinci tata ruang disusun berdasarkan pendekatan nilai strategis kawasan dan/atau kegiatan kawasan dengan muatan substansi yang dapat mencakup hingga penetapan blok dan subblok peruntukan.

PEMETAAN PARTISIPASIF

Pemetaan Partisipatif adalah satu metode pemetaan yang menempatkan masyarakat sebagai pelaku pemetaan wilayahnya, sekaligus juga akan menjadi penentu perencanaan pengembangan wilayah mereka sendiri

CIRI-CIRI PEMETAAN PARTISIPATIF

- Melibatkan seluruh anggota masyarakat.
- Masyarakat menentukan sendiri topik pemetaan dan tujuannya.
- Masyarakat menentukan sendiri proses yang berlangsung.
- Proses pemetaan dan peta yang dihasilkan bertujuan untuk kepentingan masyarakat.
- Sebagian besar informasi yang terdapat dalam peta berasal dari pengetahuan masyarakat setempat.
- Masyarakat menentukan sendiri penggunaan peta yang dihasilkan.

PENTINGNYA PEMETAAN PARTISIPATIF

- Meningkatkan kesadaran seluruh anggota masyarakat mengenai hak-hak mereka atas tanah dan sumber daya alam.
- Peta sebagai media negosiasi dengan pihak lain, karena dengan peta tersebut menjadi jelaslah bagaimana wilayah itu dimanfaatkan oleh masyarakat dan siapa saja yang berhak atas wilayah itu.
- Proses menumbuhkan semangat untuk menggali pengetahuan lokal, sejarah asal-usul, sistem kelembagaan setempat, pranata hukum setempat, identifikasi sumber daya alam yang dimiliki, dan sebagainya.
- Mempermudah pihak luar memahami pengurusan wilayah itu dan sekaligus mempermudah pengakuan dari pihak luar.
- Menumbuhkan partisipasi masyarakat baik dalam bentuk tenaga, waktu, uang, maupun material lainnya.
- Memunculkan kelembagaan lokal, baik yang dulu sudah ada maupun bentuk baru.

PERAN PEMETAAN PARTISIPASIF DALAM RENCANA TATA RUANG DAN KEBENCANAAN

RTR KAWASAN PERDESAAN

Pasal 49 UUPR --- > RTR Kawasan Perdesaan
Rencana tata ruang kawasan perdesaan yang merupakan bagian wilayah kabupaten adalah bagian rencana tata ruang wilayah kabupaten

Pasal 79 (1) UU No. 6 Tahun 2014 tentang Desa
Pemerintah Desa menyusun perencanaan Pembangunan Desa sesuai dengan kewenangannya dengan mengacu pada perencanaan pembangunan Kabupaten/ Kota

Pasal 83 (3a) UU Desa
Penggunaan dan pemanfaatan wilayah Desa dalam rangka penetapan kawasan pembangunan harus sesuai dengan tata ruang Kabupaten/Kota

RTR KAWASAN PERDESAAN

Pasal 123 (2a) PP No. 43 Tahun 2014 Tentang Desa
Pembangunan kawasan perdesaan antara lain: penyusunan rencana tata ruang kawasan perdesaan secara partisipatif

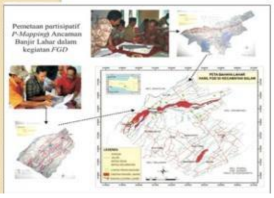
Pasal 125 (1) PP Desa
Perencanaan, pemanfaatan, dan pendayagunaan aset Desa dan tata ruang dalam pembangunan kawasan perdesaan dilakukan berdasarkan hasil musyawarah Desa yang selanjutnya ditetapkan dengan peraturan Desa

Pasal 125 (3b) PP Desa
Pelibatan Pemerintah Desa antara lain: memfasilitasi musyawarah Desa untuk membahas dan menyepakati pendayagunaan aset Desa dan tata ruang Desa

Pemetaan partisipasif menghasikan peta yang dapat dijadikan alat untuk Pengendalian Pemanfaatan Ruang untuk menjamin terwujudnya tata ruang sesuai dengan rencana tata ruang

Pemetaan Partisipatif Kurangi Risiko Bencana

- Upaya pengurangan risiko bencana merupakan permasalahan yang kompleks. Hal ini tidak hanya dikontrol oleh kondisi fisik, tetapi juga oleh berbagai permasalahan sosial, psikologi, ekonomi, hukum, dan lingkungan.
- Pencegahan bencana menjadi tidak efektif dan berkelanjutan jika masyarakat setempat tidak turut memahami permasalahan. Tantangan yang paling sulit diatasi dalam mengurangi risiko bencana adalah membuat masyarakat peduli dan termotivasi untuk berpartisipasi aktif dalam berbagai upaya mitigasi bencana.



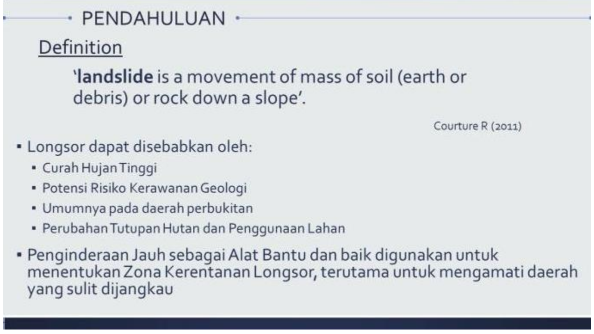
Mengantisipasi bahaya bencana maka diperlukan partisipasi pengurangan risiko bencana melalui pemetaan partisipatif. Pemetaaan partisipatif merupakan suatu alat untuk membangun masyarakat dalam hal berkomunikasi dengan berbagai pihak

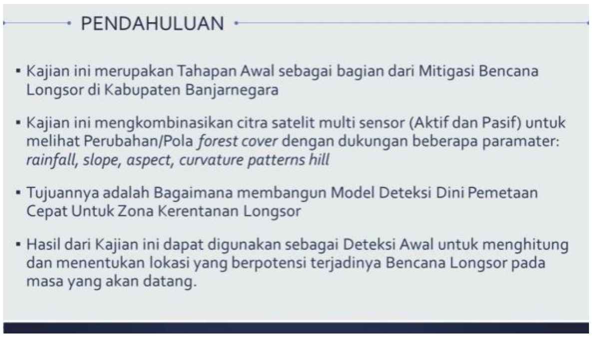
PENUTUP

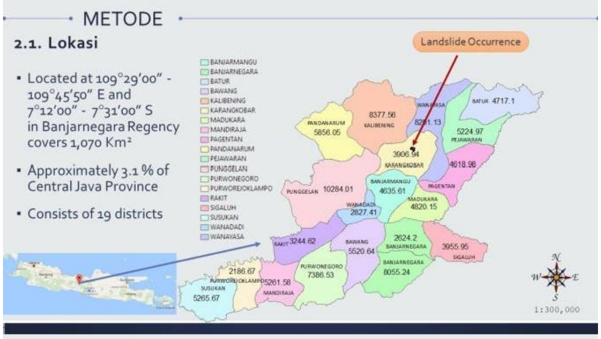
- Rencana Tata Ruang Kawasan Perdesaan (peraturan desa) harus terintegrasi dalam RTRW Kab/Kota
- Perlunya penyusunan NSPK Pedoman penyusunan Rencana Tata Ruang Kawasan Perdesaan (Ruang Lingkup substansi dan Skala Peta yang digunakan)
- Peta partisipatif menjadi bahan masukan dalam penyusunan RTR Kawasan Perdesaan dan dapat dijadikan alat untuk Pengendalian Pemanfaatan Ruang
- Pemetaan partisipasif dapat mengurangi risiko bencana karena merupakan suatu alat untuk membangun masyarakat dalam hal berkomunikasi dengan berbagai pihak. Dalam penangan risiko bencana terdapat pihak-pihak yang terkait penyampaian informasi. Adapun pihak-pihak terkait itu ialah pemerintah, masyarakat, dan ilmuwan atau akademisi.

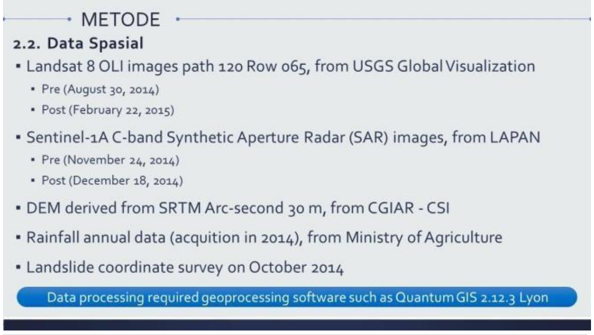
TERIMA KASIH

Presentation-4: Early Detection Model Of Rapid Mapping For Landslide Prone Area By Using Multi Sensor Images

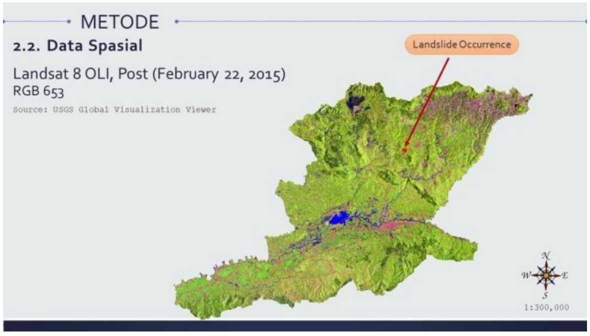




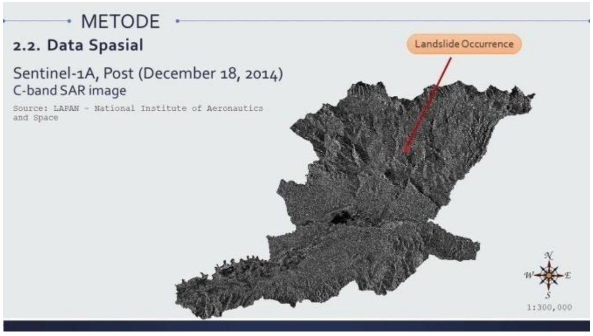

METODE
2.1. Lokasi
Located at 109°29'00" - 109°45'50" E and 7°12'00" - 7°31'00" S in Banjarnegara Regency covers 1,070 Km²
Approximately 3.1 % of Central Java Province
Consists of 19 districts
Landslide Occurrence
1:300,000

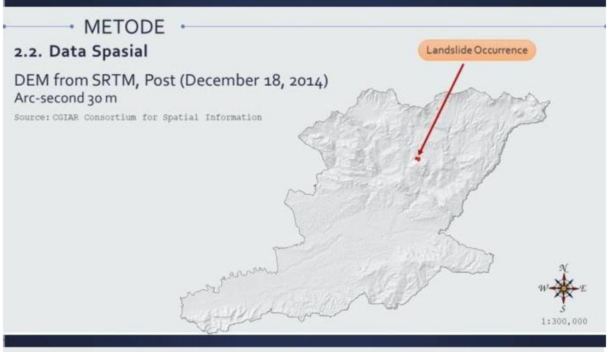

METODE
2.2. Data Spasial
Landsat 8 OLI images path 120 Row 065, from USGS Global Visualization
Pre (August 30, 2014)
Post (February 22, 2015)
Sentinel-1A C-band Synthetic Aperture Radar (SAR) images, from LAPAN
Pre (November 24, 2014)
Post (December 18, 2014)
DEM derived from SRTM Arc-second 30 m, from CGIAR - CSI
Rainfall annual data (acquition in 2014), from Ministry of Agriculture
Landslide coordinate survey on October 2014
Data processing required geoprocessing software such as Quantum GIS 2.12.3 Lyon

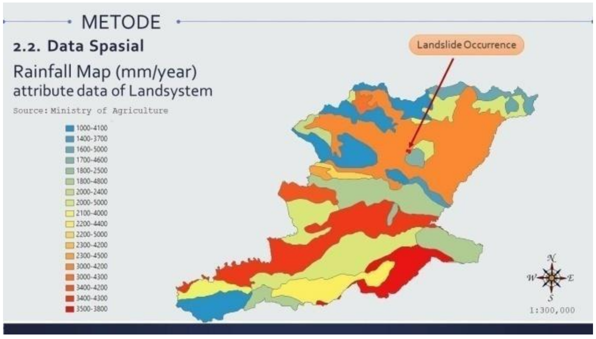

METODE
2.2. Data Spasial
Landsat 8 OLI, Pre (August 30, 2014)
RGB 653
Source: USGS Global Visualization Viewer
Landslide Occurrence
1:300,000

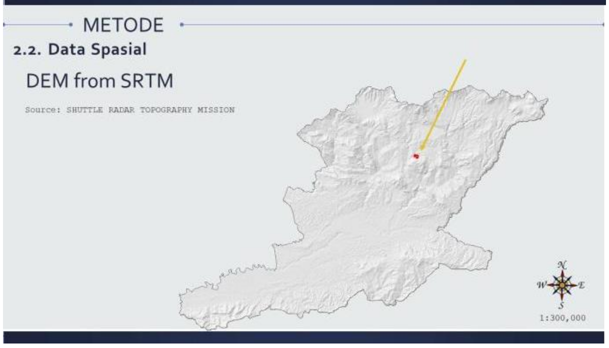

METODE
2.2. Data Spasial
Landsat 8 OLI, Post (February 22, 2015)
RGB 653
Source: USGS Global Visualization Viewer
Landslide Occurrence
1:300,000

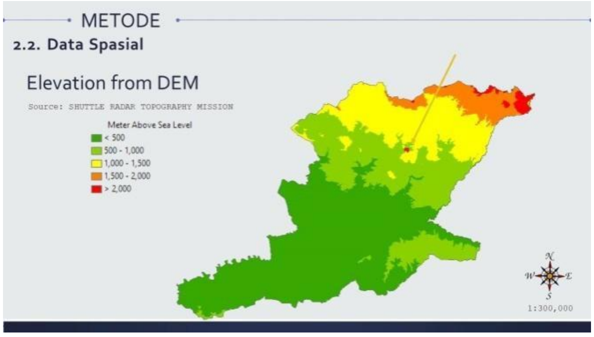

METODE
2.2. Data Spasial
Sentinel-1A, Pre (November 2, 2014)
C-band SAR image
Source: LAPAN - National Institute of Aeronautics and Space
Landslide Occurrence
1:300,000

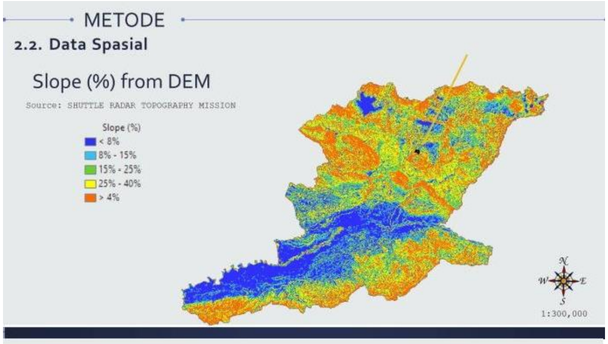

METODE
2.2. Data Spasial
Sentinel-1A, Post (December 18, 2014)
C-band SAR image
Source: LAPAN - National Institute of Aeronautics and Space
Landslide Occurrence
1:300,000

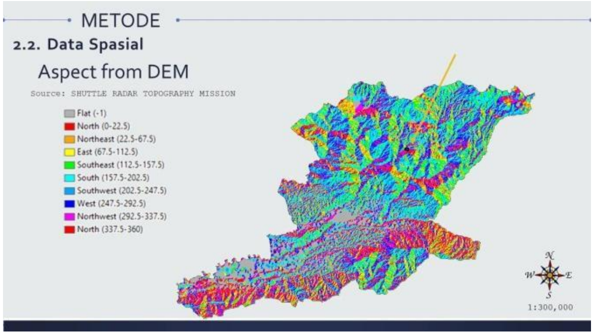

METODE
2.2. Data Spasial
DEM from SRTM, Post (December 18, 2014)
Arc-second 30 m
Source: CGIAR Consortium for Spatial Information
Landslide Occurrence
1:300,000

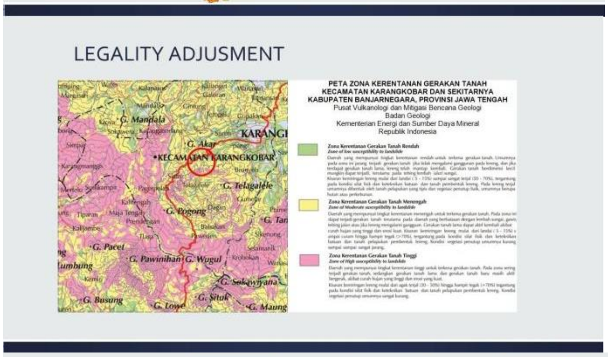

METODE
2.2. Data Spasial
Rainfall Map (mm/year)
attribute data of Landsystem
Source: Ministry of Agriculture
Landslide Occurrence
1:300,000

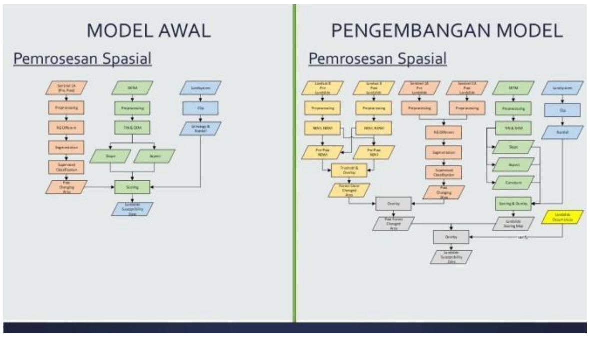

METODE
2.2. Data Spasial
DEM from SRTM
Source: SHUTTLE RADAR TOPOGRAPHY MISSION
1:300,000

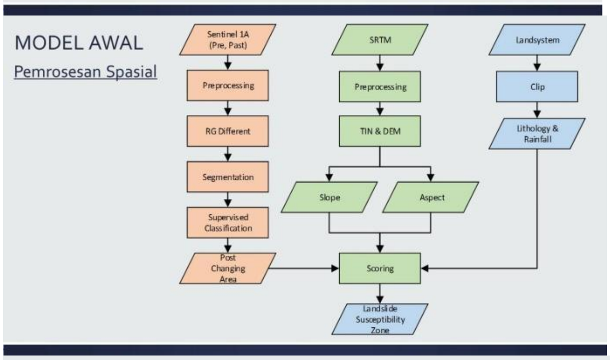

METODE
2.2. Data Spasial
Elevation from DEM
Source: SHUTTLE RADAR TOPOGRAPHY MISSION
Meter Above Sea Level
< 500
500 - 1,000
1,000 - 1,500
1,500 - 2,000
> 2,000
1:300,000

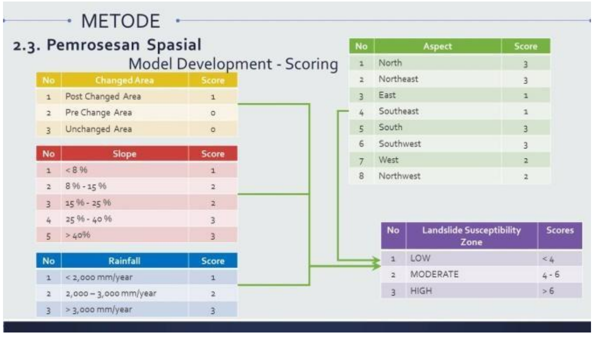

METODE
2.2. Data Spasial
Slope (%) from DEM
Source: SHUTTLE RADAR TOPOGRAPHY MISSION
Slope (%)
< 8%
8% - 15%
15% - 25%
25% - 40%
> 4%
1:300,000

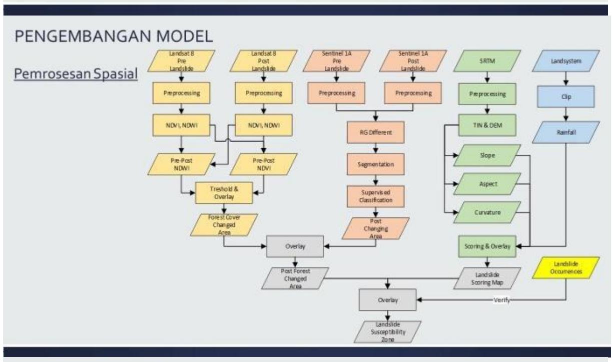

METODE
2.2. Data Spasial
Aspect from DEM
Source: SHUTTLE RADAR TOPOGRAPHY MISSION
Flat (-1)
North (0-22.5)
Northeast (22.5-67.5)
East (67.5-112.5)
Southeast (112.5-157.5)
South (157.5-202.5)
Southwest (202.5-247.5)
West (247.5-292.5)
Northwest (292.5-337.5)
North (337.5-360)
1:300,000

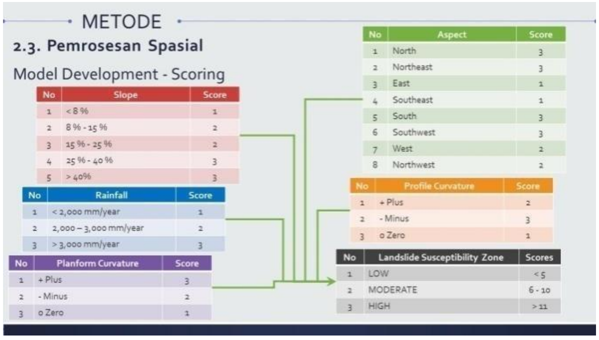

LEGALITY ADJUSMENT
PETA ZONA KERENTANAN GERAKAN TANAH KECAMATAN KARANGKOBAR DAN SEKITARNYA KABUPATEN BANJARNEGARA, PROVINSI JAWA TENGAH

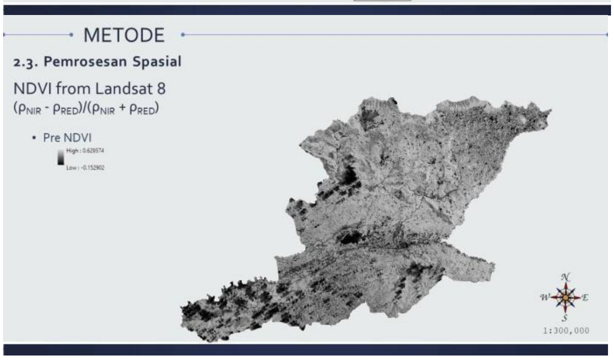

MODEL AWAL
Pemrosesan Spasial
PENGEMBANGAN MODEL
Pemrosesan Spasial

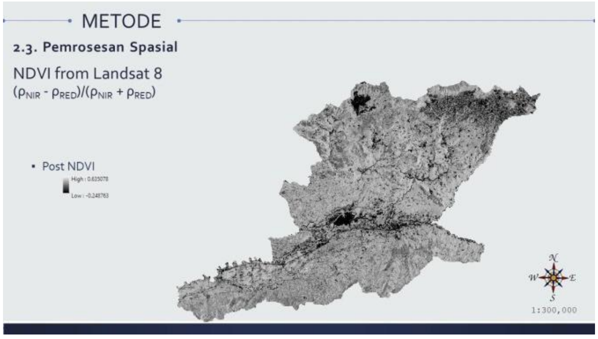

MODEL AWAL
Pemrosesan Spasial
Sentinel 1A (Pre, Past)
Preprocessing
RG Different
Segmentation
Supervised Classification
Post Changing Area
SRTM
Preprocessing
TIN & DEM
Slope
Aspect
Scoring
Landslide Susceptibility Zone
Landsystem
Clip
Lithology & Rainfall

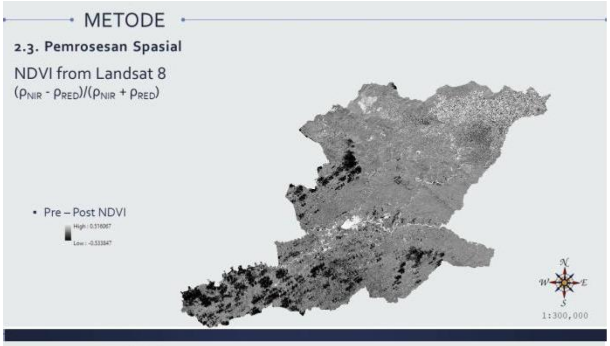

METODE
2.3. Pemrosesan Spasial
Model Development - Scoring
No Changed Area Score
1 Post Changed Area 1
2 Pre Change Area 0
3 Unchanged Area 0
No Slope Score
1 < 8 % 1
2 8 % - 15 % 2
3 15 % - 25 % 2
4 25 % - 40 % 3
5 > 40% 3
No Rainfall Score
1 < 2,000 mm/year 1
2 2,000 – 3,000 mm/year 2
3 > 3,000 mm/year 3
No Aspect Score
1 North 3
2 Northeast 3
3 East 1
4 Southeast 1
5 South 3
6 Southwest 3
7 West 2
8 Northwest 2
No Landslide Susceptibility Zone Scores
1 LOW < 4
2 MODERATE 4 - 6
3 HIGH > 6

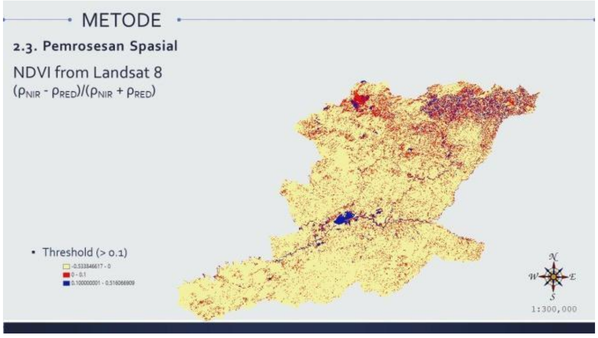

PENGEMBANGAN MODEL
Pemrosesan Spasial
Landsat 8 Pre Landslide
Landsat 8 Post Landslide
Sentinel 1A Pre Landslide
Sentinel 1A Post Landslide
SRTM
Landsystem
Preprocessing
NDVI, NDWI
Pre-Post NDVI
Treshold & Overlay
Forest Cover Changed Area
RG Different
Segmentation
Supervised Classification
Post Changing Area
TIN & DEM
Slope
Aspect
Curvature
Scoring & Overlay
Clip
Rainfall
Overlay
Post Forest Changed Area
Landslide Scoring Map
Landslide Occurrences
Verify
Landslide Susceptibility Zone

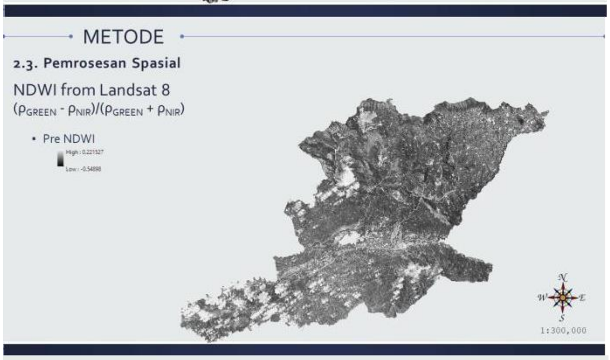

METODE
2.3. Pemrosesan Spasial
Model Development - Scoring
No Slope Score
1 < 8 % 1
2 8 % - 15 % 2
3 15 % - 25 % 2
4 25 % - 40 % 3
5 > 40% 3
No Rainfall Score
1 < 2,000 mm/year 1
2 2,000 – 3,000 mm/year 2
3 > 3,000 mm/year 3
No Planform Curvature Score
1 + Plus 3
2 - Minus 2
3 0 Zero 1
No Aspect Score
1 North 3
2 Northeast 3
3 East 1
4 Southeast 1
5 South 3
6 Southwest 3
7 West 2
8 Northwest 2
No Profile Curvature Score
1 + Plus 2
2 - Minus 3
3 0 Zero 1
No Landslide Susceptibility Zone Scores
1 LOW < 5
2 MODERATE 6 - 10
3 HIGH > 11

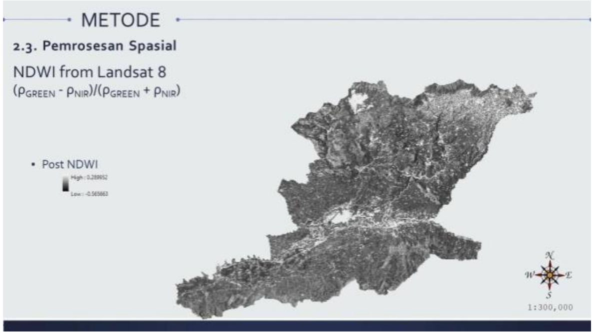

METODE
2.3. Pemrosesan Spasial
NDVI from Landsat 8
(ρNIR - ρRED)/(ρNIR + ρRED)
Pre NDVI
1:300,000

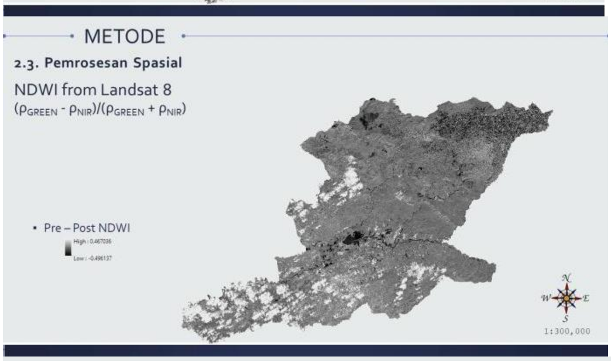

METODE
2.3. Pemrosesan Spasial
NDVI from Landsat 8
(ρNIR - ρRED)/(ρNIR + ρRED)
Post NDVI
1:300,000

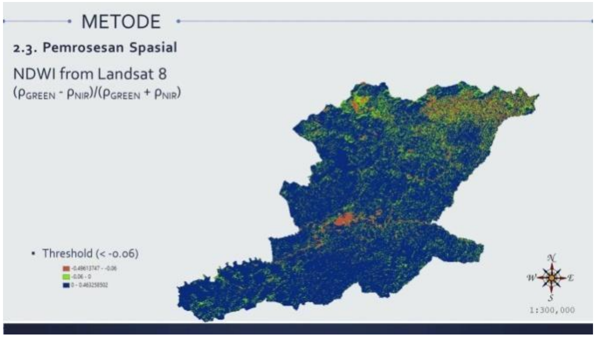

METODE
2.3. Pemrosesan Spasial
NDVI from Landsat 8
$(\rho_{NIR} - \rho_{RED})/(\rho_{NIR} + \rho_{RED})$
Pre – Post NDVI
1:300,000

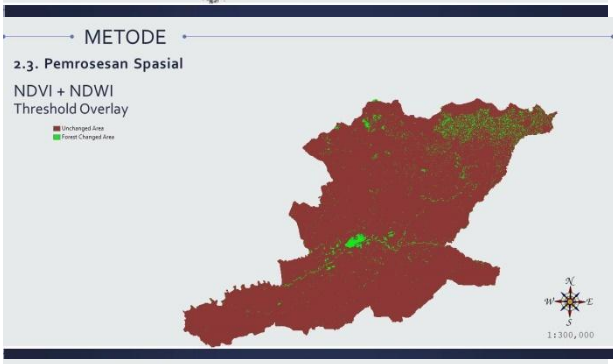

METODE
2.3. Pemrosesan Spasial
NDVI from Landsat 8
$(\rho_{NIR} - \rho_{RED})/(\rho_{NIR} + \rho_{RED})$
Threshold (> 0.1)
1:300,000

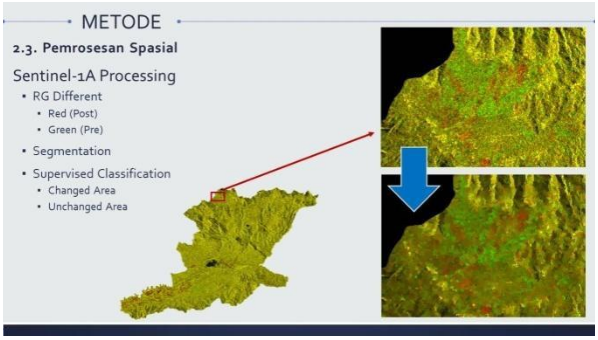

METODE
2.3. Pemrosesan Spasial
NDWI from Landsat 8
$(\rho_{GREEN} - \rho_{NIR})/(\rho_{GREEN} + \rho_{NIR})$
Pre NDWI
1:300,000


METODE
2.3. Pemrosesan Spasial
NDWI from Landsat 8
$(\rho_{GREEN} - \rho_{NIR})/(\rho_{GREEN} + \rho_{NIR})$
Post NDWI
1:300,000

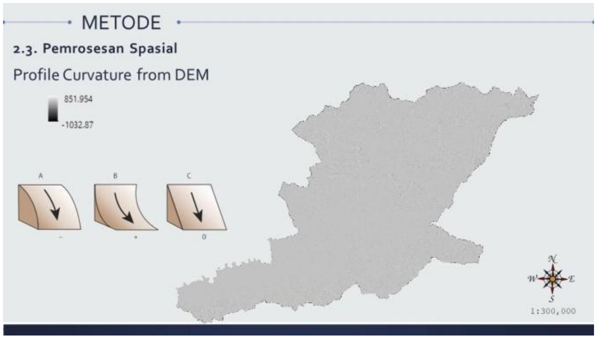

METODE
2.3. Pemrosesan Spasial
NDWI from Landsat 8
$(\rho_{GREEN} - \rho_{NIR})/(\rho_{GREEN} + \rho_{NIR})$
Pre – Post NDWI
1:300,000

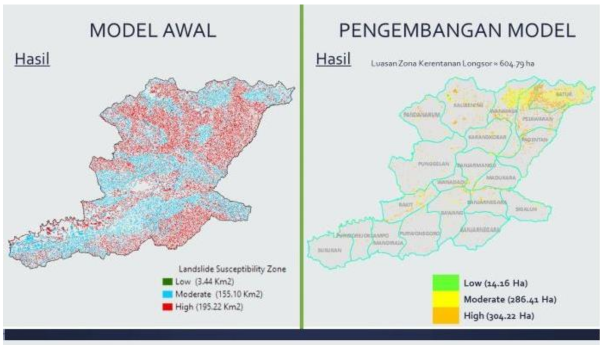

METODE
2.3. Pemrosesan Spasial
NDWI from Landsat 8
$(\rho_{GREEN} - \rho_{NIR})/(\rho_{GREEN} + \rho_{NIR})$
Threshold (< -0.06)
1:300,000


METODE
2.3. Pemrosesan Spasial
NDVI + NDWI
Threshold Overlay
Unchanged Area
Forest Changed Area
1:300,000


METODE
2.3. Pemrosesan Spasial
Sentinel-1A Processing
RG Different
Red (Post)
Green (Pre)
Segmentation
Supervised Classification
Changed Area
Unchanged Area

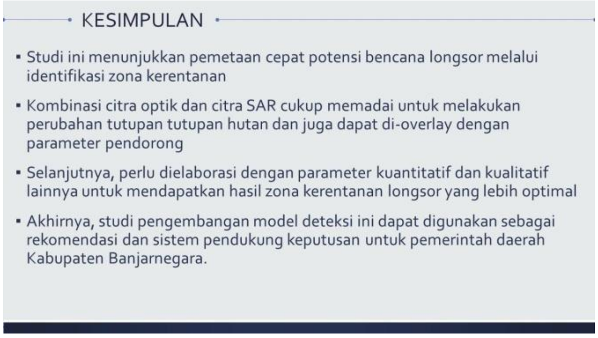

METODE
2.3. Pemrosesan Spasial
Planform Curvature from DEM
711.563
-811.535
A
B
C
1:300,000


METODE
2.3. Pemrosesan Spasial
Profile Curvature from DEM
851.954
-1032.87
A
B
C
1:300,000

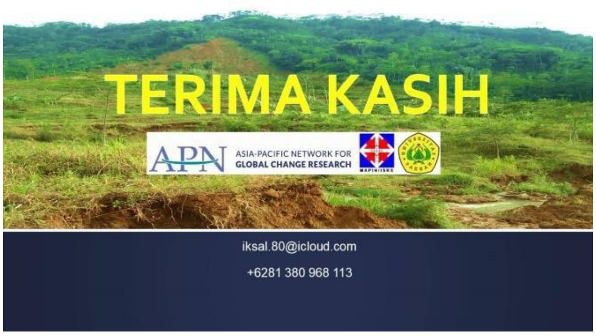

MODEL AWAL
Hasil
Landslide Susceptibility Zone
Low (3.44 Km2)
Moderate (155.10 Km2)
High (195.22 Km2)
PENGEMBANGAN MODEL
Hasil
Luasan Zona Kerentanan Longsor = 604.79 ha
Low (14.16 Ha)
Moderate (286.41 Ha)
High (304.22 Ha)


MODEL AWAL
Hasil
Low
Moderate
High
PENGEMBANGAN MODEL
Hasil
Landslide Susceptibility Zone in Each District (Ha)
Low
Moderate
High


HASIL
Landslide Susceptibility Spot in Each District (Point)
359
517
3887
472
1314
624
254
486
293
2449
578
942
171
176
2273
BANJARMANGU
BANJARNEGARA
BATUR
BAWANG
KALIBENING
KARANGKOBAR
MADUKARA
MANDIRAJA
PAGENTAN
PANDANARUM
PEJAWARAN
PUNGGELAN
PURWONEGORO
PURWOREJOKLAMPO
RAKIT
SIGALUH
SUSUKAN
WANADADI
WANAYASA


KESIMPULAN
Studi ini menunjukkan pemetaan cepat potensi bencana longsor melalui identifikasi zona kerentanan
Kombinasi citra optik dan citra SAR cukup memadai untuk melakukan perubahan tutupan tutupan hutan dan juga dapat di-overlay dengan parameter pendorong
Selanjutnya, perlu dielaborasi dengan parameter kuantitatif dan kualitatif lainnya untuk mendapatkan hasil zona kerentanan longsor yang lebih optimal
Akhirnya, studi pengembangan model deteksi ini dapat digunakan sebagai rekomendasi dan sistem pendukung keputusan untuk pemerintah daerah Kabupaten Banjarnegara.


REFERENSI
[1] Cruden, D. M. and Varnes, D. J. 1996. Landslide types and processes. In Turner, A. K. and Schuster, R. L. (Editors), Landslides Investigation and Mitigation: Transportation Research Board, US National Research Council, Special Report 247, Washington, DC, pp 36-75
[2] Hungr, O., Evans, S.G., Bovis, M., and Hutchinson, J.N. 2001. Review of the classification of landslides of the flow type. Environmental and Engineering Geoscience.7: 221-238
[3] Petley, D. N. 2012. Global patterns of loss of life from landslides. Geology, 40: 927-930
[4] Nugraha, H., Wacano D., Dipayana G.A., Cahyadi A., Mutaqin B.A., Larasati A. 2015. Geomorphometric characteristics of landslides in the Tinalah Watershed, Menoreh Mountains, Yogyakarta, Indonesia. Procedia Environmental Sciences, 28: 578-586
[5] Yunarto. 2012. Remote Sensing Technique And Geographic Information System For Mapping Movement Susceptibility Zones With Indirect Method At Kuningan Regency. Bulletin of Environmental Geology. Vol. 22, 2: 75-86 pp 4, 7, 10
[6] Noor, D. 2005. Geologi Lingkungan. Graha Ilmu, Yogyakarta
[7] Indonesian National Standard. 2005. Standard of Landslide Susceptibility Zone Map. SNI 13-7124-2005. pp 3, 5
[8] Gao, B. C. 1996. NDWI A Normalized Difference Water Index for Remote Sensing of Vegetation Liquid Water From Space. Remote Sens. Environ. 58:257-266
[9] LAPAN. 2015. Pedoman Pemanfaatan Data Landsat-8 Untuk Deteksi Daerah Tergenang Banjir (Inundated Area). National Institute of Aeronautics and Space. p 18
[10] Huang, J. 2014. Investigation on landslide susceptibility using remote sensing and GIS methods. Open Access Theses and Dissertations. Paper 33. pp 40-41
[11] Rai, P. K., Mohan, K., Kumra, V. K.. 2014. Landslide Hazard And Its Mapping Using Remote Sensing And GIS. Journal of Scientific Research Banaras Hindu University, Varanasi. 58 : 1-13 ISSN : 0447-9483 p 12
[12] Sivakami C. and Sundaram A. 2014. Landslide Susceptibility Zone using Frequency Ratio Model, Remote Sensing & GIS –A Case Study of Western Ghats, India (Part of Kodaikanal Taluk). Journal of Environment and Earth Science. ISSN 2225-0948 4:.22. p 6


TERIMA KASIH
APN
ASIA-PACIFIC NETWORK FOR GLOBAL CHANGE RESEARCH
iksal.80@icloud.com
+6281 380 968 113

4-3. Participants list

DAFTAR HADIR PESERTA SEMINAR NASIONAL PENGINDRAAN JAUH UNTUK KEBENCANAAN

NO	NAMA	UNIVERSITAS / INSTANSI	No Telepon/ HP	PARAF
1	Nadya Oktaviani	BIG (Badan Informasi Geospasial)	081313389946	
2	Agung Setiawan	BIG (Badan Informasi Geospasial)	085865247701	
3	Yustisi Ardhitasari	BIG (Badan Informasi Geospasial)	08111146926	
4	M. Irwan ~~Haryono~~ Hariyono	BIG (Badan Informasi Geospasial)	085217464447	
5	Ayu Nur Safi'i	BIG (Badan Informasi Geospasial)	08118970269	
6	Tia Rizka N Rachma	BIG (Badan Informasi Geospasial)	085227901990	
7	Munawaroh	BIG (Badan Informasi Geospasial)	08522966522	
8	Maslahatun Nashiha	BIG(Badan Informasi Geospasial)		
9	Novaldi	APIK (Adaptasi Perubahan Iklim dan Ketangguhan)	085287572355	
10	Sulistiono	Kotaku Pusat	082115999912	
11	Imron	Kotaku Pusat		
12	M. Hasym	Kotaku Pusat	085210178557	
13	Nugraha Sastra Jatmika, ST	Planologi Pakuan	085811757115	
14	Lara Haspita, ST			
15	Mirlansyah, ST			
16	M.Reza Adhitya, ST	Planologi Pakuan	087772821986	
17	Wahyu Gumilar, ST	Planologi Pakuan	08561817211	
18	Adi Prawata Akbar, ST	Planologi Pakuan	082213666382	
19	Mhade Adi Wijaya, ST	Planologi Pakuan	085233239992	
20	Bayu Anggiat			
21	Fadlam	Planologi ITSb, Bekasi	085247791555	
22	Valen	Planologi ITSb, Bekasi	082299875616	
23	Glenn Yusup	Planologi ITI, Tangerang		
24	Danu Ramadhan	Planologi ITI, Tangerang	0838 9724 1339	
25	Shara Zetiara	Planologi ITI, Tangerang		
26	Lindawati Saputri	Planologi Universitas Terbuka	08978234841	
27	Khaerani Rahma Mutiari	Planologi Universitas Terbuka		
28	Nur Atika	Planologi Universitas Terbuka	087870062738	
29	Destiningrum Retno Yustina	Planologi Universitas Terbuka	089638181108	
30	Linawati	Planologi Universitas Terbuka	085715680695	
31	Pradangga Gatra P	Planologi UNKRIS	081293918185	
33	Dedi Supriadi	Planologi UNKRIS		
34	Asep Herdiana	Planologi UNKRIS		
35	Milzam Fariz	Planologi D3 UNDIP		
36	Abdul Manaf	Universitas Ibn Khaldun	085706321667	
37	Aulia Mutiara K	Universitas Ibn Khaldun		
38	Nia Rahayu E	Universitas Ibn Khaldun		
39	M. Idrus Jamalulael	Universitas Ibn Khaldun		
40	Syarif Hidayatullah	Universitas Ibn Khaldun	081212150243	
41	Rahmatulah	Universitas Ibn Khaldun	089634725359	
42	Fadel M.Muhammad Rahman	Universitas Ibn Khaldun		
	Lalitya Narleswari	BIG		✓
	Nabilah Amalinaf	ITI		

NO	NAMA	UNIVERSITAS / INSTANSI	No Telepon/ HP	PARAF
43	Muhammad Imroni Irfan	Universitas Ibn Khaldun	0856-0510525	
44	Adi Surya Hasan	Universitas Ibn Khaldun	085694356545	
45	Rosalin Apriliyani	Universitas Ibn Khaldun	085716670381	
46	Fadila Nur Meida H	Universitas Ibn Khaldun	085716971238	
47	Ikmal Wahyudi	Universitas Ibn Khaldun		
48	Ahmad Alfan	Geodesi UNPAK	081276542158	
49	Jaka Kurnia	Geodesi UNPAK	08111 338118	
50	Rian Stadyanto	Geodesi UNPAK	089686050569	
51	Muhamad Rinaldi	Geodesi UNPAK	087874848610	
52	Gerit Ardi	Geodesi UNPAK		
53	Egi Ropika	Geodesi UNPAK	081310587422	
54	Layang Pramesti	Geodesi UNPAK	081291901033	
55	Nur Rizki Alpian	Geodesi UNPAK		
56	Aliska Pangda~~gisda~~ Gisda	Geodesi UNPAK	082213112208	
57	Fakih Rizki R	Geodesi UNPAK		
58	Misbahudin Sobari P	Geodesi UNPAK	081319966806	
59	Rahmayudin	Geodesi UNPAK	0858 8186 6861	
60	Farhan	Geodesi UNPAK	0856 1717 805	
61	Khaidir Wahid	Planologi UNPAK		
62	Iqbal Cahaya A	Planologi UNPAK	08236841 7293	
63	Nazlina Novta H	Planologi UNPAK	085776941230	
64	Unik Setyanti	Planologi UNPAK		
65	Dhea Andriani	Planologi UNPAK	085317277731	
66	Lilian Novianti	Planologi UNPAK	08588 8365 0435	
67	Eki Agus Dwi c	Planologi UNPAK	08498089896	
68	Abdurahman Ibnu S	Planologi UNPAK		
69	Rian Mardiansyah	Planologi UNPAK		
70	Wilkafifi Telaumbanua	Planologi UNPAK	082361351078	
71	Lisda Andina F	Planologi UNPAK	083811271477	
72	Yurika Kusuma D	Planologi UNPAK	081510930391	
73	Moch.Rizki U	Planologi UNPAK	0859 20042441	
74	Neneng Laesari	Planologi UNPAK	085298307575	
75	Novi Triana P	Planologi UNPAK	085659692833	
76	Tia Agus Sandra	Planologi UNPAK	08221097907	
77	Darahayu.M Burnate	Planologi UNPAK		
78	Jhosua Gilbert	Planologi UNPAK		
79	Refa Cahya Utama	Planologi UNPAK		
80	Kartika Astarie	Planologi UNPAK		
81	Rizal Satria R	Planologi UNPAK		
82	Rini Rusdiani	Planologi UNPAK	085817918775	
83	Petrus Bangkit P	Planologi UNPAK	085714975933	
84	Antono Kristianto	Planologi UNPAK		
85	Ruslan Fauzi	Planologi UNPAK	085799373263	
86	Alya Pricilia W	Planologi UNPAK		
87	Inggrit Mahaputra S	Planologi UNPAK	085692388671	
88	Putri Intan P	Planologi UNPAK	081298287242	

NO	NAMA	UNIVERSITAS / INSTANSI	No Telepon/ HP	PARAF
89	Rani Cahya Agustin	Planologi UNPAK	-	
90	Bekti Sudaryati	Planologi UNPAK	0896 381 588 47	
91	Suhendra	Planologi UNPAK	0812 8906 0370	
92	Julifa M. Latif	Planologi UNPAK	0821 21 7809 73	
93	Azhar Kahfi Muharrama	Planologi UNPAK		
94	Fadlan Dzil Ikram	Planologi UNPAK		
95	Vega Vania	Planologi UNPAK	~	
96	Ridha Dwiyantika Subekti	Planologi UNPAK	0822 97158660	
97	Zulfa Septiasari	Planologi UNPAK	087772493737	
98	Alda ~~Aprika Sari~~ Aprina sari	Planologi UNPAK	085772590548	
99	Alfiya Rochma M	Planologi UNPAK	08155725908	
100	Bisma Putra Kamara	Planologi UNPAK		
101	M. Adam	Planologi UNPAK		
102	Sudharta	Planologi UNPAK	082299863714	
103	R.Moch.Shafari	Planologi UNPAK		
104	Lida Maulidah A	Planologi UNPAK	0896 38262948	
105	Olvia Ningsih	Planologi UNPAK	0813 8116 2004	
106	Ainur Rofiq	Planologi UNPAK	085695970441	
107	Sisca Prasetiani S.P	Planologi UNPAK	081291174924	
108	Rica Balebat F	Planologi UNPAK		
109	Mauldi Azhar R	Planologi UNPAK	082298756997	
110	Eneng Dayu S	Planologi UNPAK		
111	M. Haikal Dahlan	Planologi UNPAK		
112	Mira Sariani	Planologi UNPAK	081285078537	
113	Nurhalim A	Planologi UNPAK		
114	Novrico Adhi G	Planologi UNPAK	08 1296397945	
115	Latifah	Planologi UNPAK		
116	Deni Irawan	Planologi UNPAK		
117	Mevi Andena	Planologi UNPAK	083811180051	
118	Ikhmaliska Aisha M	Planologi UNPAK	0878816600901	
119	Dedi Nurhayadi	Planologi UNPAK	087881600901	
120	Rias Ristiawati	Planologi UNPAK	087722190774	
121	Aji Suryayuda Abdullah	Planologi UNPAK	085691229516	
122	Inggit Dewi Komalawati	Planologi UNPAK		
123	Saepul Amri	Planologi UNPAK		
124	Lugia Septiansyah	Planologi UNPAK	085724141241	
125	Catur Rian Nugraha	Planologi UNPAK	0857779272150	
126	Chindy Saskia Muchtar	Planologi UNPAK	081212083211	
127	Anisa Aulia	Planologi UNPAK	085782162698	
128	Helmy Riskian	Planologi UNPAK		
129	Dita Destiana	Planologi UNPAK	085663882613	
130	Miftahul Jannah J.R	Planologi UNPAK	085774225570	
131	Siti Puji Dewi Lestary	Planologi UNPAK	08211844151	
132	Anik Damayanti	Planologi UNPAK	089660627396	
133	Murni Yakin Telaumbanua	Planologi UNPAK	081264010389	
134	M. Azura Saputra P.Y	Planologi UNPAK		

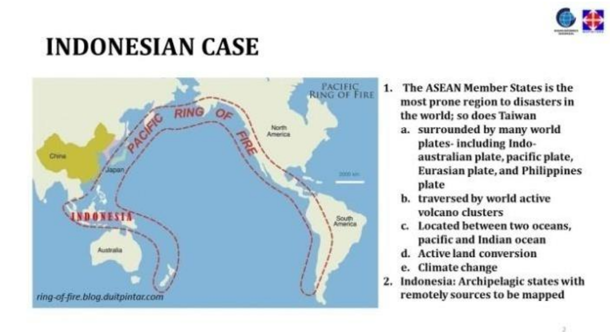
NO	NAMA	UNIVERSITAS / INSTANSI	No Telepon/ HP	PARAF
135	Cika Trinovela N.A	Planologi UNPAK	08561822214	
136	Billy Aditya	Planologi UNPAK	08561822274	
137	Nadia Ayuningsih	Planologi UNPAK	087770070992	
138	Dwi Setiowati	Planologi UNPAK		
139	Dafrizal Rasaria	Planologi UNPAK	085718837716	
140	Didin Sajidin	Planologi UNPAK	08229888 1672	
141	Try Anugrah Exal	Planologi UNPAK		
142	Stenly R. Fatie	Planologi UNPAK	081280842077	
143	Danu Harisanto	Planologi UNPAK	0812 83640008	
144	Dewi Triana	Sipil UNPAK		
145	Siti Mahpudoh	Sipil UNPAK		
146	Kiki Firda Jayanegara	Sipil UNPAK		
147	Maman Abdul Rahman	Sipil UNPAK		
148	R. Surya Hidayat	Sipil UNPAK	-	
149	Acun Aliando	Sipil UNPAK	0896 3300 1948	
150	Dani Andriana	Sipil UNPAK		
151	Abdurrahman	Sipil UNPAK		
152	Arfha Juliansyah	Sipil UNPAK		
153	Telaga Bijak Lestari	Sipil UNPAK	089639548276	
154	Adnan Santoso	Sipil UNPAK		
155	Tedi Dilian	Sipil UNPAK		
156	Bhakti Nugroho Santoso	Sipil UNPAK		
157	Atika Afrianti A	Sipil UNPAK	085215849341	
158	Lamberty W. Fatie	Sipil UNPAK	08321884 3748	
159	Febiola Fitriani Cikita	Sipil UNPAK		
160	Fransisca Claudia N	Sipil UNPAK	081283869117	
	ADMAM SANTOSO	universitas Ibn Khaldun	083811622334	
	EGI SYAHRIL M. PURNAMA, ST		082110908524	
	Saepul Amri		085659576960	
	Fathiani .N. A	PWL-IPB	081280110606	
	Sydhrial	cl.	081320139019	
	M. Girardhi F	Sipil -UNPAK.		
	Helmi Seka Ritma.	T. Geologi Unpak	085228804646	
	Heny Purwanti. ST, MT	SIPIL unpak	087870702693	
	Tri Ayu Ning Suharman			✓
	Intan Purma			✓
	Dr. Budi Susetyo, MSc	UIKA Bogor	081510447076	
	M. Rofiq	PWK Bgr		✓
	Febri cahyadi	Geodesi FT		-

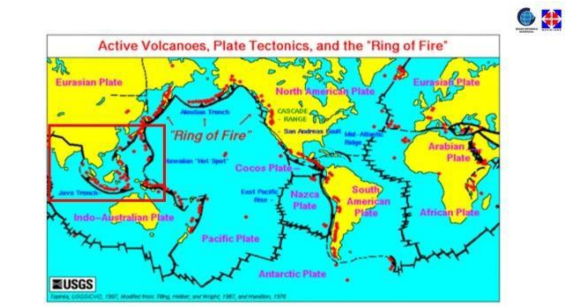
DAFTAR HADIR TAMU UNDANGAN PESERTA SEMINAR NASIONAL
PENGINDRAAN JAUH UNTUK KEBENCANAAN

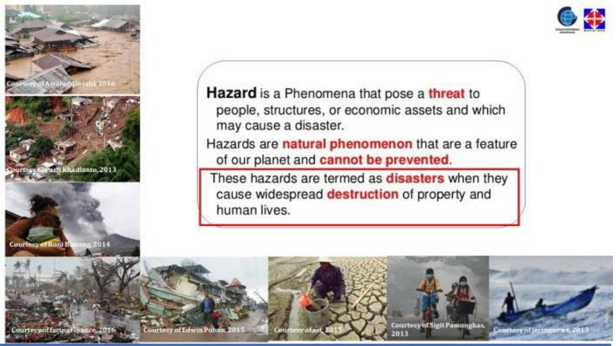
NO	NAMA	UNIVERSITAS / INSTANSI	No Telepon/ HP	PARAF
1	Iksal Yanuarsyah	UIKA - Bogor	081380968113	
2	INDARTI R.D	PWK Unpak	08128177588З	
3	Yatin Suwarno	MAPIN	0812900769о	
4	Reiza MA	— " —	081299209409	
5	UMAR MANSYUR	[illegible]	081210002960	
6	Dessy Apriyanti	Geodesi Unpak	085640737043	
7	CHERU NURACHMAN	PWK	0812871447000	
8	Wikanti Asriningrum	LAPAN	081286588213	
9	Nanin Anggraini	LAPAN	085692269583	
10	CECEP ANDRITELA F	MAPIN	087878111716	
11	Muhammad Agus Kamudi	FT. Unpak.	08128148126	
12	Teti Syahrulyati	FT. Unpak		
13	MOHAMMAD SYAIFUL	FT UNPAK	—	
14	Singgih Irianto	FT-Unpak	0812 8145340	
15	Heny Purwanti ST. MT	FT- UNPAK		
16	Agustini Badiah Machdi, ST.MT	FT- UNPAK	08111104312	
17				
18				
19				
20				
21				
22				
23				
24				
25				
26				
27				
28				
29				
30				
31				
33				
34				
35				
36				
37				
38				
39				
40				
41				
42				
43				
44				
45				

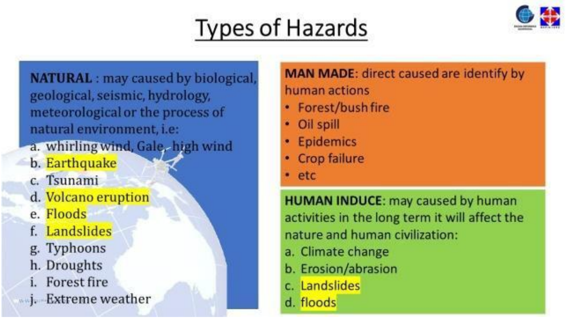
APPENDIX Dissemination of the Project in ASEAN TAIWAN Forum on Land Surveying And Geomatics: Datum, Cadaster and Hazard.

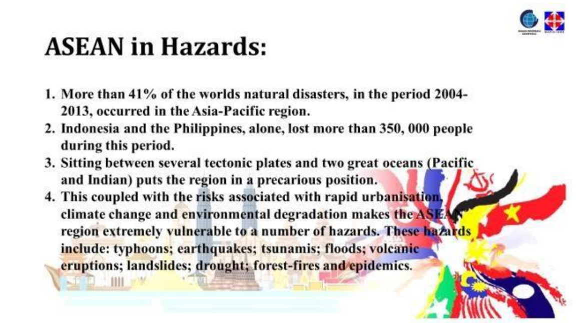
Date: July,10th 2017
Venue: Howard International House, Taipei City – Taiwan
Funding: NCTU (National Ciao Tung University)

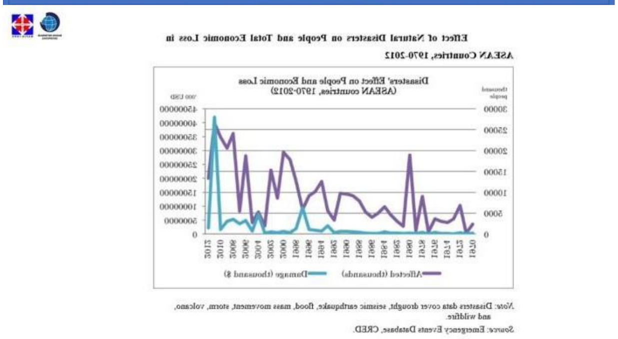












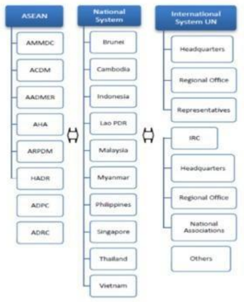
HUMANITARIAN ASPECT

DEPEND ON GEOSPATIAL INFORMATION

DISASTER ORGANISATION In ASEAN

RAPID INFORMATION

RAPID MAPPING



Source: Lai, *et al.*, 2009.

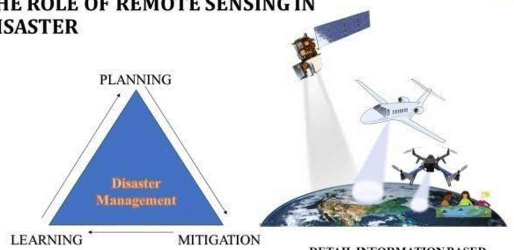
Rapid Mapping

Rapid Mapping is a procedure to provide geospatial data by combining immediate data collection and processing with a certain contextual aspect in order to give a quick overview about certain earth phenomena. This term is frequently used in the context of disaster preparedness and emergency response e.g. for presenting earth observation data (Percival, 2012).

Why Rapid Mapping?

- The utilization of geospatial data using topographic maps as a basic reference is mandatory to provide accurate quick emergency response in so called rapid mapping activities
- the utilization of space borne based data including Very High Resolution Satellite (VHRS) imagery data will be initiated immediately in the period of major disasters around the globe.
- as the vulnerable countries around a disaster prone area needs geospatial data as a framework for supporting disaster preparedness and quick emergency response.
- During disaster and emergency situations, geospatial data can provide important information for decision support system
- Development of higher resolution sensors on flexible platforms – aero plane, UAVs, gliders or other small piloted aero plane - for geospatial data acquisition offers potentials because of its flexibility and practicability combined with low cost implementations

THE ROLE OF REMOTE SENSING IN DISASTER



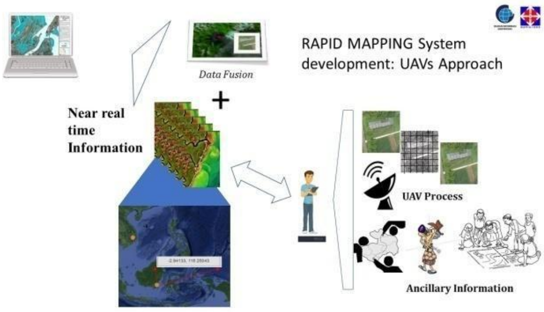
(EG2234, 2014)

DETAIL INFORMATION BASED ON Participatory approach

Why participatory?

a. Skill and knowledge possessed by persons of a region, adapted and adjusted to address changing conditions and circumstances
b. Spatial knowledge located on map is not separated from wisdom (moral, ethical and cultural value)
c. Basic technique: **ground mapping, mental mapping, sketch mapping, transect mapping and scale mapping**
d. Advance technique: 3 D moldel, GPS and UAV based mapping, GIS, multimedia and internet mapping
e. Accessibility: digital and web based mapping, GIS, broader wifi, cheaper technology, UAVs
f. powerful tool, visualize and represent spatial knowledge, collaborative collection of data, strengthen public participation In governance, community engagement

RAPID MAPPING System development: UAVs Approach



Why UAVs

1. Provide autonomous or remote operation capabilities to sensor
2. Provide capabilities for data entry
3. Examine data compression if required to telemetry large data volumes
4. Capabilities for data handling on ground
5. Information distribution to community
6. **No risk to human**
7. **Mapped inaccessible area**

Source: Google

Why UAVs

Disaster stages	Disaster type and impact on technology					
	Type A: Geophysical or Hydrological		Type B: Climatological, hydrological, or human-induced		Type C: Meteorological	
	WSN not operational UAVs fully operational (WSN, UAVs, User)		WSN partially operational UAVs fully operational (WSN, Relay UAVs, UAVs, User)		WSN fully operational UAVs partially operational (WSN, UAVs, User)	
Preparedness: Monitoring and surveying Early Warning Systems (EWS)	WSN with limited UAV roles					
	Different types of wireless sensors are statically deployed in the potential disaster area An occurrence of a disaster triggers WSN reporting with optional UAV support					
Assessment: Situational awareness Damage assessment Structural inspection	No WSN	UAV	Partial WSN	UAV	WSN	No UAV
	Damage assessment and structural inspection is being done by UAVs		Damage assessment is done by UAVs, backed up by the operational part of WSN		WSN information fusion for situational awareness	
Response and recovery: Rescue missions Supply delivery Communication system	No WSN	UAV	Partial WSN	UAV	WSN	No UAV
	Sensing, monitoring, SAR, and communication restoration is being done by UAVs		UAVs restore the broken connectivity and SAR operations using a combination of WSN and UAVs		Integration of aerial surveys and ground observations for efficient decision support systems	

source: Erdelj e al, 2017

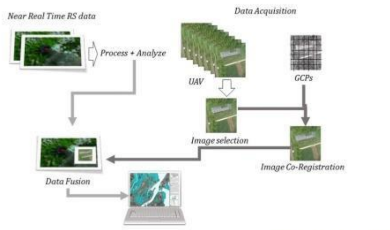
disaster prediction, assessment, and response. assist in establishing vital wireless communication links between the survivors and nearest available cellular infrastructure.

WSN = wireless sensor network. Uav: unman aerial vehicle

BASIC CONCEPTS: development of RapMet

- ✓ **Near-real-time monitoring**: the procedure of near-real-time monitoring with satellites as well as Unmanned Airborne Vehicles. (UAV) will be set up and demonstrated.
- ✓ **Data co-registration**: in disasters, various images as well as maps come from different sources. The co-registration of multiple images is a key technology for information integration. In this project, a system to co-register multiple images in near-real-time will be developed.
- ✓ **Data fusion and change detection**: one of the advantages of RS is to collect information with multiple sensors. Various methods for fusing optical with active microwave (SAR) sensor data for information extraction and change detection will be developed.
- ✓ **Decision Support System (DSS) based on WebGIS technologies**: the collected and integrated information has to be easily accessible and visible by decision makers and end-users in near-real-time and worldwide.

Development of Rapid Mapping System (RapMet)



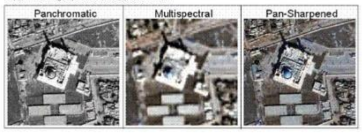
geospatial data can provide important information for **decision support system**

IMAGE FUSION

- The fusion methods in the remote sensing community deal with the pansharpening technique.
- This fusion combines the image from the Panchromatic sensor (PAN) of one satellite (high spatial resolution data) with the multispectral (MS) data (lower resolution in several spectral bands) to generate images with a high resolution and several spectral bands.
- **Pan Sharpening** is an image fusion method in which high-resolution panchromatic data is fused with lower resolution multispectral data to create a colorized high-resolution dataset.
- The resulting product should only serve as an aid to literal analysis and not for further spectral analysis

IMAGE FUSION PROCESS

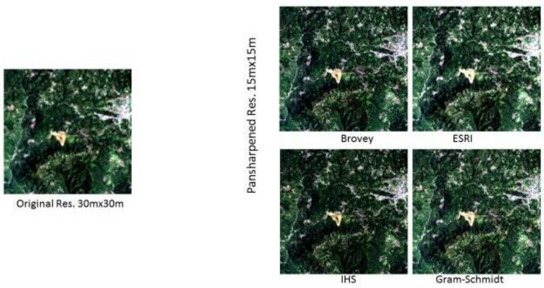
Source: http://www.harrisgeospatial.com/docs/SpearTools.html



PANCHROMATIC + MULTISPECTRAL = PAN-SHARPENED

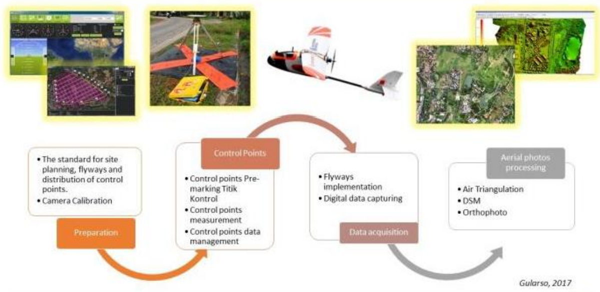
- Gram-Schmidt
- Principal Components
- Hue, Saturation, Value (HSV)
- Color Normalized (Brovey)

Different OUTPUT for DIFFERENT METHODS



PHOTOGRAMMETRY TECHNOLOGY WITH UAVS

SCOPE OF STANDARD



Gularso, 2017

Base Map Accuracy

Based on SNI 8202:201

Geometry Accuracy :

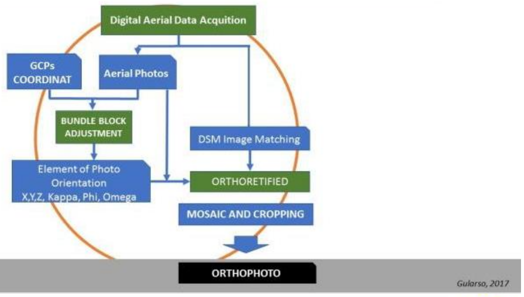
Accuracy	Class 1	Class II	Class III
Horizontal	0.2 mm x scale number	0.3 mm x scale number	0.5 mm x scale number
Vertikal	0.5 x contour interval	1.5 x class 1 accuracy	2.5 x class 1 accuracy

Scale 1:5.000

Accuracy	Class I	Class II	Class III
Horizontal	1 m	1.5 m	2.5 m
Vertikal	1 m	1.5 m	2.5 m

Gularso, 2017

Flow Chart of UAVs Data Acquisition



Gularso, 2017

EQUIPMENTS STANDARD

1. Having holes for vertical shoot.
2. Equipped with Auto Pilot
3. Equipped with Auto Level

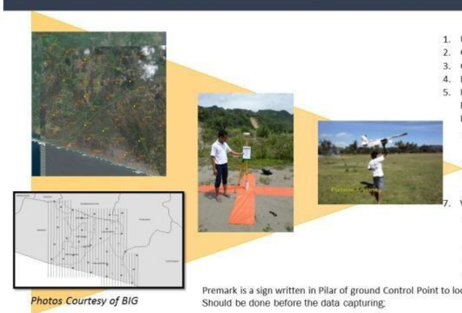
1. Type receiver Geodetic;
2. Dual Frequency;
3. The software has the ability to process GNSS data to generate coordinates with the level of accuracy required.

Capability:
1. Analytic Camera callibration
2. Automatic photo processing
3. Accepting GNSS and IMU
4. Automatic Digital surface model (DSM) and digital terrain model (DTM) process
5. mosaic orthophoto Process

1. Non metric digital aerial camera
2. Small Format Camera20.7×13.8 mm (APS-C)
3. Radiometric RGB (Red, Green, Blue)
4. fixed lens

Gularso, 2017

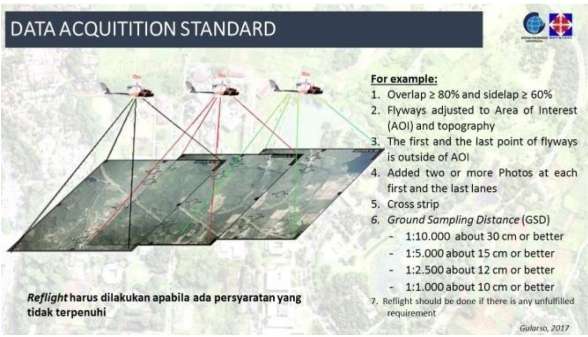
CONTROL POINTS MEASUREMENT STANDAR

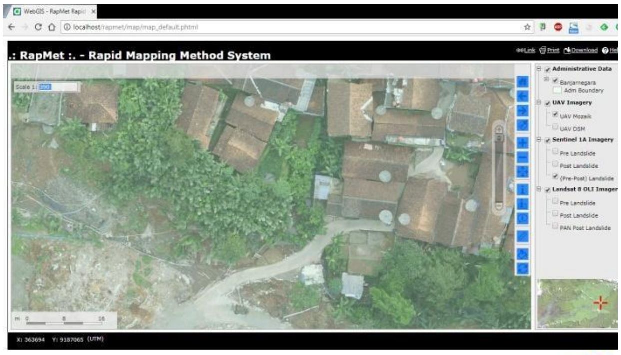


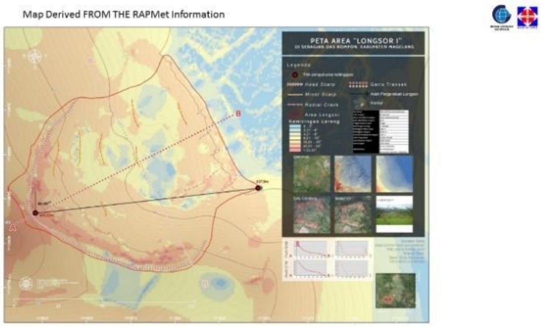
Photos Courtesy of BIG

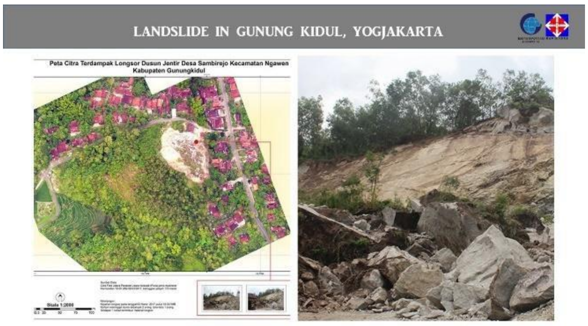
1. Using GPS Geodetic dual frequency
2. GPS observation 60 menit or more
3. GPS interval 15 second
4. Base line > 20 km;
5. Primary GPS control points tied to BIG horizontal control network Horizontal accuracy:
   - 1:10.000 about 20 cm or better
   - 1:5.000 about 10 cm or better
   - 1:2.500 about 7 cm or better
   - 1:1.000 about 5 cm or better
7. Vertikal accuracy.
   - 1:10.000 about 30 cm or better
   - 1:5.000 about 15 cm or better
   - 1:2.500 about 12 cm or better
   - 1:1.000 about 10 cm or better

Premark is a sign written in Pilar of ground Control Point to look from aerial photos. Should be done before the data capturing.









CONCLUSION

1. Rapid Mapping is needed for hazard management, especially for humanitarian aspects
2. Participatory mapping is needed for detail information of prone area
3. Uavs is one of the tool than can assist the detail information of prone area
4. A system that link the participatory group to the main disasters office is needed for further emergency respond and post disaster management

References

Erdeli, Milan, Enrico Natalizio, Kaushi R.Chowdhury and Ian F. Akyldiz. 2017. Help From The Sky: Leveraging UAVs For Disaster Management. IEEE Pervasive Computing, Volume: 16, Issue: 1; pp 24-32

Gularso, Herjuno, 2017. RSNI PEMETAAN RBI SKALA BESAR BAGIAN 2: AKUISISI DATA FOTO UDARA DIGITAL MENGGUNAKAN PESAWAT . NIR-AWAKDipresentasikan pada FGD RSNI Hotel Santika. Bogor