

Spatial and Temporal Variations of Biological Production in the Asia-Pacific Marginal Seas (APPENDIX)



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Spatial and Temporal Variations of Biological Production in the Asia-Pacific Marginal Seas (APPENDIX)

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Workshops: International Mini-Workshop on the Western Pacific Marine Biogeochemical Environmental Variability (3 – 4 February 2014)

PROGRAMME

Day 1, Feb 3 (Mon), 2014

09:30 – 10:30 **Registration**

10:30 – 10:40 **Welcome Address**

First Session: Numerical Modeling of Surface Circulation

(Chair: Eko Siswanto)

10:40 – 11:05 **Anukul Buranapratheprat, Pontipa Luadnakrob**

The influence of the South China sea on water column in the Gulf of Thailand

11:05 – 11:30 **Siraporn Tong-u-dom, Anukul Buranapratheprat**

Preliminary results of a numerical experiment on circulations in the South China Sea

11:30 – 11:55 **Benny N. Peter, Mohd Nadzri Md Reba**

Inter-annual variability of western boundary currents in the tropical North Pacific Ocean

11:55 – 13:15 **Lunch break**

Second Session: Remote Sensing Applications in the Coastal Waters and Marginal Seas

(Chair: Danling Tang)

13:15 – 13:40 **Tong Phuoc Hoang Son**

Perspective, potential, realistic application of remote sensing in coastal waters of Vietnam: Results and orientations

13:40 – 14:05 **Mohd Nadzri Md Reba, Nor Zafirah Ab. Lah, Eko Siswanto, Katsuhisa Tanaka**

Autonomous validation and calibration of satellite ocean color retrieval

14:05 – 14:30 **Joji Ishizaka, Shengqiang Wang**

Satellite estimate of phytoplankton community in the East China Sea

14:30 – 14:45 **Coffee Break**

14:45 – 15:10 **Sinjaee Yoo, Joo-Eun Yoon**

Decadal ecosystem changes in the seas around Korea

15:10 – 15:35 **Eko Siswanto, Yongjiu Xu, Hisashi Yamaguchi**

Does the Three Gorges Dam decrease primary production in the areas adjacent to Changjiang estuary?

15:35 – 17:00 **JAMSTEC Facility Tour (guided by Ms. Kyoko Takeuchi)**

18:00 – 20:00 **Social Gathering at JAMSTEC Guest House**

Day 2, Feb 4 (Tue), 2014

Third Session: In Situ Time Series Observations for Biogeochemical Studies

(Chair: I-I Lin)

- 10:00 – 10:25 **Makio C. Honda, Kazuhiko Matsumoto, Tetsuichi Fujiki, Kosei Sasaoka, Eko Siswanto, Hajime Kawakami, Masahide Wakita, Toshiro Saino**
How will the climate change affect the biological pump in the western North Pacific?
- 10:25 – 10:50 **Tetsuichi Fujiki, Kazuhiko Matsumoto, Makio C. Honda, Toshiro Saino**
Time-series observations of phytoplankton biomass and productivity in the western North Pacific by an underwater profiling buoy system
- 10:50 – 11:15 **Maki Noguchi, Reiichiro Ishii, Eitaro Wada**
Relationship between carbon and nitrogen isotope ratios along simple food chains in marine environments
- 11:15 – 11:40 **Carmen García-Comas, Chun-Yi Chang, Lin Ye, Akash R. Sastri, Yu-Ching Lee, Gwo-Ching Gong, Chih-hao Hsieh**
Mesozooplankton size structure in response to environmental conditions in the East China Sea: How much does size spectra theory fit empirical data of dynamic coastal area?
- 11:40 – 13:00 **Photo Sessions & Lunch break**

Fourth Session: Atmosphere-Land-Ocean Interactions and Biogeochemical Modeling

(Chair: Anukul Buranapratheprat & Mohd Nadzri Md Reba)

- 13:00 – 13:25 **Kedarnath Mahapatra, Yoshihiro Okada**
Influence of climate variability on pelagic ocean condition in the Kuroshio-Oyashio Transition Area using time series remote sensing data
- 13:25 – 13:50 **DanLing Tang, YongJun Song, Jie Yu, QingYang Sun, Haijun Ye, JingRou Lin**
Marine ecosystem response to typhoon in the South China Sea
- 13:50 – 14:15 **I-I Lin**
Typhoon-ocean interactions in the western North Pacific and neighboring seas – Recent highlight
- 14:15 – 14:40 **Kentaro Ando, Takuya Hasegawa, Takanori Horii, Motoki Nagura, Toru Miyama, Iwao Ueki**
Upwelling events associated with climate variations in the Indo-Pacific region
- 14:40 – 14:55 **Coffee Break**
- 14:55 – 15:20 **Prabir K. Patra**
Coupling between land and ocean biospheres
- 15:20 – 15:45 **Yugo Kanaya, Fumikazu Taketani, Hisahiro Takashima, Yuichi Komazaki, Takuma Miyakawa, Xiaole Pan, Hitoshi Irie, Makio C. Honda**
Measurements of aerosols and reactive gases in the Pacific rim region and over the western Pacific
- 15:45 – 16:10 **Yoshikazu Sasai, Chisato Yoshikawa, Sherwood L. Smith, Kazuhiko Matsumoto, Tetsuichi Fujiki, Kosei Sasaoka, Masahide Wakita, Makio C. Honda**
Seasonal variability of primary production at K2 & S1 stations using a 1-D physical-biological model

- 16:10 – 16:35 **Tran Van Chung, Tong Phuoc Hoang Son**
The numerical simulations on hydrodynamic and bio-geochemistry processes in Vietnam sea waters
- 16:35 – 17:00 **Closing Remarks**

Schedule for facility tour at JAMSTEC Yokohama Institute for Earth Sciences

1. Date: February 3, 2014
2. Venue:
JAMSTEC Yokohama Institute for Earth Sciences
3173-25 Showa-machi, Kanazawa-ku, Yokohama City, Kanagawa, 236-0001
3. Guests: APN-JAMSTEC Workshop presenters (11 in total)
4. Timetable:

3:35 – 3:45 pm	Briefing on JAMSTEC in Miyoshi Hall
3:50 – 4:10 pm	Supercomputer system, Earth Simulator in Earth Simulator Building
4:10 – 4:20 pm	Simulation images in Earth Simulator Research Building
4:25 – 4:55 pm	Hemispheric simulation screen in Earth Science Museum
4:55 – 5:00 pm	Question and answer session in Miyoshi Hall

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Messages/comments from APN-JAMSTEC Workshop participants

Anukul Buranapratheprat (Burapha University, Thailand):

The workshop provided opportunity not only for all collaborators under APN project led by Dr. Eko Siswanto but also other leading scientists to discuss their research progresses in atmospheric and ocean sciences. The presentations by all participants were excellent due to up-to-date progresses of their researches and investigations. The discussion and suggestion during the workshop were very helpful to my researches. I think many new useful ideas came up to other participants as well. JAMSTEC facility tour was also a great opportunity for participants to explore modern technologies of earth simulating system including the results of simulation in several kinds of presentations. Regarding workshop facilities, JAMSTEC conference hall was very appropriate for the workshop with convenient transportation from the hotel. The staffs were very helpful for any kinds of information the participants needed. I think this workshop is great and very successful one.

Siraporn Tong-u-dom (Burapha University, Thailand):

Thank you very much for giving me (as a young scientist) a good chance to attend the International Mini-workshop at JAMSTEC. This workshop provided me new experiences in marine sciences especially numerical modeling and remote sensing. I also had a great chance to do my first international presentation. I would like to express my sincere gratitude for all of you for comments and information. It is really helpful to my studies and researches.

Thank you for everything you have done for us for the workshop. I hope we can get together again in some future events soon.

Benny Peter (Universiti Teknologi Malaysia, Malaysia):

The “International Mini-Workshop on the Western Pacific Marine Biogeochemical Environment Variability held at Yokohama Institute for Earth Sciences, JAMSTEC, Japan was really a fruitful meeting which I attended. The meeting convened under the Asia-Pacific network ARCP project programme focused on the issues related to the productivity of western Pacific as well as the South China Sea. As the number of participants were limited (about 25), we had close exchanges on present scientific issues. The presentations/deliberations at the meeting conveyed frontier informations on the topic as well as directions for future study. The novel ideas on Chlorophyll input/ factors influencing the Chl-distribution caught special attention of the participants. Also, detailed the on-going and forthcoming research programmes at different countries such as; Japan, Korea, Taiwan, Vietnam and Thailand and possible ways of future collaboration. Above all, the JAMSTEC Facility tour on 3rd February afternoon was a rare opportunity to visit the Earth Simulator, the largest computing facility in the world and visualized different simulations of ocean/atmosphere circulations. Of course, this workshop has provided lots of information, enthusiasm and confidence to carry out more comprehensive investigations.

Mohd Nadzri Md Reba (Universiti Teknologi Malaysia, Malaysia):

It is a great pleasure to join the APN Workshop held in JAMSTEC in last February 2014 and having a good time to meet and share insight with APN scientist counterpart. Contents of workshop lie on the

context of sea-to-space in which findings and results from satellite-derived measurement, field data campaign and digital data processing are comprehensively presented in interactive discussions. All scientists had demonstrated high enthusiasm in research by highlighting some breakthroughs and this may result collaborative and joint research among them.

Sinjae Yoo (Korea Institute of Ocean Science and Technology, Korea):

The ecosystem changes due to climate change and other environmental stressors are expected to have a significant impact on the resource utilization and hence on the well-being of human societies. The impacts of climate change as well as human activities have been increasingly observed in the Western Pacific region. In fact, Northwestern Pacific is among the regions where ecosystems changes have been the fastest on the globe. While these changes in different ecosystems in the region share some commonalities in the causes and consequences, some changes are unique and local. The ecosystem changes differ not only geographically but also thematically. Therefore, it is difficult to have a whole picture of the ecosystem changes that have occurred or are going on. However, without such a big picture, it will also be difficult to understand the mechanisms of the changes. Researchers typically have some disciplines where they focus their research. While this approach can give details on some components of the whole system, this does not give a whole picture. This workshop provided a forum where scientists from different regions of the western Pacific and with different disciplinary backgrounds gather and exchange information and their views on the ecosystem changes. At the workshop, a wide range of issues on different spatial scales were presented and discussed. Such topics included warming, typhoons, aerosols and gases, circulation observation and modeling, long-term changes, upwelling, and ecosystem modeling. I, like other participants, have learned many new facts on what is going on in the Western Pacific as a whole and gained new understanding on the possible causes of the ecosystem changes in the region. Although my research interests are focused on the Northwestern Pacific marginal seas, the insights I gained from this workshop will help me think in a broader perspective. I think the workshop was very beneficial for me and we should seek ways to have meetings like this regularly in the future.

Joji Ishizaka (Nagoya University, Japan):

International mini-workshop on the Western Pacific Marine Biogeochemical Environment Variability was held on Feb. 3-4, 2014 in JAMSTEC, Yokohama. The workshop was well organized by Dr. Eko Siswanto with four sessions including Numerical model of surface circulation, Remote sensing application in the coastal waters and marginal seas, In situ time series observations for biogeochemical studies, and Atmospheric-Land-Ocean interactions and biogeochemical modeling. Research area was covered East China Sea, South China Sea, Sea of Japan, Indian Ocean, and north and tropical western Pacific area, and participants were from Thailand, Vietnam, Malaysia, Korea, China, and Japan. The presentations and discussion were very informative and fruitful, and I found there are plenty of possible future collaborations among the participants. I hope this workshop is the first step of the collaborations between JAMSTEC, Nagoya University and other Asian organizations.

Kedarnath Mahapatra (Tokai University, Japan):

International mini-workshop on the western Pacific marine biogeochemical environment variability provided an opportunity to share, learn and discuss about the ongoing research activities on various aspects of biogeochemical processes from an interdisciplinary approach – linkages and connectivity, in the western North Pacific and some regional marginal seas. The workshop succeeded in engaging participants in discussions on a diverse and wide spectrum of themes such as numerical modeling, remote sensing, in situ observation, and atmosphere-land-ocean interactions. The perspectives shared by the participants from diverse background, after each presentation through Q&A and comments, provided new insight to the problems addressed in the talks. I sincerely hope the information and insight shared and acquired by the participants at the workshop might go a long way in planning new research initiatives in the region. The specific issues and recommendations should

have been compiled through a focused framework/discussion at the last session of the workshop for necessary follow-up.

Thong Phuoc Hoang Son (Institute of Oceanography, Vietnam):

Thank so much on the organizing of this event under support of Dr Eko Siswanto, members of APN project and JAMSTEC as well. This is a good opportunity for meeting together of researchers on Ocean Colour, Oceanographer, Researcher on Climatology and Climate Change in countries belong Eastern Sea as well as South China Sea. We met in Yokohama (Japan) in friend air, discussed, shared the relevance information and data as well as understand and looking for cooperation opportunities.

We hope that we will link together better more better but only APN, JAMSTEC meeting not also other scientific events that held every year in Asia and Eastern Asia and in countries belong to South China Sea (as symposium of ACRS, JKRS, PORSEC, IOC/WESPAC) with participation of more researchers, oceanographers. Hope to support on activities of capacity building for young oceanographers by mean of workshops, short term training course that held in parallel with meeting, Conference, Symposium. There were many observed data on environmental parameters in South China Sea. There must be many unknown reason but important phenomena. How to handling and analyzing these huge data may be nerves for every researchers. What kind of needs for field data analyzing. There may be many sleeping data. If those data are revived, those science may grow up enrich. Need to collaborate between marine researchers, Oceanographer, Remote sensing Experts, Modeler for understanding more detail on oceanographic processes that occur in South China Sea.

Tran Van Chun (Institute of Oceanography, Vietnam):

Over 15 years research interests: main research and application finite element method in triangle grid use to the numerical experiment hydrodynamic problems at shallow water. In recent years, the application and development of the 3-D coupled biophysical model (Ecoham, Ecosmo) for Vietnam in waters cooperation program between Vietnam – Norway (NUFU). Therefore, to have the certain knowledge in the management of existing data sources and use it in a really effective way is a challenge for me. APN workshop is a good opportunity for meeting together of researchers on Ocean Colour, Oceanographer, Researcher on Climatology and Climate Change in countries belong Eastern Sea as well as South China Sea. The workshop helped me driven professional development in the near future.

DanLing Tang (South China Sea Institute of Oceanology, China):

This is to express my opining to the APN -JAMSTEC workshop you organized in Feb 2014. 1. The workshop topic is very good, that is one of the reason I attended during the Chinese New year holiday week. 2. The scientific program was well organized, while we got good discussion, received useful information and updated related data. 3. Hotel accommodation is also comfortable, at the same time of attending the workshop, we also got know more about Japan, and enjoyed Japanese food. 4. Those yang staffs, who were working for the APN -JAMSTEC workshop, are very nice. They give us a lot of help, from the beginning till the end. I do not know how to express my appreciations to you and to the workshop, thank you again for your wonderful work! Hope to see you again somewhere.

I-I Lin (National Taiwan University, Taiwan):

This was a very fruitful workshop which gathers people of common interests focusing on remote sensing, air-sea biogeochemical interactions and biogeochemical modeling. Though small in size, the conference was well organized. There are participants from Vietnam, Malaysia, China, Taiwan, and Korea as well as JAMSTEC scientists and participants from other Japanese institutions. During the past 2 days, much was discussed on the ocean biogeochemical processes involving climate control (e.g. the talk by Dr. Soo from Kordi and Dr. Honda), on typhoon impact (Dr. Tang and Dr. Lin), on Chanjiang Dilluted water (Dr. Siswanto). The importance of aerosol input as nutrient source was also emphasized. The talk by Dr. Ando emphasized on the time series observations, including IOD impact over the Indian Ocean and processes over the western Pacific Ocean. I am also impressed by the series

of talks observed by the 2 in situ observations of JAMSTEC, K1 and S1. The information was rich. As the participants all work on the same ocean (Western North Pacific, East China Sea, and South China Sea), the information converged quickly and the sharing was beneficial to all of us. Finally, many thanks to Dr. Eko Siswanto and Ms. Hamamoto, for the great organization and hard works to make this mini workshop possible.

APN-JAMSTEC Workshop Report

Report on workshop: Day-1

- **Opening remarks: Workshop objectives related to APN and RIGC-JAMSTEC**

Eko Siswanto (JAMSTEC, Japan)

The objectives of the workshop relevant with the Asia-Pacific Network for Global Change Research (APN) and JAMSTEC research activities were introduced.

- **First Session: Numerical Modeling of Surface Circulation**

The session mainly discussed water mass circulations in the Gulf of Thailand, the South China Sea, and tropical North Pacific Ocean, as well as water mass exchanges between the regions.

The influence of the South China sea on water column in the Gulf of Thailand

Presenter: Anukul Buranapratheprat (Burapha University, Thailand)

Dr. Anukul delivered his recent study on the influence of the South China Sea on the water column of the upper layer of the Gulf of Thailand based on in situ observations. Surface heat fluxes and tidal stirring are the most important factors, followed by freshwater fluxes, in controlling water column condition in the Gulf of Thailand. The intrusion of the South China Sea into the Gulf of Thailand leads to stable and strong water column stratification during southwest monsoon and generates double thermocline and multi-stratified water column in the Gulf of Thailand.

Q1 (Ishizaka): What is the reason or mechanism allowing the intrusion of the SCS water mass into the gulf?

A1 (Buranapratheprat): Probably it is caused by density current.

Preliminary results of a numerical experiment on circulations in the South China Sea

Presenter: Siraporn Tong-u-dom (Burapha University, Thailand)

In this presentation, using monthly mean winds, tide, and river discharge as major forcings, a 3D Princeton Ocean Model was used to investigate the seasonal circulations in the South China Sea and its adjacent Gulf of Thailand and Gulf of Tonkin. During northeast (winter) monsoon, cyclonic circulations emerge in the northern and southern parts of the South China Sea, as well as in the neighboring Gulf of Thailand and Gulf of Tonkin. However, during southwest (summer) monsoon, a large anti-cyclonic and a cyclonic circulations develop, respectively, in the southern and middle parts of the South China Sea. During the same season, the Gulf of Thailand and Gulf of Tonkin are respectively characterized by anti-cyclonic and northward surface currents.

Q1 (Patra): What is the future direction of this research in relevant with biogeochemical variability in this region?

A1 (Buranapratheprat): The work is still preliminary result mainly on the water circulation seasonal variability. But it will surely be continued to physical-biogeochemical modeling to discern biological production variability in the South China Sea.

Inter-annual variability of western boundary currents in the tropical North Pacific Ocean

Presenter: Benny Peter (University of Technology Malaysia, Malaysia)

The satellite altimeter-derived sea level anomaly by Collect Localization Satellite and surface drifter from Global Drifter program were used to derive the mean and variability of western boundary currents of the tropical North Pacific Ocean. Multi-scatterometers on board ERS-1/2, QuikScat, and ASCAT data from CREST were also used to separate the wind-driven component from the drifter velocity. The most prominent surface circulations are as follows: 1) strong circulation in the western boundary of tropical North Pacific. Highest speeds (1.5 m/s) are observed for Mindanao Current at the entrance of Celebes Sea; 2) the northward flow of the Kuroshio Current is originating at 15 °N and it strengthens further towards higher latitudes and in between a slight intrusion to the South China Sea at the Luzon Strait; 3) the western boundary currents are stronger in summer (July) compared to winter (January). But, significant intrusion of the Kuroshio Current into the South China Sea occurs during winter period; 4) the inter-annual variability of circulation illustrates strong intrusion of the Kuroshio into the South China Sea during El Nino period but the Mindanao Current is contributing more into the eastward North Equatorial Counter Current. The North Equatorial Current is stronger and shifts more in north. During La Nina period, Mindanao Current is exiting more into the Celebes Sea and weak intrusion of the Kuroshio into the South China Sea.

Q1 (Buranapratheprat): Widely reported that during El Nino, wind and current tend to decrease. But here the result shows during El Nino, Mindano surface current tends to be strong, why?

A1 (Peter): This is due to westward intensification of oceanic currents and also the coastline features.

Q2 (Patra): Does ocean circulation control the chlorophyll-a spatial distribution?

A2 (Peter): Yes, ocean circulation has a significant role in the distribution of chlorophyll-a.

● Second Session: Remote Sensing Applications in the Coastal Waters and Marginal Seas

Remote sensing and field observation-based studies covering the ocean color calibration/validation and environmental monitoring in the coastal region and marginal seas were presented during this session. The session also discussed the impacts of climate changes and anthropogenic activities on the marine biological production as well as marine ecosystems in the coastal and marginal seas in the Asia-Pacific region.

Perspective, potential, realistic application of remote sensing in coastal waters of Vietnam: Results and orientations

Presenter: Tong Phuoc Hoang Son (Institute of Oceanography, Vietnam)

Despite the advancements of remote sensing technique and geographic information system on which the marine-earth monitoring and conservation rely on, there is a limitation in terms of expert and research capabilities in the Southeast Asian countries. One of the efforts to solve the aforementioned gaps, periodic remote sensing-related training course through visiting professorship under the support of IOCCG, NF-POGO were conducted. Training on remote sensing applications in Vietnam such as 1) mangrove forest, coral reefs, sea-bottom habitat detections; 2) natural disasters and risk monitoring/mitigation in the coastal water of Vietnam; and 3) ocean color application for marine bio-resource sustainable exploitation are introduced. Dr. Son also introduced his recent study utilizing ocean color imagery in the coastal water of Vietnam.

Q1 (Yoo): It is well known that summer upwelling causes high chlorophyll-a in the coastal area of Vietnam. But, high MODIS derived chlorophyll-a in northern side of central of Vietnam appears during November. What are the causes?

A1 (Son): That was probably associated with river discharge.

Q2 (Tang): Is the image daily or monthly composite?

A2 (Son): That is daily data on 19 November 2003. However, I also saw this phenomena during other November from satellite derived chlorophyll-a.

Q2 (Tang): Is there any river there?

A2 (Son): Yes, there is.

C1 (Tang): It is strange. Better to be checked.

Autonomous validation and calibration of satellite ocean color retrieval

Presenter: Mohd Nadzri Md Reba (University of Technology Malaysia)

The talk delivered by Dr. Reba focuses on the local tuning of ocean color algorithm to provide reliable estimates of chlorophyll-a in the optically complex turbid water of the Malacca Straits. It is shown that MODIS standard chlorophyll-a algorithm highly overestimates in situ chlorophyll-a in the turbid coastal water, but slightly underestimates in the non-turbid coastal water. Local tuning on the MODIS chlorophyll-a algorithm by iterative fitting routine was conducted to reduce the absolute error. Based on the tuned algorithm, chlorophyll-a over the Malacca Straits area was estimated.

Q1 (Ishizaka): Basic question however, did you calibrate the in situ chlorophyll-a data used here?

A1a (Reba): Not, sure.

A1b (Siswanto): Yes, we did calibrate the fluorescence data using in situ chlorophyll-a data. We also collected water samples to measure chlorophyll-a concentration using fluorometer, based on which we calibrated the continuous fluorescence reading.

Q2 (Ishizaka): Is the correlation for calibration was good, so that we can believe the data?

A2 (Siswanto): Yes. But the problem here is we only have in situ data from only two stations. So, while the tuned algorithm might good for those two particular stations, the tuned algorithms are probably questionable for the wide region of the Malacca Straits.

C1 (Ishizaka): But, you have good time series data.

R1 (Siswanto): Yes, but not spatially. We are trying to utilize another dataset to cover larger area.

Satellite estimate of phytoplankton community in the East China Sea

Presenter: Joji Ishizaka (Nagoya University, Japan)

Because the East China Sea is unique and highly influenced by Changjiang diluted water, the existing global algorithms are not able to estimate phytoplankton community structure in this area. The talk hence introduced the application of remote sensing ocean color observation to estimate phytoplankton community structure in the East China Sea. The method is novel as it no longer depends upon the total concentration of chlorophyll-a.

C1 (Tang): It is interesting. It is a new method.

Q1 (Reba): How the sun-glint affects the method?

A1 (Ishizaka): What do you mean with sun-glinc effect? We know well how to do this work. We have masked invalid data/pixels, so the data are accurate.

Decadal ecosystem changes in the seas around Korea

Presenter: Sinjae Yoo (Korea Institute of Ocean Science and Technology, Korea)

The talk introduced decadal changes in the marine ecosystems in the marginal seas around the Korean Peninsula, such the East China, Yellow and East Seas. While there exist changes in those three marine ecosystems, the stressors driving the changes in the East Sea are different from those in the other marginal seas. Multitude of factors drive ecosystem changes in the East China and Yellow Seas, which one of them i.e., pollution/eutrophication can be attributed to changes in the water quality of freshwater discharge. In the East Sea however, influence of freshwater discharge is trivial hence pollution/eutrophication is relatively minor stressor to ecosystem changes. Particularly in the southern East Sea, employing phytoplankton biomass, zooplankton biomass and fish community

structure, there exists regime shift around 1990, which is associated with the linkage between the physical environments and lower trophic level changes.

Q1 (Patra): What has driven the warming of the northwestern Pacific?

A1 (Yoo): According to Yeh and Kim (2010), the warming was concurrent with the NPO-like variability of SLP in the North Pacific. They interpreted that the strengthened air circulation in the central North Pacific accelerated the sea surface circulation and hence carried more heat to the northwestern Pacific.

Q2 (Ishizaka): You suggested the increase in the primary productivity in the southern East Sea was induced by the increase of nutrients transported by the Tsushima Warm Current (TWC). But is the TWC oligotrophic?

A2 (Yoo): Yes, TWC is oligotrophic in most seasons except for winter. In winter, vertical mixing occurs to substantial depths and as a result, the surface water is replete with nutrients. Thus the larger the volume transport of TWC, the more nutrients are brought in to the southern East Sea area.

Q3 (Patra): Is there any possibility that atmospheric nutrient inputs have contributed to the increase of the primary productivity?

A3 (Yoo): Kim et al. (2011) has argued that atmospheric inputs account for about half of the nutrient supply to the surface layer in the region. They also showed the increase in the surface nutrients occurred in the mid 1980s. Therefore, it is possible that atmospheric inputs may have contributed to the increase in the primary productivity. One problem is that while atmospheric deposition in the region has steadily increased while chlorophyll-a level was stationary after the regime shift of 88/89.

Q4 (Siswanto): Why ecosystem in the southern East Sea did not show 1970s regime shift?

A4 (Yoo): 1970s regime shift is considered small.

Does the Three Gorges Dam decrease primary production in the areas adjacent to Changjiang estuary?

Presenter: Eko Siswanto (JAMSTEC, Japan)

Based on previous studies suggesting different views in regard to the possible impacts of the Three-Gorges Dam freshwater impoundment on primary production in the East China Sea, the talk was to re-review whether impoundment did decrease primary production the East China Sea. Multi-sensor satellite data and the East China Sea-specific phytoplankton biomass and primary production models were applied to generate long-term time series of primary production in the East China Sea. Although there is a declined primary production after dam freshwater impoundment, such a declined is barely seen to be solely due to freshwater impoundment. There are several cases of declining productions in the years before freshwater impoundment. In addition, there are several cases when primary production are remarkably high but seems to be related to recent red tide outbreaks. Therefore, the statements suggesting the Three-Gorges Dam freshwater impoundment to decrease primary production need to be re-considered.

C1 (Ishizaka): I have just read the paper by Liu et al. (2010). Their physical-biogeochemical model did not include suspended sediment, the reason why his result of seasonal primary production differs from in situ and satellite-based observations.

R1 (Siswanto): Thank you for the notice.

C2 (Yoo): Upwelling is probably the factor obscured the influence of river discharge on primary production.

R2 (Siswanto): Probably, but before coming to any conclusion, time series analysis need to be restricted only over the Changjiang-diluted water, as done by Gong et al. (2006). We will work on that further by including surface salinity data from FRA-JCOPE-reanalyzed product.

Relationship between carbon and nitrogen isotope ratios along simple food chains in marine environment

Presenter: Maki Noguchi (JAMSTEC, Japan)

Dr. Noguchi delivered her talk on the potency of stable isotope analysis to reveal complex interactions, including trophic interactions, and energy or mass flow through ecological communities. Analysis results from six oceanic regions were presented. It is shown that there exists strong similarity in slope of $\delta^{15}\text{N}$ versus $\delta^{13}\text{C}$ ($\Delta\delta^{15}\text{N}/\Delta\delta^{13}\text{C}$) among regions: $\delta^{15}\text{N} = 1.24[\pm 0.14] \delta^{13}\text{C} + [\text{ecosystem specific constant}]$ ($p < 0.001$) which is attributed to common physiological aspects of feeding processes.

Q1 (Honda): Can you estimate the value of $\delta^{13}\text{C}$ for primary producer from ambient water?

A1 (Noguchi): Carbon isotopic composition contained in the sea water is an important factor. However, isotope fractionation of phytoplankton is correlated with the growth rate. Phytoplankton $\delta^{13}\text{C}$ value changed according to water temperature, solar radiation and nutrient concentrations. In general, $\delta^{13}\text{C}$ of phytoplankton was high in the blooming time while other times were low value. The $\delta^{13}\text{C}$ of phytoplankton varies greatly in the short period of blooming. That is, the $\delta^{13}\text{C}$ of phytoplankton has a sharp change between space and time. For these reasons, it is difficult to measurements of $\delta^{13}\text{C}$ of phytoplankton in the field environment.

Q2 (Ishizaka): Constant relations seen in the differences six regions, but why $\Delta\delta^{15}\text{N}/\Delta\delta^{13}\text{C}$ slope reflect by seasonal change?

A2 (Noguchi): Figure of seasonal differences of $\Delta\delta^{15}\text{N}/\Delta\delta^{13}\text{C}$ plotted only lower trophic zooplankton with short life spans such as copepods, euphausiids, amphipods and chaetognath, not included higher trophic levels. On the other hands, differences six regions of $\Delta\delta^{15}\text{N}/\Delta\delta^{13}\text{C}$ map including higher trophic level such as fish. Higher trophic level animals with large body sizes and/or long life spans show less variability in their isotope ratios than those with small body sizes that prey over shorter time spans. One reason for this pattern may be that for large-bodied populations with longer life spans, isotopic ratios reflect the mean integrated value of feeding over a longer period. Thus, this general pattern (slope) for food chain draw in lower trophic level from higher trophic level.

Mesozooplankton size structure in response to environmental conditions in the East China Sea: How much does size spectra theory fit empirical data of dynamic coastal area?

Presenter: Carmen García-Comas (JAMSTEC, Japan)

Using three size metrics representing mesozooplankton size structure, Dr. García-Comas delivered her talk on the relationship between zooplankton size structure and environmental conditions in the East China Sea. The result shows no clear spatial gradient for each of the three size metrics. Trophic status exerts a stronger effect than temperature on size distribution, but its effect is opposite to model prediction. The results highlight the need for caution when using size-based indicators for monitoring environmental forcing on communities in highly dynamic ecosystems.

Q1 (Honda): What is the implications of size of mesozooplankton on carbon flux?

A1 (García-Comas): The low mesozooplankton size diversity implies lower grazing efficiency and so expected higher flux from primary producers.

Q2 (Honda): Is the change in size structure being due to changes of species composition or inside a species?

A2 (García-Comas): Due to metabolic constraints (larger need more energy to keep their basal metabolism; growth rates increase with temperature and so organisms attain maturity early and smaller; smaller have faster rates, etc etc), predator-prey constraints (larger have large prey range and higher predation success and less predators) and population dynamics (secondary production).

C1 (Tang): We observed a change in the size structure of plankton and fish after typhoon passing by the south of China, with a reduction of size.

● **Fourth Session: Atmosphere-Land-Ocean Interactions and Biogeochemical Modeling**

There are two main topics discussed in the last session of the workshop, i.e., how the land-ocean-atmosphere interactions drive ocean biogeochemical variability, and the applications of hydrodynamic and coupled physical-biological models in simulating marine biogeochemical variability. The study regions encompassed the various areas from the marginal seas of South China Sea to open oceans of northwestern Pacific Ocean and tropical regions of Indian Ocean.

Influence of climate variability on pelagic ocean condition in the Kuroshio-Oyashio Transition Area using time series remote sensing data

Presenter: Kedarnath Mahapatra (Tokai University, Japan)

Emphasizing the Kuroshio-Oyashio Transition Area, Dr. Mahapatra presented the time series of remotely-sensed oceanographic data to assess the impacts of climate variability on the pelagic ecosystem. A warming phase during 1997-99 is detected from the sea surface temperature anomaly followed by a cooling phase, attributed to the regime shift of 1998. During the warming event, the onset of spring phytoplankton bloom is delayed by more than one month compared to the normal year, however the cooling event is marked by early onset of the bloom with anomalously higher chlorophyll-a concentration. This can be attributed to increase mixing during this period as well as the early onset of spring phytoplankton bloom.

Q&A: NA

Marine ecosystem response to typhoon in the South China Sea

Presenter: DanLing Tang (South China Sea Institute of Oceanology, China)

The talk mainly introduced recent studies on the marine ecosystem responses to typhoon in the South China Sea. Interannual variation of phytoplankton biomass in the South China Sea was also mentioned. Besides commonly observed post-typhoon phytoplankton bloom in the surface layer, bloom can also be observed in the subsurface layer, attributed to typhoon-driven subsurface upwelling. Typhoon also increases dissolved oxygen in the surface layer which can be attributed to entrainment of oxygen from the air, increase of photosynthesis by phytoplankton in the surface, and transport of dissolved oxygen enriched waters from the Western Pacific through Kuroshio water intrusion. Changes in the fish community structure is also observed after the passage of typhoon. This is attributed to nearshore rainfall and offshore upwelling variations associated with typhoon passage. A new index to quantitatively evaluate the extents of surface cooling caused by typhoon passage was also introduced. C1 (Son): Decreasing chlorophyll-a in the coastal region of Vietnam in 1997/1998 is associated with El Nino.

R1 (Tang): Yes, it is right. The southwesterly wind during summer weakens, hence weak summer upwelling, causing low chlorophyll-a.

Q1 (Siswanto): Summer bloom caused by summer upwelling occurs in the coastal water of Vietnam, but winter upwelling occurs in the northwest of Luzon Island. While summer upwelling shows interannual variation associated with El Nino, is there any evidence of interannual variation of winter chlorophyll-a bloom in the areas adjacent to Luzon Island?

A1 (Tang): No, we have not investigated yet.

C2 (Buranapratheprat): I guess, that will be the future studies.

Typhoon-ocean interactions in the western North Pacific and neighboring seas – Recent highlight

Presenter: I-I Lin (National Taiwan University, Taiwan)

The upper ocean heat content in the typhoon development region has been known to increase by 15% compared to that in the early 1990s. Through the additional enthalpy flux supply, such an ocean warming contributes to the observed extra-ordinary intensification for super typhoon Haiyan which

devastated the Philippines in November 2013. The talk also introduced a new ocean coupling potential intensity index to explore the associated change in the intensity upper bound. Besides introducing researches on typhoon impacts, presentation also introduced the atmospheric deposition of aerosols (e.g., from volcanic eruption) as one of responsible factors for phytoplankton biomass variability.

C1 (Honda): How productive you are! I like the conclusion on 'the Inconvenient Truth', because only 2 out of 11 typhoons have strong enough response. However you should also consider the CO₂ outgassing aspect.

R1 (Lin): Yes, Honda is correct. In this Lin (2012), Lin only said that over the western Pacific, it was hypothesized to be a stronger CO₂ sink through strong biological pump. In the Lin (2012) paper, the inconvenient truth means that it is not a strong sink but a weak sink, through the biological pump mechanism. However, if consider also the physical pump, the outgassing very likely could make the entire contribution to be a source for CO₂.

Q1 (Kanaya): What is the nutrients contained in the biomass burning aerosols?

A1 (Lin): This is a new direction so much unknown, because previous sampling all focus on dust. In the Lin et al. DSR II (2007) paper and Lin et al. GRL (2009) paper, we found the importance of other aerosol sources (i.e. industrial pollution from Eastern China and biomass burning from the South East Asia). They should be even more important aerosol sources, as compared to the dust. However, the composition is much less known. It is an important new direction to conduct experiments on these new nutrient sources. Also, Lin et al. GBC (2011) analyzed the samples of volcanic eruption and found that Fe and P are the nutrients contained in the volcanic samples.

Upwelling events associated with climate variations in the Indo-Pacific region

Presenter: Kentaro Ando (JAMSTEC, JAPAN)

Dr. Ando introduced his recent research activities on the upwelling events associated with climate events in the Indo-Pacific region. The upwelling event in the Indian ocean is one important process of meridional overturning circulations, that convey heat from north to south across equator. Upwelling event near the Sumatra coast in the eastern Indian Ocean has been identified to provide some source cold water for maintaining Indian Ocean Dipole phenomena. In the South of Java, due to the seasonal monsoon wind the upwelling events are found annually, which causes the higher productivity together with mesoscale oceanic eddies. In the western Pacific Ocean, the seasonal upwelling events with larger amplitude tend to occur several months prior to El Nino events. These upwelling events have not been well understood, but these can impact to regional and basin scale climate phenomena.

C1 (Siswanto): One paper by Abram et al (2003) mentioned that the increased phytoplankton biomass during positive IOD in the eastern Indian Ocean may not be solely caused by anomalous upwelling, but also aerosol due to wild forest fire in Sumatra associated with drought period.

R1 (Ando): The model used here did not include atmospheric deposition.

Coupling between land and ocean biospheres

Presenter: Prabir K. Patra (JAMSTEC, Japan)

The talk was on the coupling between the oceanic and terrestrial biospheres at interannual timescale, which was analyzed utilizing SeaWiFS-retrieved ocean chlorophyll-a and land vegetation index. Analysis finds many of neighboring land and oceanic ecosystems form dipole for vegetation index and chlorophyll-a variations. It has been proposed that such land-ocean biospheric coupling is only possible through interaction between physical and geochemical processes. Observational evidences suggest that regional land-ocean biosphere coupling is likely to be resulted from fertilization of surface ocean by aerosols from the land.

Q1 (Siswanto): What is the mechanism responsible for such a dipole pattern between land and ocean?

A1 (Patra): as described in slide 10, it is due to interaction between physical and geochemical processes. When land vegetation on the land shows anomalously low during drier and hotter

conditions, it at once leads to aeolian dust transport over the coastal oceans, hence causes high chlorophyll-a.

Q2 (Mahapatra): Is there a way to separate physical (upwelling) and geochemical (aerosol/BB) effect on chlorophyll-a?

A2 (Patra): I think it is now possible to test some of the hypothesis using longer time series, as BB do not occur in same amount for each of the El Nino event.

Measurements of aerosols and reactive gases in the Pacific rim region and over the western Pacific

Presenter: Yugo Kanaya (JAMSTEC, Japan)

Dr. Kanaya delivered his talk on the recent research activities regarding atmospheric short-lived species such as aerosols, ozone and their precursor gases employing long-term in situ and satellite observations in several research areas with different levels of pollution. In the western Pacific, the observed range of Fe in late spring and summer suggests that the contribution of fine particles, mainly emitted from industrial human activity, is non-negligible in addition to that of coarse particles mainly consisting of natural mineral dust. He also recently found that water solubility of Fe in the fine mode was high, implying that human activity has increased bioavailability of Fe over the region.

Q1 (Ishizaka): How can you know if the fluorescent particles are bacteria?

A1 (Kanaya): Not clearly known. We just tentatively used a criteria which we think is best; that is, fluorescence signal is detected in all three channels (as composed by combination of two excitation wavelengths and two emission wavelengths) where fluorescence from tryptophan, NADH, and riboflavin are expected. Of course, interference from other types of particles is still possible.

Q2 (Ishizaka): Why are the bioaerosols important?

A2 (Kanaya): They may explain large unknown mass fraction of organic aerosols at least partially. Also, some of them might have high ability to form ice nuclei (IN), stimulating clouds to generate precipitation more efficiently. Therefore they may be important in relation to climate and hydrology.

Seasonal variability of primary production at K2 & S1 stations using a 1-D physical-biological model

Presenter: Yoshikazu Sasai (JAMSTEC, Japan)

In this talk, Dr. Sasai presented a recent study on the application of 1-D physical-biological model, an ecosystem model coupled with mixed layer model, to simulate the seasonal variability of surface chlorophyll and primary production in the two contrasting sub-polar and sub-tropical regions of the western north Pacific Ocean. The model was developed based on in situ observations conducted at K2 (sub-polar) and S1 (sub-tropical) biogeochemical time series stations. The model successfully captures the seasonal cycles and peak times of primary production in both stations, although underestimation is observed at S1.

Q1 (Honda): How do you think about the effects of 3-D advection or diffusion on primary production in the two time series stations? For example, nutrient uptake by passage of typhoon in the sub-tropical region.

A1 (Sasai): In future direction, I will try to examine the effects of 3-D physical processes for primary production after coupling 3-D physical-biological model.

The numerical simulations on hydrodynamic and bio-geochemistry processes in Vietnam sea waters

Presenter: Tong Phuoc Hoang Son (Institute of Oceanography, Vietnam)

The last talk was delivered by Dr. Son, introducing the simulation of hydrodynamic and bio-geochemistry processes in the coastal and offshore waters of Vietnam. A full non-linear 3D circulation

model using the finite element method was applied. The finite element method shows its potential in simulating the current circulation in the coastal waters with complex bottom topography and expanded boundary. In addition, in the whole study area, the current velocities calculated by finite element method are usually higher than that calculated by finite different method, as finite element method can simulate detail current features in the coastal, island boundaries with sand banks.

C1 (Tang): Very impressive to know the good research progress for the coastal water of Vietnam – especially, the linking between ecological modeling and remote sensing application. It is encouraging to have strong collaboration, information and data sharing between China and countries in South East Asia on oceanography and remote sensing.

R1 (Son): Thank and welcome for future collaborations. Collaboration will be considered not only between Vietnam and South East Asian countries, but also between Vietnam and East Asian countries of Japan, South Korea, China, and Taiwan.

Q2 (Sasai): How to validate the tidal current in the region of study?

A2 (Son): Time series data on sea water level (hourly for 21-year record) in Cau Da station, Institute of Oceanography is essential data for calibration and validation. We used a lot of data (3-day, 7-day average) on tidal gauge stations obtained in the river mouths of the central of Vietnam (Cai River, Dinh river of Khanh Hoa province, Kinh Dinh river in Ninh Thuan province, Da Rang river – Phu Yen province). Besides, time series of anchor stations on current measurement (1-day or longer) acquired in the coastal and offshore waters in the central of Vietnam are also collected, and applying a harmonic analysis with 8 main tidal waves as M4, M2, S2, N2, K2, K1, O1, Q1, P1.

APN-JAMSTEC Workshop Abstracts

Abstracts for presentation are mentioned in separated file: **APN_JAMSTEC_workshop_abstracts**

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 Involvement : Generating SeaWiFS new Chl-a data for the East China.
 Messages : I am much honored to be invited by the chairman of this workshop Eko Siswanto, even though I cannot join finally because of my doctor dissertation. However, I took part in the activities through collaboration with Eko Siswanto. This workshop focused on the topic in the Western Pacific Biogeochemical environmental variability, which bring great interest to me. Also, as a doctor student, I learned much from the many famous scientists through collaboration, sharing data/information. Scientific activities like this guide me to deeply and widely thinking of my study through this kind of collaboration.

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Involvement : multisensor satellite data acquisition and pre-analysis.
Messages : My involvement in this project, exposed me to learn many new things, including strengthened fundamental knowledge on oceanography and the application on remote sensing in Oceanography. in addition, the project has helped me to develop generic and communication skills, and offered me a great opportunity to attend few conferences which helped me to introduce my research field to the other researchers.

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Messages : I had involved in this project ARCP2012-21NSY-Siswanto with the project title 'Spatial and Temporal Variations of Biological Production in the Asia-Pacific Marginal Seas'. During this project involvement, I've gained experience in processing and analyzing ocean satellite data and also getting more contact with other researcher through conference events supported from the grantt. It's been a good opportunity for building our connection in the research world.

Name : **Siraporn Tong-u-dom** (Post-graduate student)
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Involvement : Modeling circulation and phytoplankton biomass using numerical and biogeochemical models.
Messages : It is my great opportunity to get involved in this APN project as a research assistance. I have learnt new knowledge not only in researching but also in organizing my time to help the coordinator, Dr. Anukul, to work for the project smoothly. My duties are to help the coordinator organize his schedules and especially work on numerical experiments. Modeling work is quite difficult for me, but under Dr. Anukul's supervision, I am getting better for it. A lot of problems regarding modeling occurs during our experiments, but we learn how to solve them step by step. Now I feel more confident to do the researches in this field, and also intend to work on ocean modeling for my master thesis. Thanks in every way for supporting me to have a great experience to visit JAMSEC, which is also my first visit to Japan. I feel excited to do the presentation in English, which is also the first time, among leading scientists. The presentations during the meeting are very useful for my researches. Many new ideas occurs then. This event encourages me to work harder for my researches and also my English. Thanks to Dr. Eko for making the meeting possible and Dr. Anukul for providing me this great opportunity. I may say that this collaborative project make me touch the real research world I have never been there before. Hopefully this is a good start for me and other young scientists for successful research couriers. Please keep in touch be collaborative.