

Annex 13 – Integrated Marine Biogeochemistry and Ecosystems Research (IMBER) Report

IMBER: Integrated Marine Biogeochemistry and Ecosystem Research (previously OCEANS)

Report 2002/2003

Submitted by
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on behalf of the IMBER Transition Team.

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New Name

At the request of the sponsors (SCOR and IGBP) a new name for the ocean biogeochemistry and ecosystems project (formerly called “OCEANS”) was identified and has been agreed to by both sponsors. The new name is IMBER: Integrated Marine Biogeochemistry and Ecosystem Research.

Transition Team meetings

The IMBER Transition Team has held four meetings and convened a major open science conference since the 2002 SCOR General Meeting:

a) An editorial meeting was held in November 2002 (Bolger Centre, Washington DC, USA) at which the format of the *IMBER Science Plan/Implementation Strategy* was established. In addition, the responsibilities of the Transition Team members at the Open Science Conference were discussed, along with planning for the conference.

b) To assist in the development of the *IMBER Science Plan/Implementation Strategy*, an Open Science Conference was held in Paris, France on 7-10 January 2003. The main aim of the conference was to gather input from the scientific community for the science themes of the new project. The conference started with 15 plenary lectures, which were followed by working group discussions. In addition, there

were two poster sessions with a total of 200 posters presented, the abstracts of which are available on the conference Web site (www.igbp.kva.se/obe/). The conference was attended by 370 participants from 36 countries.

The IMBER Open Science Conference working groups were:

1. Trace elements in ecological and biogeochemical processes
2. Physical forcing of biogeochemical cycling and marine food webs
3. Climatic modulation of organic matter fluxes
4. Direct effects of anthropogenic CO₂ on biogeochemical cycles and ecosystems
5. Integrating food-web dynamics from end to end
6. Continental margins
7. The mesopelagic layer
8. Biogeochemical hotspots, choke points, triggers, switches and non-linear responses
9. Feedbacks to the Earth System
10. Coupled models of biogeochemical cycles and ecosystems

The working groups were asked to identify and prioritise key research questions and what we need to know to answer those questions. They were also asked to identify any promising approaches, emerging technologies and regional considerations. In addition to the working group discussions, short oral reports were given on related current national and international activities and any future plans relevant to the development of the IMBER project. Patrick Holligan (Southampton Oceanography Centre) gave a "Conference Summary" presentation and this summary, the conference programme, abstracts, and final working group reports are all available on the Web site. Input from the IMBER working groups, plenary speakers, comments submitted via the IMBER Web site, along with other material, have been used by the IMBER Transition Team to identify the key science themes and issues which will form the scientific focus of the new project.

c) Before the Open Science Conference, the Transition Team held a one-day meeting dealing with the logistics of the conference. The Transition Team met for two days after the conference to collate and synthesise the scientific input from the working group to formulate the science focus of the IMBER project. The working group reports were integrated to form the initial IMBER Themes and Issues. Several articles about the conference have been provided to GLOBEC, LOICZ and JGOFS for publication in their project newsletters.

d) A second editorial meeting was held in March 2003 (Washington DC, USA) prior to the JGOFS Open Science Meeting. At this meeting the *IMBER Science Plan/Implementation Strategy* outline (Appendix 1) was further refined and initial drafts of the Themes and Issues were prepared for the IGBP Congress in Banff.

e) The IMBER Transition Team met during the IGBP Congress in June 2003 (Banff, Canada). At this meeting, the Transition Team refined the *IMBER Science Plan* and began developing the *Implementation Strategy* for the project. The Transition Team also took this opportunity to meet with the

scientific steering committees of GLOBEC, SOLAS and LOICZ to discuss key implementation issues between the projects.

Science Focus of the IMBER project

The IMBER project focus is biogeochemical cycles, ecosystems and their interactions (Figure 1). The overarching question for the project is

“How do marine ecosystems, biogeochemical cycles and their interactions respond to global change and, in turn, feed back to the Earth System?”

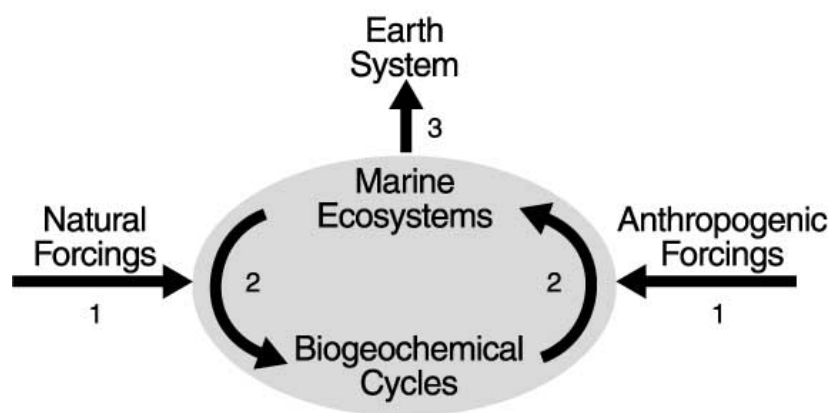


Figure 1: The scientific questions of the IMBER project focus on the impacts of natural climatic and anthropogenic forcings on geochemical cycles and marine ecosystems (arrows 1), with particular focus on how these forcings alter the relationships between elemental cycles and ecosystems (arrows 2) and how these responses feed back to the Earth System (arrow 3).

The Science Plan for IMBER has been divided into three Themes and within each theme, three Issues have been identified. Each Issue has a number of major science questions to provide a focus for the project. The IMBER scientific Themes and Issues are:

- Theme 1: Interactions between marine biogeochemical cycles and ecosystems
 - Issue 1: Sources and sinks in biogeochemical cycles, and macro/micro nutrient stoichiometry
 - Issue 2: Relationships between biodiversity, structure, function and stability of marine ecosystems
 - Issue 3: Role of macro/micro nutrient availability, assimilation and cycling in controlling food-web structure and function
- Theme 2: Sensitivity of ecosystems, biogeochemical cycles and their interaction, to global change
 - Issue 1: The impact of climate-induced changes in circulation, ventilation, and stratification on biogeochemical cycles and ecosystems

- Issue 2: Response of biogeochemical cycles, ecosystems, and their interactions, to increasing anthropogenic CO₂ and changing pH
- Issue 3: Response of biogeochemical cycles, ecosystems, and their interactions, to changes in the fluxes of macro/micro nutrients into the marine environment from land and air
- Theme 3: Feedbacks from biogeochemical cycles and the ecosystem to the Earth System components
- Issue 1: Oceanic regulation of atmospheric CO₂ concentration
- Issue 2: Feedbacks from the biogeochemical cycles and the ecosystem to climate
- Issue 3: Feedbacks to Human Dimensions

Several key domains have been identified for IMBER research, including the euphotic zone, the mesopelagic layer, continental margins, and high-latitude oceans.

The main *Science Plan/Implementation Strategy* sections that have been drafted to date are

- IIb Project Scope,
- III Themes and Issues, and
- V Project Organisation.

Linkages to Other Projects and Programmes

During the IGBP Congress, working group discussions were held with the other marine projects to discuss potential collaborations.

The IMBER Transition Team and GLOBEC SSC recognized the need for close collaboration between the two projects and identified the following options to facilitate that collaboration:

- formation of a joint “end-to-end food webs” task team
- joint endorsement of projects (with the likely outcome that some programmes may get endorsed by both projects)
- formation of a joint long-term planning team, which will develop an implementation strategy for post-2009 research.
- back-to-back SSC meetings
- ex-officio members on both Scientific Steering Committees
- publication of joint newsletters
- co-location of the project IPOs

The IMBER Transition Team and SOLAS SSC recognized that there are important collaborative opportunities between the projects. The key links between IMBER and SOLAS are most likely through SOLAS Foci 1 and 3 (to facilitate collaboration, it was agreed that IMBER will have a representative on the SOLAS working groups 1 and 3). The projects will work towards joint endorsement of projects (as with GLOBEC, the endorsement would be at individual project level and therefore some programmes may be endorsed by both IMBER and SOLAS).

The IMBER Transition Team and LOICZ SSC recognised that although the projects have taken a different approach to their implementation, there must be close collaboration between them in the region of the continental margins. This will be facilitated through the LOICZ Theme 3 and the IMBER Continental Margins working group.

There were very productive side meetings between IMBER Transition Team members and the PAGES Executive Officer Keith Alversen, and with the DIVERSITAS chair Michel Loreau to discuss the collaborative links between the projects. These will be developed further in the coming months.

Howard Cattle (executive officer of CLIVAR) attended part of the IMBER Transition Team meeting to discuss the development of key collaborations between IMBER and CLIVAR, in particular with the CLIVAR ocean basin panels.

Way Forward

The timeline for the remaining development of the *IMBER Science Plan/Implementation Strategy* is to have the Themes and Issues sections completed by July 2003. The remaining sections of the *Science Plan/Implementation Strategy* will be written by September, and a full draft of the *Science Plan/Implementation Strategy* will be available on the project Web site for comment by the scientific community by October 2003. After the integration of the comments, the *Science Plan/Implementation Strategy* will be sent to SCOR and IGBP for review.

The IMBER Transition Team has funds remaining for an editorial meeting in late 2003, if necessary. The IMBER SSC will have adequate funds available for its first meeting, as well as several small meetings designed to work on detailed research plans for IMBER activities. IMBER acknowledges the special contribution by IGBP in 2003 to support local costs in the IMBER Chair's institution for project assistance.

Funding

| Income | 2002 | 2003 | 2004 |
|---------------------------------------------|------------------|------------------|-----------------|
| SCOR – NSF | \$55,000 | \$41,667 | 50000 |
| SCOR Carry-over from Previous Year | \$5,704 | \$108,935 | \$4,935 |
| IGBP | \$24,868 | \$28,500 | 20000 |
| IGBP (staff support) | \$4,000 | \$29,625 | |
| IGBP Ocean Vision | \$2,189 | | |
| SCOR | | \$16,214 | |
| ICSU | \$50,000 | | |
| Registration Fees | | \$38,462 | |
| Total Income | \$141,761 | \$263,402 | \$74,935 |
| Expenses | | | |
| 2002 Potomac OCEANS Transition Team Meeting | \$23,124 | | |
| Representation at GLOBEC, WOCE, LOICZ OSCs | \$3,510 | | |
| Ocean Vision meeting | \$2,189 | | |
| Open Science Conference in Paris | \$4,003 | \$134,389 | |
| TT meeting in Paris | | \$26,415 | |
| Side Meeting at JGOFS OSM | | \$5,771 | |
| Other SCOR Admin | | \$2,806 | |
| NIWA Expenses | | \$29,625 | |
| IGBP Congress in Banff | | 35,794 | |
| SP/IS Editorial Meeting | | \$12,000 | |
| 2004 SSC Meeting | | | 25000 |
| SSC Executive Committee Meeting | | | 15000 |
| Subgroup Meeting 1 | | | 15000 |
| Subgroup Meeting 2 | | | 15000 |
| Subgroup Meeting 3 | | | 15000 |
| Total Expenses | \$32,826 | \$246,800 | \$70,000 |
| Remaining Balance | \$108,935 | \$16,602 | \$1,602 |

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I would like to thank Ed Urban, Wendy Broadgate, Liz Gross, Penny Cooke and the teams from the SCOR and IOC offices for their excellent support in organising the Open Science Conference in Paris. Special thanks must also go to Ed Urban and Wendy Broadgate for their continued support for the project.