

# IOC/WESTPAC E-Bulletin

## First International Workshop on the “Responses of Marine Hazards to Climate Change in the Western Pacific” (WESTPAC-ROSE-MaHaz)

Key Laboratory of Marine Science and Numerical Modelling,  
First Institute of Oceanography, China

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The First IOC/WESTPAC International Scientific Workshop on the Responses of Marine Hazards to Climate Change in the Western Pacific took place in Qingdao, China during November 23-24, 2008, with the generous host of the First Institute of Oceanography, SOA. Twenty-two Scientists attended this workshop, coming from ten Member States of IOC/WESTPAC including Australia, China, Indonesia, Korea, Malaysia, Philippines, Russia, Thailand, United States and Vietnam.

The workshop was held as a kickoff to the IOC/WESTPAC newly-adopted Project “the Response of Marine Hazards to Climate Change”. The project aims to improve the understanding of the physical processes of typical marine hazards, such as typhoon and storm surge, marine ecosystem disasters and their responding mechanisms to global climate change by the means of observations, dynamic analysis, numerical modelling and capacity building, in order to further develop the predictive capacity for climate change and the ocean responses.



During the workshop, various presentations were made on the air-sea interaction and multi-scale climate change, impacts of climate change on marine ecosystems and mitigation responses, and the application of several ocean and climate numerical

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models. Scientists also briefly introduced their on-going research activities relevant with this project and expressed their willingness to work together towards the objectives of the project.

The workshop recognized with concerns the ever increasing impacts of climate change on the marine natural hazards and ecosystem in the Western Pacific region, and welcomed the timely initiation of the project with objectives to improve the regional scientific knowledge on the trends and responding mechanism of marine hazards to climate change; The workshop also emphasized the links of this project with other on-going regional climate related projects and activities, e.g. CLIVAR, to avoid any overlapping, and complement each other for maximum benefit.

In conclusion, the workshop agreed to develop one scientific plan for this project, taking into full account of the identified area (7-15°N, 110-145°E) as the pilot target area for the Typhoon Generation Study, and Gulf of Thailand and Bohol Sea for the study on the response of marine ecosystem to climate change. Finally the workshop highlighted the importance of cooperation among countries in carrying out the projects and encouraged the member states interested to participate in the cooperation and contribution to this project in whatever ways they can.

For more information, please contact project leader, Professor Fangli Qiao at [qiaofl@fio.org.cn](mailto:qiaofl@fio.org.cn)

# An improvement in Numerical Modeling for Ocean and Climate Prediction: Surface Wave-Circulation Coupled Theory and its Application

By Fangli Qiao, Zhenya Song and Changshui Xia

*Editor's note: The importance of numerical modeling has become more and more recognized in providing accurate prediction on ocean and climate evolution, particularly in face of the ever-increasing challenges posed by climate change. However, there are still common problems both in ocean and climate numerical models. Over the recent years, significant progress has been made by Dr. Fangli Qiao and his group on the establishment of a new wave-circulation coupled theory through which the wave-induced vertical mixing can be exactly calculated from a wave model. Great improvement has been made in ocean and climate simulation and predictions when the wave-circulation coupled theory was applied to coastal circulation models, global ocean circulation models and climate models, which probably suggests a breakthrough was brought about in the field of numerical modeling.*

As the mixing process is essentially an energy balance problem, the surface wave, as the most energetic motion, should play a controlling role in the upper ocean. Unfortunately, in most ocean dynamics studies, wave motions have always been treated separately from the ocean circulation.

Previously, most ocean circulation models have overlooked the role of the surface waves. As a result, these models have produced insufficient vertical mixing, with an under-prediction of the mixed layer depth and an

over-prediction of the sea surface temperature, particularly during the summer season. As the ocean surface layer determines the lower boundary conditions of the atmosphere, this deficiency has severely limited the performance of the coupled ocean-atmospheric models and hence the climate studies.

To overcome this shortcoming, we have established a new theory on the wave-induced vertical mixing that will correct the systematic error of insufficient mixing. The additional wave-induced eddy viscosity/diffusivity is as follows (Qiao et al, 2004)

$$B_v = \alpha \iint_{\vec{k}} E(\vec{k}) \exp(2kz) d\vec{k} \frac{\partial}{\partial z} \left[ \iint_{\vec{k}} \omega^2 E(\vec{k}) \exp(2kz) d\vec{k} \right]^{1/2}$$

where  $E(\vec{k})$  is the wave energy spectrum in terms of the wave number and can be exactly calculated from a wave numerical model. The wave induced vertical mixing is due to wave motion instead of wave breaking.

Our study indicates that the wave-induced mixing penetration depth can reach more than 100m in high latitude and 30m in tropical areas. The new scheme has enabled the mixing layer to deepen, and an excellent agreement with observed climatologic data. Different Oceanic General Circulation Models (OGCMs) such as Princeton Ocean Model

(POM), Regional Ocean Modeling System (ROMS) and Hallberg Isopycnal Model (HIM) show similar improvements, both in coastal areas

(<http://www.agu.org/journals/ss/CHINASEAS/1/>) and global ocean (Xia et al., 2006, *J. Geophys. Res.*, 111, C11S03). Then we further examine the effects of surface wave on a climate models, including Flexible Global

Climate Model 0 (FGCM0) and Community Climate System Model 3 (CCSM3). The tropical biases, which in fact a common problem for all climate models without flux correction, are much improved for both experiments. Vertical mixing in the ocean is a key factor for ocean and climate simulation and prediction. (Reformed from Qiao et al., 2008, *Acta Oceanologica Sinica*, 27, 3:30-37)

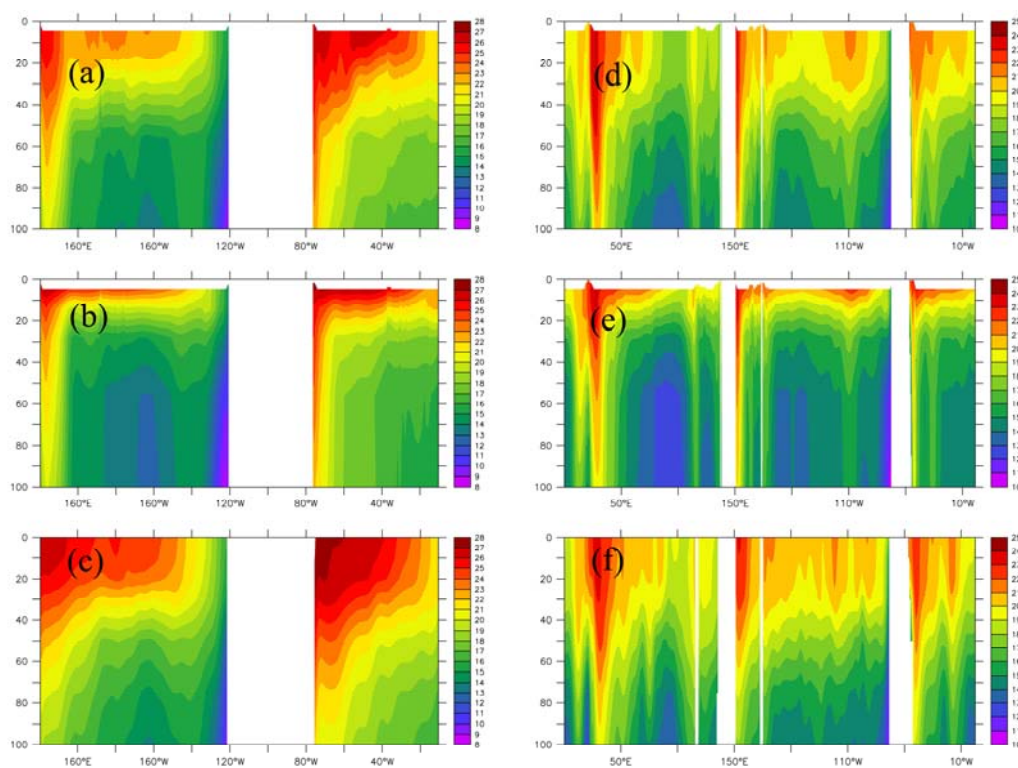
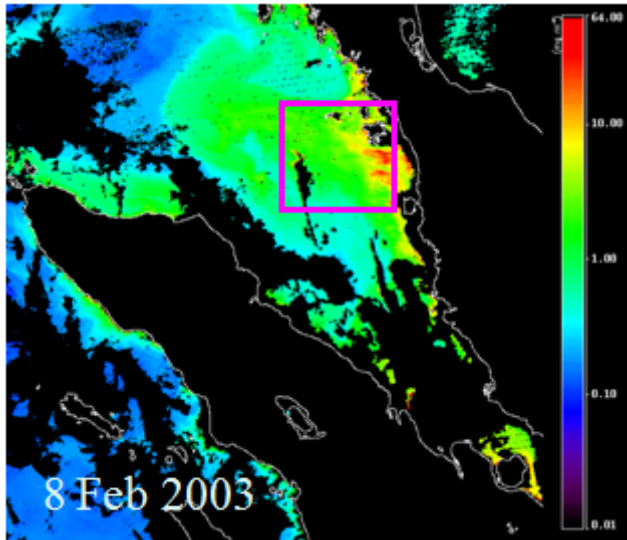


Figure caption: Temperature distributions of the upper 100 m along 35°N (left column) in August and 35°S in February (right column). Upper panel: simulation with wave-induced mixing, middle panel: simulation without wave-induced mixing, and lower panel: Levitus climatology. (From Qiao et al., 2008)

# Northern Malacca Straits Upwelling

## MODIS Aqua Image

By Chun Knee Tan, UNU, Tokyo, Japan



MODIS Aqua surface chlorophyll a of Northern Malacca Straits on 8 Feb 2003

The Malacca Straits (MS) is one of the busiest shipping routes in the world. It is wide and deep in the north, while narrow and shallow in the south. The MS is also very productive in marine resources. Beside the river runoff that supply nutrient to the marine life in MS, there is an upwelling event, which is important to support the rich ecosystem. The upwelling event will bring nutrients from deep water to the near surface and enrich the surface water.

The upwelling only occurs between the Langkawi and Penang Island during northeast monsoon (Dec-Feb), and high chlorophyll a water further advected towards the Andaman Sea, sometimes reaching northern Acheh. The upwelling is driven by the Ekman pumping

mechanism which is related to the topography of the Peninsular Malaysia.

The MODIS Aqua satellite chlorophyll a image on 8 February 2003 shows the occurrence of the upwelling event between Penang and Langkawi Island (Pink boxed). High chlorophyll a water is extended from northern MS towards the Andaman Sea. Phytoplankton bloom attracts fishes. During interview with fishermen at northern Malacca Straits, landing of Indian Mackerel was found to be the highest during and after the upwelling season (personal communication).

With more detail studies on how the upwelling will affect the marine resources, the fishery authority can create a more effective mechanism for sustainable marine resources management. It is important for the development of the application of satellite remote sensing that will help in the policy and decision making.

Detail description of the northern Malacca Straits, please kindly refer to Seasonal variability of SeaWiFS chlorophyll *a* in the Malacca Straits in relation to Asian monsoon by Tan et al., 2005

(<http://dx.doi.org/10.1016/j.csr.2005.09.008>).

Image courtesy:  
NASA GFSC Ocean Biology Processing Group  
For details, please contact  
[cktan@hq.unu.edu](mailto:cktan@hq.unu.edu)

# Building Capacity

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## Funding Opportunity

### The Mitsubishi Foundation Research Grants in the Natural Sciences

*The main objective of the fund is to enhance science, education, culture and welfare in Japan by awarding grants for activities related to academic research and social welfare.*

Eligibility:

Non-Japanese residing in Japan is eligible; limited to Japan.

Application: 5 Jan – 2 Feb 2009

For details, please access to

<http://www.mitsubishi-zaidan.jp/mzd000e.htm>

## Capacity Building

### Traineeship in observational oceanography

*The Bermuda Institute of Ocean Sciences (BIOS) is pleased to announce a second year of support from the Nippon Foundation for the NF-POGO Centre of Excellence in Observational Oceanography. Travel and living expenses of the trainees will be covered by the NF-POGO Programme.*

Tentative dates: 1 August 2009 to 31 May 2010.

Application Due: 1 February 2009.

For details, please visit

<http://www.bios.edu/education/cofe.html>

## Job Opportunity

### Director of Communications for the International Geosphere-Biosphere Programme

Applications are invited for the position of Director of Communications for the International Geosphere-Biosphere Programme (IGBP). To apply, please contact Charlotte Boss-Wilson at [Admin@IGBP.kva.se](mailto:Admin@IGBP.kva.se). Review of applications will begin on 30 January 2009.

For details, please visit <http://www.igbp.net/page.php?pid=451>

### United Nations Environment Programme (UNEP) Coordinator (Marine Ecosystem)

UNEP's Division of Environmental Policy Implementation (DEPI) is seeking professional personal for the Coordinator (Marine Ecosystem)-P5 at Nairobi, Kenya.

Deadline: 22 February 2009

For details, please visit [https://jobs.un.org/Galaxy/Release3/vacancy/Display\\_Vac.aspx?lang=1200&VACID=395f5fce-58b3-431c-9df6-d78e4994c84e](https://jobs.un.org/Galaxy/Release3/vacancy/Display_Vac.aspx?lang=1200&VACID=395f5fce-58b3-431c-9df6-d78e4994c84e)

### JAMSTEC 2009 Announcement of Postdoctoral and Research Positions

JAMSTEC Frontier Research Center for Global Change (FRCGC) is announcing the opening for Postdoctoral and Research Positions application.

Deadline: 23 January 2009

For details, please visit <http://www.jamstec.go.jp/e/about/recruit/index.html>

### Postdoctoral Position Organic Geochemistry/Paleoceanography

The University of Concepcion (UDEC), Chile, invites applications for a two-year postdoctoral position to participate in a new research program on long-term variability of hypoxia in coastal waters off Central Chile and Oregon. For application, please contact Dr. Silvio Pantoja, Department of Oceanography and FONDAP COPAS Center, University of Concepción, [spantoja@udec.cl](mailto:spantoja@udec.cl).

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## IOC/WESTPAC Activities/ Events

### IOC/WESTPAC Workshop on Marine Invasive Species and Management in the Western Pacific Region

IOC/WESTPAC Coastal Marine Biodiversity and Conservation Project in collaboration with IOC/WESTPAC Harmful Algal Blooms in the Western Pacific (WESTPAC-HAB) is organizing the Workshop on Marine Invasive Species and Management in the Western Pacific Region. The Workshop consists of two days and it will cover the following topics:

- i. Regional status on the marine invasive species and their impacts;
- ii. The possible pathway of carrying invasive species;
- iii. The possible environmental factors that facilitate the establishment of introduced species;
- iv. Possibility of introduced species establishing successfully in the non-native coastal water.
- v. Case studies on the marine invasive species management

Date: 19-20 March 2009

Venue: Chulalongkorn University, Bangkok, Thailand

Contact:

Dr. Suchana Chavanich

Email: [suchana.c@chula.ac.th](mailto:suchana.c@chula.ac.th)

Or

Prof. Dr. Yasuwo Fukuyo

Email: [ufukuyo@mail.ecc.u-tokyo.ac.jp](mailto:ufukuyo@mail.ecc.u-tokyo.ac.jp)

### IOC/WESTPAC International Training Workshop on Monitoring Technique and Emergency Response of Marine Oil Spills

The first training workshop on Monitoring Technique and Emergency Response of Marine Oil Spills will be

organized by the First Institute of Oceanography (FIO), SOA, China, in co-sponsorship with the Korea Ocean Research and Development Institute (KORDI).

Contents of the training include:

- Detection, monitoring and identification techniques of marine oil spills
- Early-warning and forecasting of oil spills
- Emergency responses and bioremediation of marine oil spills
- Case study of marine oil spills

Nomination letter from the IOC National Focal Point, together with the nominee's CV and filled-in Application Form, is required to be provided, preferably no later than **15 February 2009**.

Date: 20-23 April 2009

Venue: Qingdao, China

Contact: Ms. Xiaomei Wang

Fax: +86-532- 8896- 3253

Email: [xmwang@fio.org.cn](mailto:xmwang@fio.org.cn)

### First IOC/WESTPAC Workshop on the Coral Reef under Climate and Anthropogenic Perturbations (CorReCAP)

The first CorReCAP Workshop will be hosted by State Key Laboratory of Estuarine and Coastal Research, East China Normal University. The effects of anthropogenic perturbation and climate change are the major underlying theme of the workshop.

The topics include:

- Food-web structure and trophic dynamics of coral reef ecosystems;
- Biogeochemical cycles of coral reef systems within the frame of land – sea interaction;
- Techniques in coral reef studies, including remote sensing, modeling and monitoring etc.

# In WESTPAC

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Limited funding resources have been allocated to support the invited participants to attend this workshop

Date: May 2009 (Tentative)

Venue:

East China Normal University, Shanghai, China

Contact: Prof. Dr. Jing Zhang

Phone: +86-21-62233009 or +86-21-62232887

Fax: +86-21-62546441

Email : [jzhang@sklec.ecnu.edu.cn](mailto:jzhang@sklec.ecnu.edu.cn) or  
[office@sklec.ecnu.edu.cn](mailto:office@sklec.ecnu.edu.cn)

## 20th Session of the IOC Committee on International Oceanographic Data and Information Exchange (IODE-XX)

Date: 4 - 8 May 2009

Venue: Beijing, China

[http://www.iode.org/index.php?option=com\\_oe&task=viewEventRecord&eventID=357](http://www.iode.org/index.php?option=com_oe&task=viewEventRecord&eventID=357)

## Activities/ Events in Member States

*Indonesia*

### World Ocean Conference 2009

*The World Ocean Conference (WOC) 2009 is forum for the world community to discuss current issues in the marine field which are related to climate change, in order to achieve an international agreement and draw up an adaptive strategy to use of marine resources wisely for the benefit of humanity.*

Date: 11-15 May 2009

Venue: Manado, Indonesia

Contact: WOC'09 Jakarta Secretariat

Phone: +62-21-351-9070 Ext.1773

Fax: +62-21-386-0532

Email: [info@woc2009.org](mailto:info@woc2009.org)

<http://www.woc2009.org/home.php>

*Malaysia*

### Technical Workshop on Harmful Algae Bloom (HAB)

1st Session – 10 April 2009

2nd Session – 10 May 2009

Venue: Fisheries Research Institute (FRI), Penang, Malaysia

Organizer: Fisheries Research Institute (FRI)

Contact:

National Oceanography Directorate (NOD)

Tel: +60-3-8885-8216

Fax: +60-3-8889-3008

Email: [nod2@mosti.gov.my](mailto:nod2@mosti.gov.my)

### International Conference on Marine Ecosystem (INCOME)

Date: 26 - 28 May 2009

Venue: Langkawi Island, Kedah, Malaysia

Organizer: Universiti Kebangsaan Malaysia (UKM), Bangi, Selangor

Contact:

National Oceanography Directorate (NOD)

Tel: +60-3-8885-8216

Fax: +60-3-8889-3008

Email: [nod2@mosti.gov.my](mailto:nod2@mosti.gov.my)

### Phytoplankton Culture for Aquaculture Feed

Date: 6 -9 June 2009

Venue: Universiti Sains Malaysia, Penang

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Organizer: Universiti Sains Malaysia

Contact:

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Tel: +60-3-8885-8216

Fax: +60-3-8889-3008

Email: [nod2@mosti.gov.my](mailto:nod2@mosti.gov.my)

## Activities/ Events of Partner Organizations

### PEMSEA

#### Pre-registration of EAS Congress 2009

*The EAS Congress 2009 will be organized on 23-27 November 2009, Manila, Philippines. The theme, "Partnerships at Work: Local Implementation and Good Practices," of the EAS Congress 2009 will highlight initiatives and good practices covering key aspects of coastal and marine resource management and how interregional, interagency and multisectoral partnerships are contributing toward the attainment of regional and international environmental targets. EAS Congress 2009 is now open for pre-registration.*

For details,

<http://www.pemsea.org/eascongress/eas-congress-2009>