

**IMBER Annual Report to SCOR June 2010**

**MAJOR ACTIVITIES AND ACHIEVEMENTS**

- Official incorporation of CLIOTOP and ESSAS into IMBER
- Publication of the Way Forward for IMBER in the IMBER and GLOBEC newsletters
- Establishment of China Regional Project Office
- Supplement to IMBER Science Plan
- Science Plan and Implementation Strategy for SIBER
- ClimEco<sub>2</sub> Summer School
- Carbon and nutrient fluxes in continental margins: A global synthesis. KK Liu
- Challenger Workshop on developing IMBER research in the UK
- IMBER/SOLAS special session at EGU
- IMBER poster on Ecosystem-climate responses at high latitudes at IPY
- IMBER at OCB Summer Workshop
- IMBER at SEATECH week
- Launch of the new CMTT
- IMBIZO II
- Special Issue: Ecological and Biogeochemical Interactions in the Dark Ocean
- Special Issue: Parameterisation of Trophic Interactions in Ecosystem Modelling

**WORKING GROUPS**

Currently four working groups or task teams are active in the development and implementation of IMBER science. A fifth working group on Human Dimensions has been identified as a priority for IMBER and is now under development. Details of the activities of the IMBER working groups and task teams follow.

**1 SOLAS/IMBER Carbon (SIC!) Working Group**

The joint SOLAS/IMBER Carbon Working Group consists of three sub-groups (SG). The sub-group Chairs report to the Scientific Steering Committees (SSC) of IMBER and SOLAS and work closely with the International Ocean Carbon Coordination Project (IOCCP). Details of the activities of SG2 and SG3, which are led by IMBER SSC members, follow. The activities of SG1, which is led by SOLAS, are provided in the SOLAS report.

The Joint SOLAS/IMBER Carbon Research Implementation Plan is available at:  
[http://www.imber.info/products/Carbon\\_Plan\\_final.pdf](http://www.imber.info/products/Carbon_Plan_final.pdf).

**Sub-group 1 (SG1) Surface Ocean System (Leader: Nicolas Metzl, France)**

Please see the SOLAS annual report for details.

**Sub-group 2 (SG2) Ocean Interior (Leader: Nicolas Gruber, Switzerland)**

This sub-group is focused on approaches for determining long-term changes in the carbon inventory of the ocean and on the sensitivity of ocean carbon storage to climate change. Consequently, SG2 is interested in using observations to develop an inventory of ocean carbon storage. The Terms of Reference (TOR) for SG2 are being finalized. New SG members with the expertise to advance these TORs will soon be appointed.

SG2 did not meet formally in 2009, but members were involved in two important workshops held during the year. The first was an Ocean Carbon and Biogeochemistry Program (OCB) workshop that was held in Monterey, CA, USA in late April 2009. The workshop was focused on the use of autonomous sensors and platforms to observe ocean ecology and biogeochemistry. Members of the SG2 used the opportunity to promote the use of oxygen

sensors on Argo floats in order to study the seasonal to long-term changes in the ocean's oxygen content, which in turn allows for the export production and long-term deoxygenation of the ocean to be determined.

The second workshop, held in Ascona, Switzerland in July 2009, was organised by Niki Gruber, the SG2 Chair. The goal of the meeting was to initiate a global synthesis of ocean interior carbon data to assess the changes in carbon content since the first global ocean CO<sub>2</sub> survey was undertaken in the late 1980s and early 1990s. A secondary objective was to determine how much of this carbon change is due to the uptake of anthropogenic CO<sub>2</sub> from the atmosphere, and how much is driven by the change in the natural carbon inventory. The latter would indicate that the ocean's carbon cycle has already shifted away from that expected for a time-invariant ocean, for example, as anticipated in response to future climate change. A key outcome of this meeting was the development of an ambitious timeline with the goal to complete the global synthesis by 2012.

Members of the SG also contributed in a substantive manner to the OceanObs'09 conference held in Venice in September 2009. They were involved in the writing of several community white papers, were lead authors of a plenary paper outlining the key observational elements required to properly observe and document the expected biogeochemical changes in the ocean, and co-authored several other plenary papers.

#### Sub-group 3 (SG 3) Ocean Acidification (Leader: Jean-Pierre Gattuso, France)

The SOLAS/IMBER Carbon Research sub-group on Ocean Acidification (SIOA) was formalized in August 2009 with the objectives of: 1) coordinating international research efforts in ocean acidification, and 2) undertaking synthesis activities in ocean acidification at the international level. Information on SG 3 can be found at: [http://www.imber.info/C\\_WG\\_SubGroup3.html](http://www.imber.info/C_WG_SubGroup3.html).

The first meeting of SG3 was held in Paris, France on 1-3 December 2009. Here, SG3 noted that as several synthesis and review activities have already been undertaken or are currently in progress, SIOA efforts should be directed at generating new knowledge. Thus the initial focus should be on activities that will support new research. There are plans to launch an ocean acidification coordination initiative that will cover the following aspects:

- Integration of the ocean acidification observing network with the ocean carbon network.
- Promotion of international experiments.
- Sharing experimental platforms.
- Regular updating of the "[Guide for best practices on ocean acidification research and data reporting](#)".
- Guiding principles on data sharing.
- Training students and young scientists.
- Intercomparison exercises.
- Promote international exchange of students and Post docs.
- Promote collaboration between the natural and social sciences.

A SIOA website is to be developed that will link to both the IMBER and SOLAS websites. This will provide information on programs and projects, as well as key reports and publications relating to ocean acidification.

The SIOA has endorsed the [PAGES Workshop on Paleo-ocean Acidification and Carbon Cycle Perturbation Events](#). The workshop aims to improve the network and interaction between researchers studying the chemical, biological and physical consequences of past carbon cycle perturbations and will focus on key questions to improve our knowledge of paleo-ocean acidification and its biogeochemical consequences. It will be held from 26-28 August 2010, at the Wrigley Institute for Environmental Studies on Catalina Island, CA, USA.

## **2 Continental Margins Task Team**

The original IMBER/LOICZ Continental Margins Task Team (CMTT) completed its mandate (to organise a Continental Margins Open Science Conference and develop a strategy for the implementation of continental margins research for IMBER and LOICZ) and has been disbanded.

A new CMTT is now being formed to take the implementation plan forward. The CMTT will have co-chairs from IMBER and LOICZ and up to six other members assembled for their experience in the biogeochemistry, ecosystem functioning and human dimensions in continental margins. Kon-Kee (KK) Liu (Taiwan) has been appointed as the

IMBER co-chair of the task team, and Helmuth Thomas (Canada) is his LOICZ counterpart.

One of the first tasks of the CMTT will be to complete the draft implementation plan for continental margins research that was initiated by the original CMTT. Sections on programme implementation and the human dimension impacts in continental margins need to be added. Perspective or white papers will then be produced to stimulate the first integration and synthesis activities of the CMTT.

Several knowledge gaps were identified by IMBER SSC members (e.g., including carbon and nutrient budgets for shelf seas and the role of the continental margin pump. Discussions with LOICZ added the impacts of global change on resources (living and non-living) within the continental margins, particularly fisheries as well as the coastal Arctic. The terms of reference that will be developed once the CMTT membership has been finalised and will need to take all these suggestions into consideration.

The CMTT is expected to meet before the end of 2010 to develop the plans for the first integration and synthesis activity, possibly a 'Continental Margins IMBIZO' to be held in 2011.

The IMBER regional project office in China (IMBER RPO) will take the lead on all IMBER continental margins activities. The organisation of a dedicated Continental Margins IMBIZO has been suggested.

### **3 Capacity Building Task Team**

The Capacity Building Task Team was established to ensure that capacity building initiatives are included in all IMBER activities. This task team aims to foster research initiatives in developing countries, to facilitate participation by early career and developing country scientists in IMBER activities and training programmes, and to enhance research capabilities for IMBER-related research in regions with a limited number of scientists with interests in IMBER science. The Capacity Building Strategy and Implementation Plan is available at: [http://www.imber.info/products/Capacity\\_Building\\_final.pdf](http://www.imber.info/products/Capacity_Building_final.pdf).

The Task Team has eight members and is chaired by Jing Zhang (China). Jing Zhang also serves as the ex-officio representative for IMBER on the SCOR Capacity Building Committee (see <http://www.scor-int.org/capacity.htm> for details).

Summer Schools have proved to be a successful capacity building mechanism and IMBER has decided to hold these every second year. The first was held in Ankara, Turkey in 2008 and the next, ClimeCO<sub>2</sub> will be held at the Institut Universitaire Européen de la Mer (IUEM) in Brest, France from 23-27 August 2010. The five-day training programme entitled: Oceans, Marine Ecosystems, and Society facing Climate Change - A Multidisciplinary Approach, is being co-organized with IUEM and GIS Européen Mer. Seventy-five participants, representing 26 countries, have been selected to attend. More information on the summer school is at: [http://www.europolemer.eu/en/climeco2\\_0.php](http://www.europolemer.eu/en/climeco2_0.php).

### **4 Data Management Committee**

The Data Management Committee (DMC) promotes a cooperative data management approach that includes involving experienced data management specialists from the start of a project, and also training young scientists in good data management procedures. Alberto Piola (Argentina) replaced Raymond Pollard (UK) as Chair of the IMBER DMC at the beginning of 2010. The DMC has six members and plans to include an additional person from Asia to enhance geographic coverage.

Following on the success of the BEER data management training prior to the first IMBIZO, the DMC is organising a one-day Dry Cruise workshop one day prior to the start of the IMBIZO II. Alberto Piola and Cyndy Chandler (from Woods Hole Oceanographic Institution) will lead the workshop, but other members of the DMC will also attend. Training will be based on the data management procedures outlined in the extremely successful '*IMBER Data Management Cookbook*' that was published by the DMC in April 2009. So far, 55 participants have registered, but this number is expected to increase as locals from Crete and other parts of Greece have been invited to attend.

The current DMC plans to hold its first meeting in Crete on 9 October 2010.

## 5 Working Group on Human Dimensions

Alida Bundy (Canada) has agreed to chair a new IMBER working group on Human Dimensions. This working group is a response to the recommendation of the Transition Task Team that human effects on marine systems are a crucial perspective that needs to be incorporated into IMBER science. An IMBER Human Dimensions working group will build on the work of the GLOBEC Focus 4 Group, and also work done by the PICES - FUTURE Working Group, CLIOTOP WG5 and LOICZ.

Currently, Alida Bundy is working with the IPO to identify potential candidates for the working group. Once appointed, the group will meet in late 2010 and will be asked to organise a Scoping Workshop to determine the role and/or approaches of human dimension research in IMBER science.

## REGIONAL PROGRAMMES

IMBER currently has four regional programmes. The Integrating Climate and Ecosystem Dynamics (ICED) Programme was jointly initiated under GLOBEC and IMBER and moved fully into IMBER at the close of GLOBEC in early 2010. Two ongoing programmes, Climate Impact on Oceanic Top Predators (CLIOTOP) and Ecological Studies of Sub-Arctic Seas (ESSAS), that began under GLOBEC were officially incorporated into IMBER when GLOBEC ended on 31 March 2010. The Sustained Indian Ocean Biogeochemistry and Ecosystem Research (SIBER) Programme was initiated under IMBER. Updates on the activities of these regional programmes are given as follows.

### Climate Impact on Top Oceanic Predators (CLIOTOP)

CLIOTOP was started under GLOBEC in 2005 and the Science Plan and Implementation Strategy (SPIS) for this programme was published in the same year. CLIOTOP is a 10-year programme which aims to provide a global comparison of the impact of climate variability (at various scales) and fishing on the structure and function of open ocean pelagic ecosystems and their top predator species, and from this to develop a reliable predictive capacity of top predator populations and oceanic ecosystems.

The merger of CLIOTOP with IMBER required an update to its SPIS. Changes in CLIOTOP science were discussed at the CLIOTOP mid-term workshop, 'CLIOTOP into the future - Building Scenarios for Oceanic Ecosystems in the XXI Century', that was held in Paris, France in February 2010. Eugene Murphy and Alida Bundy, members of the IMBER SSC, attended this workshop and provided input to discussions about modifications to the CLIOTOP SPIS. It is anticipated that the revised SPIS will be available by the end of 2010.

CLIOTOP is structured around five working groups that focus on key processes and scales.

**WG 1: Early life history** aims to determine the environmental characteristics that influence the timing and intensity of reproduction and larval survival.

**WG 2: Physiology, behaviour and distribution** investigates the factors affecting spatial dynamics and population structure, as well as reproductive and feeding-related behaviour.

**WG 3 Trophic pathways in the open ocean ecosystems** compares trophic pathways among and within oceans and investigates whether seasonal and spatial variability could be used to explore the impacts of climate variability. It also considers the importance of mesopelagic versus epipelagic prey resources for oceanic top predators and if this is affected by climate change.

**WG 4 Synthesis and modelling** explores the importance of fisheries exploitation and the dynamic environment in structuring pelagic ecosystems and seeks the most appropriate mechanism(s) to provide the greatest predictive power.

**WG 5 Socio-economic aspects and management strategies** considers the socio-economic pressures on tuna fisheries and whether fisheries organisations addressed the impacts of climate variability and climate change. It also examines the usefulness of fisheries management decision support tools and how the flows in capital and knowledge among the world's large fisheries respond to variability.

A highlight for the CLIOTOP programme is publication of a special issue of *Progress in Oceanography* (28 papers) that include papers from the first CLIOTOP symposium held in La Paz, Mexico from 3-7 December 2007.

## **Ecosystem Studies of Sub-Arctic Seas (ESSAS)**

ESSAS was developed in conjunction with GLOBEC and EUR-OCEANS in 2005 and focuses on comparative studies of the impacts of climate variability on the productivity and sustainability of Sub-Arctic marine ecosystems. The ESSAS Programme includes four working groups and several national and multi-national projects. The Science Plan and *Background to the Climatology, Physical Oceanography and Ecosystems of the Sub-arctic Seas* document were produced in 2005.

Two achievements for ESSAS are the recent redesign of the ESSAS website (see: <http://www.imr.no/essas>) and the development of a special NORway-CANada Comparison of Marine Ecosystems volume for *Progress in Oceanography*. Several papers, comparing various aspects of Sub-Arctic ecosystems including climate, physical oceanography, phytoplankton production, zooplankton and fish, are currently under review.

The ESSAS 2010 Annual Science Meeting will be convened at the [Marine Research Institute in Reykjavik](#), Iceland from 30 August - 1 September 2010. This meeting includes plenary presentations, as well as comparative workshops of different sub-Arctic seas.

The second ESSAS OSM will be held in Seattle, WA USA from 22-26 May 2011. Planning for this meeting is underway and the conveners are Olafur Astthorsson (Iceland), George Hunt (USA), and Michio Kishi (Japan). The meeting will showcase the progress made by the ESSAS working groups, and the national and multi-national programs affiliated with ESSAS. This OSM will also provide a venue for identifying gaps in knowledge of Sub-Arctic ecosystems and for designing future directions for ESSAS science, especially in regard to interfacing with IMBER science objectives.

## **Integrating Climate and Ecosystems Dynamics (ICED)**

The ICED programme was developed jointly by IMBER and GLOBEC, in partnership with EUR-OCEANS, to determine the main control of Southern Ocean ecosystem dynamics and potential for feedbacks as part of the Earth system. The ICED Science Plan was published jointly by IMBER and GLOBEC in 2008. It is implemented through three major areas of activity (data synthesis, fieldwork coordination and modelling) and involves close collaboration and multidisciplinary integration of knowledge from several groups operating throughout the Southern Ocean. During the past year, ICED programme scientists have produced project-related publications, provided visibility for ICED research at international meetings, and developed proposals and outreach activities. Details are given below.

The proceedings, outcomes and a strategic plan developed by the Southern Ocean Sentinel Workshop (held 20-24 April 2009, in Hobart, Australia) have been published and are available at:

Constable, A.J., Doust, S. (2009) Southern Ocean Sentinel – an international program to assess climate change impacts on marine ecosystems: report of an international Workshop, Hobart, April 2009. ACE CRC, Commonwealth of Australia, and WWF-Australia.

This publication provides recommendations on how to measure, assess and provide early warning of climate change impacts on the Southern Ocean and how these could be used to signal future impacts on marine and other ecosystems elsewhere in the world.

The report of the *Southern Ocean Food Web Modelling Workshop*, which was held in April 2008 at Old Dominion University, Norfolk, VA, was published electronically on the ICED website (see: <http://www.iced.ac.uk/documents/FoodwebsModellingReport-final.pdf>) in January 2010. This report provides recommendations for directions in ecosystem modelling for the Southern Ocean. The reference for this publication is:

Murphy E.J., Cavanagh R.D., Johnston N.M., and Hofmann E.E. (Eds). 2010. Integrating Climate and Ecosystem Dynamics (ICED): Report of the Southern Ocean Food Web Modelling Workshop, 16-18 April 2008, Virginia, USA.

The report from the Southern Ocean Scoping Workshop, held at Princeton University, New Jersey, USA in June 2009, was also published on the OCB website in June 2010. This report provides recommendations for Southern Ocean research that will merge biogeochemical and food web studies. The report highlights areas for future research that will allow addressing questions of potential effects of climate change on Southern Ocean biogeochemical cycling, food webs, and carbon budget.

The International Polar Year (IPY) Science Conference was held from 8-12 June 2010 in Oslo, Norway. ICED scientists convened a two-day oral and poster session on “Ecosystems of the Southern Ocean”. The ICED SSC met in conjunction with the IPY Conference.

ICED has identified the coordination of Southern Ocean fieldwork as a major priority and is developing a system for collating information on relevant field activities via a web-based form. Information is fed to a live virtual globe layer (GoogleEarth). The map layer is linked to a database to ensure integration with other relevant IPY ocean projects. A new webpage has been developed on the ICED website (<http://www.iced.ac.uk/science/fieldworkmap.htm>) to accommodate this. This initiative will provide a central focus for fieldwork planning and coordination activities in the Southern Ocean, across all disciplines, for at least the next decade.

As the result of a project funded under the EUR-OCEANS programme, and involving ICED scientists, a data portal has been developed that will allow to dissemination of historical biological data sets acquired from earlier cruises to the Southern Ocean. The data sets include those from the Discovery Investigations (1925-51) and the Biological Investigations of Marine Antarctic Systems and Stocks (BIOMASS) programme (1981-1985). The website will be updated as further data are available [http://www.antarctica.ac.uk/bas\\_research/data/access/esodap/index.php](http://www.antarctica.ac.uk/bas_research/data/access/esodap/index.php)

ICED scientists have recently been awarded funds from the EUR-OCEANS Consortium to run a Foresight Workshop under the topic ‘*Global Change in Polar Systems*’. The workshop will provide an opportunity to apply the knowledge and experience gained through EUR-OCEANS and ICED and through the Arctic sub-network to explore the impacts of global change in polar marine systems. The outcomes will benefit the international science community and will build the foundations for: (1) planning and coordinating future fieldwork activities to detect natural and anthropogenic change in polar ecosystems, (2) creating a EUR-OCEANS Flagship in Polar Science, and (3) shaping future EUR-OCEANS calls in this research area under the European Framework Programme.

### **Sustained Indian Ocean Biogeochemical and Ecological Research (SIBER)**

SIBER is a developing regional program of IMBER that aims to understand climate change and anthropogenic forcing on biogeochemical cycles and ecosystems in the Indian Ocean.

The draft SIBER Science Plan and Implementation Strategy has recently been reviewed and the IMBER SSC agreed to accept it once the review comments have been incorporated. The SIBER SSC members have also been approved and will be appointed shortly. The first SIBER SSC meeting will take place from 12-16 July 2010 in Hobart, Tasmania.

### **Endorsed Projects**

IMBER currently has 21 endorsed projects from 13 different countries. The following projects have been endorsed by IMBER since the last report to SCOR:

- **LUCIFER (Lunar Cycles and Iron Fertilization)**  
Leading Applicant: Santiago Hernández-León, Spain

Project to examine the biogeochemical consequences of (1) the vertical mixing and the consequent planktonic bloom in the oceanic subtropical waters around the Canary Islands, (2) the influence of the lunar cycle observed in zooplankton in the transport of organic carbon towards the mesopelagic zone, and (3) the process of natural fertilization with iron promoted by the deposition of Saharan dust. This is of relevance due to the aim to carry out massive fertilization with iron to slow global warming.

- **BIOACID: Biological Impacts of Ocean ACIDification**  
Leading Applicant: Ulf Riebesell, Germany

Surprisingly little is known about the possible impacts of ocean acidification. BIOACID will facilitate the interaction between BIOACID scientists across disciplines, research themes and projects will include joint experiments, collaborative use of equipment and measurement capacity, exchange of samples and expertise, and the analysis and synthesis of comprehensive data sets towards an ecosystem model of ocean acidification. These activities will be complemented by training workshop offered by BIOACID experts to all members of the consortium. Following this approach, the overarching questions of BIOACID are:

What are the effects of ocean acidification on marine organisms and their habitat, what are the underlying mechanisms of responses and possible adaptations on the level of populations and communities, how are they modulated by other environmental stressors, and what are the consequences for marine ecosystems, ocean biogeochemical cycles, and possible feedbacks to the climate system?

- **MALASPINA Circumnavigation Expedition Malaspina 2010: Global Change and Biodiversity Exploration of the Global Ocean**  
Leading Applicant: Carlos M. Duarte, Quesada, Spain

MALASPINA 2010 aims to provide a coherent, high-resolution inventory of the impact of global change on the ocean ecosystem and an exploration of deep-sea microbial biodiversity and to build cooperative networks within the scientific community, thereby abating the current fragmentation and loss of relevance.

## OUTREACH ACTIVITIES

### **IMBER website**

The IMBER website (<http://www.imber.info/>) is the main communication tool for the dissemination of science results and other information relating to IMBER programmes and activities.

The IPO has developed and maintains several other websites for IMBER activities and events, such as for IMBIZO II (<http://www.imber.info/IMBIZO.html>) and the ClimECO<sub>2</sub> Summer School ([http://www.europolemer.eu/en/climeco2\\_0.php](http://www.europolemer.eu/en/climeco2_0.php)). The Ocean Acidification website for the SOLAS/IMBER SG3 (SIOA) is currently under construction. This will be mirrored on the SOLAS website.

### ***IMBER Update***

The electronic newsletter "*IMBER Update*" is published three times each year. The most recent edition was published in February 2010 and included a report by Eileen Hofmann (current SSC Chair) and Julie Hall (Past Chair) on the way forward for IMBER over the next 2-4 years as the regional programmes from GLOBEC are incorporated, new programs are developed, and new areas of research emerge.

The newsletter also provides highlights of recent IMBER science, reports of the activities of the IMBER working groups and regional programmes as well as upcoming IMBER-related conferences and workshops. IMBER Update can be downloaded at <http://www.imber.info/newsletters.html>. The newsletter is emailed to about 1200 people who are involved with IMBER in some way or have requested it.

### **eNews**

The electronic eNews bulletin is published monthly to provide information about IMBER activities and current events within the IMBER scientific network. It includes calls for funding, job opportunities, conferences and workshops.

### **Promotional Material**

The IPO produces promotional material for use at meetings or conferences, and for those wanting to know more about IMBER. These products are currently being revised to update the information and to develop a more uniform format. A new brochure, aimed at policy-makers, funding agency representatives and others who wish to know about IMBER, is currently being developed. A new IMBER poster template has recently been produced which can be adapted depending on the meeting topic or audience. The brochure and posters can be downloaded from the

IMBER website (<http://www.imber.info/useful-downloads.html>) and are available on request from the IPO.

## **Training**

### *ClimECO<sub>2</sub>*

IMBER is co-organising an interdisciplinary summer school, ClimECO<sub>2</sub> in Brest, France from 23-27 August 2010. This international summer school aims to provide participants with an overview of methods, models and approaches for analyzing the impact of climate change on marine ecosystems and the consequences for society. Themes to be covered are:

- Climate, ocean circulation, biogeochemistry and marine ecosystems.
- Climate driven changes in marine biodiversity and the interactions among species.
- Impact of global change on marine resources and uses.
- Vulnerability and adaptation to climate change in the coastal zone.
- Communicating climate change: from information to action.

Participants include both natural and social scientists working in the realm of ‘oceans and climate change’.

### *Dry Cruise workshop*

The DMC will organise a Dry Cruise workshop aimed (though not exclusively) at early career scientists and students on 10 October 2010 in Crete, Greece. The IMBER Data Management Cookbook, which summarizes best practices for data acquisition, quality control and preservation, will be the focus of this interactive one-day training activity. The aim is to increase awareness of the need to establish data management procedures, highlight the benefits of following such procedures, and to provide hands-on training on data management and data preservation. The data managers of IMBER endorsed projects have also been invited to attend.

## **INTERNATIONAL PROJECT OFFICE (IPO)**

The IMBER International Project Office (IPO) coordinates the scientific and administrative aspects of IMBER to ensure that the decisions of the SSC are executed and that IMBER science moves forward. It is based at the Institut Universitaire Européen de la Mer in Brest, France. Lisa Maddison is Executive Officer, Sophie Beauvais, the Deputy Executive Officer and Virginie Le Saout is the Administrative Assistant.

The IPO is primarily responsible for implementing decisions from the IMBER SSC, obtaining funding to support IMBER activities, providing support for the IMBER working groups and task teams, providing administrative support for the program’s activities, maintaining communication links both within and outside the program, and maintaining a data and information archive.

The IPO is funded by a French consortium that includes the University of Brest, IUEM, the Region of Brittany, Ifremer, the Conseil Général de Bretagne (Department authorities) and the City of Brest, Centre National de la Recherche Scientifique (CNRS), Institut de Recherche pour le Développement (IRD), and Université de Bretagne Occidentale (UBO).

In 2009-2010, support for activities of the IPO and IMBER was provided by:

- **IGBP:** support for the SSC meeting (\$31.5K). This included the usual annual sponsorship (\$19K) + transitional funds (\$11.5K) to support the incorporation of the new regional programmes;
- **SCOR:** support from NSF (\$50K annually, grant until 2011);
- **French Consortium:** support for IPO salaries and running expenses (\$254K)

The contract with the French consortium for IPO support terminates in August 2011. A report on IMBER activities and achievements since the start of the present funding cycle was sent to Patrick Monfray (CNRS) who is leading the process to have the contract renewed. A meeting will be organised with all the French consortium partners in fall 2010 to negotiate possible extension of the current contract.



## **REGIONAL PROJECT OFFICE IN CHINA (CHINA RPO)**

In January 2010 a Memorandum of Understanding was signed between IMBER and the East China Normal University (ECNU) in Shanghai to open an IMBER regional office in China. The IMBER China Regional Project Office (RPO) will be hosted and financially supported by the ECNU. The RPO will be staffed by a Deputy Executive Officer and an Administrative Assistant, who will report to the IMBER IPO. The RPO will not work independently but will support IMBER activities, focusing mainly on continental margins activities, as well as other IMBER activities in the Asia-Pacific region.

## **INTERACTIONS WITH OTHER PROJECTS AND PROGRAMMES**

### **SOLAS**

#### Joint SOLAS/IMBER Carbon Research group (SIC!)

The joint **SOLAS/IMBER Carbon Group** (SIC!) was formed in Oct 2005. This group works in close collaboration with IOCCP. There are three sub-groups within the SIC group:

- SG1-Surface Ocean Systems Chair: Nicolas Metzl (France)
- SG2-Interior Ocean. Chair: Nicolas Gruber (Switzerland)
- SG3-Ocean Acidification. Chair: Jean-Pierre Gattuso (France)

### **LOICZ**

#### Joint IMBER/LOICZ Continental Margins Task Team (CMTT)

A new **IMBER/LOICZ CMTT** is currently being formed and will be jointly funded by IMBER and LOICZ. Kon-kee (KK) Liu (IMBER) and Helmuth Thomas (LOICZ) have recently been appointed as co-chairs and are in the process of selecting the other team members in collaboration with the chairs of IMBER and LOICZ.

New Continental Margins book published

*Carbon and Nutrient Fluxes in Continental Margins: A Global Synthesis*, Edited by Kon-kee Liu, Larry Atkinson, Renato Quiñones and Liana Talaue-McManus has been published by Springer-Verlag in the IGBP Book Series on Global Change. The book provides perspectives on the role of continental margins in the Earth's biogeochemical system as well as highlights of biogeochemical functionality in representative regional settings. More than 150 experts contributed best estimates of carbon and nutrient fluxes in seven types of continental margins.

### **CARBOOCEAN**

An MOU was signed between IMBER and CARBOOCEAN, an integrated project that aims to provide an accurate assessment of marine carbon sources and sinks with special emphasis on the Atlantic and Southern Oceans on a time scales -200 to +200 years.

The core CARBOOCEAN themes contribute to IMBER's goals. For example, basin-wide/regional scale air-sea CO<sub>2</sub> fluxes have been found to be interannually more variable than previously thought, suggesting that the ocean sink is not as reliable and steady, at least at regional levels, as many analysis methods (assuming steady state conditions) expect.

The CARbon dioxide In the North Atlantic (CARINA) project is an activity related to SOLAS-IMBER CARbon Sub-group 2. Its objective is to collect carbon-relevant data sets (many of which had not been available to the public before) and to form a consistent, quality-controlled database for the Atlantic Ocean (including the Southern Ocean and the Arctic). CARBOOCEAN was instrumental in developing the CARINA data set

### **CLIVAR**

Climate Variability and Predictability (CLIVAR), is a core project of the World Climate Research Programme (WCRP). Its focus is the role of the oceans in climate variability and change, particularly on physical climate changes.

At the 2009 CLIVAR Scientific Steering Group (SSG) the need for CLIVAR to develop and strengthen the interactions and activities between CLIVAR's ocean activities and programmes focused on ocean biology, biogeochemistry and ecology was raised. IMBER is represented on all the relevant CLIVAR panels, although there is no direct IMBER representation on the Atlantic or Pacific Panels as yet (links are via the SOLAS/IMBER Carbon

group). Ken Drinkwater has been appointed to the CLIVAR SSG, providing a direct link between the IMBER Project and the CLIVAR SSG.

Other areas of recent IMBER/CLIVAR interaction have been through:

- Joint participation with IOCCP and the SOLAS-IMBER Carbon Group in the Global Ocean Ship-based Repeat Hydrographic Investigations Panel (GO-SHIP).
- Substantial contribution to the Community White Papers at OceanObs'09 by the CLIVAR and IMBER communities.

### **EUR-OCEANS**

IMBER signed an MOU with the EUR-OCEANS Network of Excellence, and continues to retain links with the new EUR-OCEANS Consortium.

The Consortium provided funding for the CLIOTOP mid-term workshop, allocated funding for the IMBER IMBIZO II (Crete, Greece, October 2010), and has endorsed the ClimECO<sub>2</sub> Summer School (Brest, France, August 2010).

### **PICES**

Recent interaction and collaboration between PICES and IMBER includes sponsorship of a joint session at the PICES Annual Meeting. In 2009 the IMBER-sponsored session was entitled "Outlooks and forecasts of marine ecosystems from an earth system science perspective: Challenges and opportunities". The next PICES annual meeting will occur in October 2010, in Portland, OR, USA. IMBER will co-sponsor a session on "Anthropogenic forcing in North Pacific coastal ecosystems: Understanding changes in ecosystem structure and function" at this meeting.

The workshop themes of IMBIZO II are relevant to FUTURE (PICES's new science program - Forecasting and Understanding Trends, Uncertainty and Responses of North Pacific Marine Ecosystems). Therefore, PICES is a co-sponsor of the IMBIZO II and is providing travel support for three invited speakers from the North Pacific.

PICES-IMBER cooperation has also been strengthened by the generous contribution of PICES to support nine early career scientists from PICES member countries to attend the IMBER ClimECO<sub>2</sub> summer school. The topics to be covered by ClimECO<sub>2</sub> also fit well with themes of FUTURE.

In the interest of continued collaboration and cooperation, IMBER has agreed co-sponsor the second International PICES, ICES and IOC Symposium on "Effects of Climate Change on the World's Oceans", to be held in May 14-18, 2012, in Yeosu (Korea). Support will be provided for an invited speaker to attend a joint IMBER-PICES session.

Similarly, IMBER will sponsor an invited speaker at a joint session at the 2011 PICES Annual Meeting in Russia. The Meeting is entitled: "Mechanisms of ecosystem reorganization in the North Pacific Ocean".

### **National activities**

IMBER activities are underway in many countries (e.g. Belgium, China, France, Italy, India, Japan, Korea, New Zealand, Norway, Spain, Turkey, UK, and USA). Examples of some of these activities are:

- **Belgium:** there is no specific IMBER initiative in Belgium, but several national programmes contribute to IMBER aims and activities. These include:

PEACE (<http://www.co2.ulg.ac.be/peace/>),  
AMORE (<http://www.ulb.ac.be/assoc/esa/AMORE/amore.htm>)  
BELCANTO-III (<http://www.co2.ulg.ac.be/belcanto/>) and,  
TIMOTHY ([http://www.imber.info/EP\\_CAIBEX.html](http://www.imber.info/EP_CAIBEX.html)).

- **China:** a new project, "Key Processes and Mechanisms of Sustainable Food Production in the Coastal Ocean of China" of the IMBER-GLOBEC Marine Dynamics program, has begun and will focus on marine biogeochemical cycles and key processes of end-to-end food web in the China seas. The establishment of the IMBER Regional Project Office in Shanghai is a major achievement.

- **Japan:** IMBER-related scientists in Japan participated in the “Linkages in Biogeochemical Cycles and Ecosystems between Surface Ocean and Lower Atmosphere” data synthesis workshop in December 2009. Also in December 2009, young scientists participated in the ‘IMBER for the creation of new ocean provinces’ workshop in Tokyo. A one-day symposium on ‘Key parameters of biogeochemical cycles in the Pacific Ocean’ symposium was organised by IMBER-Japan and SOLAS-Japan in March 2010 in Tokyo. The POMAL (Population Outbreak in Marine Life), the national project related to IMBER, is ongoing.
- **Korea:** The Korean GLOBEC committee is being transformed into the Korean IMBER committee and will promote IMBER-related activities to the Korean Oceanographic Society to attract more scientists. It will also maintain the supporting program for young scientists. In May 2010, the Korean GLOBEC committee hosted the 4th China-Japan-Korea GLOBEC/IMBER Symposium, where the status and future direction for IMBER-like research in the Northwest Pacific ecosystems were discussed. Jing Zhang, a past member of the IMBER SSC attended this meeting and provided a presentation on IMBER science.
- **France:** Focus 1 of the French program CYBER (“Biogeochemical Cycles, Ecosystems and Resources”), is the French contribution to IMBER. Three projects supported by CYBER are: BOUM (<http://www.obs-vlfr.fr/proof/boum/>), MALINA (<http://www.obs-vlfr.fr/Malina>) and POTES: (<http://www.com.univ-mrs.fr/LMGEM/potes>). The success of the first meeting of the French scientists from the IMBER and SOLAS communities resulted in a recommendation to hold these meetings at two-year intervals. The next meeting will be held in 2011.
- **India:** SIBER recently organised a workshop where a national committee was established which could an IMBER committee.
- **Spain:** There is no formal IMBER program in Spain, however, several projects funded in 2009 are closely related to the IMBER goals. These include:
  - Impacts of global change on Mediterranean marine ecosystems (MEDEICG).
  - Variability of the structure and function of the pelagic trophic webs in productivity areas of the Alboran Sea.
  - Generation of oceanographic scenarios for the 21st century for the Mediterranean Sea and the northeast sector of the Atlantic Ocean.
  - Predicting the metabolic balance of the oceans (PNAS).
- **USA:** Ocean Carbon and Biogeochemistry (OCB) is the US contribution to IMBER.
- **Italy:** a Special Issue of *Ecological Modelling* that resulted from an IMBER-endorsed conference, ‘Challenges for ecological modelling in a changing world: Global Changes, Sustainability and Ecosystem Based Management’ 2007, was published recently (*Ecol Mod.* 2009, 220 (21): 2825-3110). IMBER has also endorsed the ‘Advanced school on complexity, adaptation and emergence in Marine Ecosystems’ that will be held in Trieste, Italy at the ICTP Center from 18-27 October 2010. IMBER has also endorsed the now almost completed VECTOR project. A final project report is expected in 2011.

## FUTURE ACTIVITIES

- **IMBER at SEATECH Week.** The IMBER IPO presented IMBER at the International Marine Science and Technology week that was held by the Centre of European Excellence for Oceanography and the Marine Environment in Brest, France from 21-26 June 2010. This is an interdisciplinary forum for the marine science and technology sectors. Five days of seminars and workshops are combined with a trade fair, concerned with maritime research and development.
- **IMBER *ClimECO*<sub>2</sub> Summer School** at Institut Universitaire Européen de la Mer, Brest France 23-27 August 2010.
- **IMBER Endorsed Conference:** The 14th Biennial Challenger Conference for Marine Science on "Ocean Challenges in the 21<sup>st</sup> Century", in Southampton, UK, 6 - 9 September 2010.
- **IMBER DMC Dry Cruise workshop** at the Creteaquarium in Crete, Greece on 10 October 2010.
- **IMBER IMBIZO II**, IMBER’s second international science meeting, will take place 11-14 October 2010 at the Hellenic Centre for Marine Research and Creteaquarium in Crete, Greece. The meeting will consist of three interdisciplinary workshops held in parallel, with joint plenary and poster sessions. The workshop themes are:
  1. The effect of varying element ratios on community structure at low trophic levels and food quality at mid and high trophic levels.
  2. Large-scale regional comparisons of marine biogeochemistry and ecosystem processes – research approaches and results.

### 3. Sensitivity of marine food webs and biogeochemical cycles to enhanced stratification.

More than 160 applications were received. However, the three workshop have been limited to around 40 participants each in order to ensure good interaction and participation. Workshop outcomes will be published as reports and synthesis papers in special issues of peer-reviewed scientific journals. Six scientists from Brazil, Chile, India (2), Mexico and Turkey will benefit from the SCOR travel funds for developing countries that was awarded to IMBER last year.

Additional funding has also been provided by the US National Science Foundation to support the attendance of 5 early career scientists and one workshop convener from the USA.

- **First SIBER SSC Meeting** in Perth, Australia 12-16 July 2010.
- **IMBER Endorsed Workshop** on Paleo-ocean Acidification and Carbon Cycle Perturbation Events, Catalina Island, USA, 26-28 August, 2010
- **Meeting of the SIC! SG2** at the COCOS/RECAPP meeting in Viterbo, Italy from 6-8 October 2010.
- **IMBER joint session** (S12: Anthropogenic forcing in North Pacific coastal ecosystems: Understanding changes in ecosystem structure and function) at the PICES-2010 Annual Meeting from 22-31 October, 2010, in Portland (Oregon, USA).
- Second **IMBER-SOLAS French Meeting** in 2011.
- **IMBER sponsorship** of an IMBER-related session at the ICES PICES IOC 'Effects of Climate Change on World's Oceans' Symposium from 14-18 May 2012, in Yeosu, Korea.
- **Second ESSAS OSM** will be held in Seattle, WA USA from 22-26 May 2011.

### SELECTED PUBLICATIONS

**Special Issue: Eastern Boundary Upwelling Ecosystems: Integrative and Comparative Approaches**, *Progress in Oceanography* Volume 83, Issues, Pages 1-4:1-428 (December 2009) Edited by Pierre Fréon, Manuel Barange, Javier Arístegui and A.D. McIntyre.

**Supplement to the IMBER Science Plan and Implementation Strategy.** The IMBER/GLOBEC Transition Task Team (TTT) was appointed by SCOR and IGBP to recommend how IMBER should accommodate new developments in marine ecosystem research that need addressing post-GLOBEC. The final TTT report was published as a supplement to the IMBER Science Plan early in 2010.

**New Continental Margins Book:** Liu, K., L. Atkinson, R. Quiñones, and L. Talaue-McManus (Eds.) 2010, Series: Global Change - The IGBP Series 744 p. 278  
ISBN: 978-3-540-92734-1

**New SIBER publication:** Wiggert, J. D., R. R. Hood, S. W. A. Naqvi, K. H. Brink and S. L. Smith (2009) Indian Ocean Biogeochemical Processes and Ecological Variability. AGU Monograph Series, American Geophysical Union, Washington, D.C.

**Special Issue: Parameterisation of Trophic Interactions in Ecosystem Modelling:** Edited by Michael A. St. John, Ivo Grigorov, Javier Ruiz and Patrick Monfray. *Progress in Oceanography* Volume 84, Issues 1-2, Pages 1-138 (January-February 2010).

**Special issue on China from China-GLOBEC/IMBER "973" project:** Deep-Sea Research II China GLOBEC II: Case study of the Yellow Sea and East China Sea Ecosystem dynamics. Qisheng Tang, Julan Su and Jing Zhang (eds.), Volume 57, Issues 11-12, (June 2010)

### UPCOMING PUBLICATIONS

**SIBER Science Plan and Implementation Strategy** (August 2010)

**Deep Sea Research II Special Issue:** Ecological and Biogeochemical Interactions in the Dark Ocean. Deborah K. Steinberg and Dennis A. Hansell (eds). (July/August/ 2009)

**REQUEST FOR FUNDING**

IMBER requests SCOR Developing Country Travel Funds to assist scientists from developing countries to attend the following two meetings:

- 1)The Second ESSAS Open Science Meeting that will be held in Seattle WA. USA from 22-26 May 2011,
- 2)The joint SIC SG1 and SG2 Ocean Carbon Synthesis Workshop to be held in Paris, France in summer 2011.

**Amount requested: US\$7 500**

**ACKNOWLEDGEMENTS**

IMBER would like to take this opportunity to thank SCOR for its continued support.