FINAL REPORT for APN PROJECT

Project Reference Number: CBA2011-16NSY-Li

Demonstration Study on Advancing Global Change Research Approaches Based on Inter-Agency Collaboration and Data Infrastructure of GENESI and GeoBrain

The following collaborators worked on this project:

Guoqing Li, CEODE(CAS),China ,gqli@ceode.ac.cn

Chuang Liu,CGCRC(CAS),lchuang@igsnrr.ac.cn

Qinghua Ye,ITP(CAS),yeqh@itpcas.ac.cn

Jibo Xie,CEODE(CAS),jbxie@ceode.ac.cn

Pakorn Apaphant,GISTDA,pakorn@gistda.or.th

Liping Di,George Mason University,ldi@gmu.edu

Paul F. Uhlir, J.D.,US National Academy of Sciences,puhlir@nas.edu

Togtoh Chuluun, National University of Mongolia,chuluun@nrel.colostate.edu

Tomoko Doko and Wenbo Chen,Keio University.{dokochan, chenwb }@sfc.keio.ac.jp

Mohd Nordin Hasan, director of ICSU-AP office,nordin.hasan@icsu-asia-pacific.org

Luigi Fusco and Roberto Cossu,ESA/ESRIN,{Luigi.Fusco, Roberto.Cossu }@esa.intl

Demonstration Study on Advancing Global Change Research Approaches Based on Inter-Agency Collaboration and Data Infrastructure of GENESI and GeoBrain

Project Reference Number: CBA2011-16NSY-Li
Final Report submitted to APN

PAGE LEFT INTENTIONALLY BLANK

OVERVIEW OF PROJECT WORK AND OUTCOMES

Minimum 2pages (maximum 4 pages)

Non-technical summary

< 200 words >

The potential cost reductions for data searching, accessing and processing in GC research can greatly benefit scientists. New GCR approaches have been made possible from the evolution of data infrastructure under the GEOSS. Following the last APN project in 2009 on the introduction of such new data facilities and processes in Mongolia, this new proposal will focus on live demonstrations and study approaches from the rebuilding of some typical GCR study cases (lake-ice changing in China Tibet, flood monitoring in Southern East Asia). This proposal is focusing on live demonstrations and study approaches using some typical global change research study cases, such as long-term lake ice-cover changes in the Tibetan area and fast flood tracking in Southern East Asia. The inter-agency collaboration data infrastructures of GENESI-DEC (Ground European Network for Earth Science Interoperations - Digital Earth Communities) and GeoBrain will be used to provide scientific data for the mode change research.

Objectives

The main objectives of the project were:

1. To build a communication platform among leading international research communities (CEOS/WGISS, GEOSS, UN GAID and ICSU-CODATA), and Asia-Pacific area entities through technical transfers.
2. To make improvements in technology applications for training workshops and the work of technical support teams.
3. To help SE Asian scientists enhance and improve flood tracking through the application of new data service systems.
4. To help regional scientists to enhance and improve Tibetan Plateau research on lake ice changes through the application of new data service systems.
5. To generate guidance for how the world's next generation of data infrastructures can improve regional global change studies.
6. To develop prototypes of regional global change research data portals for harvesting and providing access to the necessary observational data from very large operational data facilities around the world.

Amount received and number years supported

The Grant awarded to this project was:

US$ 40,000 for 1 Year 2011/2012

Activity undertaken

The proposed technology transfer project will cover several activities. One training workshop for the two case studies' teams and other scientists, decision-makers and young professional students, was held in Beijing in August of 2011. Team members from both GENESI-DEC and GeoBrain system will give lectures and hands-on help to local experts and help them to modify their research methods, including access to internationally available data and computing resources. Another meeting was held in Thailand in January of 2012, which makes a clear the implementation plan to improve the two study cases. Technical support teams from GENESI-DEC and GeoBrain will be invited to visit the Tibet in May of 2012 to assist in the implementation of new data management methods.

Results

(1) An operational project website, linked to the existing APN project website, was developed to provide user information and collected best practices.
(2) Web portals with automatic information generating capabilities, can serve as a work platform for the study of long term changes of Tibetan area lake ice-cover and fast flood monitoring in Southern East Asia.
(3) One scoping meeting and one training workshop was held.
(4) Two technical visits and live-demonstration work between the technical support teams and GCR scientists are held in Thailand and Tibet, China.
(5) Best-practices from GEOSS and APN to apply new SDI (spatial data infrastructure) are demonstrated.

Relevance to the APN Goals, Science Agenda and to Policy Processes

The proposed project will be tightly related to several APN goals in the third strategic plan (2010-2015). It will support the regional cooperation in global change research on lakes ice-cover of the Tibetan area in China (relevant to APN goal 1). The activities involved are expected to improve the scientific and technical capabilities of the nations and transfer global change knowledge and technology (relevant to APN goal 3). It also will strengthen the cooperation with other global change related networks like GENESI-DEC in EU, and GeoBrain in USA and ICSU (relevant to APN goal 3). The study areas and modes can meet the APN's scientific agenda in land use and sustainable development (relevant to APN Scientific Research Agenda 1,3). Two case studies are quite relevant to APN's sustainable development plan because these areas are quite sensitive to global climate change. This project can enhance scientific capacity in China and SE Asian countries to improve decision-making related to global change (relevant to APN Scientific Capacity Development Agenda). And the experience on global change research in this project can be extended to other developing countries in the Asia Pacific area. Malaysia, Mongolia and Thailand have been invited to join in this proposal, and they can play important role to share the experiences from this activity.

Self evaluation

The objectives of project have been fully reached, with a lot of communication and collaboration between inter-agency cooperation. Longer term cooperation with joint international societies has been built for the capability promotion in AP area based on collaboration and infrastructure. Demonstration studies on Global Change Research in AP area were implemented in Southeast Asia flood and Tibet ice-lake changing cases. The collaboration techniques and data infrastructure can be used to promote the APN capability on GC research.

Potential for further work

Through the implementation of the project, many experience and inter-agency collaboration techniques on Global Change has been obtained, which is potential for the future work. The international live demonstration experience for young scientists and experts obtained from this project can be used in other developing countries. The collaboration technique from GC experts on how to use inter-agency data infrastructure can be used in the related GC research project in the future. Also the experiences of GC live demonstrations can server GC experts as live demos and useful showcases in the future research.

Publications (please write the complete citation)

1. Jibo Xie, Guoqing Li, Wenyang Yu, Jian Wang,Lixia Guo, Xiaoyu Wang,, Environmental factor detection using multi-source earth observation data based on distributed computing: Water body monitoring as use case, Journal of Applied Remote Sensing (under review)

References

1. APN website, http://www.apn.gr.jp/newAPN/indexe.htm
2. CEOS/WGISS website, http://www.ceos.org
3. GEOSS website,http://www.earthobservations.org/
3. UN GAID website, http://www.un-gaid.org/
4. CODATA website, http://www.codata.org/

Acknowledgments

Acknowledgment to collaborating institutions, resource persons, etc., should be placed here

Bedsides the support on both finance and scientific scope from APN, our work also has been supported in form of human resources and meeting facilities by the Centre for Earth Observation and Digital Earth (CEODE), CAS and Thailand Geo-Informatics and Space Technology Development Agency (Public Organization),ESA, GeoBrain, CEOS,ISDE,ICSU-CODATA,GEO, UNGAID e-SDDC.

TECHNICAL REPORT

Minimum 15-20 pages (excluding appendix)

Preface

The potential cost reductions for data searching, accessing and processing in GC research can greatly benefit scientists. New GCR approaches have been made possible from the evolution of data infrastructure under the GEOSS. Following the last APN project in 2009 on the introduction of such new data facilities and processes in Mongolia, this project will focus on live demonstrations and study approaches from the rebuilding of some typical GCR study cases (lake-ice changing in China Tibet, flood monitoring in Southern East Asia). The new research modes generated from this study can be extended to other GCR scenarios in the Asia-Pacific region.

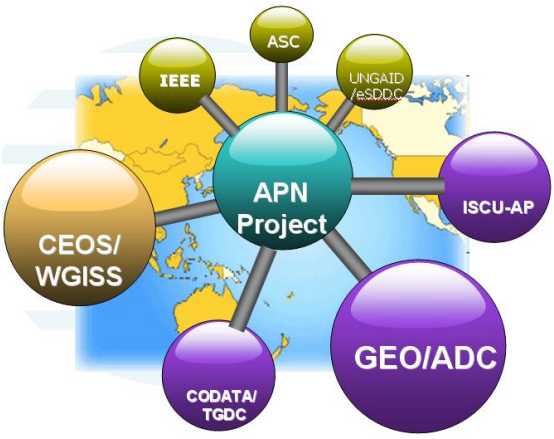
Table of Contents

1.0 Introduction

This section should include background information, scientific significance, objectives, and other relevant information leading to the development and justification of the current project.

The potential cost reductions for data searching, accessing and processing in GC research can greatly benefit scientists. New GCR approaches have been made possible from the evolution of data infrastructure under the GEOSS. Following the last APN project in 2009 on the introduction of such new data facilities and processes in Mongolia, this new proposal will focus on live demonstrations and study approaches from the rebuilding of some typical GCR study cases (lake-ice changing in China Tibet, flood monitoring in Southern East Asia).

This proposal is focusing on live demonstrations and study approaches using some typical global change research study cases, such as long-term lake ice-cover changes in the Tibetan area and fast flood tracking in Southern East Asia. The inter-agency collaboration data infrastructures of GENESI-DEC (Ground European Network for Earth Science Interoperations - Digital Earth Communities) and GeoBrain will be used to provide scientific data for the mode change research.



The proposed technology transfer project will cover several activities. One training workshop for the two case studies' teams and other scientists, decision-makers and young professional students, was held in Beijing in August of 2011. Team members from both GENESI-DEC and GeoBrain system will give lectures and hands-on help to local experts and help them to modify their research methods, including access to internationally available data and computing resources. Another meeting was held in Thailand in January of 2012, which makes a clear the implementation plan to improve the two study cases. Technical support teams from GENESI-DEC and GeoBrain will be invited to visit two institutes（in China Tibet and Thailand） in May of 2012 to assist in the implementation of new data management methods.

The work plan and timeline were identified as following:

(1) June of 2011, notification of approval

(2) August of 2011, kick-off meeting and training workshop in Beijing

(3) January of 2012, implementation plan meeting and technical visit and live-demonstration work in Thailand

(4) May of 2012, technical visit and live-demonstration work in Institute of Tibetan Plateau, CAS, China
(5) June of 2012, final report to APN and to participating support entities (GENESI and GeoBrain)

2.0 Methodology

Explain how you carried out the project, which should follow logically from the aims. Depending on the kind of data, this section may contain subsections on experimental details, materials used, data collection/sources, analytical or statistical techniques employed, study field areas, etc. Provide sufficient detail for a technical/scientific audience to appreciate what you did. Include flowcharts, maps or tables if they aid clarity or brevity.

(1) Organize a professional working team under the supervision of WGISS. Form an Earth Observation data-sharing platform for global change research based on next-generation spatial-data-infrastructure, supported by ESA and NASA.
(2) Select two typical global change research topics and the representative study areas. The preliminary suggestions are flood monitoring in Southern East Asian area and Lake ice-cover study in Tibet of China
(3) The project members will share their data and techniques through technical transfers.
(4) Propagate the project information and research results to the public through meetings, workshops, training sessions, and publications.
(5) Establish a preliminary framework for global change research that will be technically supported by GEOSS.
(6) The demonstration system of this global change study will be freely accessible to the public.

3.0 Results & Discussion

Explain your actual findings, including figures, illustrations and tables. Make comments on the results as they are presented, but save broader generalizations and conclusions for later. Discuss the importance of your findings, in light of the overall study aims. Synthesize what has (and has not) been learned about the problem and identify existing gaps. Recommend areas for further work.

(1) How to collaborate between inter-agency data infrastructures for Global Change Research

EO technologies are regarded as the main data-providing method, and many efforts to use such technologies in GCR have been adopted by many international EO communities. This trend is also apparent and used in some professional GC programmes and some methodologies have been created to use EO capabilities. Space agencies around the world have developed the next generation technologies to help the end-user easily accessing the processed EO data as the resources of GC items.

Based on this project, a professional working team is organized under the supervision of WGISS. Form an Earth Observation data-sharing platform for global change research based on next-generation spatial-data-infrastructure, supported by ESA and NASA. GENESI-DEC and GeoBrain system attended this team. GENESI-DEC is a European FP7-funded project and one task listed is to help the Asian scientist community to use the GENESI platform in their normal research. (2)GeoBrain is a NOAA and NSF funded project run by George Mason University, which also needs to demonstrate applications in the Asia-Pacific area. For this project, they gave lectures and hands-on help to local experts and help them to modify their research methods, including access to internationally available data and computing resources.

Ground European Network for Earth Science Interoperations (GENESI) digital Earth Communities will establish open data and services access, allowing European and worldwide Digital Earth Communities to seamlessly access, produce and share data, information, products and knowledge. This will create a multi-dimensional, multi-temporal, and multi-layer information facility of huge value in addressing global challenges such as biodiversity, climate change, pollution and economic development. GENESI-DEC evolves and enlarges the platform developed by the predecessor GENESI-DR project by federating to and interoperating with existing infrastructures.

- Discovery of heterogeneous distributed data (in situ, satellite, airborne);
- Controlled access to data in the respect of the data policies;
- Access to high performance processing services;
- Strong scalability for federation of new Digital Repositories;
- Adoption of data curation and preservation solutions.

GENESI-DEC will initially focus on the following Digital Earth Communities, with dedicated use cases:

- The Seafloor and Ocean Observation Community
- The Global Atmosphere Observation Community using Aircraft
- The Global Change Earth Observation Community
- The territorial development and spatial planning Community
- The Black Sea catchment observation community

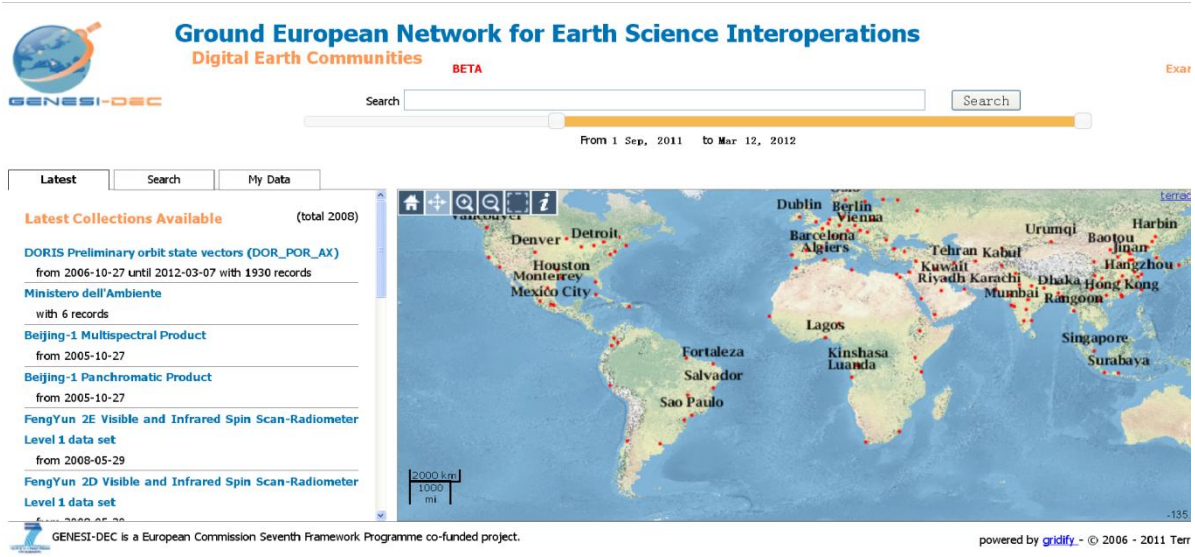


Fig. 1 GENESI DEC Web Portal

GeoBrain is a comprehensive cyberinfrastructure uniquely providing advanced, specialized, value-added, and well-integrated Earth observation data, information and knowledge services to worldwide users. Large amounts of data from major federal Earth observation agencies, including NASA, NOAA, and USGS, are online accessible and analyzable through GeoBrain's online user portals, essentially providing an unprecedented, data-intensive, and CI-enabled online learning and research environment with adequate data services, geoprocessing and analysis functions, and modeling software tools to anyone who has a laptop/desktop computer connected to the Internet. GeoBrain online environment is an on-demand, human-centered and specialized computational cyber-laboratory, which allows scientists, educators, and students to conduct dynamic geospatial discovery, teaching and learning tasks from any Internet connected computer at any time.

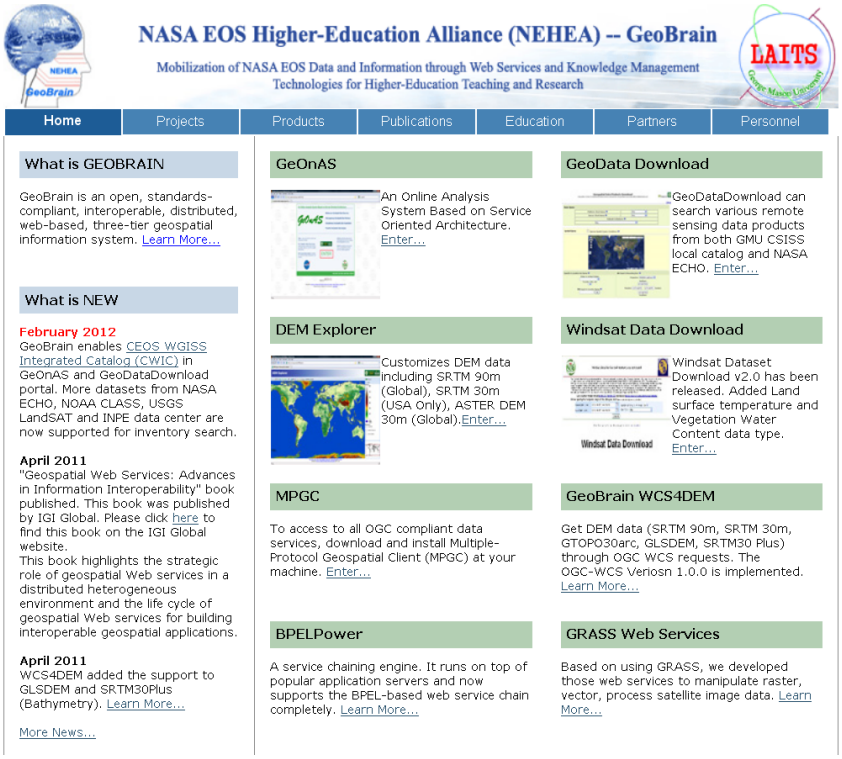


Fig.2 GeoBrain web Portal

(2) How to select study cases and feed the demand of Global Change Research

Two study areas are selected and will be used for live demonstration on Global change research: Lake Ice monitoring case study on the Tibetan Plateau and Flood case in South East Asia: Chao Phraya River. Inter-agency collaboration and data infrastructures of GENESI and GeoBrain will be used to help researchers to get data for the study cases.

a. Lake Ice monitoring case study on the Tibetan Plateau:

1) Geographic areas:

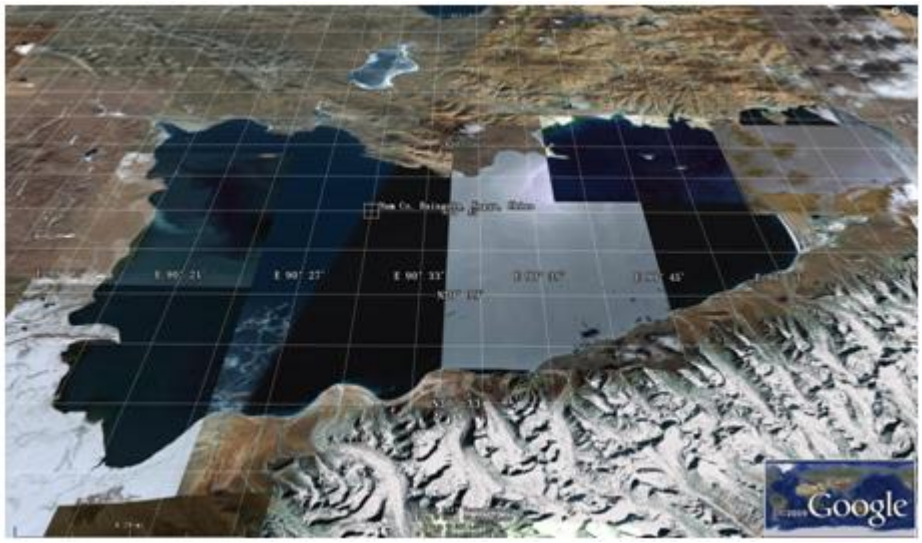


Fig. 3. Nam Co (N30° 30′ ~30° 56′ , E90° 16′ ~91° 03′) (map from Google Earth)

Nam Co (N30° 30′ ~30° 56′ , E90° 16′ ~91° 03′ , Fig.1), about 1982km2(Lu et al., 2005), 4718m above sea level (a.s.l.), located in the middle of Tibetan Plateau. It is about 78.6 km length from East to West, 24.9 km width from South to North, and has a maximum depth of 122 m(Li et al., 2008). The Nyainqentanglha range locates to south of the lake, with an average altitude of

6000 m. Snow, ice, permafrost melt and precipitation are the main sources of water to Nam Co. Annual precipitation is less than 300 mm. According to the meteorological records at Nam Co station since 2005, the region is affected by the India monsoon.

2). Data in need,

- Daily surface temperature, which includes lake surface temperature, land surface temperature.
- Atmospheric transmittance
- Fine Optical images every day, e.g., MODIS.

3). Temporal interval of interest, every day.

b. Flood case in South East Asia: Chao Phraya River

1) Geographic area:

Fig. 4 Chao Phraya River

The Chao Phrayais a major river in Thailand. It runs through Bangkok, the capital city, and then empties into the Gulf of Thailand. The rough co-ordinates of the river are 13 N, 100 E. This area has a wet monsoon climate, with over 1,400 mm of rainfall per year.

2) Data Needed:

- DEM
- Land use/Land cover
- Soil type
- Soil moisture
- Climate data (if available)
- Optical/microwave observation

3) Temporal interval of interest:

Daily for flood season and pre- and post-flood (August –December)

(3)How to coordinate inter-agency data and processing resources for near real-time response for hazard

Major flood happed during the monsoon season 2011 in Thailand. Flood event is monitored by earth observation data from CEODE, China and ESA. Optical and ASAR are used together to monitoring the flood area. The flood algorithms and automatic collaborative computing platform is used to monitor the flood inundation area for the flood mitigation of Thailand. The monitoring data are sent to Thailand agency for flood mitigation.

In the current processing procedure, Professional RS and GIS software are used for EO data processing that only skilled users know how to use. After EO data acquisition, several steps are needed to extract the water body boundary from satellite imageries. These steps are usually done by manual. The workflow technique can be used to chain the steps into automatically processing task. An integrated portal provides users with a unified data query, workflow start, workflow status report, and result visualization. And one important issue of the platform is that moving the computing near the data. The automatic workflow engine is deployed near the archive data sources or the location where data access is available. In the platform, CEODE has the MODIS receiving device, so the MODIS algorithms and workflow is hosted in the CEODE servers. Ukraine space institute has the ASAR data access to the ESA (European Space Agency) archive by international cooperation project, so the ASAR algorithms and automatic workflow is deployed there. And by developing the integrated portal, users can select spatial and temporal extent of the datasets and send the processing request to both sides.

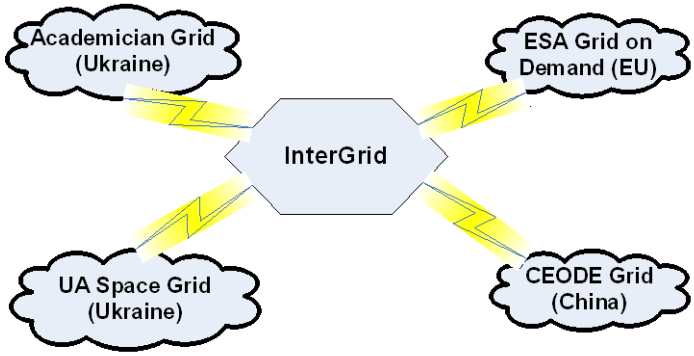


Fig. 5 WAG for flood monitoring

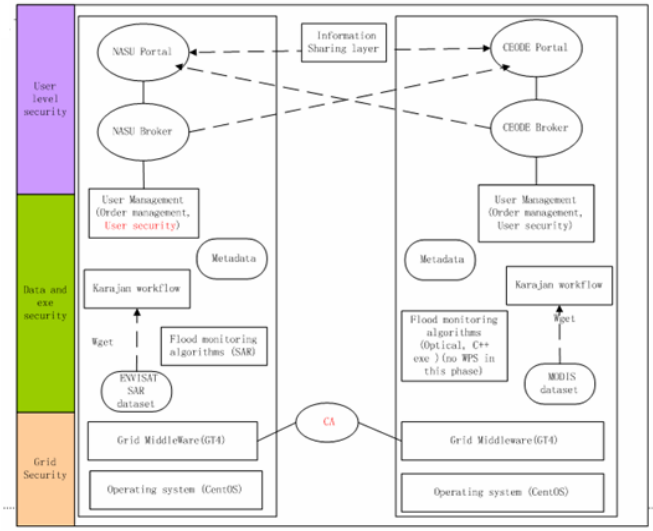


Fig. 6 Architecture of WAG

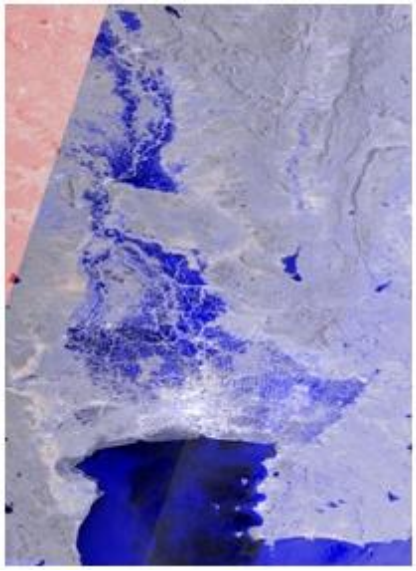


Fig. 7 2011 Thailand Flood monitoring result from ASAR data by ESA

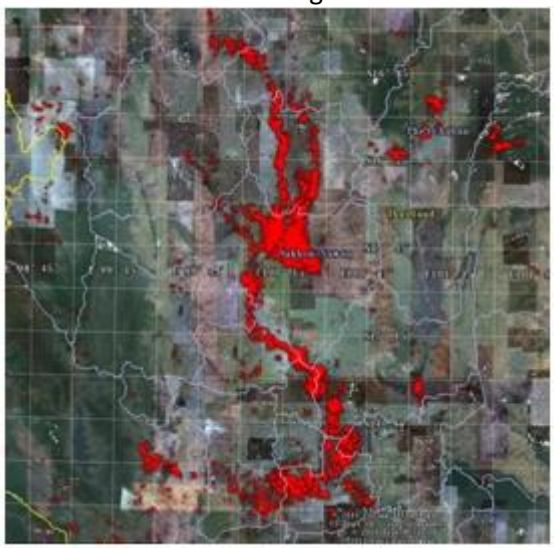


Fig. 8 2011 Thailand flood monitoring from MODIS data by CEODE (Visualized in KML)

(4)How to introduce the inter-agency data infrastructure technologies to GCR scientists

To introduce the inter-agency data infrastructure technologies to GCR scientists, several meetings, workshops and filed works were held in this project.

a). Beijing project kick off

The kick off and scope discussion were done via telecom and email communication among data infrastructure holders, scientists, and young researches. Prof. Guoqing Li introduced the approved proposal. The preventatives of GeoBrain and GENESI exchange the ideas on how to support GCR based on the EO data infrastructure. Also the work plan of the project was discussed.

Time: 4:00~6:30 PM (GMT +1: 9:00~11:30 AM), Nov 2, 2011

Attendees: Guoqing Li, Pakon, Chuang Liu, Qinghua Ye, Luigi and Roberto,Liping Di's team, Jibo Xie

- Project kick off & Work plan. The project is started and the work plan is discussed.
- Use Cases discussion. Two use cases: Long-term lake ice monitoring of Nam co in the Tibetan

Plateau and Flood case of Chao Phraya River in South East Asia are determined to be the live demonstration and best practices for the project.

- Project Output discussion. The output of the project is discussion.

b) Meeting on the case study of Lake Ice monitoring on Tibetan plateau

Topic: Discussion on the case study of Lake ice monitoring on Tibetan plateau
Time: 2012-1-7 9:00~1130 AM
Location: Room A305, CEODE, CAS, Beijing
Attendees: Prof. Chuang Liu, Prof. Qinghua Ye and two students, Prof. Guoqing Li, Dr. Jibo Xie

Summary:
Firstly, Prof. Li introduced the APN funded project and Dr. Xie gave an introduction of the case study. Then the lake ice monitoring case is discussed in detail. The Lake named NAM Co and Selincuo are selected as study area for lake ice monitoring. Also the glacier lake on the plateau will be used as study area. The required EO data by case study and what data Geobrain and GENESI can provide are focused to discuss. And the output of the case study is determined to give a report. At last the Tibet workshop is discussed. The time schedule, attendees and arrangement are discussed and agreement was reached.

c). Scope meeting of APN funded project in Bangkok

The meetings were held in Bangkok, Thailand January of 2012 (delayed because of 2011 flood in Thailand), which made a clear the implementation plan to improve the flood case study implementation of new data management methods. The visits and meetings include four parts, Technique visit and meeting in National Disaster Warning Center (NDWC), Meeting on Flood monitoring and early warning in Thailand (GISTDA), Technique visit and meeting at Ground Receiving Station (Lad Krabang) of GISTDA and Technique visit at GISTDA THEOS Control & Receiving Station (Siracha) during 11~13 January, 2012. The summary of the visits and meetings is as following.

- Technique visit and meeting in National Disaster Warning Center (NDWC)

Topic: Cooperation on disaster warning and monitoring
Firstly, Captain Song introduced the disaster warning system and facilities in the NDWC. The center is responsible for monitoring incoming data, evaluating the intensity and severity of the natural occurrence, and risk assessment. The centre is staffed 24 hours by multi-disciplinary experts including natural sciences and crisis management. The Tsunami Early Warning System is running, warning of an impending tsunami or other natural disaster can be issued in high risk areas in near real time. A warning for high risk areas around Thailand will be issued when the high probability of a tsunami incident occurring. The center can also receive data transmitted from the Pacific Tsunami Warning Centre in Hawaii, the US Geological Survey and the Japan Meteorological Agency and other sources round-the-clock. Warnings for high risk areas will also be transmitted simultaneously via the nationwide radio network, as well as by SMS to cellular phone users. To alert tourists and residents of coming dangers, sirens in the towers will be sounded. Public warnings in the form of audio-recordings in various international languages will be broadcasted from warning towers installed along the beachfront.

Fig 9 the National Disaster Warning Center of Thailand

The flood early warning and monitoring was also the interested topics for the center. The watching tower system can also be used for flash flood watching especially for the mountain area. But the capacity for near real time flood forecasting and monitoring is still need to be enhanced. Especially, in 2011, Thailand was hit by a severe flood and they feel that new methodologies. For the Earth observation based flood monitoring, this APN project provided help using the GENESI and CEODE satellite and data infantries.

Fig. 10 Meeting in NDWC

Prof. Guoqing Li introduced the APN funded project. The NDWC showed great interests in this project. And Attendees had a discussion on the potential cooperation on flood in Southeast Asia. All agreed on the multi agency collaboration and earth observation can help the flood disaster mitigation. After the meeting, the attendees visited the early warning system and facilities NDW

- Meeting on Flood monitoring and early warning in Thailand (GISTDA)

Firstly, Prof. Guoqing Li introduced the APN funded project. The project focus on live demonstrations and study approaches from the rebuilding of some typical GCR study cases (lake-ice changing in China Tibet, flood monitoring in Southern East Asia). It is focusing on live demonstrations and study approaches using some typical global change research study cases, such as long-term lake ice-cover changes in the Tibetan area and fast flood tracking in Southern East Asia. The inter-agency collaboration data infrastructures of GENESI-DEC (Ground European Network for Earth Science Interoperations - Digital Earth Communities) and GeoBrain will be used to provide scientific data for the mode change research. Prof. Li also introduce the progress of the project and the flood event to be the study case in the southern east Asia. All attendees showed the interests and agreed on the study area.

Fig 11 Geo-Informatics and Space Technology Development Agency (GISTDA)

Fig 12 Meeting on flood case study in GISTDA

Then Dr. Jibo Xie gave a presentation on the flood case study in Southeast Asia. The geographic area is selected. And the Chao Phrayais a major river in Thailand can server as the study area. It runs through Bangkok, the capital city, and then empties into the Gulf of Thailand. The rough coordinates of the river are 13 N, 100 E. This area has a wet monsoon climate, with over 1,400 mm of rainfall per year. The objective of the study is flood monitoring based on Earth Observation, inter-agency collaboration and data infrastructures (GeoBrain & GENESI) for the study, and a collaborative portal as output. The input data and temporal interval of interest were analyzed. The data infrastructure of GeoBrain and GENESI-DEC were introduced. GeoBrain is a comprehensive cyber-infrastructure

The attendees had a discussion on how to cooperation on flood study under the framework of APN funded project. All agreed the study area and topic of the case study and promised to attend it actively. The output of the cooperation is supposed to be 1) Jointly publishing 2) Implementation: draw attention of decision makers. But some software development for the inner state research work can not be done.

Fig. 13 Discussion on cooperation

Also GISTDA showed the cooperation intention with APN for writing new proposal on history disaster management among multi agencies in the Asia-Pacific area because their flood early forecasting system should be based on historical disaster data.

- Technique visit and meeting at GISTDA Ground Receiving Station (Lad Krabang & **Siracha**)

Topic: Technique visit and meeting at Ground Receiving Station

Firstly a short meeting was held in the station. The GISTDA researchers and engineers introduced the ground receiving facilities and related systems. Also they presented their experiments on Earth Observation data receiving and processing during the 2011 Thailand flood period. Prof. Li introduced the APN funded project. The flood monitoring case study in Southeast Asia was emphasis addressed. And also the automatic flood monitoring system based on Earth Observation was introduced. Both sides showed the cooperation interests under the framework of APN. Further cooperation on the flood monitoring and Global change research based on Earth Observation was determined to be continued.

Fig. 14 Meeting in Ground Receiving Station of GISTDA

Then the attendees visit the ground receiving facilities. Thailand Ground Receiving Station was set up and became satellite data distributor to users worldwide. The available satellite data are such as LANDSAT, SPOT, NOAA, ERS and MOS et al. The Landsat, RADARSAT, MODIS, Allos, THEOS receiving and processing systems were introduced by GISTDA staffs.

Fig. 15 Facility visiting and discussion

The Thailand Earth Observation Satellite (THEOS) is the first operational earth observation satellite of Thailand. The THEOS program was developed by GISTDA, EADS Astrium, the prime contractor, initiated work on the satellite in 2004. THEOS was successfully launched by Dnepr launcher from Yasny, Russian Federation. GISTDA is developing a worldwide network of distributors to allow the users to use and access to all GISTDA products.

Fig. 16 GISTDA THEOS Control & Receiving Station

Firstly, the staffs of THEOS Control & Receiving Station gave a welcome meeting and introduced the condition of the THEOS facilities. Prof. Li introduced the status of the APN funded project. All the attendees showed the interest of multi-agencies international cooperation on Earth Observation and Global Change related disaster mitigation under the framework of the APN.

Fig. 17 Meeting with the researchers and engineers

After the meeting, a technique visit of THEO's facilities was taken by all attendees with the guide of GISTDA researchers. During the visit, technique discuss were on satellite control and data receiving and processing especially during the flood disaster period.

Fig. 18 Visiting the THEOS satellite control and receiving facility

d). APN - CODATA Joint Workshop on Open Access to Global Change Data and Information in Asia-Pacific Region (23-31 May 2012, Xining/Qinghai – Lhasa/Tibet, China)

Attendees: CHEN Zhongxin,FENG Qiang,HOU Yuansheng,Huang Zonghu,LI Guoqing,LI Jianhui,Liping Di,LIU Chuang,Mohd Nordin Hasan,Paul F. Uhlir,SHI Peili,Tomoko Doko,Wenbo Chen,XIE Jibo,XU Zheping,YE Qinghua(GOU Peng),ZHANG Xianzhou,ZHOU Xiang

Summary:

Tibet plateau is called the third pole and is one of the most sensitive regions influenced by Global Change. And also one of the case studies (Nam Co long-term lake ice monitoring) in this APN funded project is located here. This joint workshop is jointly organized by APN project team and CODATA team. The main topic of this workshop is on Open Access to Global Change Data and Information in Asia-Pacific Region. The attendees are from the research institutes related with Global Change study. The workshop was partly held in Xining, Qinghai, where the attendee can get along with the high land problem. The main part of the workshop was held in Lahasa, Tibet. The workshop was cosponsored by APN, CODATA/ICSU, CN-CODATA, IRDR/ ICSU, CEODE (CAS), IRSA(CAS), ITPCAS(CAS), and IGSNRR(CAS). The workshop totally included 6 sessions, including 4 meeting session and 2 field work session. The topics of the meeting sessions are "Joint Action on Open Access to Asia-Pacific Global Change Data and Information" and "Data Resources and Technical Support for Case Studies of Global Change Studies". The filed works included "Visiting Qinghai Lake Observing Station and Field Work of Qinghai Lake and Around Area" and "Field Work on Namco Lake and Around Area". And 19 attendees participated in the meetings and field work.

- Session 1: Visiting Qinghai Lake Observing Station and Field Work of Qinghai Lake and Around Area

May 25, 2012 Friday

Location: Qinghai Lake, Qinghai

During this session, the attendees of the workshop visited and have field work in the Qinghai lake national nature reserve. It is Located in Gangcha, Haiyan and Gonghe County, Qinghai Province. Qinghai Lake nature preservation zone is the largest salt-water lake in China, whose area approximates to 4952 km^2. It's famous for a special kind of "Huang"fish and millions of migrant birds, also the well-known resort and natural reserve. Due to its ecologic dominance, it was authorized as the national nature reserve in 1997. In the lake area, there are 6 species of animals and 164 species of birds. Qinghai Lake is a saline lake situated in the province of Qinghai, and is the largest lake in China. It is 3,205 m (10,515 feet) above sea level in a depression of the Tibetan Plateau. Twenty-three rivers and streams empty into Qinghai Lake, most of them seasonal. Five permanent streams provide 80% of total influx. The lake is located at the crossroads of several bird migration routes across Asia. Many species use Qinghai as an intermediate stop during migration.

Prof. Guoqing Li chaired this field work session. The fellows of the Qinghai lake national reserve introduced the facilities and surveillance system of Qinghai Lake. Prof. Li introduced the APN funded Global Change projects and the reserve showed their interests in further cooperation with APN and related projects. Scientists from AP area discussed the further inter-agency collaboration on the Global Change in this area.

Fig. 19 Field work in Qinghai Lake

Fig. 20 the Bird Island

Fig. 21 visit of the surveillance system of Qinghai Lake

- Session 2~3: Joint Action on Open Access to Asia-Pacific Global Change Data and Information
  May 26, 2012 Saturday
  Location: Xining, Qinghai

There are two sessions in this meeting. Prof. Chuang Liu chaired the first session. Prof. Nordin Hasan gave the presentation of "Data demand for Global Change and Disaster Reduction in Asia-pacific region". And Prof. Guoqing Li introcuded the idea of Long-term disaster and global change data management for AP region. The data sharing police is discussed in the presentation of Roadmap for scientific data sharing on GeoSciences by Paul Uhlir. Prof. Liping Di presented the " GeoBrain Cyberinfrastructure to Support Global Change Research". GeoBrain is one of the EO data infrastructure used in this project.

The second session was chaird by Prof. Xiang Zhou. Firstly, Prof. Liping Di introduced the GEOSS Component and Service Registry. And Dr. Tomoko Doko introduced the Japanese global change research and its data support facilities.

During the discussion, attendees discussed the further operation on the Global Change research. The new idea on how to share historical disaster data was proposed and considered to be the next APN proposal was dicussed.

Fig. 22 Section 2

Fig. 23 Section 3

Fig. 24 Discussion

- Session 4: Field Work on Namco Lake and Around Area

May 29, 2012, Tuesday

Location: Lhasa, Tibet

Dr. Wenbo Chen chaired this field work session. The fellows of the station introduced the condition of the station. Attendees visited the facilities of the station. Then a field work around lake was held. This field work was hosted by Nam Co Comprehensive Observation and Research Station (CAS). Nam Co(N30°30′ ~30°56′ , E90°16′ ~91°03′), about 1982km^2, 4718m above sea level (a.s.l.), located in the middle of Tibetan Plateau. About 78.6 km length from East to West, 24.9 km width from South to North, and has a maximum depth of 122 m. The Nyainqentanglha range locates to south of the lake, with an average altitude of 6000 m. Snow, ice, permafrost melt and precipitation are the main sources of water to Nam Co. Annual precipitation is less than 300 mm. According to the meteorological records at Nam Co station since 2005, the region is affected by the India monsoon.

The Long-term lake ice monitoring by Earth Observation is one of the case studies in this project. And inter-agency collaboration and data infrastructures (GeoBrain & GENESI) for the study. The attendees discussed the case studies in Nam co under this project. Inter-agency data infrastructure such as GeoBrain and CEODE has provided EO data support for this best practices.

Fig. 25 Nam Co Comprehension Observation and Research Station (CAS)

Fig. 26 Sensors and observation device at the station

Fig. 27 Nam Co Lake

- Session 5~6: Data Resources and Technical Support for Case Studies of Global Change Studies
  May 30, 2012, Wednesday
  Location: Lhasa Ecosystem Station of Chinese Academy of Sciences

Before the session, attendees visited the Institute of Tibet Plateau Research (Lhasa), one cosponsor of the APN project in the morning. The crews of the institute introduced the facilities and projects. And the institute has very good international cooperation experiences. Especially, the international project named "Third Pole Environment (TPE)" is one of the most important Global Change research project in the world. And they showed great interest to have further cooperation with APN project.

Fig. 28 Visit of Institute of Tibet Plateau Research (Lhasa)

The two sessions of the Tibet meeting was held in the Lhasa Ecosystem Station of Chinese Academy of Sciences. The topic of the meeting is Data Resources and Technical Support for Case Studies of Global Change Studies.

The first session was chaired by Tomoko Doko. Dr. GOU Peng in present of YE Qinghua introduced the Method and algorithms for long-term lake ice monitoring. Dr. Wenbo Chen presented her study of Monitoring Glacier lakes Changes in Himalaya Area during the Last Thirty Five Years. Dr. ZHOU Xiang gave the presentation titled Space Science and Technology for Environmental Impact Studies. And Dr. Jibo Xie introduced how to support the case study in the APN project.

The second session was chaired by Prof. Guoqing Li. Prof. Chuang Liu introduced the digital Geomuseum for Global Change Studies. Dr. XU Zheping presented the digital Biomuseum for Global Change Studies. And Dr. FENG Qiang gave the presentation of the Progress of IRDR in China.

During the discussion, the attendees talked about the further research and cooperation and considered the Tibet plateau as one of the most important area for live demonstration and best practices in the future proposal.

Fig.29 First session

Fig. 30 Second session

Fig. 31 Group Photo after the workshop

(5) An operational website that provides user information and collected best practices

An operation website was built and maintained in this project. The website includes project information, resources, Handbook, best practices and events. Under the agreement from attended agencies and members, some materials (Handbook, technique report, etc) will be published together with the collection from the workshop. These proceedings will be openly available online and freely distributed in print form to the attendees of the workshop and training school, and to the main global change research entities in this area.

Fig. 32 Project collaboration website (http://apn.ceode.ac.cn/)

(6) Dissemination of the APN funded Project

a) IRDR 2012

Conference: Disaster Risk: Integrating Science and Practice

Workshop: Long Term Disaster Data Archiving and Sharing for Scientific Research, chaired by Prof. Guoqing Li and Prof. Carol Song from Purdue University.

Time: 8:30~10:15 am Nov. 2, 2011

Location: Beijing International Convention Center (BICC)

Attendees: Nordin Hasan, Paul Paul Uhlir, Chuang Liu, Carol Song, Robert Chen, Guoqing Li, Jibo Xie

	Topic	Speaker	Notice
8:30-8:35	Welcome address	Guoqing Li	CEODE/CAS
8:35-8:55	Data Management in Natural Disaster Mitigation	Guoqing Li	CEODE/CAS
8:55-9:15	WGISS report on space based disaster data activities	Pakorn Apaphant	GISTDA, CEOS/WGISS
Break			
9:25-9:45	Disaster data democracy for developing countries	Chuang Liu	IGSNRR/CAS
9:45-10:05	Cyber technical opportunity for Global disaster management	Carol Song	Purdue Univ
10:05-10:15	Discussion		
Session close			

In Guoqing's report, APN and its initiative projects on inter-agency data service technology has been heavily mentioned.

b) Purdue Visit and APN cooperation

During his three months visiting in Purdue University at summer of 2011, Guoqing Li had taken three meetings with professors in this university for the potential cooperation under APN framework. (Prof. Larry Biehl and Prof. Carol Song from RCAC of Purdue, Prof. Okan Ersoy and Prof. Melba M. Crawford from Department of Engineering for Research.) APN and its scope had been learned by them. Both sides agreed that APN can provide good platform to improve the collaboration among AP scientists. At this moment, two teams from Purdue have worked with their international partners on the development of APN proposal, such as Infrastructure for Early Detection, Monitoring, and Decision Making in Environmental Disasters by Okan, and social network based improving to information discovery for global change community by Carol.

c) Wigiss 34 meeting

As representative of Guoqing Li and APN team, Dr. Lizhe Wang attend the WGISS 34th meeting held in Tokyo at middle of May. He introduced the processing of this APN project and the cooperation between CEODE, ESA and NASA on this project.

d) CODATA 2012,Taibei meeting

Although CODATA 2012 conference will be held at 28~31 Oct of 2012, three months after the close of this APN project, we still want to make dissemination and contributions from this project, without financial cost. A session on "data-intensive computing in earth science and geocomputing" has been submitted to the conference and APN has been listed in it.

4.0 Conclusions

Restate the study aims or key questions and summarize your findings

Based on Inter-agency collaboration and data infrastructures of GENISI and GeoBrain, the project can assist developing countries in building capacity to access a larger sharing of multilateral and global research and development programmes. The developing countries can simply select the baseline technology and tools to

build their information systems and infrastructures for the global change research. The study areas and modes can meet the APN's scientific agenda in land use and sustainable development. This project can enhance scientific capacity in China and SE Asian countries to improve decision-making related to global change. The demonstration study in developing countries can help to assist them in enhancing their capacity in their capacity of environment. Global change research and applications should also be a process to improve the communication and collaboration between different countries and agencies. This project can help the decision-makers in both developed and developing countries to know that it is important to consider inter-agency collaboration while they make their own country's plans. They also can realize that such architecture is based on effective data protection strategies**.**

5.0 Future Directions

Through the implementation of the project, many experience and inter-agency collaboration techniques for GCR has been obtained, which is potential for the future work. The international experience for young scientists and experts obtained from this project can be used in other developing countries. The collaboration technique from GC experts on how to use EO technology can be used in the related GC research project in the future. Also the experience of how to build data exchange platform and live demonstrations can server GC experts as live demo and useful showcase.

References

Follow a standard format when citing your references

1. APN website, http://www.apn.gr.jp/newAPN/indexe.htm
2. CEOS/WGISS website, http://www.ceos.org
3. GEOSS website, http://www.earthobservations.org
3. UN GAID website, http://www.un-gaid.org/
4. CODATA website, http://www.codata.org/
5. GPOD website, http://gpod.eo.esa.int/
6. ICSU website http://www.icsu.org/

Appendix

Conferences/Symposia/Workshops
Agenda/Programme (including title, date and venue)
Participants list (comprising contact details of each participant, including organisation, address, phone number, fax number, and email address)

1. Beijing project kick off

The kick off and scope discussion were done via email communication among data infrastructure holders, scientists, and young researches.

- Project kick off & Work plan. the project is started and the work plan is discussed.
- Use Cases discussion. Two use cases: the Tibetan Plateau and Flood case in South East Asia, Chao Phraya River
- Project Output discussion. output of the project is discussion.

2. Meeting on the case study of Lake ice monitoring on Tibetan plateau

Topic: Discussion on the case study of Lake ice monitoring on Tibetan plateau
Time: 2012-1-7 9:00~1130 AM
Location: Room A305, CEODE, CAS, Beijing
Attendees: Prof. Chuang Liu, Prof. Qinghua Ye and two students, Prof. Guoqing Li, Dr. Jibo Xie

Summary:
Firstly, Prof. Li introduced the APN funded project and Dr. Xie gave an introduction of the case study. Then the lake ice monitoring case is discussed in detail. The Lake named NAM Co and Selincuo are selected as study area for lake ice monitoring. Also the glacier lake on the plateau will be used as study area. The required EO data by case study and what data Geobrain and GENESI can provide are focused to discuss. And the output of the case study is determined to give a report. At last the Tibet workshop is discussed. The time schedule, attendees and arrangement are discussed and agreement was reached.

1) Study area 1: Nam Co and Selincuo:

- Qinghua Ye will provide the lat-lon range of the lakes
- 10 years' MODIS L1B (available ,this project will provide newly data) and AVHRR data(this project will try to provide) are used for monitoring
- MERIS data and ASAR data since 2005 are needed for cross-validation (This project will provide)
- Landsat TM is used to do higher resolution analysis for some day.
- This project will provide the frequency and data list of the long-term monitoring of the ESA data.

2)Study area2: Glacier lake

- Wenbo Chen will provide the lat-lon range of Glacier Lake
- Long term EO data is already available (about 30 years)
- This project will provide MERIS, Aster, ASAR data for cross-validation

3)Output:

- This project will provide Earth observation data of the study areas to researchers.

- And researchers will give the report based on the EO data.

3. Scope meeting of APN funded project in Bangkok

The meetings were held in Bangkok, Thailand January of 2012 (delayed because of 2011 flood in Thailand), which made a clear the implementation plan to improve the flood case study implementation of new data management methods. The visits and meetings include four parts, Technique visit and meeting in National Disaster Warning Center (NDWC), Meeting on Flood monitoring and early warning in Thailand (GISTDA), Technique visit and meeting at Ground Receiving Station (Lad Krabang) of GISTDA and Technique visit at GISTDA THEOS Control & Receiving Station (Siracha) during 11~13 January, 2012. The summary of the visits and meetings is as following.

(1)Technique visit and meeting in National Disaster Warning Center (NDWC)
Topic: Cooperation on disaster warning and monitoring

Attendees: Guoqing Li (CEODE,China), Jibo Xie(CEODE,China), Preesan RAKWATIN(GISTDA,Thailand), Captain Son (NDWC,Thailand), and other staffs in NDWC

Time: 2012-1-11 9:00~11:30 am

Location: National Disaster Warning Center, Thailand

Summary:
Firstly, Captain Song introduced the disaster warning system and facilities in the NDWC. The center is responsible for monitoring incoming data, evaluating the intensity and severity of the natural occurrence, and risk assessment. The centre is staffed 24 hours by multi-disciplinary experts including natural sciences and crisis management. The Tsunami Early Warning System is running, warning of an impending tsunami or other natural disaster can be issued in high risk areas in near real time. A warning for high risk areas around Thailand will be issued when the high probability of a tsunami incident occurring. The center can also receive data transmitted from the Pacific Tsunami Warning Centre in Hawaii, the US Geological Survey and the Japan Meteorological Agency and other sources round-the-clock. Warnings for high risk areas will also be transmitted simultaneously via the nationwide radio network, as well as by SMS to cellular phone users. To alert tourists and residents of coming dangers, sirens (As shown in Fig. 1.3) in the towers will be sounded. Public warnings in the form of audio-recordings in various international languages will be broadcasted from warning towers installed along the beachfront.

(2). Meeting on Flood monitoring and early warning in Thailand (GISTDA)
Topic: Flood monitoring and early warning in Thailand
Attendees: Guoqing Li (CEODE,China), Jibo Xie(CEODE,China), Preesan RAKWATIN(GISTDA,Thailand), Pakorn Apaphant (GISTDA,Thailand),Kampanat Deeudomchan (GISTDA,Thailand), other GISTDA staffs
Time: 2012-1-11 1:30~5:00 pm
Location: GISTDA, Bangkok

(3) Technique visit and meeting at GISTDA Ground Receiving Station (Lad Krabang)
Topic: Technique visit and meeting at Ground Receiving Station

Attendees: Guoqing Li (CEODE,China), Jibo Xie(CEODE,China), GISTDA staffs

Time: 2012-1-12 9:00~11:30 pm

Location: Ground Receiving Station (Lad Krabang) of GISTDA

(4). Technique visit at GISTDA THEOS Control & Receiving Station (Siracha)
Topic: Flood monitoring and early warning in Thailand

Attendees: Guoqing Li (CEODE,China), Jibo Xie (CEODE,China), GISTDA staffs

Time: 2012-1-12 1:30~4:00 pm

Location: GISTDA THEOS Control & Receiving Station (Siracha)

4. APN - CODATA Joint Workshop on Open Access to Global Change Data and Information in Asia-Pacific Region

24-31 May 2012, Xining/Qinghai – Lhasa/Tibet, China

Joint Organizers

- APN Project Team on "Demonstration study on advancing global change research approaches based on inter-agency collaboration and data infrastructures of GENESI and GeoBrain" (CBA2011-16NSY-Li)
- CODATA Task Group on Preservation of and Access to Scientific and Technical Data in Developing Countries (CODATA-PASTD)

Co-Sponsors:

- Asia-Pacific Network for Global Change Studies (APN)
- Committee on Data for Science and Technology, International Council for Sciences (CODATA/ICSU)
- China National Committee for CODATA (CN-CODATA)
- China National Committee for Integrated Research on Disaster Risk(IRDR/ ICSU)
- Center for Earth Observation and Digital Earth (CEODE), CAS
- Institute of Remote Sensing Applications(IRSA), CAS
- Institute of Tibetan Plateau Research (ITPCAS), CAS
- Institute of Geographic Sciences and Natural Resources Research(IGSNRR), CAS

Co-Chairs:

- Prof. LI Guoqing, PI of APN Project, Director of Data Management of Center of , Chinese Academy of Sciences
- Prof. GU Xingfa, Co-Chair of CODATA-PASTD, Director of department of science and technology in Institute of Remote Sensing Applications, Chinese Academy of Sciences

Secretary： Miss. CUI Honghong, CEODE, Chinese Academy of Sciences

Agenda

May 23,2012 Wednesday Time: 11:30 - 14:00 **Location: Duwang Beijing Dark Restaurant, No. 201, Huizhongbeili, Chaoyang District, Beijing, Tel: (010) 64919660035**		
Welcome and Opening Ceremony Lunch Chair: Prof. GU Xingfa, Co-Chair of CODATA-PASTD, Director of Institute of Remote Sensing Applications, Chinese Academy of Sciences		
May 24, 2012 Thursday Registration **Location: Xining, Qinghai**		
Registration: 1:00pm -6:30pm Location: Qinghai Huachen Hotel, Xining, Qinghai Province, China No. 45. BaYi Middle Rd, Xining, Qinghai, China		
18:30 – 20:30	Welcome Dinner	CODATA-PASTD
May 25, 2012 Friday **Location: Qinghai Lake, Qinghai**		
Session 1: Visiting Qinghai Lake Observing Station and Field Work of Qinghai Lake and Around Area		**Chair: LI Guoqing**
13:00	Welcome and Introduction to the Qinghai Lake Observing Station	HOU Yuansheng Qinghai Lake Observing Station, IGSNRR, CAS
18:30 – 20:30	Welcome Dinner	China National Committee for CODATA
May 26, 2012 Saturday **Location: Xining, Qinghai**		
Session 2: Joint Action on Open Access to Asia-Pacific Global Change Data and Information (1)		**Chair: LI Jianhui**
9:00	Introduction to speakers	
9:05 – 9:30	Data demand for Global Change and Disaster Reduction in Asia-pacific region	Nordin Hasan
9:30 – 9:55	Long-term disaster and global change data management for AP region	LI Guoqing
9:55 – 10:20	Roadmap for scientific data sharing on GeoSciences	Paul Uhlir

10:20 – 10: 45	Geobrain support for the case study	Liping Di
10: 45 – 11: 05 Break		
Session 3: Joint Action on Open Access to Asia-Pacific Global Change Data and Information (2)		**Chair: Zhou Xiang**
11:05 – 11:30	Introduction to Geobrain system and other GEOSS activities	DI Liping
11: 30 – 11: 55	Facilities of Chinese Academy of Sciences for Open Access to Global Change Data	LI Jianhui
11: 55 – 12:20	Japanese global change research and its data support facilities	Tomoko Doko
12: 20 – 12: 50	Discussions	
12: 50 – 13: 30	Lunch	
13: 30 – 15: 30	Preparing for traveling to Lhasa by Train at 17:00	
May 27, 2012,Sunday **Location: in the train to Lhasa**		
Arrive Lhasa by Train at 18:00, and check in Hotel in Lhasa Lawei international hotel No.38 Dejibei Road , Lhasa, Tibet, China		
May 28, 2012, Monday **Location: Lhasa, Tibet**		
Health adoptive activities to Tibet		
May 29, 2012, Tuesday **Location: Lhasa, Tibet**		
Session 4: Field Work on Namco Lake and Around Area		**Chair: Gou Peng**
11:00-12:30	Hosted Lunch	ITPCAS
13:00-16:00	Welcome and Introduction of Nam co Monitoring and Research Station for Multisphere Intera Observing Station	HUANG Zonghu, Manager of Namco Lake Observing Station
20:00-22:00	Dinner	Hosted by APN project
May 30, 2012, Wednesday **Location: Lhasa Ecosystem Station of Chinese Academy of Sciences**		

12:00-13:00 hosted lunch by Lhasa Ecosystem Station		
Session 5: Data Resources and Technical Support for Case Studies of Global Change Studies (1)		**Chair: Tomoko Doko**
13:00 – 13:25	Method and algorithms for long-term lake ice monitoring	YE Qinghua (GOU Peng)
13:25 – 13:50	Monitoring Glacier lakes Changes in Himalaya Area During the Last Thirty Five Years	Wenbo Chen
13:50 – 14:15	Space Science and Technology for Environmental Impact Studies	ZHOU Xiang
14:15 – 14: 40	How to support the case study in the APN project	XIE Jibo
14: 40 – 14: 05	Break	
Session 6: Data Resources and Technical Support for Case Studies of Global Change Studies (2)		**Chair: Guoqing Li**
15:05 – 15:30	Digital Geomuseum for Global Change Studies	LIU Chuang
15: 30 – 15: 55	Digital Biomuseum for Global Change Studies	XU Zheping
15: 55 – 16: 20	ESA GENESI support for the case study	Roberto Cusso (tele-con)
16:20–16:45	Progress of IRDR in China	FENG Qiang
16: 45 – 16: 10	Welcome and Introduction to the Lhasa Ecosystem Station of CAS	ZHANG Xianzhou
17: 10 -17: 30	Guide for Visiting the Lhasa Ecosystem Station of CAS	SHI Peili
Session 7: Summary and Closing Ceremony		**Chair: LIU Chuang**
17: 30 -18: 00	Summary and Closing Ceremony	
May 31, 2012, Thursday **Location: Lhasa, Tibet**		
Participates Leave Lhasa for home		

Contact person: Prof. Guoqing Li Tel: +86 15601050120

Dr. Jibo Xie Tel: +86 13911550481

Participant List

Name	Affiliation	Title	Contact Informaion
CHEN Zhongxin	IARRP, CAAS	Professor	ifvsxn@gmail.com
CUI Honghong	CEODE,CAS	Secretary	hhcui@ceode.ac.cn
FENG Qiang	CEODE,CAS IRDR,China	Associate Professor	qfeng@ceode.ac.cn
HOU Yuansheng	Qinghai Lake Observing Station, IGSNRR,CAS	Chief	+86 13086261803
Huang Zonghu	Manager of Nam co Monitoring and Research Station for Multisphere Intera Observing Station,	Engineer	zhhuang@itpcas.ac.cn
LI Guoqing	CEODE,CAS	Professor	gqli@ceode.ac.cn
LI Jianhui	CNIC,CAS	Professor	lijh@cnic.cn
Liping Di	George Mason University, USA	Professor	ldi@gmu.edu
LIU Chuang	IGSNRR,CAS	Professor	lchuang@igsnrr.ac.cn
Mohd Nordin Hasan	Director of the ICSU Regional Office for Asia and the Pacific	Professor	nordin.hasan@icsu-asia-pacific.org
Paul F. Uhlir	Director of the Board on Research Data and Information and of the U.S. National Committee for CODATA	Professor	PUhlir@nas.edu
SHI Peili	Deputy Director of Lhasa Ecosystem Station of CAS	Professor	
Tomoko Doko	Keio University, Japan	Dr.	dokochan@sfc.keio.ac.jp
Wenbo Chen	Keio University, Japan	Dr.	chenwb@sfc.keio.ac.jp
XIE Jibo	CEODE,CAS	Associate Professor	jbxie@ceode.ac.cn
XU Zheping	Institute of botany, CAS	Engineer	xuzp@ibcas.ac.cn
YE Qinghua (GOU Peng)	ITPCAS	Dr.	yeqh@itpcas.ac.cn
ZHANG Xianzhou	Director of Lhasa Ecosystem Station of CAS	Professor	
ZHOU Xiang	IRSA,CAS	Director of S &T	zhouxiang@irsa.ac.cn

Funding sources outside the APN

A list of agencies, institutions, organisations (governmental, inter-governmental and/or non-governmental), that provided any in-kind support and co-funding for the project and the amount(s) awarded. If possible, please provide an estimate amount.

Besides the above contributed joint funding, there are many physical projects funded by other communities that would cooperate with this proposed project. (1)GENESI-DEC is a European FP7-funded project and one task listed is to help the Asian scientist community to use the GENESI platform in their normal research. (2)GeoBrain is a NOAA and NSF funded project run by George Mason University, which also needs to demonstrate applications in the Asia-Pacific area. (3)The team members of the Tibetan lake ice research in China have collected some data to do their work, and Dr. Ye visited the GENESI-DEC team with Prof. Li to ask for collaboration on her research. (4)Prof. Li is leading many Chinese projects and international projects closely related to this proposal. The harvesting portal in CEODE can connect to the main resources around the world and provide locally services with more than 200TB global change observation data. In this proposal, these related projects mentioned above will provide additional synergy and many times the financial support than the US$ 40,000 (requested from APN) for the implementation of the proposed project.

List of Young Scientists

Include brief detail (full name, involvement in the project activity) and contact detail (name of institution/country and email address) of your scientists involved in the project. Also include short message from the young scientists about his/her involvement in the project and how it helps develop/build his capacity and the knowledge he gained.

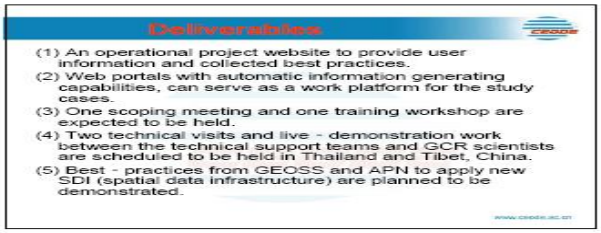
Name	Institution	Email	Address
Tomoko Doko	PhD candidate, Keio University, Research Fellow of the Japan Society for the Promotion of Science.	docochan@sfc.keio.ac.jp	Japan
Chen Wenbo	Keio University	chenwb@sfc.keio.ac.jp	Japan
Jibo Xie	Center for earth observation & digital earth	jbxie@ceode.ac.cn	China
Qinghua Ye	Institute of Tibet Plateau, CAS	yeqh@itpcas.ac.cn	China

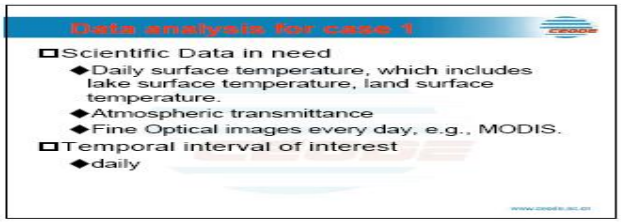
Glossary of Terms

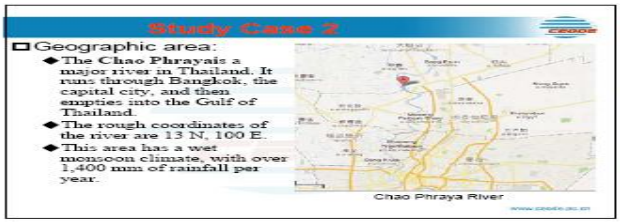
Include list of acronyms and abbreviations

EO	Earth Observation
AP	Asia-Pacific
GC	Global Change
CEOS	Committee on Earth Observing Satellites
WGISS	The Working Group on Information Systems and Services
UN-GAID	The Working Group on Information Systems and Services
e-SDDC	Global Alliance for Enhancing Access to and Application of Scientific Data in Developing Countries
GEO	Group on Earth Observations
GEOSS	Global Earth Observation System of Systems
CODATA	Committee on Data for Science and Technology
ISCU	International Council for Science
ICSU-ROAP	ICSU Regional Office for Asia&Pacific
GC-APWG	Global Changing Asian-Pacific Wide Grid
PWTW	APN Proposal-Writing Training Workshop
CEODE	Center for Earth Observation and Digital Earth
CAS	Chinese Academy of Science
GISTDA	Geo-Informatics and Space Technology Development Agency
ASIAES	The ASEAN+3 Satellite Image Archive for Environmental Study
UNOOSA	United Nations Office for Outer Space Affairs
GeoBrain	GeoBrain is a comprehensive cyber infrastructure uniquely providing advanced, specialized, value-added, and well-integrated Earth observation data, information and knowledge services to worldwide users.
GENESI	Ground European Network for Earth Science Interoperations

APN project implementation plan by Prof. Guoqing Li in the kick-off meeting







Work to be done

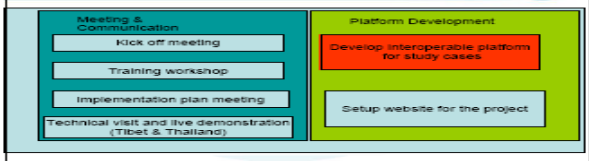
- Meetings, workshops and training courses to reduce the gap between Global Change (GC) scientists and SDI
- Technical visits and live - demonstration work between the technical support teams and GCR scientists
- Develop a platform which can integrate distributed data, algorithms, visualization for study cases
- Setup operational project website

Meetings & Workshop

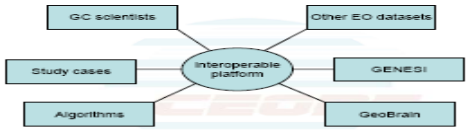
- Kick off meeting
  - Location : Beijing
  - Attendees: Project collaborators,GC experts
- Training workshop
  - Location:Beijign
  - Attendees: GC experts,Geobrain,GENESI,Young scientists
- Implementation plan meeting
  - Location:Thailand
  - Attendees: GC experts,Geobrain,GENESI,Young scientists

- Technical visit and live-demonstration in Institute of Tibetan Plateau
  - Location: Tibetan
  - Attendees: GC experts,Geobrain,GENESI,Young scientists
- Technical visit and live-demonstration in Thailand
  - Location:Thailand
  - Attendees: GC experts,Geobrain,GENESI,Young scientists

Implementation framework



Interoperable platform for study cases



Project website

- Components
  - Project introduction
  - Activities info: meeting, workshop, traning, live-demonstration
  - Data access
  - Study case
  - Publications

Presentation of Study case of Namco lake,Tibet by Dr. Jibo Xie in Beijing meeting

Study Area

- Geographic area:
  - Nam Co 纳木错(N30° 30' ~30° 56' , E90° 16' ~91° 03'), about 1982km2(Lu et al., 2005), 4718m above sea level (a.s.l.), located in the middle of Tibetan Plateau.
  - About 78.6 km length from East to West, 24.9 km width from South to North, and has a maximum depth of 122 m(Li et al., 2008).
  - The Nyainqentanglha（念青唐古拉） range locates to south of the lake, with an average altitude of 6000 m. Snow, ice, permafrost melt and precipitation are the main sources of water to Nam Co.
  - Annual precipitation is less than 300 mm. According to the meteorological records at Nam Co station since 2005, the region is affected by the India monsoon.

Objective

- Long-term lake ice monitoring by Earth Observation
- inter-agency collaboration and data infrastructures (GeoBrain & GENESI) for the study
- A collaborative portal for the use case

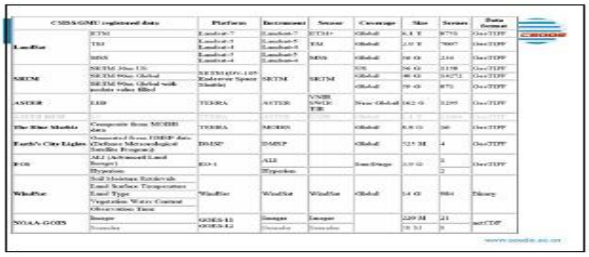
Data analysis

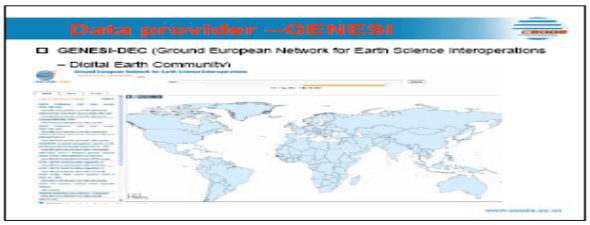
- Scientific Data in need
  - Daily surface temperature, which includes lake surface temperature, land surface temperature.
  - Atmospheric transmittance
  - Fine Optical images every day, e.g., MODIS.
- Temporal interval of interest
  - daily

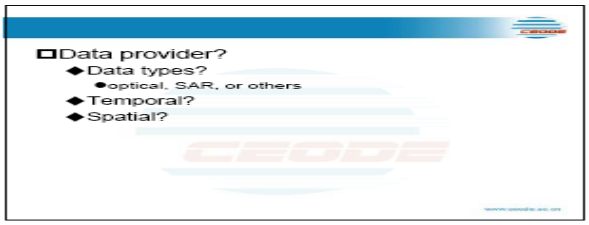
Data provider --GeoBrain

NASA EOS Higher-Education Alliance (NEHEA) -- GeoBrain

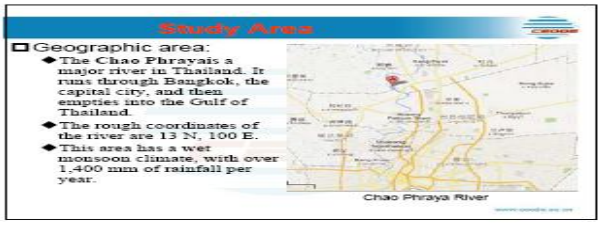
- GeoBrain is a comprehensive cyberinfrastructure uniquely providing advanced, specialized, value-added, and well-integrated Earth observation data, information and knowledge services to worldwide users.
- Large amounts of data from major federal Earth observation agencies, including NASA, NOAA, and USGS, are online accessible and analyzable through GeoBrain's online user portals

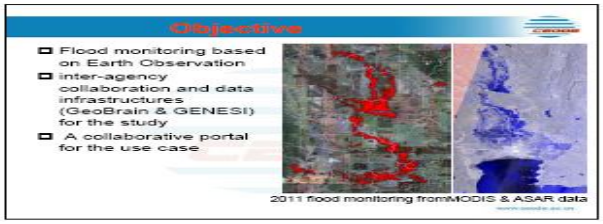


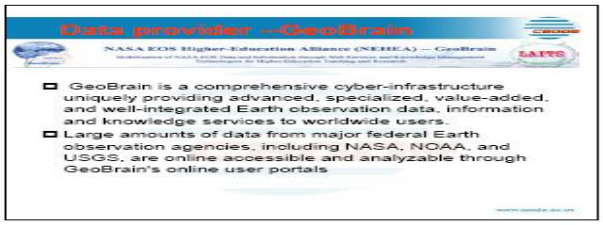


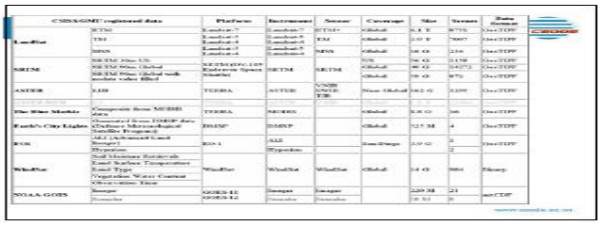


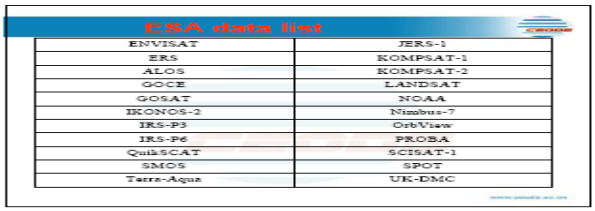
Presentation of Southeast Asia study case by Prof. Guoqingli & Jibo Xie in Bangkok meeting

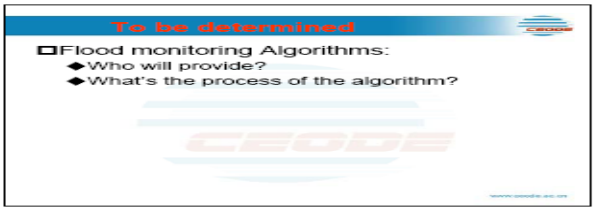


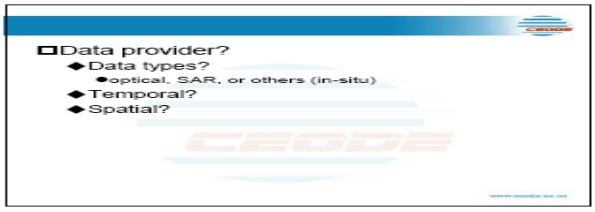


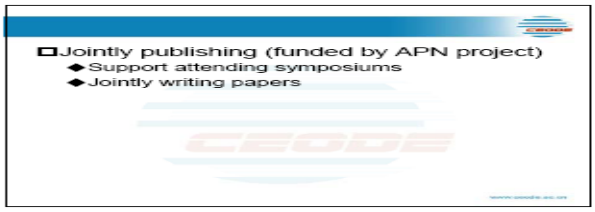












Parts of Abstracts of the presentation in APN - CODATA Joint Workshop:

(1) Long-term glacial lake monitoring (Wenbo Chen)

The Himalaya holds the world record in terms of range and elevation. The range of the Himalaya is approximately 2,900 km long, stretching from Afghanistan to Myanmar, and 250 - 400 km wide from 27ºN to 36ºN in a curve shape. It is one of the most extensively glacierised regions in the world outside the Polar Regions. Since the second half of the 20th century, many glaciers in the Himalaya have retreated and many small glaciers have already disappeared due to climate changes. These changes have directly affected changes of glacial lakes in number and size. The rapid accumulation of water in these lakes can lead to a sudden breach of the moraine dam. There have been several occurrences of Glacial Lake Outburst Flood (GLOF) events in several Himalayan regions. If the trend continues, not only is a long-term loss of natural fresh water storage predicted to be disaster, also can be catastrophic to the communities and infrastructure downstream. Thus, long-term glacial lake monitoring is necessary for the regional environment and local ecosystem. Inventory of glacial lakes in Himalayas was built upon using remote sensing (RS), geographic information system (GIS), topographic map, photographs, and field studies. It implemented since 1990s, including Bhutan, China, India, Nepal, and Pakistan. Many new glacial lakes have appeared, and some have been rapidly expanded, especially at the end moraine. The inventory of glacial lakes could be useful in gaining an understanding of the spatial and temporal development of glacial lakes in high mountain ranges.

(2) GeoBrain Cyberinfrastructure to Support Global Change Research (D*iping Di)*

Global change studies are typically data-intensive, especially when the studies deal with global change issues at regional, continental, or global scale. In such studies, huge amount of data, most of which are acquired through remote sensing, has to be processed, integrated, and analyzed. Typically such data are

archived at geographically dispersed data repositories in mutually incompatible forms. For most of scientists, dealing with data is not an easy task which requires significant knowledge and local computing resources. The recent development of standard-based Cyberinfrastructure (CI) technology aims to solve this problem by pushing the paradigm shifts from everything locally owned and operated to sharing of data, computing resources and knowledge over the Web via standard-based interoperable interfaces. CI is playing an essential and increasingly important role in data-intensive global change studies. GeoBrain is one of CIs, which makes large amount of data and computing resources interoperable and sharable over the Web. It has adopted and developed the latest Web service, geospatial interoperability and related information technologies and provided an innovative approach to data-intensive global change studies. This presentation discusses GeoBrain architecture, the adopted interoperability standards and specifications, the available data and computing resources, and the online processing capabilities. It also shows examples of how to use GeoBrain to conduct global studies.

(3) Japanese global change research and its data support facilities (Tomoko Doko)

The Earth has been evolving slowly over the past 4.6 billion years. Nevertheless, recently, human activities have begun to affect our planet significantly. To protect the Earth's environment and ecosystems and to help human societies to develop in harmony with nature, it is essential to understand the mechanisms of the global environment and to observe and predict global change. In Japan, JAMSTEC (Japan Agency for Marine-Earth Science and Technology) is a well-known research agency for global change research field. Currently JAMSTEC has a research institute “RIGC (Research Institute for Global Change)” in its house. RIGC deals with the science of environmental change, and aims to monitor the oceans, air, land, and ecosystems. RIGC also cooperates with institutions both at home and abroad, e.g. the Global Earth Observation System of Systems (GEOSS), and the United Nations Intergovernmental Panel on Climate Change (IPCC). RIGC contributes to decision-making on climate change solutions and the enhancement of the earth’s sustainability on a global and human scale, while securing Japan’s presence in the arena of environmental change. On the other hand, Japan undertook to locate the head office of The Asia-Pacific Network for Global Change Research (APN) by assignment of former Environment Agency (current Ministry of Environment), and has been supporting concrete activities with collaboration among consortium countries and international agencies. APN is a network of 22 member country governments that promotes global change research in the region, increases developing country involvement in that research, and strengthens interactions between the science community and policy-makers. As data support facilities, Japan has an enriched public-common dataset. For instance, most of geographical data is organized by the National Land Agency, e.g. Digital Map 25000 (Spatial Data Framework). An international project, “Global Map” series, was initiated by Geographical Survey Institute of Japan. For the data related to environment, “GIS dataset on the Natural Environment, Japan” is available by Nature Conservation Bureau in Ministry of the Environment. Most recently, JAXA developed “Global Change Observation Mission 1st– Water (GCOM-W1), named SHIZUKU.” The H-IIA Launch Vehicle No. 21 (H-IIA F21) with "SHIZUKU" onboard will be launched on May 18, 2012.

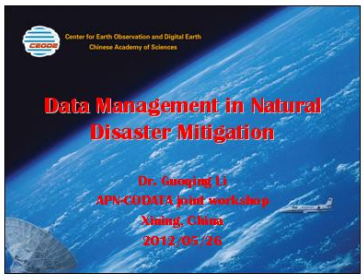
(4) The ICSU World Data System in relation to data demand for global change and disaster reduction in the Asia-Pacific region.(Nordin Hasan)

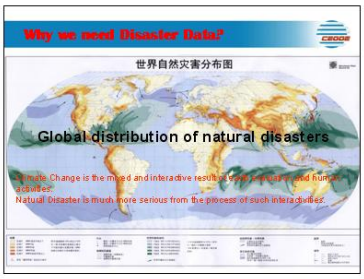
The World Data Systems (WDS) supports ICSU’s mission and objectives, ensuring the long-term stewardship and provision of quality-assessed data and data services to the international science community and other stakeholders. A new International Programme Office was established in 2012 and builds on the 50-year legacy of the ICSU World Data Centre system (WDC) and the ICSU Federation of Astronomical and Geophysical data-analysis Services. Many existing WDCs and Federation Services, as well as numerous other data centres, services and activities, have already expressed interest in becoming part of the new system. The WDS concept aims at a transition from

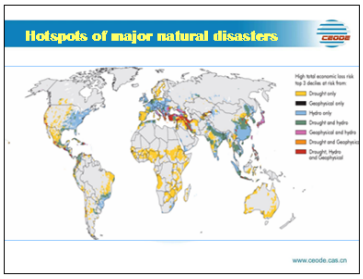
existing stand-alone WDCs and individual Services to a common globally interoperable distributed data system that incorporates emerging technologies and new scientific data activities. The new system will build on the potential offered by advanced interconnections between data management components for disciplinary and multidisciplinary scientific data applications. Applications for the new WDS are already being investigated, including the WDC online portal which is being considered as a proof of concept for an element of the new system. WDS will enjoy a broader disciplinary and geographic base than previous ICSU bodies and will strive to become a worldwide 'community of excellence' for scientific data. To this end, WDS will work closely with ICSU's Committee on Data for Science and Technology (CODATA). The new WDS will support ICSU's mission and objectives, ensuring the long-term stewardship and provision of quality-assessed data and data services to the international science community and other stakeholders.

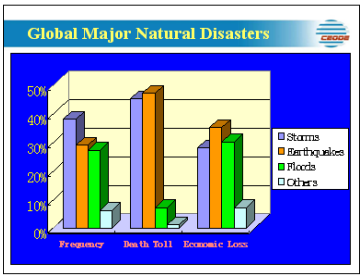
Presentation by Nordin Hasan on the APN-CODATA joint Workshop

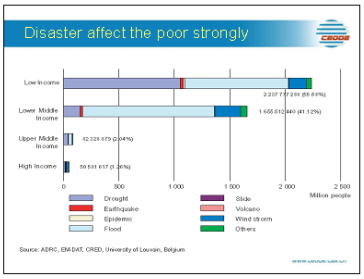
Presentation by Guoqing Li on the APN-CODATA joint Workshop

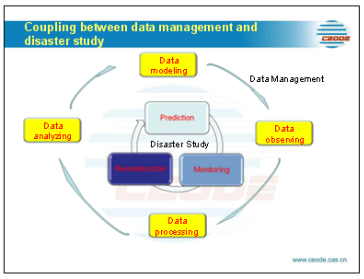


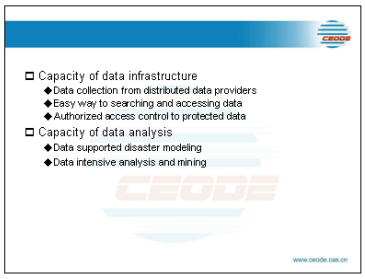


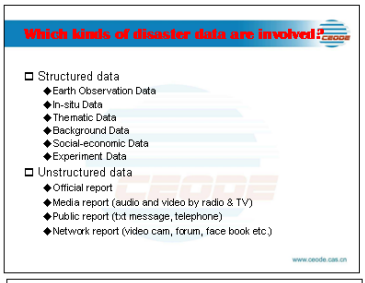


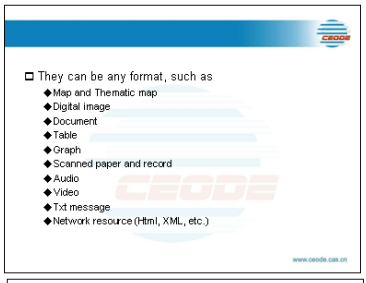


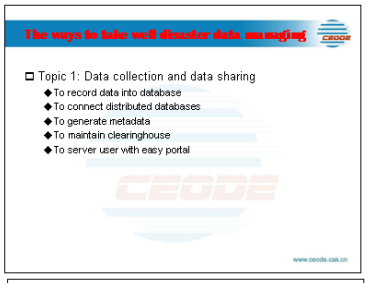


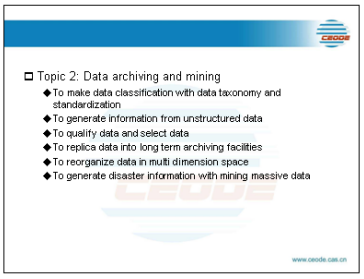


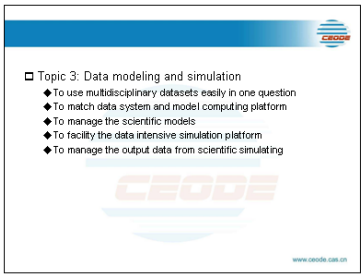


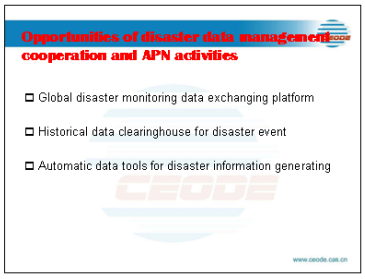












Presentation by Paul Uhlir on the APN-CODATA joint Workshop

Roadmap for Sharing of GeoSciences Data

International Training on Collaborative Technologies in Earth Observations for Global Change Research in the Asia-Pacific Region
Xining, China, 26 May 2012

by
Paul F. Uhlir
Director, Board on Research Data and Information
National Academy of Sciences
Washington, DC
USA
puhlir@nas.edu

Roadmap for Sharing of GeoSciences Data

In this presentation I will:

- Provide some background context and rationale
- Define what a digital commons is
- Present the benefits of providing research data online without reuse restrictions
- Discuss some negative effects of excessive restrictions on data access and reuse
- Raise some of the tensions that exist between open and closed information systems
- Identify the principal stakeholders in forming data policy
- Review various models and examples of such commons that already exist online, created from the bottom up; and
- Conclude with a brief discussion of one top-down data policy development in global change research: the GEOSS Data Sharing Principles and Implementation Guidelines

Roadmap for Sharing of GeoSciences Data

Comparison of some key characteristics of the print and digitally networked paradigms

PRINT	GLOBAL DIGITAL NETWORKS
(pre) Industrial Age	post-industrial Information Age
fixed, static	transformative, interactive
rigid	flexible, extensible
physical	'virtual'
mostly local or national	global
linear	non-linear, asynchronous, with time/space collapsed
limited content and types	unlimited contents and multimedia
distribution difficult, slow	easy and immediate dissemination
copying cumbersome, not perfect	copying simple and identical
significant marginal distribution cost	zero marginal distribution cost
single user (or small group)	multiple, concurrent users
centralized production	distributed production
slow knowledge diffusion	accelerated knowledge diffusion

Roadmap for Sharing of GeoSciences Data

What is a digital commons?

Digital data and information originating principally from government or publicly-funded sources;

- Made freely available for broad, common use online;
- With the material in the public domain, or with only some rights reserved (using common-use licenses, such as Creative Commons); and
- Typically organized thematically through an institutional mechanism.

Roadmap for Sharing of GeoSciences Data

Advantages of (open access) digital commons for science:

- **Promotes interdisciplinary, inter-institutional, and international research;**
- **Enables automated knowledge discovery;**
- Avoids duplication of research and promotes new research and new types of research;
- Reinforces open scientific inquiry and encourages diversity of analysis and opinion;
- **Allows for the verification of previous results;**
- Makes possible the testing of new or alternative hypotheses and methods of analysis;
- Supports studies on data collection methods and measurement;
- Facilitates the education of new researchers;
- Enables the exploration of topics not envisioned by the initial investigators;
- Permits the creation of new data sets when data from multiple sources are combined;
- **Facilitates transfer of information between developed/developing countries;**
- **Promotes capacity building in developing countries; and**
- **Generally helps to maximize the research potential of new digital resources and technologies, providing greater returns from public investments in research.**
- **Many other advantages and justifications outside research...**

Roadmap for Sharing of GeoSciences Data

Compelling reasons for placing government-generated data and information in the public domain or under common-use conditions:

- ***Legal.*** A government entity needs no legal incentives from exclusive property rights to create information. Both the activities that the government undertakes and the information produced by it in the course of those activities are a [global] public good.
- ***Socioeconomic.*** Many economic and non-economic positive externalities; Network effects can be realized on an exponential basis through the open dissemination of data and information online.
- ***Ethical.*** The public has already paid for the production of the information. The burden of additional access fees falls disproportionately on the individuals least able to pay. Open access benefits the poor and disadvantaged.
- ***Political.*** Transparency of governance is undermined by restricting citizens from access to and use of public data and information. Rights of freedom of expression and information are compromised by restrictions on re-dissemination of public information, particularly of factual data.

Roadmap for Sharing of GeoSciences Data

Broad implications of excessive restrictions (economic, legal, technical) on access to and reuse of data and information from public sources:

1) **Higher research costs**
2) **Lost opportunity costs**
3) **Barriers to innovation**
4) **Less effective scientific cooperation and education**
5) **Sub-optimal quality of data**
6) **Widening gap between OECD and developing countries**

Openness **thus should be the default rule, subject only to legitimate and well-justified exceptions.**

Roadmap for Sharing of GeoSciences Data

Legitimate restrictions on public access to government data

- National security and public safety
- Personal privacy
- Confidentiality
- Respecting proprietary rights of private-sector parties
- Other specialized reasons

Roadmap for Sharing of GeoSciences Data

Key stakeholders in the development of scientific data access policies and laws—from the top down and the bottom up:

Top down policy development

- Governments
- Research funding agencies
- International and intergovernmental (scientific) organizations

Bottom up policy development

- Universities and not-for-profit research institutes
- Industry research institutions
- Learned societies (umbrella research community organization)
- Individual researchers
- General public

Roadmap for Sharing of GeoSciences Data

Existing digital commons models created from the bottom up:

- Open-source software movement (e.g., Linux and 10Ks of other programs worldwide, many of which originated in academia for research applications);
- Distributed Grid computing or e-science (e.g., SETI@Home, LHC@Home);
- Open data centers and archives (e.g., GenBank, EROS Data Center);
- Federated open data networks (e.g., NASA Distributed Active Archive Centers, Global Biodiversity Information Facility);
- Open access journals (e.g., PLoS + > 7500 scholarly journals, many in developing world—SciELO, Bioline International);
- Open repositories for an institution's scholarly works (e.g., the Indian Institute for Science, + > 1400 formally registered globally)
- Open repositories for publications in a specific subject area (e.g., the physics arXiv, CogPrints, PubMedCentral);
- Free university curricula online (e.g., the MIT OpenCourseWare);
- Emerging discipline or applications commons and integrated open knowledge environments (e.g., geocommons, neurocommons).

Roadmap for Sharing of GeoSciences Data

Organisation for Economic Co-operation and Development (OECD) ***Recommendation for Principles and Guidelines for Access to Public Research Data*** **(2007):**

- **Openness**
- **Flexibility**
- **Transparency**
- **Legal conformity (with other existing laws)**
- **Protection of intellectual property**
- **Formal responsibility**
- **Professionalism**
- **Interoperability**
- **Quality**
- **Security**
- **Efficiency**
- **Accountability**
- **Sustainability**

Roadmap for Sharing of GeoSciences Data

A Global, Coordinated, Comprehensive and Sustained System of Earth Observing Systems

Address the need for timely, quality, long-term, global information as a basis for sound decision making.

Agreed GEO Data Sharing Principles

- There will be **full and open exchange of data, metadata, and products** shared **within** GEOSS, **recognizing relevant international instruments and national policies and legislation.**
- All shared data, metadata, and products will be made available with **minimum time delay** and **at minimum cost.**
- All shared data, metadata, and products being **free of charge or no more than cost of reproduction** will be **encouraged for research and education.**

GEOSS 10-Year Implementation Plan, adopted 16 February 2005 *(text1.asdoc)*

Guidelines in 8 Areas

1) Promoting implementation of the principle of **full and open exchange of data** in accordance with the GEOSS Data Sharing Principles
2) Encouraging GEOSS users to **reuse and re-disseminate** shared data, metadata, and products
3) Ensuring **consistency** in the implementation of the GEOSS Data Sharing Principles with relevant international instruments and national policies and legislation
4) Implementing **pricing policies** consistent with the GEOSS Data Sharing Principles
5) Reducing the **time delays** for making data available through GEOSS
6) Promoting **research and education uses** of GEOSS data
7) Developing **metrics and indicators** for GEOSS data sharing activities
8) Developing effective **coordination and outreach mechanisms** for implementing the GEOSS Data Sharing Principles

Why Is This Important for Global Change Research?

- GEOSS will likely be the foundation for internationally coordinated Earth observations from both remote sensing and *in situ* platforms for the next decade and beyond
  - Improving data access and interoperability requires not only significant technical progress, but also major policy & institutional commitments
  - Strong implementation guidelines will help set the standard for such commitments and for Future Earth Observation data access policies.
- GEOSS also represents a major effort to ensure that scientific observations and research benefit society
  - It is in the interest of the research community and society as a whole to maximize these benefits
  - Scientists have a unique role—and responsibility—to help ensure the accessibility, quality, and appropriate use of GEOSS data in applied research and decision making.

Presentation by Liping Di on the APN-CODATA joint Workshop

GeoBrain Cyberinfrastructure to Support Global Change Research

Liping Di
Center for Spatial Information Science and Systems (CSISS)
George Mason University
ldi@gmu.edu, http://csiss.gmu.edu

CSISS

Contents

- Challenges in global change studies
- Introduction to Architecture of GeoBrain Web Service System
- Web services in GeoBrain
- Product virtualization and geoprocessing modeling
- e-Science applications

CSISS

Challenges in Global Change Studies

- Typically data- and/or computation-intensive, especially when the studies deal with global change issues at regional, continental, or global scale.
- huge amount of data, most of which are acquired through remote sensing, have to be processed, integrated, and analyzed.
  - Archived at geographically dispersed data repositories
  - Mutually incompatible forms
  - Require significant knowledge and local computing resources
- For most of scientists, dealing with huge volume of data is not an easy task
  - No enough computing resources and data handling skills
  - Only a few scientists have required resources to conduct global change research.

CSISS

Cyberinfrastructure

- The recent development of standard-based Cyberinfrastructure (CI) technology aims to solve this problem.
  - Cyber-based sharing of data, computing, analysis capability, knowledge, and organizational wisdom.
- CI is pushing the paradigm shifts from everything locally owned and operated to sharing of data, computing resources and knowledge over the Web via standard-based interoperable interfaces.
- CI is playing an essential and increasingly important role in data- and computation-intensive global change studies.

CSISS

GeoBrain CI

- Provides innovative methods for publishing, accessing, visualizing, and analyzing geospatial data and for building and sharing geospatial knowledge
- Establishes an unique online data-intensive learning and research environment freely available to users all over the world
- Makes peta-bytes of Earth observation (EO) data archived at NASA, NOAA, USGS, and other world's major space agencies easily accessible to and usable by higher-education users as if they have such resources locally.

CSISS

GeoBrain Capabilities (1)

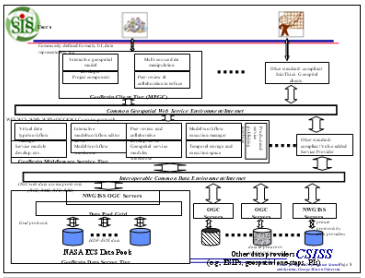
- An open customizable geospatial data source.
  - Work with all HDF-EOS data in EOSDIS online data storages.
  - Work with all netCDF and GeoTIFF data in NOAA and USGS and other space agencies
  - Provide interoperable, personalized, on-demand data access and services (IPODAS) to the data automatically
    - Users will obtain data that exactly match their requirements in term of format, projection, spatial/temporal coverage and resolutions.
    - OGC WCS, WMS, and CSW interfaces are provided.
- An on-line data analysis system.
  - Several hundred geospatial web services are provided on-line for analyzing any of the EOSDIS online data.
  - Services are developed in-house with OGC standards or converted from more than 200 GRASS GIS functions.

CSISS

GeoBrain Capabilities (2)

- An on-line platform for geospatial-processing modeling.
  - A regular user can construct a geospatial processing model conceptually to tell step by step how a type of geospatial products can be generated from lower-level inputs.
  - The model will be converted automatically to executable web-service workflow once the user specifies geospatial coverage and time of the model output and generate the output for user.
  - After proper review, the model is kept in the system as a type of products the system can offer (virtual geospatial products).
  - Automatic composition of the processing models with support of ontology and type matches are prototyped (OWL-S based).
- An platform for sharing geospatial knowledge
  - The processing models at concept level represent the geospatial knowledge.
  - The models should be sharable with other systems.
- All these capabilities of GeoBrain form the common cyberinfrastructure for conducting data-intensive Earth science research

CSISS



CSISS

Standards and Interoperability

- The GeoBrain system has implemented ISO TC 211 standards for geographic metadata, and the Open Geospatial Consortium (OGC) and World-Wide Web Consortium (W3C) standards for the data and service interoperability.

CSISS

GeoBrain's Geospatial Web Services

- Individual geospatial web services are the building blocks for constructing a geospatial processing workflow.
- The power of GeoBrain relies on the availability of large numbers of standard compliant, chainable services.
  - Developed by the GeoBrain project team
  - Converted from the traditional standalone analysis system
  - Developed by the community
- This project has spent a fair amount of time and resources to develop individual geospatial web services.
  - All GeoBrain services follow the OGC and W3C service standards.
  - All services are chainable.
- The URLs for those services can be found at http://geobrain.laits.gmu.edu.

CSISS

GRASS Web Services

- It is very time consuming to develop such services from scratch and the project cannot afford to develop services in this way.
- Our strategy is to make existing geospatial processing packages web-service enabled.
- The software package we chose is an open source GIS package called GRASS.
  - add SOAP-based web service interfaces and provide WSDL descriptions to more than 200 geospatial processing modules in GRASS.
- A detailed description of the GRASS Web services can be found at the web page:

http://geobrain.laits.gmu.edu:8099/webservices/grass/Grass_Webservices.html

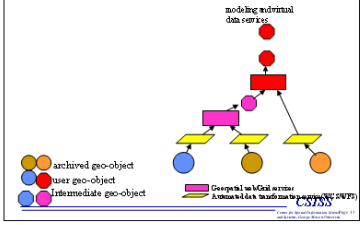
CSISS

Geoprocessing modeling

- Earth System Science (ESS) research and applications often involve in collecting, analyzing and modelling with a huge amount of multi-source, multi-scale and multi-discipline geospatial data.
  - Those data are processed step-by-step in geospatial analysis systems to extract information and knowledge products for applications and decision makings.
  - Conceptually, the step-by-step processes from the raw data to a user-specific product form a geospatial processing model.
  - The model is expressed as a workflow in GeoBrain.
  - The web services are the building blocks for the workflows/models.
- Two geospatial processing modelling approaches are implemented- expert creation and ontology-based automatic creation.

CSISS

Geospatial Processing Models (GMP)/GeoTree



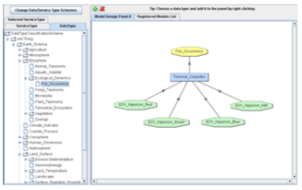
CSISS

Product Virtualization in GeoBrain

- A virtual product is a product that has not been produced but the system knows how to generate it on demand.
- In GeoBrain, a virtual product is represented by a GeoTree created by the user through a Web modeling interface with the support of ontologies of both data and service types.
- The GeoTree represents conceptually how a geospatial product is generated from the raw data step by step.
  - It actually is a graphic representation of a geospatial processing model.
- Everything in the GeoTree is defined at type level instead of instance level
  - Allow the users to define a product at conceptual level
  - Avoid the details of instances
  - Make the model reusable by any other users
  - More reliable on product generation

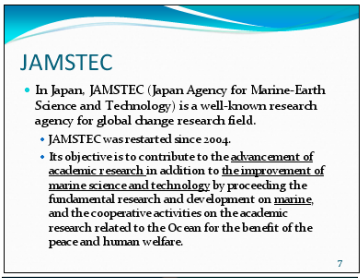
CSISS

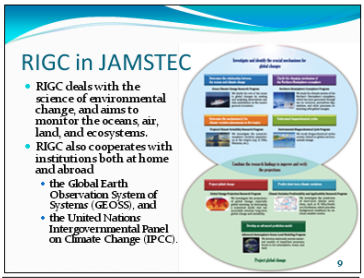
Expert Creation: Abstract Model Designer

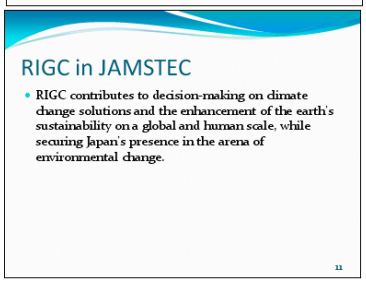


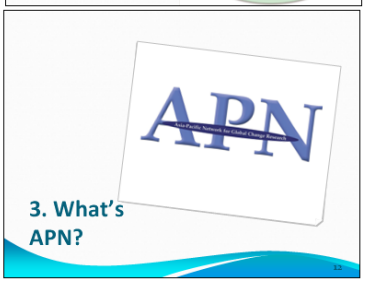
CSISS

Presentation by Tomoko Doko on the APN-CODATA joint Workshop

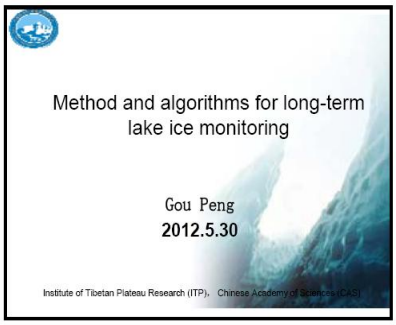


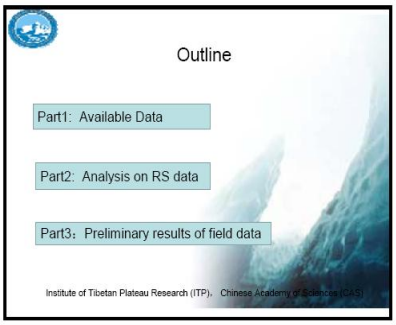


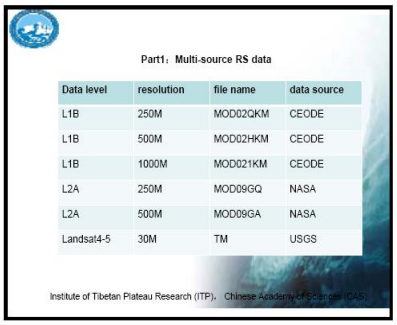


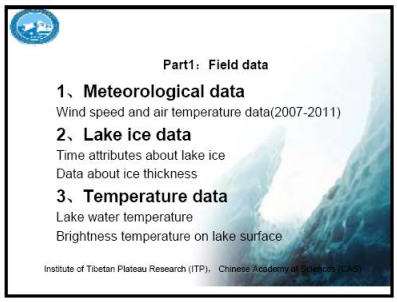


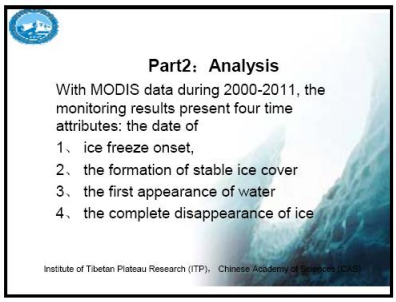
Presentation by Qinghua Ye (Gou Peng) on the APN-CODATA joint Workshop

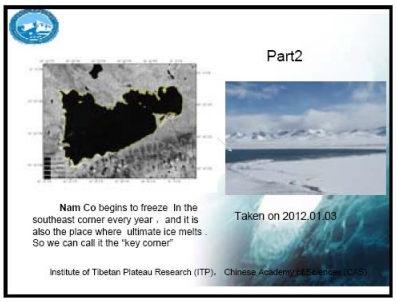


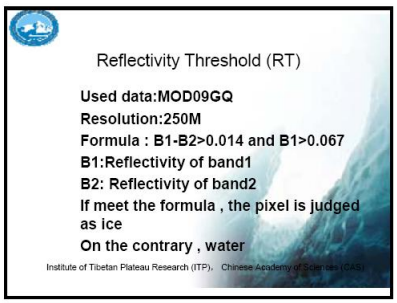


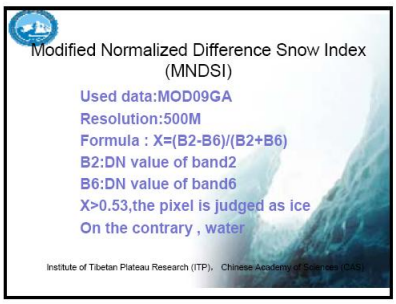


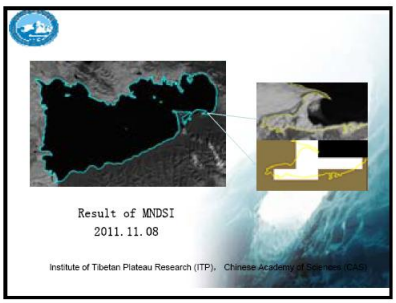




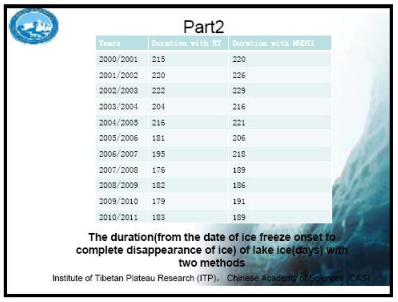


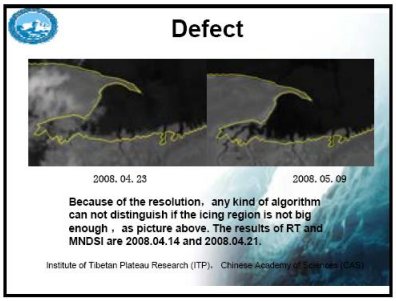


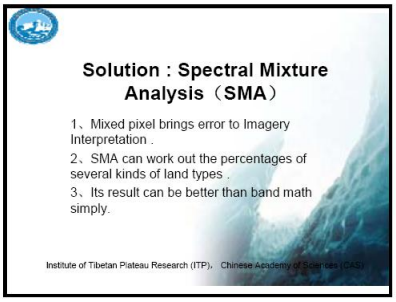




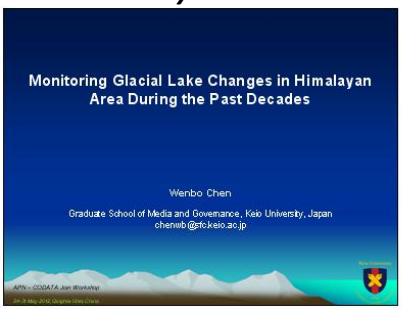
CBA2011-16NSY-LI-FINAL REPORT

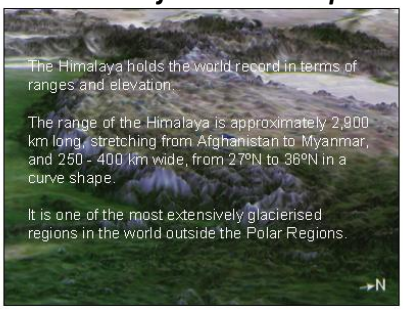


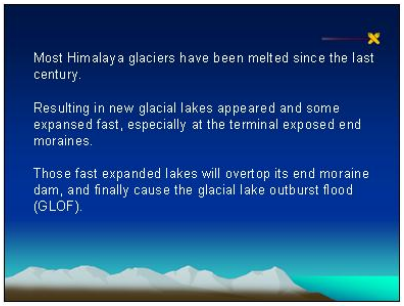


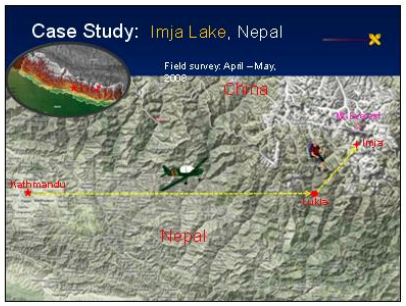


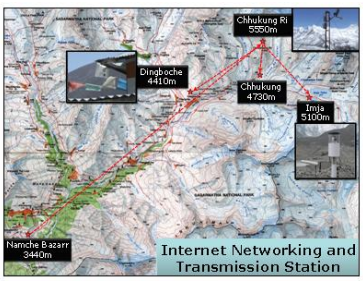
Presentation by Wenbo Chen on the APN-CODATA joint Workshop

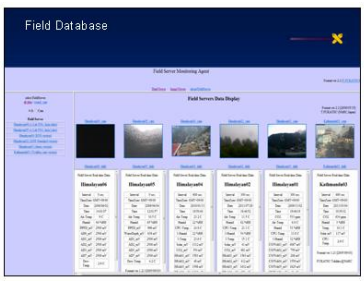


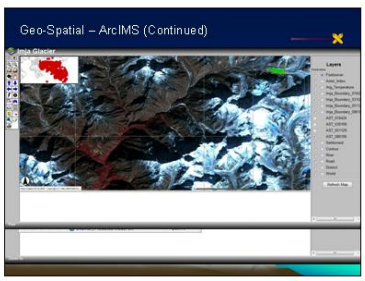


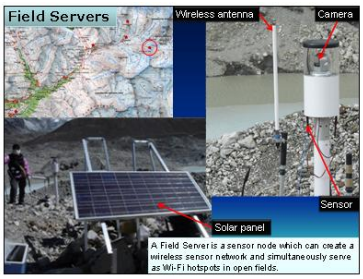


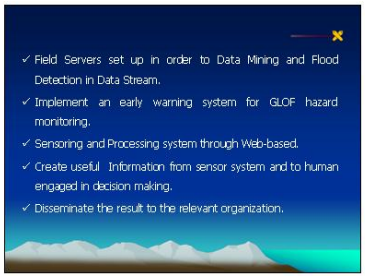


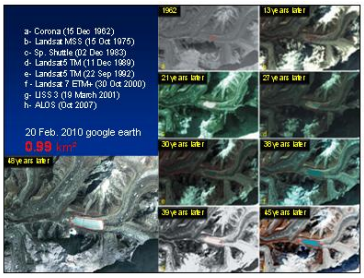




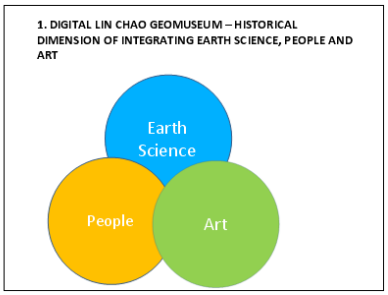


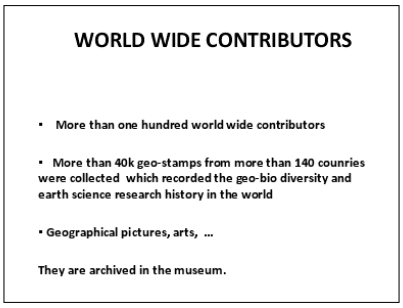


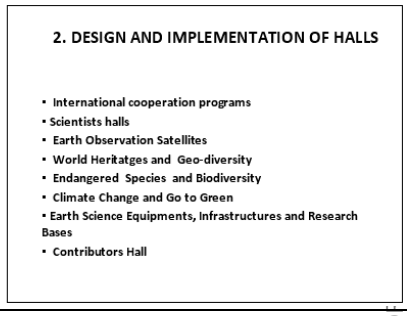


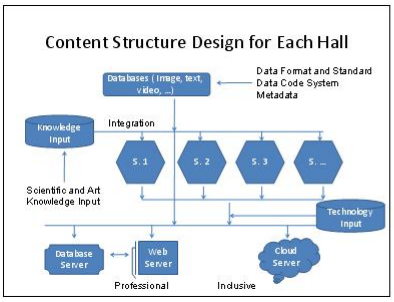


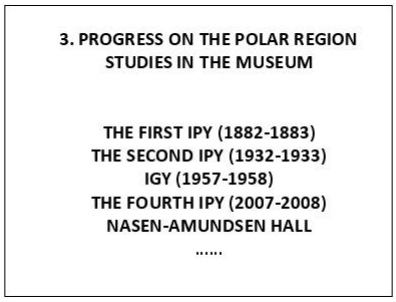
Presentation by LIU Chuang on the APN-CODATA joint Workshop

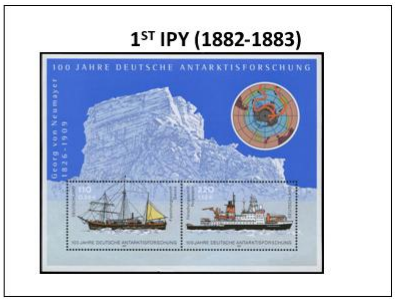


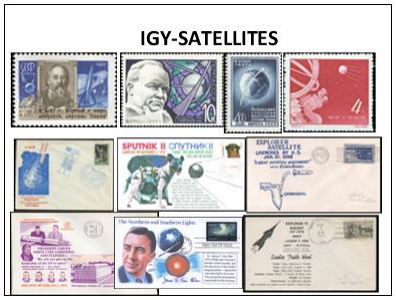


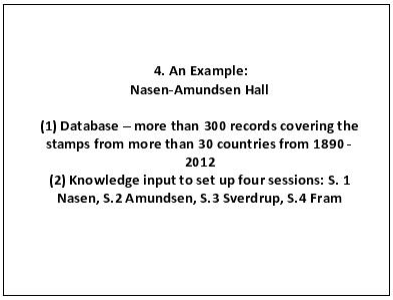


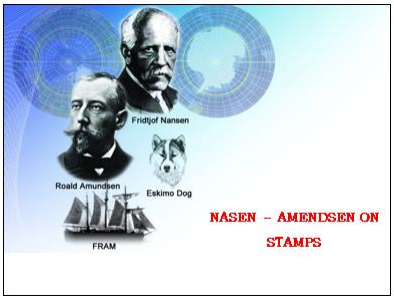




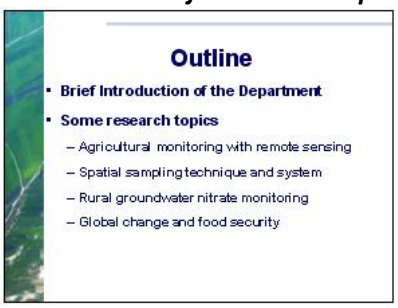


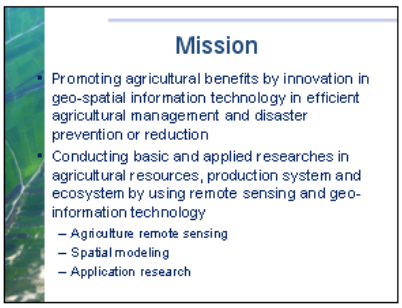


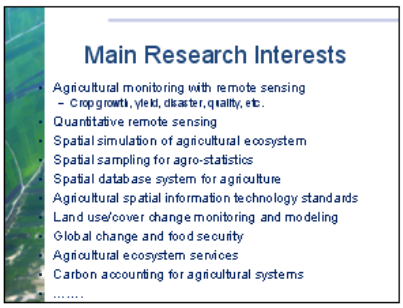


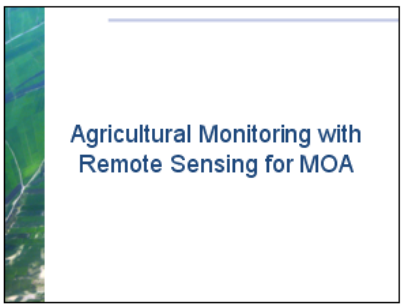


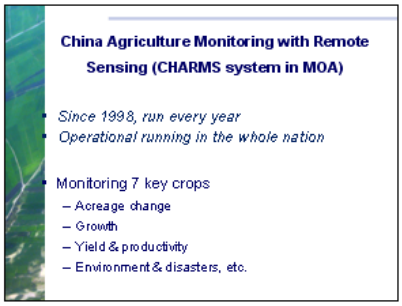
Presentation by Zhongxin Chen on the APN-CODATA joint Workshop

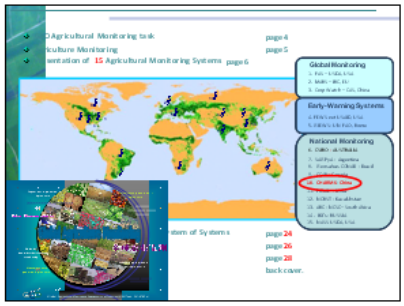


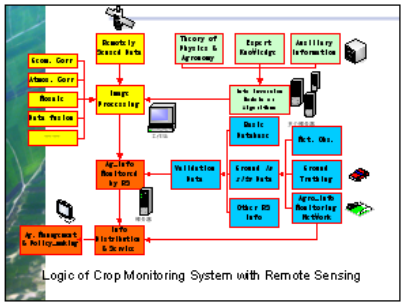


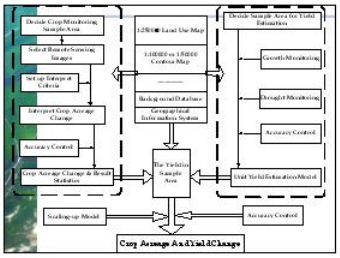


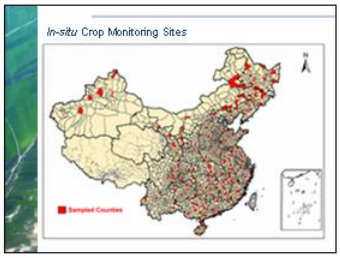


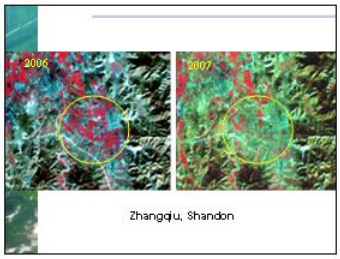


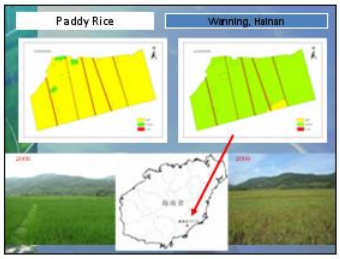


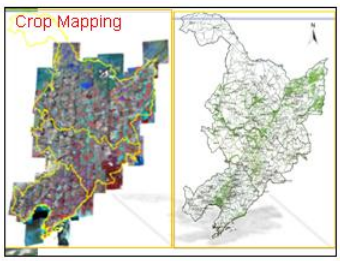


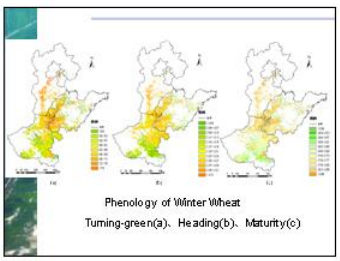


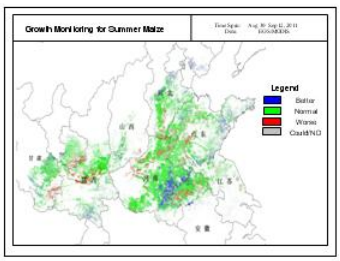












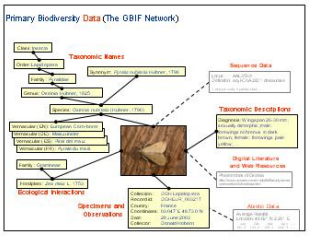
Presentation by Zheping Xu on the APN-CODATA joint Workshop

Digital Biomuseum for Global Change Studies

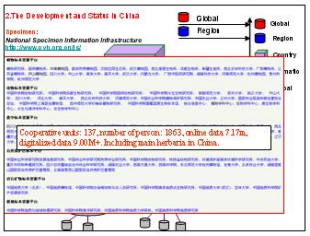
Zheping Xu, 2012-5-30, Lhasa
The Institute of Botany, The Chinese Academy of Sciences
xuzp@ibcas.ac.cn

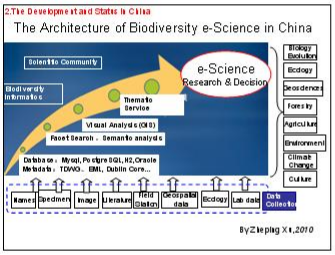
Content

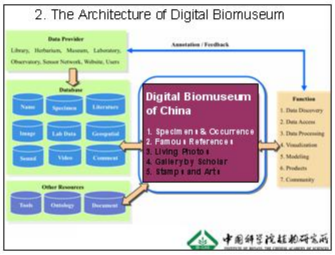
- The Development and Status in China
- The Architecture of Digital Biomuseum
- Work Related to Global Change



1.The Development and Status in China







3. Work Related to Global Change

Presentation by Qiang Feng on the APN-CODATA joint Workshop

IRDR PROGRESS IN CHINA

冯强

IRDR-CHINA 秘书处

2012年5月30日

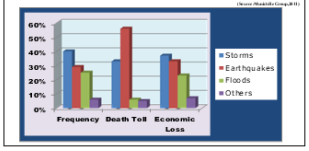
OUTLINE

- About IRDR and IRDR China
- China's Efforts in Risk Research and Mitigation
- Contributions to IRDR and Best Practices
- Perspectives of IRDR in China

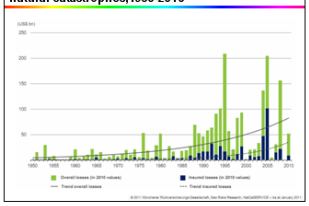
Global Natural Disaster Assessment

From 1950 to 2011, the great natural disasters have resulted in:

- **A death toll of up to 2.38 million**
- **Economic losses up to US$ 2，174 billion**



Overall losses and insured losses from great natural catastrophes,1950-2010

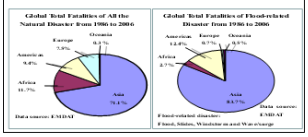


Total global disaster fatalities

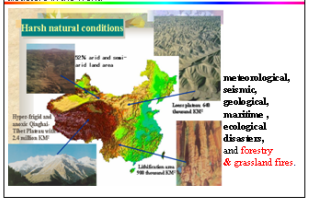
Asia is the most affected

By All Natural Disasters (Left)

By Flood-Related Disasters (Right)



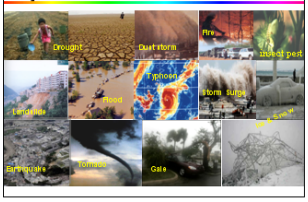
China is one of the few countries most affected by natural disasters in the world



Exposure,Vulnerability,disaster Risk are going up

- By far, with the fast socio-economic development, the exposure and vulnerability of China to natural hazards is much higher than ever before, that is to say, the disaster risk is rising.
- Over **70% of cities**, more than **50% of the population** in China are distributed in the regions where are highly exposured to meteorological, seismic, geological,marine disasters.
- **>2/3 of the territory** are threatened by drought and flood.
- **About 69% of the land** are of mounteanous area and highland where frequently strickened by geologocal disasters such as landslides, rock-mud flows and landslips.
- China is the nation with **the most records** of inlands earthquakes in the world., **1/3 of inland earthquakes** all over the world occurred in China.

Major Natural Disasters in China

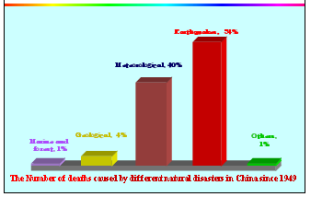


Brief summary of disasters in China:

- Almost all types of natural disasters
- **6 of the world's top 10 deadliest natural disasters**
- **The most severe: floods, droughts, typhoons, earthquakes**
- **Affecting more than 200 million people every year**
- **Economic losses:3-5% of the annual GDP**

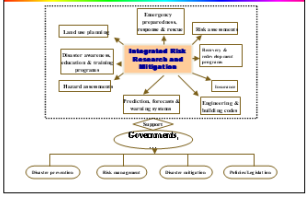
Natural disaster has become an important restricting factor for economic and social development.

Life loss caused by natural disasters in China since 1949



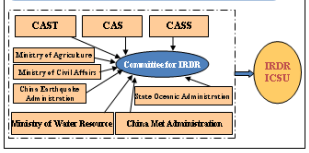
IRDR IPO Established in Beijing

Functions of Disaster Risk Research and Mitigation

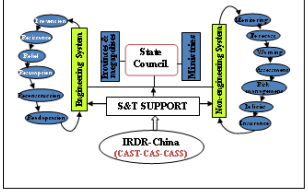


Solution of IRDR in China

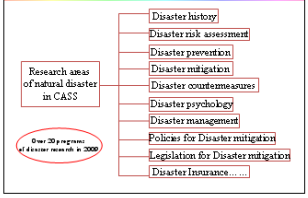
A committee named IRDR-China has been established as a response to IRDR ICSU to facilitate national, regional and international cooperation tasks in natural disaster mitigation.



The Role of IRDR-China in the National System of Disaster Governance



Sociological research areas of disaster mitigation in CASS



OUTLINE

- About IRDR and IRDR China
- China's Efforts in Risk Research and Mitigation
- Contributions to IRDR and Best Practices
- Perspectives of IRDR in China

The Great Ancient Achievements for Disaster Mitigation

Ancient seismograph (132 AD)

Doujiang Weir 256 B.C. Qin Dynasty

Global efforts to disaster mitigation

- Modern S&T application in Disaster mitigation;
  Weather watch web, Seismic measurement network, Oceanic observation systems, Tsunami monitoring systems……
- International activities
  UN → IDNDR(1990-2000) → ISDR(2000—)
- International cooperation agreements & mechanisms
  UN-SPIDER , CHARTER , CEOS , GEOSS, WMO ……
  UN-International Center for Drought Risk Reduction (ICDRR)(April, 2007,Beijing)

In the Appendix section, the report may also include:
Actual data or access to data used in the study
Abstracts, Power Point Slides of conference/symposia/workshop presentations
Conference/symposium/workshop reports

The final project report must follow the template outlined in this document. Use Calibri font size 12 for all the headings and font size 11 for the text.

The report is to be submitted **one month before the end the Contract Period** in the following formats:

1. By airmail to the address below:
   a. **Soft Copy – 2 CD-ROMS**, appropriately labeled and covered using the design and information on the cover page of the Report Template
   b. **Hard Copy – 2 bound copies** appropriately labeled and covered using the design and information on the cover page of the Report Template

   Dr. Linda Stevenson
   APN Executive Science Officer
   APN Secretariat
   4F East Building
   1-5-2 Wakinohama Kaigan Dori
   Chuo-Ku, Kobe 651-0073 JAPAN

2. By e-mail and addressed to Dr. Stevenson (lastevenson@apn-gcr.org) and Ratisya Radzi (arradzi@apn-gcr.org).
   Kindly note that our server can also receive attachments of up to 8MB file size. In case that the final project report file size exceeds 8MB please try any of the following options:

   a. For a file size of more than 8MB but less than 10MB please send the report to our Gmail account at apngcr@gmail.com and notify us in our APN account so we could check for it immediately.
   b. For a larger file size please try the following:
      - Upload on your institution's ftp server and provide to us the download details (i.e. IP address, login details, etc)
      - Send through any of the free file hosting available in the internet. Please note that these free file hosting save your files for a limited number of days so it is very important to notify us immediately. Some of these are the following:
        - http://www.filefactory.com/
        - http://www.mediafire.com/
        - http://www.yousendit.com/
3. A separate **CD** containing other project outputs (i.e. publications, photos, etc)