

# IMBER *Update*

Issue No. 8 - October 2007

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## Editorial

### The IMBER/LOICZ Continental Margins Open Science Conference: a success !

The IMBER/LOICZ Continental Margins Open Science Conference was held at the East China Normal University, Shanghai, September 17-21. The overall goal of the conference was to provide a forum to highlight recent advances in continental margins biogeochemical cycles and ecosystems research, and to identify future research challenges. The aims of the conference were to, estimate the relative importance of the changing forcings - natural and human - and to determine how much change in shelf ecosystems can be attributed to the respective forcings. The Conference, while building on biogeochemical advances from programs such as JGOFS and LOICZ I, aimed to take the next steps:

- linking the biogeochemical cycles of the coastal and open oceans,
- linking organisms, including higher organisms, to biogeochemical processes,
- moving past the present-day status of our understanding and incorporating response/prediction to the global and local changes,
- exploring the function and possible future changes of the continental shelf pump and the climate-related biogeochemistry of continental margins, and



- assessing the variability and sustainability of continental margin ecosystems.

The conference was focused around 7 topics: (1) ocean-shelf biogeochemical exchanges, (2) continental shelf biogeochemistry and couplings with benthic systems, (3) continental shelf ecosystems from high to low latitudes, (4) integrated observations and modelling: visions and reality, (5) eutrophication and oligotrophication of coastal systems, (6) sustainable use of continental shelf resources, and (7) low oxygen on continental shelves. Each topic session began with a keynote presentation followed by oral and poster presentations and a discussion session. The prize for Best Student presentation was awarded to Melilotus Thyssen (Université de la Méditerranée, France) for her oral presentation entitled "Temporal and spatial high-frequency monitoring of phytoplankton by automated flow cytometry and pulse-shape analysis".

A total of 110 scientists from 25 different countries attended the conference. Travel grants for 8 scientists from Brazil, China, India, and Ukraine were provided by the Scientific Committee on Oceanic Research (SCOR) through a grant from the U.S. National Science Foundation. Financial support for the conference was also provided by East China Normal University, the Chinese Ministry of Education, the National Science Foundation of China and the Shanghai Municipality.

The major outcome of the conference was the identification of key research themes for the development of an implementation plan for collaborative research efforts on coastal biogeochemistry and ecosystems. Over the next three months, Jack Middelburg and Nancy Rabalais (the co-conveners of the conference) will lead a small writing group who are preparing a draft of a joint IMBER/LOICZ Implementation Plan for biogeochemistry and ecosystems research in continental margin regions. This document will be available on the IMBER and LOICZ websites for community comment early in 2008.

The conference booklet, including abstracts from presentations, is available for download on the Conference website (<https://www.confmanager.com/main.cfm?cid=792>).

Presentations and additional information regarding the preparation of the implementation plan will be available soon on the IMBER and LOICZ websites ([www.imber.info](http://www.imber.info); [www.loicz.org](http://www.loicz.org)).



*A group of participants to the Continental Margins OSC in front of the Yifu Building, East China Normal University, Shanghai.*



# Science Highlight

## Towards a global database of oceanic nitrous oxide measurements

By Alina Freing and Hermann W. Bange

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Nitrous oxide ( $\text{N}_2\text{O}$ ) is an important greenhouse gas that is also involved in stratospheric ozone depletion. The ocean is one of the most important natural sources of atmospheric  $\text{N}_2\text{O}$ , thus it is important to improve our understanding of the pathways to production of  $\text{N}_2\text{O}$  and distribution of oceanic  $\text{N}_2\text{O}$  (cf. IMBER/SOLAS Science Plan and Implementation Strategy on Carbon research). However, current models of the global oceanic distribution of  $\text{N}_2\text{O}$  and its impact on global change are potentially biased as we lack an overall view of the distribution of  $\text{N}_2\text{O}$  in the ocean.

Eighteen months ago an initiative was started to compile the existing data sets for oceanic  $\text{N}_2\text{O}$  concentrations, and to use the data collected to compute global  $\text{N}_2\text{O}$  fields. These will then be used to improve the oceanic  $\text{N}_2\text{O}$  parameterisations for use in biogeochemical models. Thanks to the generous support of many colleagues we have compiled a comprehensive database of most of the existing  $\text{N}_2\text{O}$  data and, where available, associated hydrographic parameters, oxygen and nutrient measurements for both depth profiles and surface and atmospheric

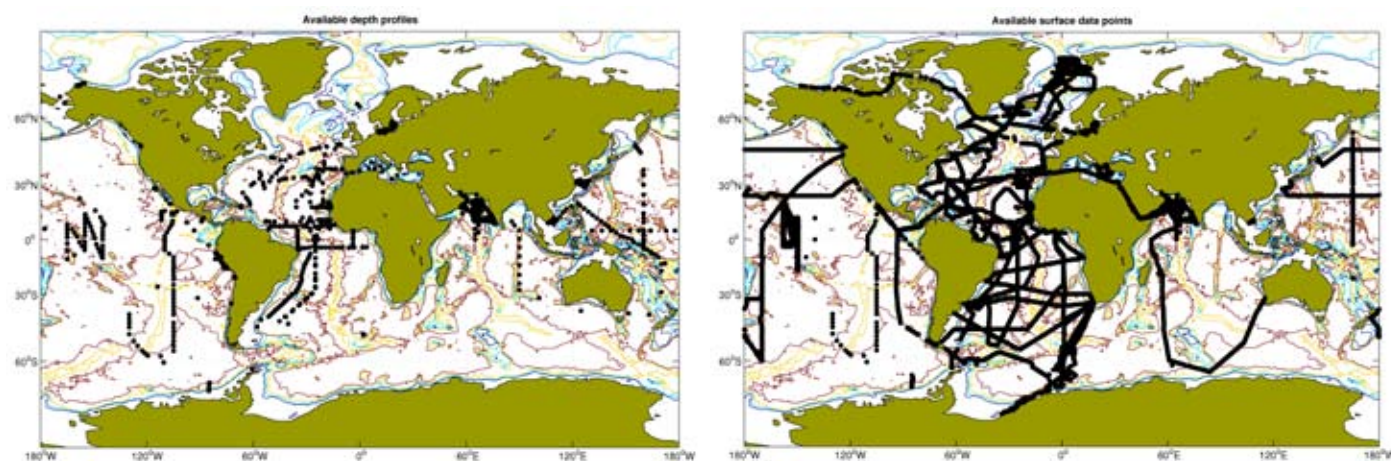


Figure 1: Compiled  $\text{N}_2\text{O}$  data. Left panel: depth profiles. Black dots mark the location of the profiles. Right panel:  $\text{N}_2\text{O}$  surface ocean measurements.

measurements. So far we have archived 12284 data records from 1026 stations (Figure 1 - left panel) and 55503 surface data points (Figure 1 – right panel).

In order to create an internally consistent dataset, every data set underwent a standard treatment:

(i) The data were “smoothed” in the sense that all “obvious” errors (e.g. coordinates falling on land masses) were removed and, where necessary, units were converted to make the absolute values comparable and all deduced variables (potential temperature, potential density, etc.) were recalculated. This was ensured by a visual inspection of the individual profiles for distinctive features and a statistical outlier test using Tschebyscheff’s Theorem. Since the  $\text{N}_2\text{O}$  concentrations were found not to be normally distributed, every concentration which fell outside four standard deviations above and below the mean was flagged as a preliminary outlier. Mean and standard deviation (and therefore outlier) were separately calculated for each cruise. Potential outliers were then re-inspected along with associated hydrographic parameters. If these showed no indication of the presence of different water masses, the outlying values and the associated data were deleted.

(ii) To improve comparability of the individual profiles, all variables were interpolated to WOCE-standard depth for each profile. The interpolation scheme used is that of Steffen (1990). This scheme is similar to Spline interpolation based on cubic polynomials for each interval and yields a smooth, locally defined curve. In this context it is superior to a Spline interpolation since it is monotonic in each interval, that is every extreme point of the curve coincides with a sampling point. This resulted in another 13516 interpolated data records.

(iii) For cruises that lacked one or more of the listed parameters (temperature, salinity  $O_2$ , AOU, nitrate, phosphate), these values were supplemented from the World Ocean Atlas (Conkright et. al., 2001). In case of sporadic missing values the nearest neighbour-technique was employed to fill gaps. We used a weighted Euclidean measure taking regional, hydrographic and oxygen/nutrient concentrations into account.

What is next? The next step is to identify a suitable method of interlaboratory calibration. Where there are overlapping stations or stations within a reasonable distance of each other for different cruises a crossover analysis will be performed. Unfortunately, the data coverage only allows for this in a few well-sampled regions, for example, the Arabian Sea.

When we have computed the final  $N_2O$  global fields they will be stored in a public database. Each dataset will be identified to the original authors and connected to the relevant publications. Once the database is completed the next step towards a  $N_2O$  parameterisation will be to quantify the mixing signal using extended optimum multiparameter analysis (Karstensen, 1999). We hope that identifying this signal will give us a much clearer view of the relationship between physical/biological properties and the  $N_2O$  formation rate.

We would like to expand our database, so if we sparked your interest in this project please consider making your  $N_2O$  data available. Please do not hesitate to contact [afreing@ifm-geomar.de](mailto:afreing@ifm-geomar.de) and [hbange@ifm-geomar.de](mailto:hbange@ifm-geomar.de).

This work is funded by a PhD scholarship given to AF (DFG - BA1990/7) and by the Marine Biogeochemistry Research Res. Div. of IFM-GEOMAR. Many thanks to all the colleagues who generously contributed their data.

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## High-resolution temporal and spatial sampling of phytoplankton

Melilotus Thyssen and Michel Denis

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Phytoplankton represents about 2% of the Earth's photosynthetic biomass, but contributes up to 50% of the annual Earth photosynthesis and play a key role in the sequestration of atmospheric  $CO_2$  in the ocean. Quantifying phytoplankton biomass and production is difficult as the distribution of phytoplankton exhibits high short-term variability superimposed on seasonal cycles and longer term variations. In addition, spatial distributions are patchy at scales from cm to kms. This spatial and temporal variability stimulated the development of new technology, which provides fully automated, high-frequency measurements at the single cell level, both with respect to time and space. These high-frequency measurements will enable better characterisation of the temporal and spatial heterogeneity of the distribution of phytoplankton.

The ACYPHAR (Atlantic flow CYtometry spatial study of PHytoplankton through Automated Recording) project studied the surface phytoplankton (1~50  $\mu m$ ) distribution between Horta (Faial, Azores Island) and Lorient (France)

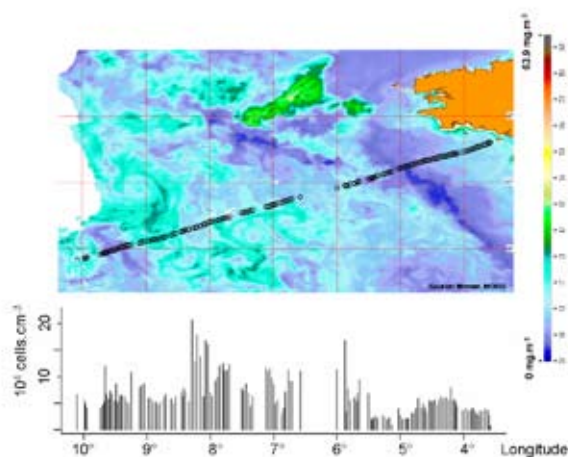


Figure 1: Abundance distribution of the summed phytoplanktonic cells analysed by the CytoSub along the track of the Fetia Ura (empty circles) in the last part of the cruise, superimposed to the ocean colour image (MODIS OC5 IFR, courtesy of CERSAT IFREMER).

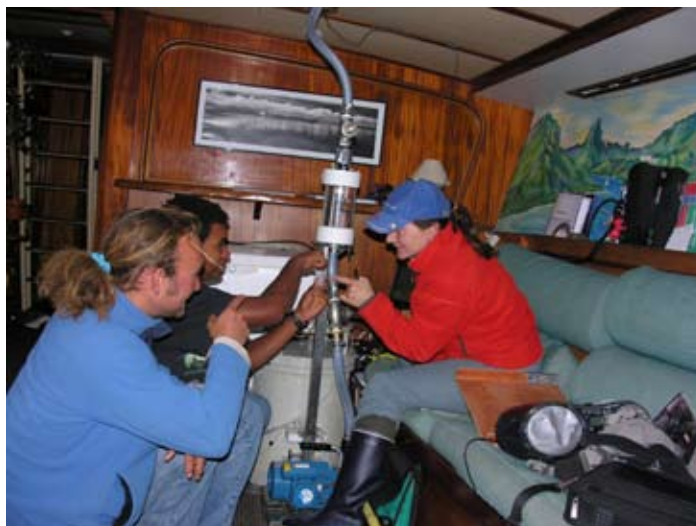


Figure 2: Melilotus Thyssen explaining to a teenager, watched by a crew member, how to collect in the buffering reservoir, a subsample of the seawater just analyzed by the CytoSub, on the floor in its cylindrical housing. Photo M. Denis.

from 14 to 23 April 2007, on the *Fetia Ura*, a 33 m schooner belonging to SARL SEANERGIES OCEANES ([www.seanergies.com](http://www.seanergies.com)).

The CytoSub ([www.cytobuoy.com](http://www.cytobuoy.com)) is an automated flow cytometer that was used to analyse samples every 15 minutes, giving an analysis of samples every 2.8 km. In parallel, the seawater properties were determined with an autonomous CTD (SBE 37SMP) and the location of the sampling was determined with a GPS coupled to the CytoSub computer. Although the CytoSub is able to analyse large cells (up to 1 mm) and cell chains with natural samples, it is limited to the 1–50  $\mu\text{m}$  size range due to the combination of the small analysed volume and the low concentration of larger cells.

Five clusters of phytoplankton cells were resolved in the samples on the basis of their forward and side scatter and fluorescence properties. Specific relationships were determined between their distributions within the different water masses sampled during the cruise. The distributions of the clusters were compared to chlorophyll *a* concentrations estimated from satellite ocean-colour data (Figure 1). The high-resolution observations showed significant variability, critical to explaining the impact of intrinsic and extrinsic factors on phytoplankton spatial and temporal distributions.

The ACYPHAR project was combined with a training project for young offenders, DEFERLANTE. Project scientists contributed to the training program of DEFERLANTE by providing the teenagers and their instructors basic information on the ocean and the marine ecosystem. This occurred through discussions and interactive Power-Point presentations. An epifluorescence microscope coupled to a CCD camera (CYSCOPE, Partec) was used to display on a computer screen organisms collected with a plankton net. The teenagers were also made responsible for subsampling every 4 hours (Figure 2). Through the interaction with the scientists, the teenagers expressed a high interest for the marine environment global change and the scientific method. They also became aware of the importance of marine phytoplankton in oceanic food webs and as regulators of greenhouse gases.

The success of the ACYPHAR programme has demonstrated the feasibility of automated flow cytometry analysis of phytoplankton onboard ships, of opportunity to collect, in a cost effective way, high-resolution spatial and temporal data on phytoplankton distributions.

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*Melilotus Thyssen was awarded the Best Student presentation at the IMBER/LOICZ Continental Margins conference for her oral presentation entitled “Temporal and spatial high-frequency monitoring of phytoplankton by automated flow cytometry and pulse-shape analysis”.*



# Meeting reports

## Joint IMBER/GLOBEC SSC executive meeting

The IMBER Executive Meeting was held at the European Institute for Marine Studies (IUEM) in Brest (France), home of the IMBER International Project Office, October, 7<sup>th</sup> to 9<sup>th</sup>. During the IMBER Executive meeting the activities of working groups were reviewed, a meeting was held with the current funders of the IMBER IPO to discuss renewing the funding for the IPO in 2008, and future priorities were identified.

Several major events are planned for 2008. These include

- a training workshop for young scientists focused on “Climate driving of marine ecosystem changes” which will be held in Brest, France in April and led by Wilco Hazeleger. The goal is to increase the interactions between climate science and marine biogeochemistry/ecosystem communities, with a focus on impacts of climate variability on the marine environment.
- a Summer School in Ankara (Turkey) led by Temel Oguz is planned for August 2008. The objective of this Summer School is to introduce participants to research focused on the interactions of end-to-end marine food webs and biogeochemical cycles in various oceanic systems.
- the 1<sup>st</sup> IMBER IMBIZO\* will be held in Miami, Florida, USA, in November 2008. This event will take the form of a set of three concurrent workshops. The topics of the three workshops will be: (1) Mesopelagic systems (co-chaired by Debbie Steinberg and Hiroaki Saito), (2) Bathypelagic systems (co-chaired by Dennis Hansell and Gerhard Herndl), and (3) End-to-end Food Webs (co-chaired by Coleen Moloney and Mike Roman). The workshops will be co-located, with joint plenary sessions to enhance interactions between participants. The overall theme of the IMBER IMBIZO will be “Biogeochemical and ecosystems interactions in a changing ocean”.

*\*Zulu word for meeting or gathering*



*IMBER and GLOBEC members with SCOR and IGBP representatives*



Kirsten Wilmer-Becker<sup>1</sup> and Patrick Monfray<sup>2</sup>

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Recognising the potential benefit of cooperation and collaboration between GODAE (Global Ocean Data Assimilation Experiment) and IMBER in addressing ecosystem modelling, a workshop was held in Paris in June to review the present biogeochemistry and ecosystem modelling development within GODAE. The aims of the workshop were to identify common interests; and to evaluate real-time datasets and assimilation schemes that will be required for biogeochemistry and ecosystem applications. During the workshop three key issues were identified: (1) improvement of present GODAE products for IMBER research, (2) improvement of the observing system for ecosystem modelling, (3) the use of GODAE products for IMBER research.

The **improvement of present GODAE products** for IMBER research will require a thorough evaluation of GODAE-derived vertical fluxes that can be used to drive the biogeochemical and ecosystem models developed in the IMBER project, an examination of the impact of volume conservation in GODAE products and an assessment of the reliability of forcing fields estimated by GODAE systems. The use of sequential data assimilation methods (e.g. Optimal Interpolation or Kalman filter) for correcting the physical state of the model causes problems when the estimated state is used to drive biogeochemical models. The lack of data to constrain the biogeochemical variables makes these variables more susceptible to the spurious vertical fluxes of the physical state. This is particularly important as many biogeochemical variables are controlled by vertical subsurface processes, which are not well represented and resolved by the current physical models of GODAE. The quality of the vertical flux estimates will need to be reconsidered and the application of smoothers or more advanced assimilation methods may need to be implemented. Also consistent surface forcing fields are a key requirement for reliable ecosystem modelling. Currently only two GODAE systems, ECCO and Japan's K-7 systems (both based on 4D-Var assimilation method), provide forcing fields that are consistent with the oceanic state estimates. It is recommended that these forcing fields be used along with other products (e.g. Numerical Weather Prediction products) to provide a more complete assessment.

An **improvement of the observing system for ecosystem modelling** is essential to respond to the increasing interest in coupled biological/physical processes, the prediction of ecosystem response to climate change, and an integrated ecosystem approach to fisheries management. Optimisation of the current observing systems should consider the development of physical-biological data assimilation methods as well as the possibility of conducting a quantitative assessment of model skills. There is also a need for new and advanced in-situ and remotely sensed observational data (required at global and particularly at regional scales) to be made available, for example: oxygen (there are only 73 Argo floats equipped with oxygen sensors worldwide - as of July 2007), nitrate, carbon ( $pCO_2$ ) and inherent optical properties (IOP) to name a few. Also, rate measurements such as primary production and data for boundary conditions are required. An assessment of the impact of observations on model behaviour should be conducted through twin experiments using observing system simulation methods (OSSEs). This should provide methods to identify gaps and improve the efficiency of the observing system while reducing the cost of development and maintenance of such systems.

Discussion of the **use of GODAE products for IMBER research** focussed on online/offline coupling, and GODAE state variables for IMBER analyses, reanalyses and forecasts. Consideration was given to identifying data needs and user requirements. IMBER requirements for state variables include fields currently not considered by GODAE, for example vertical velocity and vertical mixing as well as the mixed layer depth (MLD). MLD has direct impacts on biogeochemistry and ecosystems in a much more fundamental way than physics. Model and observational error covariances may also have to be reconsidered. It is uncertain whether data assimilation for IMBER is feasible at this stage in terms of the available observations related to model state variables. The dependence of the ecosystem

and biogeochemical states on the initial state error also needs to be determined. Model-data validation and model-model intercomparisons must be undertaken as the next step and consequently new metrics developed.

More information on these issues and a 2-5 year plan on further GODAE-IMBER activities will be published soon on the [IMBER](#) and [GODAE](#) websites.

#### References:

K. Wilmer-Becker, GODAE-IMBER meeting minutes, 2007, [GODAE-website](#)

T. Lee, Improving GODAE products for applications in IMBER research, 2007, [GODAE-website](#)

R. Murtugudde, Use of GODAE products by IMBER, 2007, [GODAE website](#)

R. Barciela, Ocean Observing Systems: development needs from a GODAE-IMBER perspective, 2007, [GODAE-website](#)

## PICES 16<sup>th</sup> Annual Meeting: The Changing North Pacific

Hiroaki Saito

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In the past two decades, climate impacts in the North Pacific have been intensely studied, to investigate the relationships between climate change and ecosystem oscillations or regime shifts. This has been the main theme of the Climate Change and Carrying Capacity (CCCC) programme of the North Pacific Science Organization (PICES) and a regional project of GLOBEC. In addition to the natural forcing, the North Pacific is also impacted by increasing human activity. Anthropogenic influences are greater in coastal waters with direct human impacts such as coastal development, pollution, eutrophication, damming of rivers and fishing, etc. It is important to investigate historically observed climate, physical oceanographic and biological patterns to understand the structure of the system and to identify the mechanisms of change. However, the empirical relationships between forcing and responses obtained are inadequate to project the “natural” or previously observed patterns.

After the completion of the CCCC programme (around October 2008) PICES is planning to develop a new integrated science programme to understand and forecast responses of North Pacific marine ecosystems to climate change and human activities at basin-wide and regional scales, and to communicate the results of the programme to resource managers and the general public. This is a challenging task; however, it is important that scientists ensure data are available to underpin sustainable use of the marine resources that are under the pressures of anthropogenic forcings. The goals of this new PICES program overlap with the goals of IMBER and hence provide an excellent opportunity for collaboration between IMBER and PICES.

The 16<sup>th</sup> PICES Annual Meeting will be held on 26 Oct. – 5 Nov. 2007, in Victoria, Canada. The meeting theme is “The changing North Pacific: Previous patterns, future projections, and ecosystem impacts”. A keynote lecture “The North Pacific, human activity, and climate change” will be given by Dr. Ken Denman (Univ. of Victoria, Canada). The meeting comprises 11 topic sessions, 4 paper and poster sessions, and 6 workshops. The themes of the topic sessions are related to the meeting theme: decadal change in carbon biogeochemistry in the North Pacific; ecosystem approach to fisheries: improvements on traditional management for declining and depleted stocks; the relative contributions of off-shore and in-shore sources to harmful algal bloom development and persistence in the PICES region; operational forecasts of oceans and ecosystems; phenology and climate change in the North Pacific: implications of variability in the timing of zooplankton production to fish, seabirds, marine mammals and fisheries (humans). During the conference, an open forum on the new PICES integrated programme will be held to collect comments from participants.

More than 450 attendees are expected to attend the meeting. For more details, visit the web page: <http://www.pices.int/meetings/annual/PICES16/background.aspx>.



# Interactions with partner programmes

## Second Symposium on The Ocean in a High-CO<sub>2</sub> World

Ed Urban<sup>1</sup>, Maria Hood<sup>2</sup>, and Wendy Broadgate<sup>3</sup>

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<sup>2</sup>Intergovernmental Oceanographic Commission, UNESCO, Paris, FRANCE

<sup>3</sup>International Geosphere-Biosphere Programme, Royal Swedish Academy of Sciences, Stockholm, SWEDEN

It is well established that the atmospheric concentration of carbon dioxide has been increasing over the past two centuries, especially since the Industrial Revolution dawned and the internal combustion engine was invented. This increase, especially since the middle of the 20<sup>th</sup> Century, has exceeded the rate in pre-industrial times, as estimated from ice core records. The rise in atmospheric CO<sub>2</sub> would have been even greater if the ocean had not absorbed much of the CO<sub>2</sub>. Only recently has the ocean science community understood the magnitude of pH changes and significant effects on marine organisms and ecosystems that could result from ocean absorption of CO<sub>2</sub> (Orr et al., 2005; Royal Society, 2005; Kleypas et al., 2006). The Scientific Committee on Oceanic Research (SCOR) and the Intergovernmental Oceanographic Commission (IOC) of UNESCO co-sponsored the first symposium on The Ocean in a High-CO<sub>2</sub> World in May 2004, which stimulated much new research (including through IMBER and SOLAS), national scientific and policy reviews, and public attention to the issue of ocean acidification.

SCOR, IOC, the International Atomic Energy Agency, and the International Geosphere-Biosphere Programme are planning a second Symposium on The Ocean in a High-CO<sub>2</sub> World. This symposium will be held at the Musée Océanographique in Monaco on 6-8 October 2008. The purpose of the meeting is to provide an interdisciplinary forum to assess what is known about ocean acidification and priorities for future research. The symposium will include both invited and contributed oral presentations, and poster presentations. (Because of time limitations, most contributed abstracts will be presented as posters). The symposium will include the following topics: scenarios of ocean acidification; effects of changes in seawater chemistry on nutrient and metal speciation; ocean carbon system from deep-time to the present to the distant future; paleo-chemistry; mechanisms of calcification; impacts on benthic and pelagic calcifiers; physiological effects, from microbes to fish; adaptation and (micro)evolution; fisheries, food webs, and ecosystem impacts, biogeochemical consequences and feedbacks to the Earth system; economic consequences; and CO<sub>2</sub> disposal.

Early registration and abstract submissions will open on 31 March 2008.

Manuscripts based on presentations at the symposium can be submitted to a special issue of *Biogeosciences* and research priorities will be published separately for the benefit of ocean scientists and research program managers worldwide.

The Planning Committee for the symposium is chaired by James Orr of the Marine Environment Laboratories (MEL-IAEA) in Monaco and includes the following members: Ken Caldeira, Victoria Fabry, André Freiwald, Jean-Pierre Gattuso, Peter Haugan, Patrick Lehodey, Silvio Pantoja, Hans-O. Pörtner, Ulf Riebesell, and Tom Trull.

Information about the meeting will be posted at [www.ocean-acidification.net](http://www.ocean-acidification.net), as it becomes available.

### References

- Kleypas, J.A., R.A. Feely, V.J. Fabry, C. Langdon, C.L. Sabine, and L.L. Robbins, 2006. *Impacts of Ocean Acidification on Coral Reefs and Other Marine Calcifiers: A Guide for Future Research*, report of a workshop held 18–20 April 2005, St. Petersburg, FL, sponsored by NSF, NOAA, and the U.S. Geological Survey, 88 pp.
- Orr, J. et al. 2005. The Ocean in a High CO<sub>2</sub> World. Proceedings from the International Symposium; Special Issue of the Journal of Geophysical Research-Oceans, v. 110, 2005.
- Royal Society. 2005. *Ocean Acidification Due to Increasing Atmospheric Carbon Dioxide*. Royal Society, London.

# IMBER-sponsored meetings

## Climate driving of marine ecosystem changes (CLIMECO)

### Training for young marine scientists

April 21-24, 2008, Brest, France



#### Scientific rationale and objectives

Biogeochemical cycles and ecosystems in the ocean are strongly affected by a wide range of physical processes, including temperature changes, horizontal and vertical transport, and upwelling and mixing of deep water. The importance of the variations of physical climate system on ocean biogeochemistry and ecosystems is recognized and embedded in the Science and Implementation plans of Global Ocean Ecosystem Dynamics (GLOBEC), Surface Ocean-Lower Atmosphere Study (SOLAS) and Integrated Marine Biogeochemistry and Ecosystems Research (IMBER) projects.

Many questions concerning the predicted impacts of climate variability, such as the North Atlantic Oscillation and the El Niño-Southern Oscillation, on the marine environment are still unanswered. Attempts have been made to answer those questions, but it has become clear that more actions are needed in order to formulate clear responses. However, the expertise on patterns of climate variability and their projected changes in future climate lies in the Climate Variability and Predictability project (CLIVAR). Amongst other research objectives, CLIVAR focuses on the role of the coupled ocean and atmosphere within the overall climate system, with emphasis on variability, especially within the oceans on seasonal to centennial time scales, and the response of the climate system to anthropogenic forcing.

Consequently, it has become clear that a collaborative effort between physical climate science and marine biogeochemistry/ecosystem research communities is needed to address the questions identified. This workshop will bring together those two different scientific communities to address the issues mentioned above.

#### GOALS of the workshop

- 1) To increase the interactions between physical climate science and marine biogeochemistry/ecosystems communities with a focus on impacts of climate variability on the marine environment;
- 2) To foster cooperation between physical climate scientists and marine scientists;
- 3) To take stock of IPCC 4AR results, ocean/atmosphere reanalysis data and observational data, where relevant for impacts on the marine environment.

## Preliminary programme

This workshop is a combination of science presentations around defined themes followed by discussions and “hands-on” sessions where young scientists with a marine biogeochemistry/ecosystems background will learn how to use climate data. This includes finding relevant data, scrutinising its quality and knowing how to make use of it.

## Themes

- Changes in atmospheric forcing (wind stress, heat and fresh water fluxes) of the ocean in the 20th century and projections for the future.
- Changes in water mass properties in the 20th century and projections for the future.
- Applications and limitations of data sets and climate models.

## More information

Products for hands-on sessions data archives: PCMDI IPCC coupled model archive, flux data sets, ocean reanalysis data sets (e.g, ECCO, SODA), hydrography.

Tools: Climate Explorer for statistical analysis; Hydrobase; Ocean Data View

Lecturers: Matthew Collins, Benjamin Giese, Gustavo Goni, Wilco Hazeleger, Geert Jan van Oldenborgh, Anne-Marie Treguier

The workshop will be held at the Institut Universitaire Européen de la Mer, Brest, France.

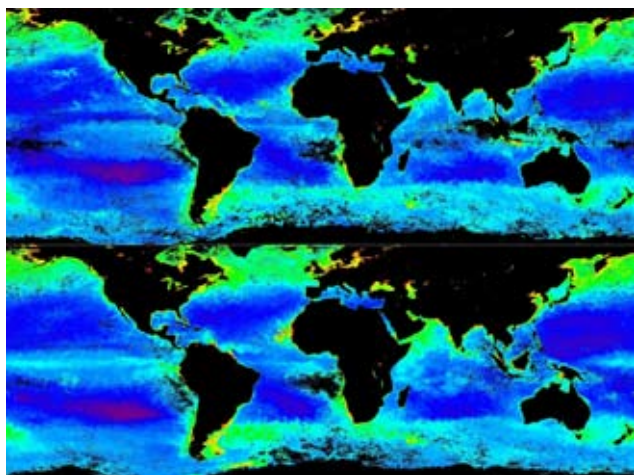
Application submission deadline: 15 January 2008

Notification of acceptance: Early February 2008

Organizing Committee: Wilco Hazeleger, Martin Visbeck, Geir Ottersen, Richard Sanders, Sylvie Roy, Ivo Grigorov and Olivier Aumont,

Sponsors: IMBER, CLIVAR, GLOBEC, EUR-OCEANS, WCRP, UBO/IUEM, Région Bretagne

[http://www.imber.info/CLIMECO\\_home.html](http://www.imber.info/CLIMECO_home.html)



Drastic change between Dec 97 (top) to Dec 98 (bottom) in surface chlorophyll patterns due to El-Niño climatic event. Credit: Seawifs project, NASA

The **Surface Ocean CO<sub>2</sub> Variability and Vulnerability Workshop Report** has been published

This workshop was co-sponsored by the International Ocean Carbon Coordination Project (IOCCP), the Surface Ocean-Lower Atmosphere Study (SOLAS), the Integrated Marine Biogeochemistry and Ecosystem Research (IMBER) project and the Global Carbon Project (GCP), and co-chaired by Bronte Tilbrook (CSIRO) and Nicolas Metzl (CNRS – France). A *Deep-Sea Research II* special Issue is in preparation and the submission deadline is now October 5<sup>th</sup>, 2007.

For more information: Download the Report (pdf 3.3Mb); Download the EOS Meeting Summary; Visit the symposium site for poster abstracts, national activity reports, and powerpoint presentations.

**Ocean Acidification Network** launched by SCOR, IOC, IAEA-MEL, and IGBP

At the first Ocean in a High-CO<sub>2</sub> World symposium, participants recognized that ocean acidification and its potential impacts on the marine ecosystem have not been adequately conveyed to the general public, or even to the broader scientific community. Recommendations from the first symposium included several education and outreach activities, including the development of a website for the international community to compile information and news. As ocean acidification gains more public attention and we move towards the 2<sup>nd</sup> Ocean in a High-CO<sub>2</sub> World symposium, the sponsors agreed to develop a website dedicated to news and information resources on ocean acidification as well as ocean carbon sequestration issues. We are pleased to announce the launch of the Ocean Acidification Network at [www.ocean-acidification.net](http://www.ocean-acidification.net), which we hope you will use as your central news and information source.

Comments and recommendations for improving the site should be sent to the sponsors (Maria Hood, Ed Urban, Wendy Broadgate, and Jim Orr).

For more information: [www.ocean-acidification.net](http://www.ocean-acidification.net)



# Austral Summer Institute VIII (ASI VIII)

November 27, 2007- January 26, 2008, Concepcion, Chile

## Atlantic Ocean Carbon Synthesis

### Group Homepage Launched

For more information: Visit the site at:  
<http://www.carbon-synthesis.org>

**SEACARB**, the R-based program which calculates parameters of the carbonate chemistry has been quite extensively revised. The update also benefits from new code contributed by Jim Orr.

The seacarb package can be downloaded here

(<http://www.obs-vlfr.fr/~gattuso/seacarb.php>) or from the Comprehensive R Archive Network (<http://cran.at.r-project.org/src/contrib/Descriptions/seacarb.html>).

## THE WOCE ATLAS SERIES - VOLUME 2 Pacific Ocean

The second volume of the WOCE Atlas Series (The Pacific Ocean prepared by Lynne Talley at SIO) has been published. It contains 347 pages of:

- introductory material
- vertical sections of up to fifteen parameters along the WOCE One-Time Hydrographic survey lines
- horizontal property maps on depth and density surfaces
- property-property plots

The atlas also includes a DVD containing all the printed plates plus additional material. The contents can be seen online at [http://www-pord.ucsd.edu/whp\\_atlas/pacific\\_index.htm](http://www-pord.ucsd.edu/whp_atlas/pacific_index.htm)

The **Group on Earth Observations** (GEO) is an intergovernmental (ministerial-level) group leading a worldwide effort to build a Global Earth Observation System of Systems (GEOSS) over the next 10 years. This group works to gain high-level support and commitment from governments to develop an integrated observing system, building on the existing system elements (e.g., GOOS, GTOS, GCOS, etc). See <http://www.earthobservations.org/index.html> for more information. The 2007 Global Earth Observations Ministerial Meeting will be held in Cape Town, South Africa on 30 November 2007. An information book is being developed for the Ministers, with chapters that describe the key issues being addressed by a Global Observing System. Ocean carbon and acidification have been included as key issues in a chapter called The Blue Planet Observations of the Global Ocean being produced by the GOOS office at UNESCO, with authors Jim Baker, Howard Roe, Peter Dexter, Jean-Louis Fellous, John Field, Bob Weller, and Stan Wilson.

IMBER is co-sponsoring the Austral Summer Institute VIII (ASI VIII) to be held at the main campus of UDEC and at the Marine Biology Station in Dichato. ASI VIII will be held from November 27, 2007 through January 26, 2008 and will take place at the [Department of Oceanography](#) and the [Center for Oceanographic Research in the eastern South Pacific](#) of the University of Concepcion.

## Automated plankton recognition: State of the art, calibration and practice

November 27 - December 6, 2007)

## Sediment biogeochemistry: From the coast to the abyss

10-19 December, 2007

## Ecology and diversity of marine microorganisms (ECODIM V)

7-26 January, 2008

## Oceanography and climate change: Past, present and future scenarios

14-25 January, 2008

## Sponsors

[University of Concepción](#), [Andes Foundation](#), [IOC UNESCO](#), [FONDAP](#), [COPAS Center](#), [WHOI](#), [POGO](#), [PAGES](#), [IMBER](#), [Agouron Institute](#), [Ministry of Education \(MECESUP\)](#), [Millennium Nucleus in Microbial Ecology and Environmental Microbiology and Biotechnology \(EMBA\)](#)

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Bay of Concepcion, central Chile. Photo: Didier Rousset

# Eastern boundary upwelling ecosystems symposium

June 2-6, 2008, Las Palmas, Gran Canaria, Spain

## Venue

The symposium will take place from 2 to 6 June 2008 at the Auditorium Foundation of Las Palmas De Gran Canaria: <http://www.auditorio-alfredokraus.com/web/presentation.htm>

Deadline for Abstract submission: 1 January 2008 (through the website)

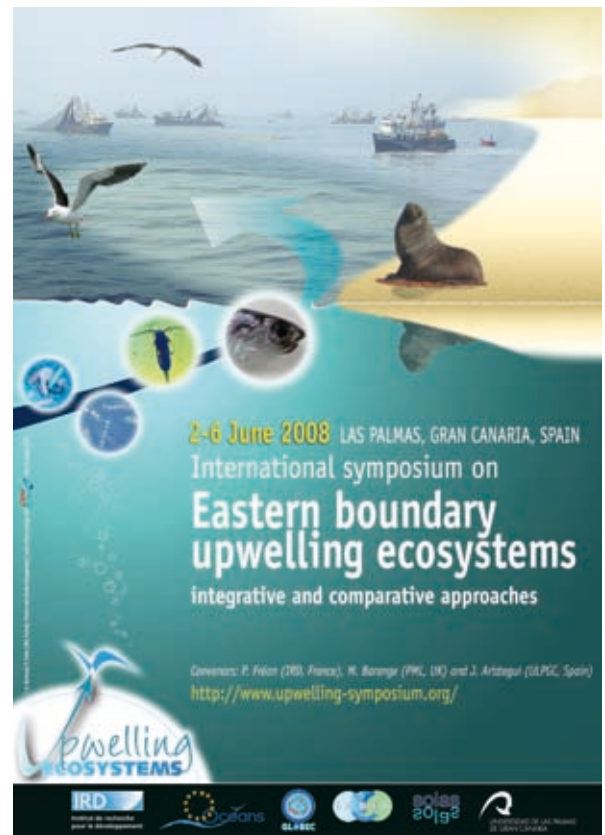
## Symposium Scope

The symposium will consider most aspects of the dynamics, structure and functioning of the four major eastern boundary upwelling ecosystems linked to the Benguela, California, Canary (African Canary and Iberian Peninsula) and Humboldt Current systems. These aspects include climate and ocean dynamics, climate change, physics of the ocean and atmosphere, biogeochemistry, ecosystem production, ecology (including behavioural ecology), food-web structure and dynamics, trophic interactions, fisheries assessment and management.

Contributions addressing retrospective analysis and modelling integrative approaches, coupling at least two ecosystem compartments and studies dealing with management issues, particularly ecosystem-based management, are encouraged. Experimental studies are also welcome. Papers including socio-economic aspects are favoured although those focusing exclusively on social and/or economic sciences will not be considered. All temporal and spatial scales are to be considered, as well as processes cutting across several scales. Priority will be given to comparative approaches between eastern boundary ecosystems and to integrated end-to-end studies of whole ecosystems.



<http://www.upwelling-symposium.org/>



Mark your calendars!

## IMBER IMBIZO - 2008

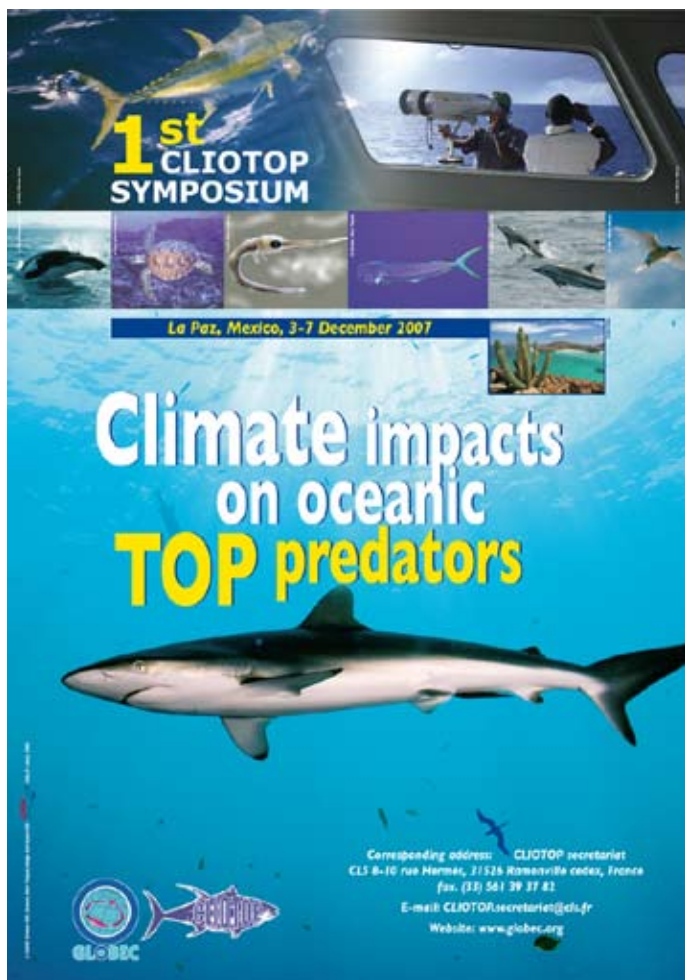
Biogeochemical and ecosystems interactions in a changing ocean

November 2008, Miami

3 concurrent workshops:

- 1) Mesopelagic (co-chaired by Debbie Steinberg and Hiroaki Saito),
- 2) Bathypelagic (co-chaired by Dennis Hansell and Gerhard Herndl), and
- 3) End-to-end Food Webs (co-chaired by Coleen Moloney and Mike Roman).





23 - 26 June 2008, Plymouth, UK  
Hosted by Plymouth Marine Laboratory

# AMEMR 2008

## Advances in Marine Ecosystem Modelling Research II 'Bridging the Gaps'

This International symposium is being convened as a forum for presentation and discussion of all aspects of model based marine ecosystem research, encompassing numerical, conceptual, mathematical and statistical approaches, focussing on understanding and predicting the marine ecosystem rather than the technical aspects. This is highly relevant to today's major challenges such as climate change, sustainable management of marine bio-resources and human impacts on the marine system.

The symposium will contribute to the next generation of model based exploration by providing scientists an opportunity to discuss and contrast recent advances, outstanding problems and future requirements.

Programme: [enquiries@amemr.info](mailto:enquiries@amemr.info)  
Registration: [admin@amemr.info](mailto:admin@amemr.info)

Timeline  
\* Call for abstracts: Sept 2007  
\* Abstract deadline: Jan 2008  
\* Programme announced: March 2008  
\* Registration from late 2007, closing in May 2008

[www.amemr.info](http://www.amemr.info)



FAO, Rome, Italy 8-11 July 2008  
i n t e r n a t i o n a l s y m p o s i u m

# Coping with global change in marine social-ecological systems

[www.peopleandfish.org](http://www.peopleandfish.org)

## MARINE PLANKTON: FROM CELLS TO ECOSYSTEMS

A celebration of the scientific career of  
Professor Patrick M. Holligan

3 April 2008

Robbins Centre, University of Plymouth, UK



The conference will comprise invited presentations on marine plankton physiology and ecology relevant to Patrick's career. A selection of the presentations will be published in a special issue of the *Journal of Plankton Research* which will form part of the conference registration pack.

Registration opens on 1 November 2007. To register your interest, please go to <http://www.holligan-fest.org/>

### Speakers include :

|                           |                         |
|---------------------------|-------------------------|
| Nick Owens (PML)          | Carol Robinson (PML)    |
| Peter Burkill (SAHFOS)    | Mark Moore (Essex)      |
| Robin Pingree (MBA)       | Barney Balch (Bigelow)  |
| Suzanne Turner (UEA)      | Toby Tyrrell (NOC)      |
| Mike Zubkov (NOC)         | Steve Groom (PML)       |
| Charles Yentsch (Bigelow) | Emilio Maranon (Vigo)   |
| Alex Poulton (NOC)        | Jonathan Sharples (POL) |





# IMBER-related meetings & conferences

## 2007

### PICES XVI

Session 2 “Decadal changes in carbon biogeochemistry in the North Pacific”

October 26 - November 5

[http://pices.int/meetings/annual/PICES16/scientific\\_program.aspx](http://pices.int/meetings/annual/PICES16/scientific_program.aspx)

### Austral Summer Institute VIII (sponsored by IMBER)

November 27, 2007 – January 26, 2008, Concepcion, Chile

<http://www2.udec.cl/oceanoudec/oceanografia/>

### ECEM'07 the 6th European Conference on Ecological Modelling

Challenges for ecological modelling in a changing world: Global Changes, Sustainability and Ecosystem-Based Management

November 27-30, Trieste, Italy

<http://www2.ogs.trieste.it/ecem07/>

e-mail: [ecem07@ogs.trieste.it](mailto:ecem07@ogs.trieste.it)

### 1st CLIOTOP Symposium: Climate impacts on oceanic top predators

December 3-7, La Paz, Mexico

<https://www.confmanager.com/main.cfm?cid=722>

### AGU 2007 Fall Meeting

December 10-14, San Francisco, USA

<http://www.agu.org/meetings/fm07/>

## 2008

### The 14th Ocean Sciences Meeting

March 2-7, Orlando, FL, USA

Deadline for abstract submission: October 2, 2007

<http://www.aslo.org/orlando2008/>

### OceanSensors08

April 7-11, Warnemunde, Germany

<http://www.oceansensors08.org>

### General Assembly of the European Geosciences Union, the EGU 2008

April 13-18, Vienna, Austria

Deadline for Abstracts: 14th January 2008

[http://www.cosis.net/members/meetings/skeleton/view.php?p\\_id=310&PHPSESSID=7ff96dcf87402f3fcd2b03c81e22cb3f](http://www.cosis.net/members/meetings/skeleton/view.php?p_id=310&PHPSESSID=7ff96dcf87402f3fcd2b03c81e22cb3f)

### ICES/PICES/IOC Symposium

Effects of climate change on the world's oceans

May 19-23, Gijón, Spain

[http://www.pices.int/meetings/All\\_events\\_default.aspx#Int\\_Symp](http://www.pices.int/meetings/All_events_default.aspx#Int_Symp)

### International Symposium

Eastern Boundary Upwelling Ecosystems: Integrative and Comparative Approaches

June 2-6, Las Palmas de Gran Canaria, Spain

<http://www.upwelling-symposium.org/>

### International Symposium: Coping with global change in marine social-ecological systems

July 8-11, Rome, Italy

<http://www.peopleandthesea.org/>

### 2<sup>nd</sup> Symposium on the Ocean in a High-CO<sub>2</sub> World

October 6-8, Monaco

31 March 2008: registration and abstract submissions open

<http://www.confmanager.com/main.cfm?cid=975&nid=7388>

IMBER is an international  
project of IGBP and SCOR

GLOBAL  
I G B P  
CHANGE

 International Council for Science  
Scientific Committee on Oceanic Research

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## INSTRUCTIONS TO CONTRIBUTORS

The *IMBER Update* is published quarterly and is released in on-line version ([www.imber.info/newsletters.html](http://www.imber.info/newsletters.html)).

## ARTICLES

We invite you to submit your contribution to the *IMBER Update* using the following guidelines: Articles can be up to 650 words with 2 accompanying figures and/or pictures. When sending illustrations for the *IMBER Update* please include them in as high resolution as possible, minimum requirement is 300 dpi as tif or eps. Text should be in .doc or .txt. To get the detailed template for submission, please contact [elena.fily@univ-brest.fr](mailto:elena.fily@univ-brest.fr).

The IMBER Science Plan and Implementation Strategy is available on request at [imber@univ-brest.fr](mailto:imber@univ-brest.fr) and is downloadable from the website, [www.imber.info/SPIS.html](http://www.imber.info/SPIS.html)

For submissions and subscriptions, contact [imber@univ-brest.fr](mailto:imber@univ-brest.fr)

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