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Editorial

SIBER Science Plan Writing Workshop Goa, India, 27-30 November 2007

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As a follow-up of the Workshop on "Sustained Indian Ocean Biogeochemical and Ecological Research (SIBER)" held at the National Institute of Oceanography (NIO), Goa on 3-6 October 2006, another workshop was convened by Raleigh Hood and Wajih Naqvi at NIO to write the SIBER Science Plan from 27 to 30 November 2007. This workshop was primarily funded by India's Council of Scientific & Industrial Research (CSIR) with additional financial support provided by IMBER, the Perth office of the Intergovernmental Oceanographic Commission (IOC), the U.S. National Aeronautics and Space Administration (NASA) and U.S. National Oceanic and Atmospheric Administration (NOAA), and the Embassy of France in India. As SIBER is designed to be a regional initiative under the auspices of IMBER and GOOS, IMBER has been actively involved in its planning.

The Workshop was attended by 9 scientists from the United States, 6 from India, 3 each from Australia and France, and 1 each from Germany, Japan, Kuwait, Netherlands, Oman and the United Kingdom. Brief presentations by all participants were followed by Working Group and plenary discussions. The following six major themes were identified keeping in view the unique features of the Indian Ocean

biogeochemistry and ecosystem dynamics: (1) Boundary current dynamics, interactions and impacts; (2) Equatorial circulation and Indonesian through flow, including climate and circulation phenomena such as MJO, IOD, Wyrtki Jets, etc.; (3) Controls and fate of primary production in the Indian Ocean including marginal seas; (4) Biogeochemical differences between the Arabian Sea and Bay of Bengal; (5) Global change and anthropogenic impacts; and (6) Role of higher trophic levels in ecological processes and biogeochemical cycles. The different Working Groups will prepare sections of the Science Plan and Implementation Strategy, the first draft of which is expected to be available in April 2008.

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Science Highlight

Importance of bottom nepheloid layers on the transport and delivery of sediment to the eastern Cariaco Basin, Venezuela

Laura Lorenzoni[1], Frank E. Muller-Karger[1,4], Robert C. Thunell[3], Eric Tappa[3], Claudia Benitez-Nelson[3], David Hollander[1], Ramón Varela[2], Yrene Astor[2] and Chuanmin Hu[1]

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Due to their high topographic relief and susceptibility to erosion, mountainous coastal rivers deliver high sediment loads to continental margins. Yet, the coastal biogeochemistry associated with these small rivers remains poorly characterized. Understanding the transport of lithogenic material from the continent to the coastal ocean is also critical to reconstruct past environments and predict the effect of anthropogenic activities on sediment delivery to the ocean (Milliman and Syvistski, 1992). The Cariaco Basin is an anoxic basin located off the coast of Venezuela (Figure 1) and stores one of the most detailed marine paleoceanographic sediment records (Yarincik et al., 2000). The CARIACO (CArbon Retention In A Colored Ocean) oceanographic time-series project (http://www.imars.usf.edu/CAR/), located in the Cariaco Basin, seeks to understand the linkages between surface processes and sediment deposition at the bottom of the basin.
The eastern Cariaco Basin receives the discharge from three small mountainous rivers (Manzanares, Neverí and Unare). The Neverí and Unare empty onto the wide, gentle sloping and shallow (100 m depth) Unare Platform. The Manzanares empties near a submarine canyon near the city of Cumana (Figure 1). These rivers were examined during the rainy season in September 2003 and 2006. Optical transmissometer measurements collected in the water column and near the bottom were coupled with particulate organic matter (POM) observations to understand sediment distribution and composition.

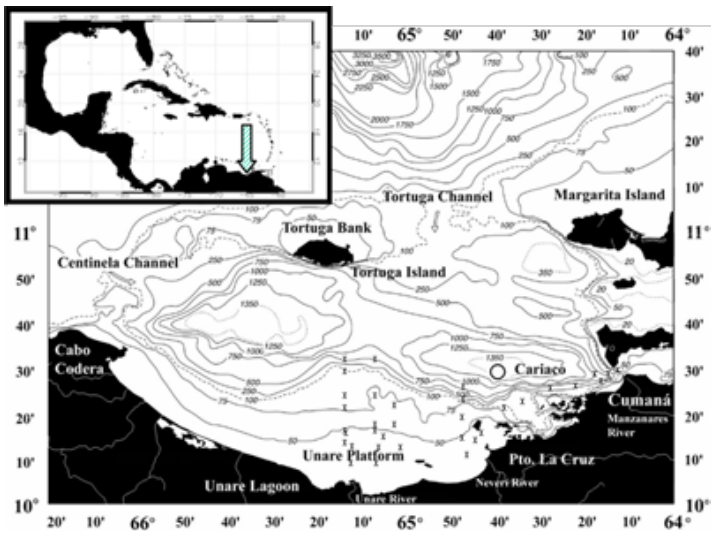

Figure 1 - Top Insert: Location of the Cariaco Basin (arrow). Bottom: The Cariaco Basin showing position of the CARIACO station (circle). Crosses indicate sampling locations.

Suspended sediments entering the basin sank to the bottom within 10 km from the mouth of the rivers. Bottom nepheloid layers (BNLs) were identified in all sampled locations, and seem to be an important dispersal mechanism of terrigenous sediments. BNLs extended up to 50 km from the river mouths, reaching the 100m isobath and effectively transporting sediment into the deep Basin. BNLs were observed near the mouths of the three rivers, although they were more extensively developed over the Unare Platform. Their thickness varied from 2 to 20 m, thickest close to the shelf break. BNLs in the Cariaco Basin may be maintained by wind- or tidally driven resuspension events and local

currents. Intermediate nepheloid layers (INLs) were also observed near the shelf break and, in particular, near the Manzanares River.
Though higher in particle concentration, BNLs were, in general, lower in particulate organic carbon (POC), nitrogen (PON) and phosphate (POP), compared to measurements in the overlying water column. This suggested that BNLs may not be a primary mechanism for delivering terrigenous POM to the deeper anoxic waters of the Basin during the rainy season. Terrigenous sediments originating in the Coastal Mountain Range of Venezuela are found in the deep sediments of Cariaco Basin. As the sediments travel from the coast to the interior of the basin they may serve as mineral ballast for marine particulate organic carbon (POC).
Data from the sediment trap array maintained at the time-series station (Thunell et al., 2007) suggest that terrigenous sediment from the BNLs may be delivered to the deep basin in pulses, in response to atmospheric events. Similar observations have been made off the Namibian and Oregon coasts (Inthorn et al., 2006; Hales et al., 2006). This is particularly important because the marine-derived POC that was produced and settled on the shelf during the upwelling season could be effectively sequestered to the deep. BNLs also represent a potential, transitory source of iron to the suboxic zone of the Cariaco Basin (Percy et al., 2007).
We conclude that BNLs and INLs play an important role in the seaward transport of particulate material in the Cariaco Basin. However, we still need to fully characterize composition and mechanisms of transport to understand their role in biogeochemical cycles and continental shelf dynamics. Understanding this is critical not only to interpret the paleoceanographic record of the Cariaco Basin correctly, but also to predict future changes linked to anthropogenic activities.

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Bio-optics and fate of terrestrial CDOM as key issues in biogeochemical modelling of Arctic and subarctic coastal seas

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Faced with the challenges of global change and sustainable development, modern oceanography has seen the emergence of new observation and predictive tools. In the past two decades, remote sensing and numerical modelling have evolved considerably to infer oceanic variability with a high spatial and temporal resolution hard to achieve with field surveys alone. This is a key issue for understanding the carbon cycle, especially in productive coastal waters which are impacted by human induced eutrophication. Little has been done, however, about the impact of CDOM-dominated waters on plankton production modelling in the coastal ocean often constrained by complex bio-optical properties.
Here we present some quantitative elements about such constraints based on recent modelling efforts within the Gulf of St. Lawrence (GSL), Canada. The GSL is a highly dynamic subarctic marginal sea receiving the second largest freshwater runoff (~700 km^3 yr^{-1}) of North America from the St. Lawrence River and many tributaries. The high concentrations of nonchlorophyllous material (mainly terrestrial CDOM) drained from the continent cause the St. Lawrence estuarine waters to be of case 2 type[1]. They impact both quantitatively and qualitatively the underwater light field experienced by phytoplankton over a large part of the GSL. The results presented here were produced from a high resolution coupled physical/biological model[2, 3] accounting for freshwater-associated turbidity. An extensive *in situ* dataset was used to parameterize the model through an inverse relationship linking seawater salinity with a diffuse attenuation coefficient of PAR associated to nonchlorophyllous material (k_p) (Fig. 1).

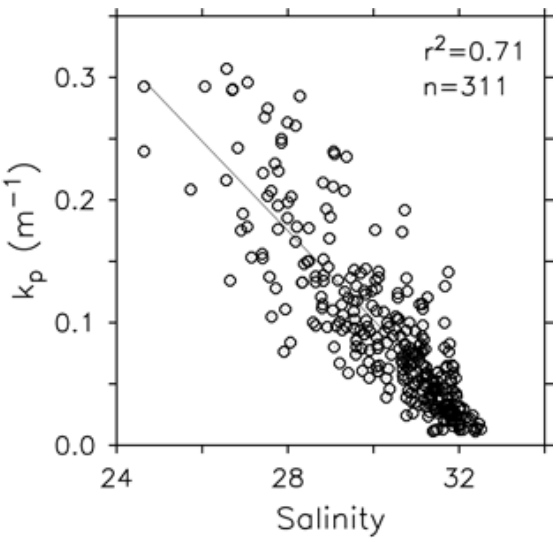

Figure 1 - Scatter plot showing the linear relationship between seawater salinity and the diffuse attenuation coefficient due to nonchlorophyllous material (k_p) derived from *in situ* measurements. The linear regression gives the equation k_p=0.0364 Salinity +1.1942 with a correlation coefficient r2=0.71. (From Le Fouest et al., 2006)

Comparisons of model outputs for 1998 with coincident SeaWiFS ocean colour data and extensive nitrate and Chl-a measurements suggested CDOM-dominated waters largely contributed to SeaWiFS-derived Chl-a[2], causing its overestimation in the western GSL. Nevertheless, the striking agreement between the simulated CDOM-dominated plume and SeaWiFS patterns made it possible to validate the regional estuarine circulation and associated mesoscale variability (Fig. 2), highlighting the farfield effects of the plume over the western part of the Gulf.

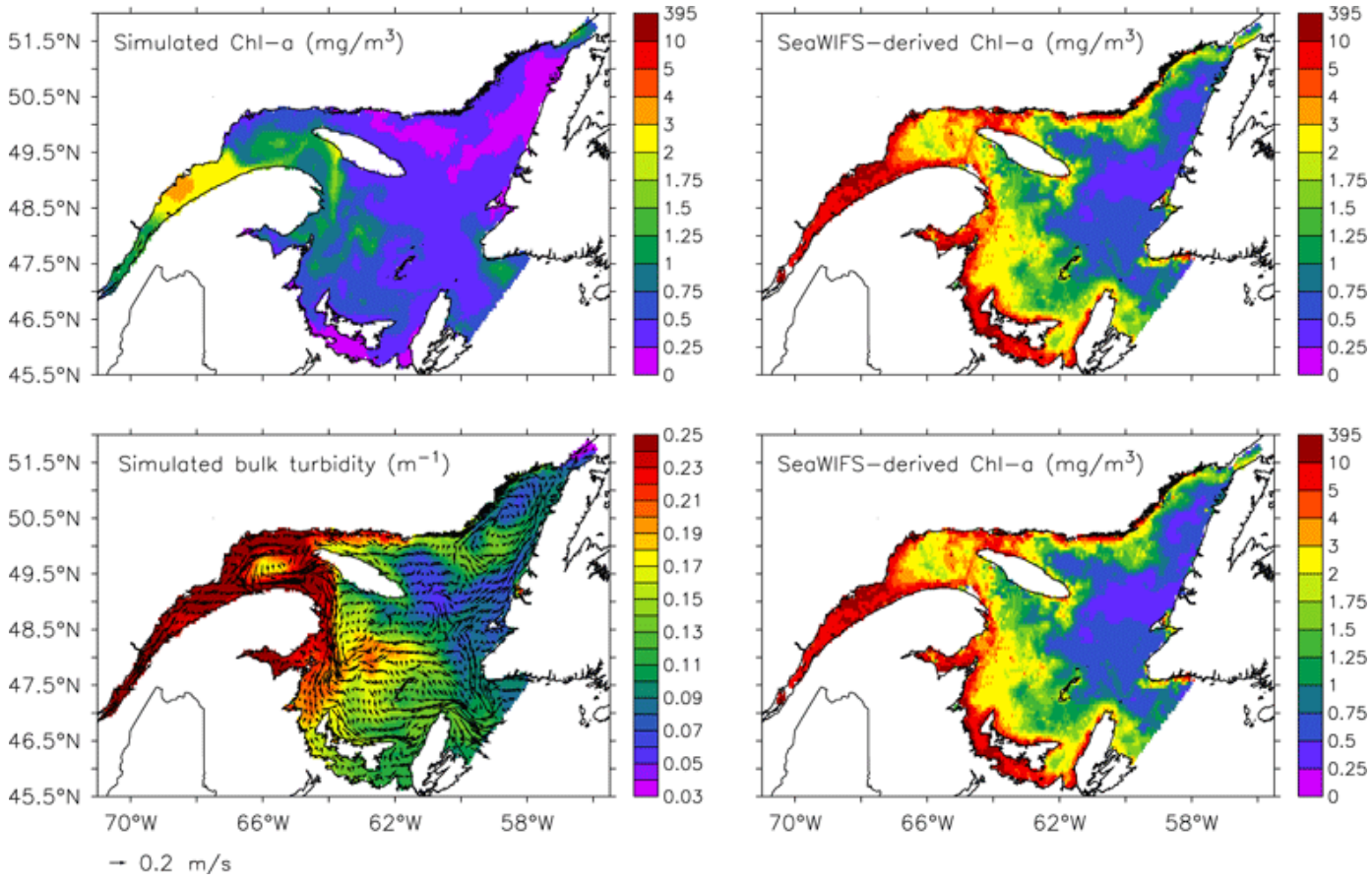

Figure 2 - Comparisons of SeaWiFS-derived Chl-a (right panels) in respect with simulated surface (0-10 m depth-averaged) Chl-a (upper left panel) and diffuse attenuation coefficient due to nonchlorophyllous material (lower left panel) for the 2-8 July 1998 period. Arrows overlaid on the lower left panel are the simulated mean surface (0-10 m depth-averaged) currents. Note the irregular scale for the SeaWiFS-derived and simulated Chl-a panels. (From Le Fouest et al., 2006)

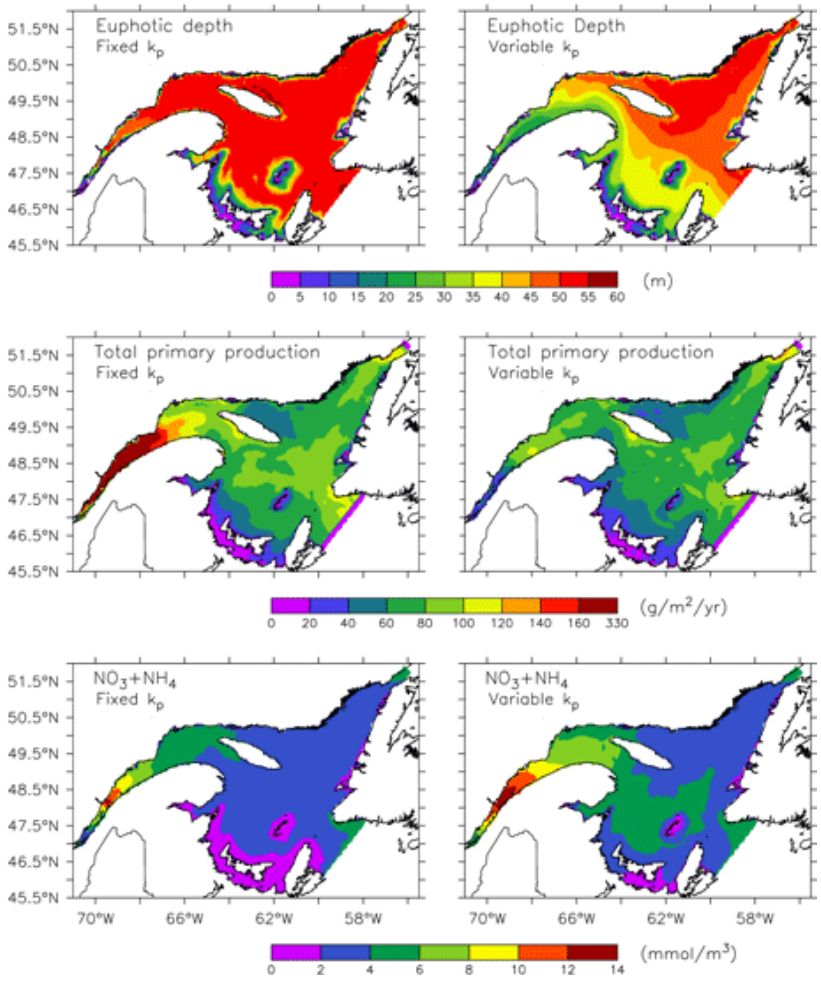

Figure 3 - Annual mean of the euphotic depth (0.1% of surface PAR; upper panels), yearly and depth-integrated (0-50 m) primary production (middle panels), and annual mean of depth-averaged (0-50 m) nitrogen nutrients (lower panels) for the simulation set up with a constant (k_p=0.04 m-1; left panels) and salinity dependent diffuse attenuation coefficient due to nonchlorophyllous material (right panels).

Figure 3 illustrates the impact of the plume on primary production by comparing model runs with and without the parameterized bulk turbidity[4]. The impact came primarily from differences in the euphotic depths with a marked shallowing along the estuarine plume from the Estuary towards the southwestern GSL (Fig. 3, upper panels). This difference translated into a delayed spring bloom and lower primary production rates in river-influenced areas (Fig. 3, middle panels), with a consequent effect on nutrient dynamics over half the GSL (Fig. 3, lower panels). Comparisons with literature estimates and coincident in situ data suggested nutrients were under- and overconsumed in simulations with and without riverine CDOM shading, respectively. A further sensitivity analysis (not shown) was completed by including photoacclimation, that is, the adjustment of the photosynthetic efficiency of phytoplankton to local underwater light conditions. Including photocclimation allowed simulated nutrient concentrations and lateral fluxes to get closer to observations, emphasizing the key role of this process in the plankton dynamics and nutrient budget of the GSL.

Modelling the freshwater-associated bio-optical variability and phytoplankton response in terms of photosynthetic efficiency are key issues in predicting plankton productivity and nutrient budgets in river-influenced coastal systems like the GSL. Changes in phytoplankton productivity is of major concern for the coastal Arctic Ocean, which is predicted to experience global warming sooner and to a greater extent than elsewhere. Remobilisation of thawing permafrost carbon stocks together with an increasing river discharge might result in more CDOM reaching the coastal Arctic waters, with a consequent impact on the ecosystem productivity. In this perspective, modelling the fate and bio-optical properties of terrestrial CDOM poses as an inescapable but challenging topic in the biogeochemical modelling of changing Arctic and subarctic coastal waters.

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Accurately measuring deep-sea microbial activities and their impacts on biogeochemical cycles

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The effects of elevated hydrostatic pressure concern all organisms living in the world's largest (by volume) habitat: the deep sea. Historically underestimated in terms of its contribution to the Biosphere, the deep sea remains one of the least known and most poorly understood environments on our planet. The implementation plan for the joint SOLAS-IMBER ocean carbon research points out the need to study microbial activities under *in situ* pressure conditions (see p.32) to improve this situation, but states, we believe incorrectly, that deep-sea microbial activity is "commonly" measured at atmospheric pressure with resulting rates "higher than might be expected." From decades of research paying close attention to the use of *in situ* conditions, we know that life in the deep sea is more complicated than this. The aim of this short article is to summarise knowledge of pressure effects on microbes in the deep sea and redress this mischaracterization.

The field of deep-sea microbiology was born 125 years ago and pressure-adapted microbes or piezophiles (also known as barophiles) have been obtained readily from many different deep-sea regions by researchers around the world. These organisms include members of the domains Archaea and Bacteria. Various archaeal isolates within both the Euryarchaea and Crenarchaea kingdoms have been obtained, along with bacterial strains belonging to the genera *Carnobacterium, Colwellia, Desulfovibrio, Marinitoga, Moritella, Photobacterium, Pyschromonas, and Shewanella* (reviewed in[1]). The membrane properties of piezophiles have been well described and the unique abilities of piezophiles to be motile, transport nutrients, and undergo DNA replication and translation under high pressure are being studied[2]. Protein adaptation to high pressure has also been examined in comparative studies of piezophiles and microbes adapted to atmospheric conditions[3].

The first measurements of deep-sea microbial activity made without pressure changes were reported by Jannasch and Wirsen (1973), who concluded that "elevated pressure decreases rates of growth and metabolism of natural microbial populations collected from surface waters as well as from the deep sea"[4]. Contrary to this early conclusion, virtually all other data from the water column obtained under *in situ* conditions have shown that the trend is the reverse: microorganisms at depth are adapted to both the high pressure and low temperature conditions of their environment. Hence incubation of deep-sea samples at atmospheric pressure commonly underestimates (not overestimates, as written in the SOLAS-IMBER Implementation Plan) *in situ* activity under ambient conditions[5-8]. Exceptions to this general trend occur only under specific conditions; for example, with a large charge of particles or mixing waters[9] or according to the substrate used[10].

Microbial communities in the deep ocean may contain both autochthonous microbes adapted to *in situ* temperature and pressure and allochthonous microbes transported from the ocean surface layer, for example by settling particles. Activities of the allochthonous microbes decrease with depth, limiting their capacity to degrade organic matter sinking through the water column[11-13]. They may be inactive (though not dead) under deep *in situ* conditions, but can dominate (or form a significant portion of) community activity when measured under surface pressures and/or temperatures. Thus, community activity measurements made under surface versus deep-sea conditions may reflect entirely different components of the community: one cannot predict *in situ* activity from unpressurised incubations[14-16]!

Only with microbial rates measured under *in situ* conditions (e.g., high-pressure, low temperature, ambient food availability) do realistic calculations of the flow of matter and energy as mediated by microbes become possible for the deep sea, and thus throughout the water column. By combining such rate measurements with recent developments on single cell approaches and new insights highlighting possible chemoheterotrophy, we can expect to better understand elemental cycles in the mesopelagic and bathypelagic zones – a welcome key objective within joint SOLAS-IMBER ocean carbon research.

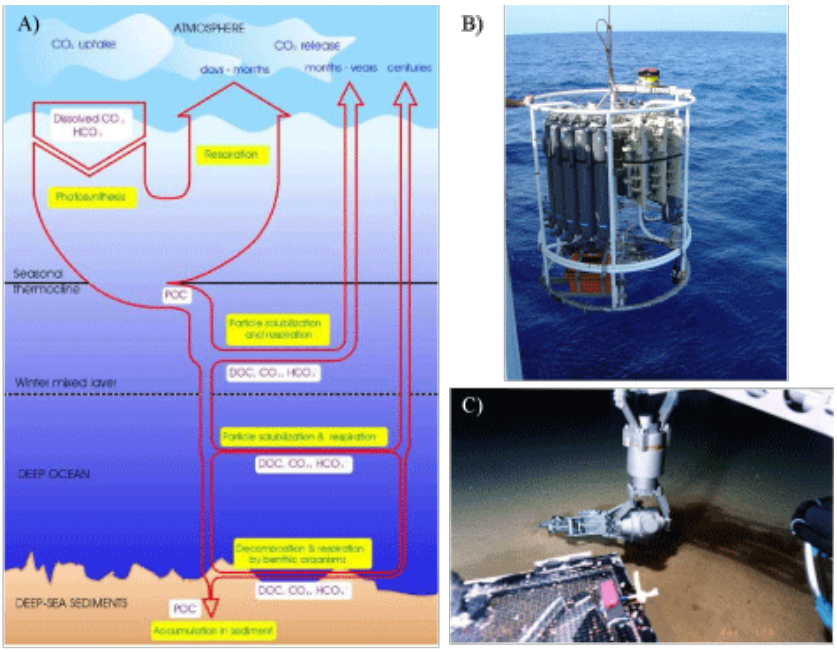

Fig A– Schematic diagram showing the flux of carbon through the NE Atlantic water column to the deep-sea sediment. REPRODUCED FROM Turley, FEMS Microbiol. Ecol., 2000).

Fig B – High Pressure Serial Sampler (HPSS, Bianchi et al., DSR, 1999) fitted on a classical Sea-Bird Carousel to sample deep-sea waters without change of in situ pressure condition (see www.com.univ-mrs.fr/~tamburini).

Fig C – Samples from Mariana Trench Challenger Deep at a depth of 10,898 m on February 28, 1996 (Kato et al., Extremophiles 1997).

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Meeting reports

The CLIOTOP Symposium: Perspectives through an IMBER lens

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The first CLIOTOP (Climate Impacts on Oceanic Top Predators) Symposium was held on 3-7 December 2007 in La Paz, Mexico; I attended as a representative of the IMBER Scientific Steering Committee. The symposium aimed to stimulate international scientific collaboration among researchers studying the responses of oceanic top predators to climate variability and change and to intensive fishing pressure. The symposium aimed to showcase current research and to identify future challenges. The symposium was largely successful in these endeavours, although there were few marine mammal specialists present, apparently because of a concurrent marine mammal conference held in Cape Town.

The symposium had approximately 175 presentations, of which about half were presented orally and half as posters. All oral sessions were held in plenary, which provided a good opportunity to obtain an overview of marine top predator research across species and regions. Poster

presentations were split into two sessions. Details of the abstracts and many of the PowerPoint presentations can be obtained from the CLIOTOP Web site (http://web.pml.ac.uk/globec/structure/regional/cliotop/cliotop.htm). In this article I will not attempt to summarise the range of topics presented, but will confine my comments to some personal perspectives on general scientific topics that might be of interest to IMBER scientists.

One of the interesting topics that recurred in a number of presentations was the link between oceanic mesoscale features and the movements and distributions of top predators, often linked to "hot spots" and high-use areas. Judicious use of ocean satellite data and logging devices attached to animals provided fascinating insights into the behaviour of top predators in relation to oceanic features and the related ecology of these systems. These studies covered a number of taxa, including squid, fish, sharks, turtles, seabirds, seals and cetaceans, and there appears to be huge scope within CLIOTOP for comparing the strategies adopted by animals with different biology and life history traits, and predicting differential responses to climate change.

Links to climate change were elaborated in a number of presentations, highlighting the advantages of using highly mobile top predators to integrate ecological signals in the ocean. I was impressed at the widespread use of stable isotopes to try to understand the food webs in which the top predators occurred. Of particular interest was the unifying effort made within the CLIOTOP research community to standardize methods and thus enable meaningful comparisons. This carried over into other attempts to carry out global integration, but clearly more such efforts are needed for cross-taxa comparisons and comparisons among oceanic regions. Discussions along these lines occurred during some of the Working Group meetings held during the symposium, further highlighting one of the strengths of the CLIOTOP project (co-ordinating comparative studies).

There were some extremely interesting presentations on uses of technology, including the tracking of both ocean features and animals (ranging from small fish to whales), and *in situ* image analysis of ichthyoplankton. The early life history of top predators is a focus of one of CLIOTOP's five working groups, and this was manifested at the symposium as a number of presentations elaborating the biology and ecology of the eggs, larvae and juveniles of a variety of fish species. The range of methods that have been employed in these and other studies illustrated the utility of the single-species approach adopted in CLIOTOP in bringing together many research disciplines. The human dimensions of top predator research were represented in a few presentations, mostly linked to fishing policy issues.

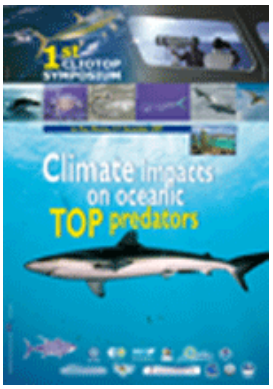
Having had limited previous exposure to the research falling within the CLIOTOP project, I found the combination of single-species ecology and large-scale forcing issues to be intellectually stimulating, both at the level of the natural history of the organisms and globally. Links from top predators to biogeochemistry were explicit in some of the modelling presentations and to some extent in the plankton-focussed research (including ichthyoplankton). The long life spans and broad ranges of many of the species increase the scope of the time and space scales of the research, with fascinating presentations on the jumbo squid (*Dosidicusgigas)* representing a notable extreme with regard to the scales of responses.

The symposium was a great success, showcasing some fascinating science and pointing to some useful future activities. Some of this will be captured in publications emanating from the symposium, many in a special issue of *Progress in Oceanography* that will be published within the next year or so.

My thanks to IMBER for supporting my participation at the symposium.

More information ...

The presentations and some of the posters from the **CLIOTOP** symposium are now available on the GLOBEC Web site at:
http://www.globec.org/structure/regional/cliotop/symposium/symposium.htm
If you would like to provide a pdf of your poster for the Web site, please send it to Dawn Ashby in the GLOBEC IPO (d.ashby@pml.ac.uk).
Please note that the deadline for submitting manuscripts to the special issue of *Progress in Oceanography* is **29 February 2008**. Manuscripts should be submitted directly to the *Progress in Oceanography* Web site (http://ees.elsevier.com/prooce/). You will need to register and log into the site and then select the *Article Type* carrying the short title of the *Special Issue (CLIOTOP Symposium)* that will be available shortly.



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PICES 16th Annual Meeting Report

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The North Pacific Marine Science Organization (PICES) held its 16th annual meeting "The changing North Pacific: Previous patterns, future projections, and ecosystem impacts" in Victoria, Canada. More than 500 people gathered and presented recent findings in 11 topic sessions, 5 paper sessions and 6 workshops. These sessions and workshops targeted various marine science issues, with many of them focused on interdisciplinary issues, such as the interactions between ecosystem and biogeochemical cycling, ecosystem responses to climate change, etc. One of the topics in the 16th Annual Meeting was the relationship between fisheries and ecosystems, specifically, how the fisheries, which often harvest top predators of the food-web and/or damage habitats, modify marine ecosystem structures and impact ecosystems. Also, two sessions and one workshop discussed ecosystem-based fisheries management (EBFM) and the ecosystem approach to fisheries. EBFM assesses the impact of fisheries on not only target species but also bycatch species and habitats, and is thought to be beneficial to the sustainability of marine ecosystem services, including fisheries production. In these sessions, some examples of initiatives for implementing EBFM as well as recent developments of the modeling and concept for EBFM, were represented. Although there are many unsolved issues for practical use of EBFM, there is growing momentum toward the EBFM evident at the conference.
During the annual meeting, many papers represented recent changes in physical, chemical and biological properties in the North Pacific Ocean. LIke other parts of the Earth System, the North Pacific Ocean is changing under the pressures of human activity. Motivated by growing societal concern for the future of marine ecosystems and the potential threats to the varied benefits derived from them, PICES is developing a new interdisciplinary programme named FUTURE (Forecasting and Understanding Trends, Uncertainty and Responses of North Pacific Marine Ecosystems). The objective of FUTURE is to understand and forecast responses of North Pacific marine ecosystems to climate change and human activities at basin-wide and regional scales, and to broadly communicate this scientific information to PICES members, governments, resource managers, stakeholders and the public. During the annual meeting, an open forum and workshop on FUTURE were held and community comments on the FUTURE Science Plan were tabled to the writing group. There are many common aspects between the science plans of FUTURE and IMBER, for example, studying the mechanisms underlying ecosystem responses to natural and anthropogenic forcing factors, and developing effective ways to communicate complexity to policy makers, resource managers, society, etc. Considering these overlaps it is quite natural and appropriate for active collaboration between IMBER and PICES to be established. Julie Hall, IMBER Chair, attended the workshop and showed strong interest of IMBER to collaborate with PICES FUTURE. The importance of the collaboration with external projects such as IMBER was considered important for FUTURE. The FUTURE study group is moving to develop the implementation strategy, with programme implementation beginning at the next annual meeting in Oct.-Nov. 2008, in Dalian, China.
During the annual meeting, IMBER proposed a topic session for the next annual meeting entitled "End to End food webs: Impacts of a Changing Ocean". A holistic end-to-end approach is needed to study the impacts of global change in marine food webs and biogeochemical cycles. This proposal was approved. More details of the session will be provided on the PICES Web site soon (http://www.pices.int/).

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Interactions with partner programmes

Report from CLIVAR SSG-15

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The 15th meeting of the CLIVAR Scientific Steering Group (SSG) was held at the Headquarters of the World Meteorological Organization (WMO), Geneva, Switzerland, from 11-14 September 2007. CLIVAR, Climate Variability and Predictability, is a core project of the World Climate Research Programme (WCRP). It has a particular focus on the role of the oceans in climate variability and change. CLIVAR focuses on physical climate changes. These changes drive changes in marine ecosystems and biogeochemical processes which is a focus of IMBER.

Following a welcome by the Deputy Secretary General of WMO, the meeting heard presentations from the three other WCRP projects and several other programmes and activities, including IMBER. The IMBER presentation was made by Dr. Wilco Hazeleger, a member of the IMBER SSC and co-chair of CLIVAR's Atlantic Panel. His presentation briefed the SSG on the goal and themes of IMBER, current IMBER-related projects and planned meetings and workshops, including the upcoming IMBER-led "Spring School" on Climate Driving of Marine Ecosystems, which CLIVAR is co-sponsoring. Later in the meeting, Niki Gruber (new to the IMBER SSC and a member of CLIVAR's Southern Ocean Panel), made a presentation to the SSG on the changing Southern Ocean carbon sink. In discussion, the SSG agreed on the need to strengthen its existing link to IMBER, in particular through seeking explicit representation of IMBER on all of four of CLIVAR's ocean basin panels (Atlantic, Pacific, Indian and Southern Ocean).

The meeting followed with reports of progress with CLIVAR activities. To identify just a few highlights, the Atlantic Panel continues to foster, develop and promote the thermohaline circulation monitoring system, while in the tropics the Tropical Atlantic Climate Experiment (TACE) is now well underway and is moving toward its intensive observation phase in 2009. Under the CLIVAR/GOOS Indian Ocean Panel, the Indian Ocean array of sustained observations continues to develop, in liaison with efforts to make biogeochemical measurements there. The Southern Ocean Panel is contributing to developing plans for a Southern Ocean Observing System beyond the International Polar Year (IPY) and is overseeing the IPY Climate of Antarctica and the Southern Ocean cluster. The Pacific Panel is focusing on improved understanding of the **E**l **N**iño-**S**outhern **O**scillation and its interactions with other climate phenomena, including coordination of a number of existing and planned field

programs. A focus of CLIVAR's Global Synthesis and Observations Panel is the assessment and coordination of existing global ocean synthesis efforts, which will lead to new data sets with optimal combination of observations and model data.

Two key WCRP-wide modelling experiments using coupled ocean-atmosphere models being planned by CLIVAR are, (1) a Climate System Historical Forecast Project, aimed at exploring the wider seasonal predictability of the climate system across its different components, and (2) coordinated experimentation to study multi-decadal prediction and predictability. Both of these will be seeking to engage with the wider community by inviting diagnostic sub-projects much as was done for the WCRP archive of model runs for IPCC AR4. In addition, a new set of benchmark Coordinated Ocean-ice Reference Experiments (COREs) has been developed by CLIVAR's Working Group on Ocean Model Development, whilst the WCRP/CLIVAR Working Group on Coupled Modelling is working with others, including IGBP's Analysis, Integration and Modeling of the Earth System (AIMES) project, to define the scenarios and integrations that will be used in any future IPCC assessment. The output of these projects is highly relevant to IMBER as it will describe the physical climate changes and variability in the ocean.

In addition to assessing progress, the SSG also discussed CLIVAR's contributions to WCRP's cross-cutting activities and gave consideration to CLIVAR's current organization and final legacy. CLIVAR, has it's « sunset date » in 2013, in relation to which the SSG agreed to hold a second CLIVAR Science Conference in 2011 to be followed by a final closure meeting in 2013.

Additional information about CLIVAR can be found at www.clivar.org and from icpo@noc.soton.ac.uk. Papers and PowerPoint presentations for the SSG-15 meeting are at www.clivar.org/organization/ssg/ssg15/ssg15.php. WCRP is co-sponsored by WMO, the International Council for Science and the Intergovernmental Oceanographic Commission of UNESCO.

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Regional activities

Europôle Mer, what is it?

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Europôle Mer was born officially in 2004 in western Brittany, France as an initiative from the European Institute for Marine Studies (Brest), the Marine Biology Station (Roscoff) and IFREMER (Brest). This consortium, which has 15 members[1], aims to federate the efforts of universities and research institutes in the field of marine sciences and technology. Scientists from these organizations have been engaged for several years as scientific coordinators of three Networks of Excellence, two Integrated projects, one Integrated Infrastructure Initiative and one EraNET[2], funded by the European Commission. Since 2007, the Europôle Mer consortium has been funded by the French Ministry of Research and Higher Education, CNRS, IFREMER, and the other members.

The implementation plan of Europôle Mer comprises development of research cooperation of 5 scientific themes (marine genomics, climate – ocean interactions, integrated coastal zone management, deep-sea domain, and marine automated systems and robots). It also develops doctoral networks such as MENTOR, a joint initiative by the universities of Brest, Southampton, Bremen, Kiel and Bergen for student exchange, credit recognition, co-supervision and joint diploma. Besides driving research and education programs, Europôle Mer encourages scientific and technological transfer of knowledge from the scientific community, trades and industries, as well as the general public through public outreach activities for the European community.

Based on scientific expertise and a rich local entrepreneur network focused on marine sciences and technologies in Brittany, Europôle Mer has the ambition to permanently establish the far west of France on the map of oceanographic excellence. With strengthened capabilities through cooperation and an increased visibility on national and international scales, Europôle Mer aims at taking leadership in oceanic research in the future.

In 2008 Europôle Mer will continue to implement its science plan. Examples are a meeting held on 31 January – 1 February 2008 at IUEM in Brest, gathering the local scientific community and some experts on topics related to global change – ocean – marine ecosystems interactions; a first call for projects regarding biotechnologies; acquisition of some advanced equipment for genomic analysis; launch of international chairs of excellence in several research priority areas; and a first benchmark meeting during the Sea Tech Week, which will be held in Brest on 13-17 October 2008 and will draw together scientists and engineers from around the world to share their expertise on marine sciences and technology.

For more information please contact europolemer@univ-brest.fr or visit www.europolemer.eu

[1] A complete list of the members of Europôle Mer is available at www.europolemer.eu

[2] The ERA-NET Scheme aims at developing and strengthening the coordination of national and regional research programmes within the European Research Area.

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IMBER-related meetings & conferences

Climate driving of marine ecosystem changes (CLIMECO)...*Training for young marine scientists*
21-24 April 2008, Brest, France

The call for the CLIMECO training activity - sponsored by IMBER, GLOBEC, EUR-OCEANS and CLIVAR - was very successful. We received 190 applications from young marine scientists and the selection of the 30 candidates was a challenge. The numerous applications have allowed us to choose a group of high level science PhDs and post doctoral fellows and lead us to expect a productive training opportunity. The final list of selected candidates shows gender balance (19 females and 11 males) as well as geographical balance, all continents being represented (11 Europeans, 12 North Americans, 3 South Africans, 2 South Americans, 1 Japanese and 1 Australian).
The CLIMECO training workshop will be a combination of scientific plenary sessions on defined themes followed by discussions and "hands-on" sessions in which young scientists with a marine biogeochemistry/ecosystems background will learn how to use climate data. This includes sourcing relevant data, scrutinising its quality and knowing how to make use of it. The plenary sessions will include the following topics:

- Ocean physics, patterns of climate variability and biogeochemical cycles
- Contribution of the ocean observing system to investigate ocean variability
- Modelling ocean circulation and variability
- Combining ocean observations and circulation models
- Patterns of climate variability and change forcing the ocean
- From physics to fish and bioclimate feedbacks
- Physical ocean processes (upwelling, mixing, surface forcing), nutrients and fish
- Future changes in the atmosphere - ocean system
- Marine ecosystems

The products for hands-on sessions will be data archives such as PCMDI IPCC coupled model archive, flux data sets, ocean reanalysis data sets (e.g. ECCO, SODA and hydrography) and tools such as Climate Explorer for statistical analysis, hydrobase and Ocean Data View. The lecturers are highly qualified scientists coming from France, The Netherlands, Norway, the United Kingdom and the United States. For more information on the instructors, see http://www.imber.info/CLIMECO_INSTRUCTORS.html
The local organizing committee is arranging an audio recording of the lectures and hands-on sessions in order to make them accessible on the CLIMECO Web site together with the presentations after the workshop. It will allow the candidates who won't be able to participate in CLIMECO and other potential scientists to also benefit from the training.
Finally, all candidates were asked to prepare a poster presenting their research. A poster session will be held on Monday, 21 April during the icebreaker where local students and scientists will be invited. The posters will be displayed for the duration of the workshop in order to allow exchange between workshop participants and the local students and scientists.

http://www.imber.info/CLIMECO_home.html

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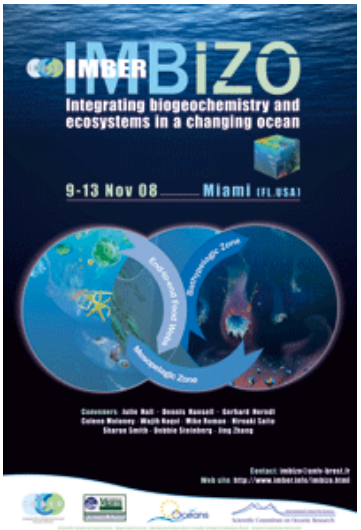

First IMBER IMBIZO: Integrating biogeochemistry and ecosystems in a changing ocean

November 9 -13, 2008 , Miami, FL, USA

The first IMBER IMBIZO will review current knowledge and identify key questions for future research on end- to-end marine food webs, and the biogeochemistry, ecosystems and their interactions in both the mesopelagic and bathypelagic ocean.
The IMBIZO's innovative format of three concurrent and interacting workshops with joint plenary and poster sessions will provide a forum for stimulating discussion between interdisciplinary experts and encourage the linkage between biogeochemistry and ecosystem research. The three concurrent workshops are:
1. Ecological and biogeochemical interactions in end-to-end food webs (co-chaired by Coleen Moloney and Michael Roman)
2. Ecological and biogeochemical interactions in the mesopelagic zone (co-chaired by Debbie Steinberg and Hiroaki Saito)
3. Biogeochemistry and microbial dynamics in the bathypelagic zone (co-chaired by Dennis Hansell and

Gerhard Herndl)
Each of the workshops will prepare a special journal issue containing synthesis and primary research papers resulting from the workshop contributions and discussions.
The IMBER IMBIZO will also provide an opportunity for junior and senior scientists to participate in a half-day interactive workshop and discussion on data integration practices (co-chaired by Raymond Pollard and Todd O'Brien).
For further information regarding this conference, visit our Web site http://www.imber.info/IMBIZO.html or send your enquiries to: imbizo@univ-brest.fr.

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2008 Ocean Sciences Meeting- From the Watershed to the Global Ocean

2-7 March 2008, Orlando, Florida, USA

View the complete session list at: http://www.aslo.org/meetings/orlando2008/sessionlist.html

IMBER Town Hall Meeting during ASLO Meeting (Orlando, FL, March 2-7, 2008)
Discover the status and opportunities of the IMBER project, and meet with members of the project Scientific Steering Committee, at a town hall meeting during the ASLO/Ocean Sciences meeting in Orlando, FL (March 2-7, 2008). The IMBER meeting is scheduled for Monday, March 3rd, noon to 1:30 PM, in Room W101. Organizers: Dennis Hansell (dhansell@rsmas.miami.edu) and Mike Roman (roman@hpl.umces.edu).
Further information at: http://www.aslo.org/meetings/orlando2008/town_hall.html

Town Hall Meeting on Ocean Acidification: "Ocean Acidification: Towards an Interagency Approach"
Tuesday March 4, 2008 from 7:30 to 9:30 in Room W108. For more information contact Libby.Jewett@noaa.gov

More IMBER-related sessions at http://www.imber.info/special_sessions.html

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European Geosciences Union General Assembly 2008

13 – 18 April 2008, Vienna, Austria

View the Ocean Sciences sessions at:
http://www.cosis.net/members/meetings/programme/view.php?m_id=49&p_id=310
View the Biogeosciences sessions at:
http://www.cosis.net/members/meetings/programme/view.php?m_id=49&p_id=297
The marine biogeosciences session will be coordinated by Jack Middelburg, member of the IMBER Scientific Steering Committee

IMBER/SOLAS special session: OS9/OS11 Open session on IMBER/SOLAS and sensitivity of marine ecosystems to climate change (co-listed in BG, CL & SSP) Convener: Robinson, C. Co-Convener: Salihoglu, B.; Oguz, T.; Lancelot, C.
http://www.cosis.net/members/meetings/sessions/information.php?p_id=310&s_id=4984&PHPSESSID=e91512a14b6b6e17733baac86799f109

More IMBER-related sessions at http://www.imber.info/special_sessions.html

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International Symposium - Eastern boundary upwelling ecosystems: integrative and comparative approaches

June 2-6, 2008, Las Palmas de Gran Canaria,, Canary Islands, Spain


http://www.confmanager.com/main.cfm?cid=845

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

July 8-11, 2008, Rome, Italy


http://www.confmanager.com/main.cfm?cid=84