# Minutes from the 16th Meeting of the JGOFS Scientific Steering Committee

Amsterdam, the Netherlands, 7-8 July 2001

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INTRODUCTION

The 16th meeting of the JGOFS SSC was held at the Royal Netherlands Academy of Arts and Sciences (KNAW) and hosted by the International Geosphere-Biosphere Programme (IGBP) and the Academy. Ducklow, Chair of the SSC, opened the meeting at 0900 on Saturday, 7 July 2001.

1.1. Welcome and Opening Remarks

Ducklow greeted the members, new members and guests, and described the objectives and format for the 2-day meeting. Each participant gave short introductory presentations, and after the introductions, Ducklow announced the regrets from Peter Burkill, Bronte Tilbrook, Trevor Platt, Douglas Wallace and Paul Falkowski. Special recognition was provided to the new members, Reiner Schlitzer (Germany), chair of the newly formed Global Synthesis and Modelling Working Group (GSWG), and Huasheng Hong (China-Beijing), 2nd term at-large member approved by IGBP and SCOR Officers. Following the departure of Neil Swanberg (IGBP) and Elizabeth Gross (SCOR), the new IGBP Deputy Director for Natural Sciences, Wendy Broadgate, and the new Executive Director of SCOR, Ed Urban, were recognized and acknowledged at their first JGOFS SSC meeting. In Platt’s absence, Nicolas Hoepffner (JRC, Ispra, Italy) represented IOCCG (International Ocean Colour Coordinating Group). Ducklow also recognized the new staff at the IPO (International Project Office), Bernard Avril and Reidun Gjerde and welcomed them to their first SSC meeting. Guests during the meeting included Larry Atkinson from LOICZ (CMTT) and Ken Buesseler from US JGOFS Planning Office. A list of participants that attended this meeting is given in APPENDIX 1.
1.2. Report from the Chair
Ducklow briefly reviewed JGOFS progress towards synthesis and modelling since the 15th Meeting (April 2000) and addressed several points made recently in an USJN article (APPENDIX 2): fieldwork nears completion, regional synthesis and modelling activities continues along with parallel activities in IGBP synthesis, retrieval of all JGOFS data sets remains a high priority, new activities initiated in ocean modelling, transition programmes in ocean biogeochemistry fully recognized internationally, and the release of publications from the project, e.g., AMBIO Special Report No. 10, IGBP Science Series No. 2, and Deep-Sea Research Part II volumes. To the chairs of the synthesis groups and task teams contributing to the Synthesis Plan (Figure 1), he expressed his gratitude and appreciation, and pointed towards the activities that lies immediately ahead on the calendar (APPENDIX 3).

1.3. Approval of the Agenda
A draft agenda and working papers was distributed before the meeting, and the agenda was approved without comments, additions or deletions (APPENDIX 4). The agenda focuses on the progress of the regional groups and task teams engaged in synthesis, review of the international and national efforts engaged in the future of ocean biogeochemistry, review of national efforts engaged in synthesis and modelling activities, and plans for the third and final JGOFS Open Science Conference. The minutes of the 16th SSC Meeting include all submitted working papers (reports on activities and progress) since the 15th SSC Meeting in April 2000 (Bergen, Norway). A list of all acronyms appears on page 26 of the minutes.

1.4. Amsterdam reimbursements and local arrangements
Reidun Gjerde (IPO) provided information on the local arrangements, reimbursement procedures and bank forms, and logistics for the SSC dinner (APPENDIX 5).

2. OLD BUSINESS

2.1. Approval of the Minutes from the 15th SSC Meeting
The SSC reviewed the minutes and status of each action items (APPENDIX 6) from the 15th Meeting in Bergen, April 2000. The SSC approved the minutes as written. Hanson mentioned that the minutes will be placed on the JGOFS web site and later printed in the JGOFS Report Series.

2.2. Second Open Science Conference (Bergen)
Hanson reported on the final statistics and finances of the 2nd JGOFS OSC held in Bergen last April 2000. Briefly, 218 participants registered that included 10 invited speakers, 58 contributing speakers, 110 posters, 40 general participants, and 5+ unregistered students (day participants). Over 23 countries were represented at the Conference. Countries with >30 abstracts included USA (36), France (31) and Germany (31); countries with 10-12 abstracts each were UK, Norway, Japan and India; and countries with <9 abstracts each were Australia, Belgium, Bermuda, Canada, Chile, China-Beijing, China-Taipei, Columbia, Denmark, Italy, Kenya, Monaco, New Zealand, Puerto Rico, Spain and Turkey. The Best Student Speaker was Laurent Bopp with co-authors Patrick Monfray, Olivier Aumont, James C. Orr, Jean-Louis Dufresne and Hervé Le Treut (France) on “Potential impact of climate change on marine production”; and the Best Student Poster was Xavier Giraud with co-authors Philippe Bertrand, Véronique Garçon and Isabelle Dadou (France) on “Sensitivity of the NW African and Benguela upwelling systems to the sea level change: a modelling approach using nitrogen isotopes”. The conference cost US$164,700, and the final finances are given in APPENDIX 7.

2.3. Synthesis Products: Publication Update
Hanson reported that the editors completed the science editing of the AMBIO Special Report No. 10 (May 2001) and the IGBP Science Series No. 2 (July 2001) and that both issues are now being distributed to the JGOFS community. The former publication is targeted to the global climate research scientists and ocean biogeochemists while the latter is written in a style adapted for ministers and directors of funding agencies, government officials, NGO (non-governmental organizations) and other decision-makers.

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1 Abstracts from the aforementioned country
For the Springer-Verlag book, Hanson informed the SSC that Fasham has received 8 of the 12 chapters, and they are out for peer review or being revised (Appendix 8). The others are expected shortly and are needed to fill the gaps. Publication has now slipped from late 2001 to mid 2002. Fasham also reported that Angela Bayfield was hired as the book’s editor manager. She is presently the managing editor for Progress in Oceanography. Lochte felt that some pressure on chapter authors is needed and that there is help available. Ducklow agreed and has offered Fasham help in retrieving chapters. Hanson emphasised that the technical editing must be completed this year due to the conditions under the ICSU funds, or unused funds must be returned to ICSU, which would embarrass SCOR Officers and hinder future efforts to raise ICSU funds.

3. SYNTHESIS GROUPS & TASK TEAMS BUSINESS

Ducklow briefly reviewed the future plans for the global synthesis of JGOFS research (see Illustration: Appendix 29). In addition, US JGOFS confirmed that the 3rd and final JGOFS Open Science Conference would be held 5-8 May 2003, which coincides with the completion of USA funding. The conference site is the US National Academy of Sciences in Washington DC. Planning has begun and full international participation is essential to its success. Public lectures in collaboration with the Smithsonian Institution are being considered. Mark Abbott, US JGOFS SC Chair, requested suggestions from the international JGOFS SSC for special sessions, speakers, and activities (see §6.1 US JGOFS national report).

Ducklow requested a brief progress report from the chairs of the Synthesis Groups, Task Teams and Working Group.

3.1. EPSG (Equatorial Pacific Synthesis & Modelling Group)

Le Borgne reported on the EPSG membership and described past activities and future plans of the EPSG (Appendix 9). A concern arising from the report was the need of data from Japan for the forthcoming CD-ROM. Saino mentioned that (Nozaki), chair of the data management advisory group at JODC (Japan Ocean Data Centre) should be contacted, as almost all metadata from North Pacific Process Study has been written. Le Borgne, as well as Conkright, felt that they are missing cruise and observation data in the inventory of the North and the Equatorial Pacific Process Studies and the CO₂ survey. Saino explained that the problems are related to data policy in JODC, which is different from that at JAMSTEC, where the data are held 2-3 years before it is sent to JODC. Le Borgne requested help from DMTT to retrieve at least the metadata and the relevant references of publications. Saino also mentioned a project-tagging problem, i.e., if a project is not identified as a JGOFS project, then data will not be released to JGOFS researchers.

Le Borgne updated the SSC on the DSR II volume, co-editors R. Feely, D. Mackey and R. Le Borgne, planned for publication in 2002. The editors met in Hobart recently and wrote the introduction to the Equatorial Pacific synthesis volume. All manuscripts are due August 2001 for peer review.

ACTION: Le Borgne will submit a workshop proposal and request financial support in Year 2002.

3.2. NASG (North Atlantic Synthesis & Modelling Group)

Garçon reported on the NASG membership and described past activities and future plans of the NASG (Appendix 10). The 3rd NASG meeting was held in Arcachon, 15-16 January 2001. A report is now available on the JGOFS web site and will be printed in the JGOFS Report Series. Next year the group will move to replace Drange and Wallace who are rotating off, and the group is announcing a Special Issue publication in Deep Sea Research Part II on JGOFS Research in the North Atlantic Ocean: A Decade of Research, Synthesis and Modelling, Volume 48, No 10, May 2001. Wolfgang Koeve and Hugh Ducklow are guest editors.

Garçon also reported on the “Green Ocean Model” workshop held in Villefranche-sur-Mer, France, June 2001. The ”Green Ocean” meeting was organised by Corinne LeQuéré with financial support also from IGBP/GAIM Task Force. Participants focussed on several key issues, such as the controls of CO₂.
at different time scales, tracers of the carbon cycle, DMS, Fe, services to fisheries, and CO₂ sequestration. “Green Ocean” wants to bring more dynamics in the coupling of biophysical models.

Regarding the “Green Ocean Model” and GAIM Task Force, Ducklow felt that GAIM needs stronger interactions with GLOBEC and LOICZ in the future, in addition to their links with JGOFS via JGTT (OCMIP) group. Anderson concurred and provided another example where stronger ties are urgently required: Continental Margins. How do we integrate margins in inverse modelling? The answer will help us setting boundary conditions between margins and oceans.

Garçon returned to the issue of the AMT (Atlantic Meridional Transect) and data availability, which was discussed last year in Bergen. The NASG recommends that future AMT ship schedule not undergo any major change and certainly not less than the frequency of twice a year cruises (see Footnote #2). The AMT programme after a one-year hiatus measures physical, biological and bio-optical properties and processes through the diverse ecosystems of the North and South Atlantic Oceans. The primary objective is to improve the understanding and interpretation of the functional relationships between biological particles and processes, and ocean colour. Modelling work covers in particular the North Atlantic, including shelf waters. A special issue of Progress in Oceanography, Volume 45, No. 3-4, 2000, is devoted to the Atlantic Meridional Transect.

NASG future plans and needs include a synthesis group meeting, a link in the France-JGOFS website to PI and groups, a CMTT link to NASG (plus OMEX), initiating of interactions between NASG and GSTT, and planning of a joint session at the 2002 EGS meeting.

ACTION: Garçon will request nominations for the new members and seek JGOFS Executive approval of candidates.
ACTION: Garçon recommends that JGOFS support the AMT application to NERC for the continuation of the programme2.
ACTION: Garçon will submit a proposal requesting Year 2002 financial support.

3.3. IOSG (Indian Ocean Synthesis & Modelling Group)

Burkill sent regrets and asked Ducklow/Hanson to report on the IOSG membership and to describe past activities and future plans of the IOSG (APPENDIX 11). Hanson informed the SSC that Louisa Watts, Peter Burkill and Sharon Smith edited a synthesis report in June and now available for comments. The draft report was circulated among the SSC. After review, the committee strongly endorsed the report and recommended that the editors and authors finish the editing process, and send it to the IPO for the JGOFS Report Series and the JGOFS International web site. After a long search, Burkill recommended Sharon Smith to lead the IOSG activities and requested SSC approval.

ACTION: The SSC unanimously supported Burkill recommendation and approved Smith as the next Chair of the IOSG. Burkill remains on the IOSG until the synthesis group disbands.

3.4. SOSG (Southern Ocean Synthesis & Modelling Group)

Tréguer reported on the SOSG membership and past and future activities (APPENDIX 12). From the 3rd Southern Ocean Brest symposium, 2 special issues in DSR II are planned: one will be submitted in July (P. Tréguer, P. Pondaven, B. Anderson, M. Abbott, eds.) and another in October 2001. In 2002, SOSG is planning a special Southern Ocean session at the AGU/ASLO OSM in February and a SOSG workshop-meeting following the OSM at the University of Hawaii. APPENDIX 12 includes several national reports (recent and future plans). In addition to the Fe experiments mentioned in the German-JGOFS report (see §6.2), Lochte informed the SSC that Victor Smetacek is also preparing an Iron Experiment for this fall (2001), where north and south polar waters are to be distinguished.

2 Update on the AMT application. In November 2001, NERC notified Carol Robinson at PML that the application to continue the AMT programme was approved (the first NERC consortium grant). The first of six cruises is planned for September 2002, but actual time depends on ships logistics.
ACTION: SOSG has not finished revising their new synthesis modelling ToR. IPO sent the Executive comments on revision of the ToR to Bathmann back in June 2000.

3.5.  NPSG (North Pacific Synthesis & Modelling Group)

Bychkov reported on the NPSG membership, past activities and future plans (APPENDIX 13). Bychkov described two joint PICES-JGOFS sessions on carbon cycle and ecosystem dynamics during the PICES IX meeting in Japan last October and the upcoming joint session on plankton size classes and function during PICES X meeting in Canada this October. A publication will follow in Oceanography. For data synthesis, a workshop was held during PICES IX and the National Institute will publish a report for Environmental Studies (NIES) and in the PICES Science Report series. For CO₂ data intercomparison, there were 15 labs involved (7 from Japan; 4 from USA; one from Canada, Russian Federation, South Korea, and China-Taipei. A report is also expected from NIES. For the data exchange and integration (see PICES newsletter, Volume 9 (2): 20-21, 2001), JODC, US-NODC, CDIAC, MEDS, etc. have formed links to compile an International North Pacific Data Inventory for CO₂ and CO₂-related data. This inventory will be available through the JODC (MIRC/IJCD) web site. Garçon asked how much of those data are included in the last Takahashi’s inventory and what is the status of the data inventory? Bychkov estimated that 30% of the inventory might be included in Takahashi’s latest assessment.

Bychkov also reported that NPSG expects an issue in Deep-Sea Research II with Arthur Chen, Paul Harrison, Toshiro Saino and Alexander Bychkov (eds.) in early 2002. At present, there are six papers from Canada and Japan, 1 paper each from China-Beijing and China-Taipei. The USA has not submitted any papers to the issue. Another publication is expected in Journal of Oceanography (late 2003). Conkright asked whether the CD-ROM in the DSR II issue includes data. Bychkov felt that it depends on the funding agency policy, and JAMSTEC is one of the most reluctant to provide access to data because of its data releasing policy. Plans for future cruises in the North Pacific still continue. Canada plans to support three cruises per year to Station PAPA, and Japan has scheduled two annual cruises (summer and winter) in western North Pacific (Station KNOT). In addition, there are plans for an Fe-Fertilisation Experiment at station PAPA in the North Pacific in May 2003.

ACTION: Bychkov confirmed that the overdue reports on past NPSG meetings would be submitted soon.

3.6.  PJTT (Paleo JGOFS Task Team)

Lochte reported on the PJTT membership and its past and future activities (APPENDIX 14). The first meeting of the PJTT was last summer and at a subsequent meeting in Germany, plans were made to propose a new SCOR Working Group, which will promote the main tasks of the PJTT. In the fall (2001), an international, 2-day workshop is planned, which is opened to all interested scientists (30-40 participants plus 2 invited speakers). The important function of this workshop will be to provide input to the plan for Future Ocean Biogeochemistry Studies that is being developed now as a new future IGBP focus.

3.7.  CMTT (Continental Margin Task Team)

Quiñones reported on the CMTT membership and on its past and future activities (APPENDIX 15). The CMTT synthesis plan, including the publication of a book, is well underway with the completion of several workshops on the Eastern-Western Boundary Current Systems (Fall 2000), the Polar Margins and Seas (Summer 2001), and the Tropical Margins and Seas (planned for Fall 2001). A book is being prepared for publication in 2003 on the assessment of carbon exchanges at the margins. However, to fill an obvious gap on global coverage in the assessment, Task Team and workshop Chairs recommended that a fourth workshop be held in the near future on Sub-Polar Ecosystems. Quiñones also reported on an upcoming meeting at UNESCO in Paris from 8-11 August 2001, called COASTS (Coastal Ocean Advanced Scientific and Technical Studies). Several members of JGOFS and LOICZ will attend.

3.8.  DMTT (Data Management Task Team)

Conkright reported on the DMTT membership and on its recent and future activities (APPENDIX 16). She mentioned that the last proposal to NASA has been rejected and there are no USA funds to gather
JGOFS level 1 datasets and burn on CD-ROM(s). Steffen suggested that NIAES might help. NIAES is designed for data collection of environmental projects and that Robert (Bob) Costanza in the US might help. Conkright will contact Costanza and also provide her proposal (to NSF) to anyone who is interested in seeking DMTT support. Lochte volunteered to lead a proposal through the EU for possible funding and Steffen mentioned that he would send a letter and/or discuss the issue of JGOFS data management at the next Intergovernmental Funding Agencies meeting.

**ACTION:** Conkright and Avril agreed to draft a letter that supports the urgent funding for international data management to assist global synthesis and modelling groups.

Conkright also urged the SG and TT chairs to invite a DMTT member or a national data manager to their meetings when such meetings are held in their countries. Such action would facilitate greater cooperation between observationalists, modellers and data managers.

3.9. **PMTT (Photosynthesis Measurement Task Team)**

Hanson reported that the PMTT, disbanded in 1999, is finishing up with the last remaining task, the Photosynthesis Measurement Manual ([APPENDIX 17](#)). We plan to print it in JGOFS Report Series later this year.

3.10. **JGTT (JGOFS-GAIM Task Team)**

Monfray reported on the JGTT membership and Terms of Reference ([APPENDIX 18](#)) and its recent and future activities. Regarding members, Monfray requested approval of Nicolas Gruber (UCLA, USA) replacing Raymond Najjar on the Task Team. Future activities include model comparison with tracers such as 13C, 3He, etc. and participation in OCMIP posters cluster. Monfray also proposed an open workshop with GAIM-TF, JGOFS-GAIM Task Team and the new JGOFS GSWG in Italy in May-June 2002. Critical for this workshop is data accessibility.

**ACTION:** SSC approved the membership change of Nikki Gruber for Ray Najjar.

3.11. **GSWG (Global Synthesis and Modelling Working Group)**

Schlitzer reported on the GSWG membership and Terms of Reference ([APPENDIX 19](#)) and its plans for future activities. He mentioned that he and the members drafted its ToR following the model of previous synthesis groups and recommended that the new initiative be called a Working Group to avoid confusion with the disbanded Global Synthesis and Modelling Task Team (1999) and because of its closer ties to the observational approach. Ducklow felt that the ToR needed more focus, e.g., specific products, to insure that the results are transferred to future programmes and requested that the SSC members provide further inputs to GSWG ToR. Schlitzer confirmed that he and the GSWG would revise/modify the ToR after considering SSC comments for approval.

Regarding data acquisition for the working group, Schlitzer emphasised that model validation and calibration are made with very few large datasets because of a lack of agreement between the algorithms and the methods. He felt that the GSWG could help alleviate some of the data availability problem experienced thus far mentioned in JGOFS (DMTT and JGTT). Hoepffner also mentioned that there is a similar need for the validation and calibration of satellite data, e.g., SIMBIOS.

4. **INTERNATIONAL PROGRAMMES**

4.1. **IGBP (International Geosphere-Biosphere Programme)**

Steffen reported that after several meetings, a prospectus has been drafted regarding the next decade of Global Change Research, called the "Joint Carbon Project" (JCP). The joint sponsors are IGBP, WCRP, IHDP and DIVERSITAS. The JCP prospectus focuses on (i) spatial and temporal patterns, and variabilities, (ii) underlying processes and feedbacks (up to socio-economic aspects), and (iii) carbon futures (including societal consequences). The JCP adds value compared to what there is now. He announced that next Saturday, there would be a Carbon meeting at the KNAW, open to all interested global change research scientists. The JCP will include the future of global ocean science(s) with SOLAS, CLIVAR and possibly marine biogeochemistry. Lochte mentioned that the new joint plan has
common characteristics with future EU Marine Framework; and Ducklow added with the earlier US Carbon Science Plan. Elements of those plans and reports from other ocean meetings were taken into account during the development of the JCP.

Anderson questioned the 10-year life span attached to the future plans? Steffen replied that the JCP must be visible and realistic, and a timeline forces synthesis. The national funding agencies support this science framework (fieldwork, integration and assessment). Atkinson asked how does IGOS fit into those plans? Steffen replied that IGOS would be integrated along with IPCC matters. Hoepffner added that the EU initiative will have an environment-monitoring component in its plans, and Bychkov inserted that there will also be a CLIVAR / PICES session at the next annual PICES meeting in B.C., Canada in October 2001. Haugan also cited that during the Southampton meeting on ocean transport of heat, CO2, etc., CLIVAR offered to help with logistics. Monfray added that there is not only a need for repetitive transects (WOCE lines) but also moorings, time-series, and automatic buoys.

4.1.1. Futures Meeting on Ocean Biogeochemistry

Broadgate briefly presented the Ocean Futures Plan, lead by Peter Burkill (chair). The next steps will be to set recommendations, research strategy and identify new projects in a coherent framework. Ducklow emphasised that there is a need for a clearly identified framework for marine biogeochemistry. Steffen acknowledged this concern and mentioned that the gap after JGOFS must be minimised. Ducklow asserted that JGOFS sunset date is approaching fast and the ocean biogeochemistry community will need an implementation plan soon. Input from JGOFS synthesis and modelling phase will help the process, says Steffen. The details of the ocean biogeochemical framework will be heard from John Field later (see Section 4.2.1 under SCOR).

4.1.2. Open Science Conference (Amsterdam, July 2001)

Broadgate commented briefly on the plenary, sessions and posters at the OSC, 10-13 July in Amsterdam. She felt that the OSC would provide an important platform to launch IGBP-WCRP-IHDP-DIVERSITAS new joint efforts in global change research. A document, called the Amsterdam Declaration (APPENDIX 20) and signed by the four directors of the international programmes, would be circulated for signatures during the conference.

In regards to the poster sessions, Hanson informed the SSC that the IPO developed two posters on JGOFS (one on the organization and structure with other programmes, and another on major science highlights). Avril circulated coloured A4 copies of the posters. For the JGOFS displays, Hanson asked for SSC volunteers to stand by the posters at the IGBP / IHDP / WCRP booth during the breaks and lunches, meet the global change communities, and answer questions/inquiries on JGOFS research. It is important for the community to hear from the JGOFS experts in the field of ocean biogeochemistry. The following people volunteered: Lochte, Ducklow, Le Borgne, Garçon, Atkinson, Anderson, Hong, and Saino. In addition to the booth posters, a duplicate set of posters would be displayed with US JGOFS handout material (brochure) during the Ocean and Coastal Poster sessions. Lochte informed the participants of the joint JGOFS-LOICZ-GLOBEC Ocean and Coastal session at the OSC and invited everyone to attend.

4.2. SCOR (Scientific Committee on Oceanic Research)

Urban reviewed a few activities at SCOR. He mentioned in particular the new initiatives on harmful algal blooms, GEOHAB (Global Ecology and Oceanography of Harmful Algal Blooms, SSC Chair Patrick Gentien, France), air-sea interactions, SOLAS (Surface Ocean and Lower Atmosphere Study, SSC Chair Peter Liss, UK), phytoplankton and global change (Marine Phytoplankton and Global Climate Regulation: the Phaeocystis spp. Cluster as a Model, WG 120, WC Chair Winfred Gieskes, The Netherlands), and export production (Sediment Trap and Th-234 Methods for Particulate Organic Carbon Export in the Upper Ocean, WG 116, WG Chair Ken Buesseler, WHOI, USA). In response to Haugan’s question on GEOHAB, Urban said that there is no link to IGBP at the moment, but SCOR would entertain joint partners.

4.2.1. Future Ocean Biogeochemistry

Field presented an overview of the Future Ocean Biogeochemistry plans and issues arising. At present the SCOR-IGBP Ocean Future Committee (OFC) consists of Peter Burkill (Chair), John Field (SCOR...
reporter), Robert Costanza, Raja Ganeshram, Julie Hall, W. Jenkins, Kon-Kee Liu, Celia Marrasé, Patrick Monfray, Richard Matear, Bradley Opdyke, Shubha Sathyendranath, John Steele, and Doug Wallace. The key questions are: What controls the time-varying biogeochemical state of the oceanic system and how it changes in response to global change? How do marine food web respond? How will the accumulations of carbon compounds within the ocean respond? The common themes are (1) role of the marine food web in the twilight zone, (2) comparison of food web structures and functions in the continental margin and the open ocean, (3) change in the marine food web on decadal or centennial time scales, (4) integrate across the size spectrum from bacteria to fishes, and (5) coupling-decoupling of the biogeochemical cycles of C, N, P, Si. He also mentioned the need to involve CLIVAR (WCRP), SOLAS and other international marine programmes. A draft progress report of the OFC will be delivered to SCOR in October 2001, and the final meeting will be held in Barcelona, December 2001. In 2002, OFC will request IGBP SC review.

Field received good feedbacks on the ocean future report from the SSC, for example, improper wording should be checked, like “accumulation of respired carbon”; what is the “twilight zone?” Field defined the “twilight zone” between the 1%-PAR and 1000-m depths; paleo-aspects should be more explicit; present focus is on a biological approach of the ecosystem; ocean future needs to involve CLIVAR; Fe is missing in the list of elements for which cycle will be studied; ocean future need to involve GOOS for long-term observations and monitoring; must define how ocean futures fit into the current-future, national-international frameworks. Field commented that this is only a recommendation to SCOR and IGBP and the group work will end at the end of 2001; report needs to be more than just recommendations but needs to prioritise and address mid-term questions; there should be an announcement of opportunity; there is a need for bottom-up inputs from scientists; need realistic, shorter-term, more focused items. It is too broad. Why another plan from IGBP & SCOR when money will be let from national agencies, which may not follow that plan? Field mentioned that there exists feedback but it is a perennial problem in timing. The European Marine Science Plan could also be helpful; and the plans are quite similar at the international and the national levels. So, there are some agreements in future plans.

4.2.2. SCOR–IOC Advisory Panel on Ocean CO2

Ducklow announced Doug Wallace regrets and asked Haugan to provide a brief report on the Advisory Panel committee (APPENDIX 21). Haugan reported that the Advisory Panel, which has evolved from the previous IOC-JGOFS CO2 Advisory Panel, with Doug Wallace as chair. The revised ToR for the Advisory Panel includes long-term carbon observations as one of the primary targets. Scott Doney (NCAR, Boulder, CO, USA) and Maria Hood (IOC, UNESCO, Paris, France), with broad input from the community, have prepared a background report on ocean carbon observations as a contribution to the integrated global observing system (IGOS) process. The report is available from Maria Hood at IOC. The Advisory Panel furthermore continues activities started by the previous panel in particular on maintaining high quality on ocean carbon observations, and has also started the process of assembling information in order to keep a watching brief on activities of ocean carbon sequestration. This panel will be actively used by the OOPC and thereby GOOS.

The Global Ocean Observing System (GOOS) structure has changed recently. A GOOS Steering Committee now oversees development in interaction with the intergovernmental committee (I-GOOS) and the GOOS Office at IOC in Paris. The Ocean Observations Panel for Climate (OOPC), chaired by Neville Smith, takes responsibility for designing global observing systems for the deep ocean, while a new Coastal Ocean Observations Panel (COOP), formed from three previously existing panels, deals with issues like living resources and pollution. The OOPC with its broad mandate relies on a number of panels and committees for input and advice.

There was a discussion concerning the many facets of GOOS and different related groups and organizations. With particular reference to JGOFS science, the Partnership for Global Observations (POGO) was mentioned as potentially useful for deep ocean carbon and tracer work (in conjunction with hydrography). The question was raised to what extent CLIVAR is interested in carbon cycle
science. CLIVAR certainly aims to contribute to design of long-term climate observations with clear links to GOOS.

4.2.3. IOCCG (International Ocean Colour Coordinating Group)

Hoepffner reported that Trevor Platt is the IOCCG Chair and the website is [www.ioccg.org/](http://www.ioccg.org/). Three reports are now available from the working groups (WGs). There are several ongoing WGs, such as calibration (Robert Frouin), comparison of algorithms (M. Wang), coordination of datasets (?), operational ocean color (Chris Brown), level 3 (composite) products (David Antoine), extraterrestrial solar flux (J. Müller), and reports will follow. Courses are being offered on remote sensing for scientists from developing countries. Tréguer asked what are the recent progress in remote sensing of non-chlorophyll pigments and the progress for remote sensing in coastal waters? Not much, replied Hoepffner. Hong asked what about detection of red tides? Hoepffner gave the same answer. Venetia Stuart (IOCCG, c/o BIO, Halifax, N.S., Canada) provided an overview of IOCCG activity (APPENDIX 22).

4.3. WOCE (World Ocean Circulation Experiment)

Haugan provided a brief recap of the JGOFS/WOCE Ocean CO₂ Transport workshop held in Southampton, 25-29 June. A discussion and an initiative developed during the workshop for a joint WCRP/IGBP initiative to ensure that hydrographic measurements already planned (and identified as being required) go ahead to the mutual benefit of WCRP (through CLIVAR) and IGBP (through JGOFS and new ocean biogeochemistry programmes). A recent communication on the Global Hydrography Initiative is given in APPENDICES 23.

4.4. POGO (Partnership for Observation of the Global Oceans)

Following Field’s presentation on the future of ocean biogeochemistry (see §5.2), Ducklow asked Field for a brief report and update on POGO, as he chaired the recent Biology Workshop for POGO. Details of the workshop are highlighted in POGO activity report (APPENDIX 24). For further information, please visit the website: [www.sioworld.ucsd.edu/pogo.html](http://www.sioworld.ucsd.edu/pogo.html).

5. NATIONAL PROGRAMMES

National chairs and contacts provided the following national reports before the meeting. Unfortunately, time did not allow for any oral presentation during the SSC meeting. Reports are provided here as part of the record.

5.1. United States (Abbott)

1) Field Work: Field programmes continue at the Time Series Stations located near Bermuda and Hawaii. A workshop on time series research will be held at the Bermuda Biological Research Station in September 2001.


A second Southern Ocean volume is in press, a third Southern Ocean volume is presently soliciting manuscripts, and a fifth Arabian Sea issue is in preparation. The US-JGOFS Newsletter (USJN) is published four times per year and distributed to approximately 1800 scientists, program managers, policy makers and educational centers. A searchable subject index for past issues is maintained on the US JGOFS web site and new issues are available on line in PDF format.

3) Steering Committee Activities: The SC is continuing to focus on management of the Time-Series Stations and the US JGOFS Data Management Office (DMO), oversight of the Synthesis and Modeling Program (SMP). The SC convened last in February 2000, and will meet again 16-18 October 2001 in Woods Hole.
4) Synthesis and Modeling Program: Principal investigators of the Synthesis and Modeling Program (SMP) held their annual workshop in at the Woods Hole Oceanographic Institution in July 2000. The next SMP workshop is planned for 16-20 July 2001. A topical workshop on marine calcification was recently held at WHOI (6-8 June 2001) and another topical workshop on iron dynamics is planned for 19-21 September 2001 in Monterey, California. Results from SMP research and standard data sets are now being delivered using the SMP/Live Access Server, which can be accessed via the US-JGOFS web site.

5) Research Opportunities: The US National Science Foundation anticipates issuing one more Announcement of Opportunity (August 2001) for proposals to carry out research in support of the Synthesis and Modeling Program. This represents the final opportunity to obtain support from the US NSF for US JGOFS research. NASA will be announcing the results of its first Carbon Cycle Science solicitation shortly. The NASA program includes ocean, land, and atmosphere studies of carbon cycling.

6) Public Outreach: US JGOFS has two "legacy documents" highlighting US JGOFS achievements. The first is a brochure designed for the general public, which can be ordered from http://usjgofs.whoi.edu. Over 4000 copies of this brochure have already been distributed worldwide. The second is a series of articles designed for non-JGOFS scientists that will appear in Oceanography (published by The Oceanography Society) in November 2001. Manuscripts for this special issue are presently being reviewed. The US JGOFS web site has been completely redesigned to make it easier for JGOFS and non-JGOFS researchers to learn about US JGOFS activities and locate data sets.

7) Open Science Conference: US JGOFS is planning to host the next JGOFS Open Science Conference, 5-8 May 2003 in Washington DC, to coincide the completion of the JGOFS funding cycle in the US. The conference will be held at the facilities of the US National Academy of Sciences. Planning has begun for this conference. Suggestions for special sessions, speakers, and activities are welcome! Public lectures in collaboration with the Smithsonian Institution are being considered. International participation is essential to the success of this conference.

8) Future Carbon Cycle Science Programs: Research agencies in the US have begun active discussions and planning for continuing research on carbon cycle processes, including land, atmosphere, and ocean. US JGOFS researchers are active participants in these planning activities.

9) Ocean Color Satellites: the US National Aeronautics and Space Administration (NASA) are presently considering the continued operation of SeaWiFS. SeaWiFS is providing essential benchmark measurements critical for other ocean color sensors, such as MODIS, GLI, and MERIS.

5.2. Germany (Lochte)

German JGOFS continues to carry out synthesis and modelling activities in the Arabian Sea and in the North Atlantic Ocean. The German Ministry of Research funds these two projects for two years until end of 2002 and summer 2003, respectively. In both cases, the emphasis is on analysing the data from the previous field studies and on bringing together the results of many different groups in order to achieve a synthesis of main driving processes and to improve the coupled biogeochemical models. Data archiving for long-term stewardship is another main aim of both projects. The Alfred-Wegener Institute coordinates the Southern Ocean JGOFS activities in Germany. An iron fertilisation experiment (EISENEX) was carried out with R/V Polarstern with international participation. The results supported the earlier SOIREE study and more detailed analyses were carried out in the EISENEX study promising interesting new insights. A further iron enrichment experiment is presently planned.

5.3. China-Taipei (Gong)

Taiwan has been actively engaged in research related to the Joint Global Ocean Flux Study (JGOFS) since 1989. The major contribution of Taiwan to JGOFS was the Kuroshio Edge Exchange Processes (KEEP) project, which ended in July 2000. A special issue of the Continental Shelf Research on KEEP was published as the initial product of the synthesis effort of KEEP (Wong et al., 2000). The outcome
of KEEP along with other contemporary biogeochemical studies on continental margins have drawn global attention as to raise the issue that the continental margin carbon fluxes are significant in the global carbon cycle (Liu et al., 2000a,b).

While the JGOFS has entered the synthesis stage, oceanographers on Taiwan continue to organize new projects for the ocean biogeochemistry related to Global Change Research. Three new projects are emerging: the Long-term Observation & Research of the East China Sea (LORECS), the South China Sea Integrated Biogeochemical Experiment (SIBEX) and the South-East Asia Time-series Station (SEATS). The goal of LORECS is to investigate the biogeochemical processes in the ECS that lead to uptake of anthropogenic CO$_2$ and to detect the likely changes resulting from damming of the Changjiang (previously the Yangtze River) in the future. The goal of SIBEX is to study major biogeochemical processes and the food webs of the South China Sea. The goal of SEATS is to understand the upper ocean dynamics and biogeochemical fluxes in the water column at a time-series station in the South China Sea in response to different physical forcings, from monsoon to El Niño events.

5.4. Japan (Saino)

The JGOFS North Pacific Process Study (NPPS), for which JGOFS-Japan took a major part, completed its phase of intensive field observations in March 2000. Some of the sub-programmes of the North Pacific Process Study, e.g., CREST-KNOT (Kyodo North Pacific Ocean Time Series) observation, SAGE (Sub Arctic Gyre Experiment), CREST-Okhotsk Sea programme (Air-Sea-Ice Interaction), West-COSMIC (CO$_2$ dumping assessment), are still on-going. In addition to those, the GCMAPS (Global Carbon Cycle Mapping) programme is conducting field survey in the western equatorial Pacific. Some of the results from the NPPS are submitted to the Deep-Sea Research II special volume on the North Pacific Biogeochemical Processes, to be published in June 2002.

The National Committee of JGOFS was re-organized in October 2000. The chairmanship of Nobuhiko Handa (Aichi Prefectural University) was taken over by Toshiro Saino, and Yukihiro Nojiri (National Institute for Environmental Studies, Tsukuba) was appointed as a new chair of the Data Management Advisory Group. New committee members’ term is from October 2000 through September 2003. The committee has met twice and determined its objectives. Those are 1) to lead the synthesis phase of the Japanese JGOFS North Pacific Process Study, 2) to promote management and archiving of the data not only obtained in the NPPS, but also historical data utilized in the synthesis studies, and 3) to establish a national plan for the future ocean biogeochemistry study in conjunction with national committees for LOICZ, GLOBEC, and newly established committee for SOLAS. The National Committee for SOLAS was established in November 2000. Chairman is Mitsuo Uematsu (Ocean Research Institute, Univ. Tokyo) and some of the members are shared with the JGOFS Committee. It is planned that the draft report be completed by the end of March 2002.

JGOFS Japan is working closely with PICES. Yukihiro Nojiri serves as a member of PICES WG13 on CO$_2$ data integration. A PICES CO$_2$ Data Integration Implementation Workshop will be held in Tokyo from July 31 to August 2, 2001. Nojiri also leads a working group named IJCD (Inventory for Japanese Chemical-oceanographic Data) whose member are comprised of data originators in most of the major organisations, data managers of JODC, and scientists of Marine Information Research Centre associated with JODC. Now, a test web site is established at MIRC (www.mirc.jha.or.jp/).

5.5. Chile (Quiñones)

The activities of JGOFS-Chile can be classified in three major periods: 1991-1997, 1997-2000, 2000-to date. In what follows, a brief description of each of the periods is given:

1991-1997

Funded mostly by the project "Marine Natural Resources: JGOFS/SAREC" (Swedish Agency for Research Cooperation), the JGOFS-Chile Programme started in 1991. The study site was located offshore Coquimbo (central-north Chile, 30°S) and included the mooring of deep sediment traps and current meters. These moorings and its time-series have been kept until today. Biogeochemical
intensive studies were conducted mostly on 15 short cruises (about one week each). This is also the period when JGOFS-Chile has a well-structured organization with periodic meetings and some funding for organizational matters. It is important to note that these activities were essential in triggering the higher levels of funding obtained in the next period.

2) 1997-2000
This period is characterized by the Chilean-government funding of two major research programmes. Both programmes were affiliated to JGOFS-Chile.

a) Primary production and its fate in the pelagic food web and ocean-atmosphere CO$_2$ exchange in the upwelling ecosystem of Antofagasta. Grant SECTORIAL/FONDECYT 5960002-96 (CONICYT, Chile). Total Funds: US$350.000. Duration: 2 years.

This multidisciplinary grant conducted two major cruises fully dedicated to the study of biogeochemical processes (January 1997, July 1998) in the Antofagasta area (23°S). Measurements never conducted before in the Humboldt Current System were implemented such as pCO2 and DOC measurements.

b) FONDAP-Humboldt Programme “Circulation and Physical-Biological Interactions in the Humboldt Current System (HCS) and their Impact upon Regional Biogeochemical Cycling” (CONICYT, Chile). Total Funds: US$ 1.5 Million. Duration 3 years.

The FONDAP-Humboldt Programme is the bigger grant ever funded by the Chilean Government to conduct basic oceanography. Major improvements in equipment were attained. A total of over 35 cruises of different duration, including four major ones, were conducted. Intensive process studies took place off Concepción (37°S) and Iquique (20°S). The FONDAP-Humboldt Programme produced already 40 published papers, 19 in press, 28 in review and 29 in preparation. All of them destined to main international journals (ISI). This grant included, in addition to pelagic research, an important benthic component. The FONDAP-Humboldt Programme was also connected to international GLOBEC.

During this period, the knowledge on the biogeochemistry and physical oceanography of the Humboldt Current System has improved tremendously. Nevertheless, the IGBP-related programmes in Chile did not have financial support for organizational matters. In addition, the small JGOFS-Chile community was “fully loaded” with field programmes, and accordingly, the JGOFS-Chile Programme is characterized in this period by a “loose” organizational structure.

3) 2000-2003
After the end of the FONDAP-Humboldt Programme (September 2000), the JGOFS-Chile Programme has kept field programmes based on three grants funded by CONICYT (Chile) to individual researchers (see below). In addition, a proposal for a new major FONDAP-Programme in oceanography was sent to CONICYT in April 2001. It is expected that a final decision about this proposal will be taken by CONICYT in October 2001.

On the other hand, R. Quiñones is conducting exploratory conversations with CONICYT authorities to obtain some basic funding for organizational matters related to the coordination of the Chilean oceanographic contribution to IGBP Projects (i.e., JGOFS, GLOBEC, LOICZ). It is expected that this initiative could provide the needed umbrella not only for improving JGOFS-Chile organization but also for stimulating Chilean incorporation into the new international initiatives related to marine biogeochemistry.

Grants affiliated with JGOFS-Chile, 2001-2003
Decomposition of organic matter in the water column: The role of bacteria and zooplankton in modifying chemical structure and fluxes in the oxygen minimum zone (OMZ) off Chile. Principal Investigator: Silvio Pantoja, Co-PI: Humberto González (Austral University of Chile, Valdivia). Duration: 2000-2003, Funding Agency: Fondecyt Grant Nº1000366 (CONICYT, Chile), Total: US$ 140000.

Eastern Pacific Consortium for Research on Global Change (Note: The Consortium includes scientists from Chile, Peru, Ecuador, Colombia, Costa Rica, Mexico, United States, and Canada. It is also connected to GLOBEC), Principal Investigator: Timothy R. Baumgartner (CICESE. Mexico), Co-PI’s (Chile): Giovanni Daneri (University of the Sea, Valparaíso), Renato Quiñones (University of Concepción, Concepción), Osvaldo Ulloa (University of Concepción, Concepción), Duration: 1999-2003, Funding Agency: Inter-American Institute for Global Change Research, Total: US$800000.

5.6. Norway (Johannessen)

We are presently working on a synthesis of all work done in the Nordic Seas. There is an overview based upon work done. Most of the activities reflected in this work is based upon our cooperation with other countries as well and can for this reason not be stated as a Norwegian activity. Most of the funding for studies of biogeochemistry in Norway comes from the EU funding system. During the fall, we hope to have a synthesis ready that covers the whole Nordic Seas and will include the new TRACTOR work. For an overview of the Norwegian activities, please find the following references that can be used as a guide for the present status. There are more papers from other scientists as well were my name is not included. I think that Baliño before she left the JGOFS IPO has an updated author list with these references. Of new activities to be announced is: New proposals to fund future studies in biogeochemistry and development of autonomous sensors have been sent to different funding agencies. This is as far as I can get before I leave for a short vacation. The joint WOCE/JGOFS/IOC workshop was a success.

5.7. Spain (Duarte)

The Spanish IGBP Committee has been recently reorganised (as of April 2001), with the aim of entering a more operative phase after a period of inactivity and a past period aimed at identifying the scientists within the country working on JGOFS-relevant issues.

A new subcommittee on Oceanic Programmes (JGOFS-GLOBEC-SOLAS) has been set up, with the following composition:
Subcomité Programas de Ecosistemas Marinos

Celia Marrasé (coordinator - Chair)
Institut de Ciencies del Mar (CSIC)
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Javier Ruiz
Departamento de Biologia y Ecología
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Instituto de Investigacions Mariñas (CSIC)
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Antonio Bode Riestra
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Fax 34 981-229077

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Where Carlos M. Duarte acts de oficio, as President of the Spanish IGBP Committee. Celia Marrasé is an active member of the IGBP community (member of scientific committee of GLOBEC, and member of the SCOR/IGBP Planning Committee on the Future of Ocean Biogeochemistry Research), and should be able to lead the committee through fruitful avenues.

A web page has been set up, although still under construction, where information on Spanish JGOFS activities is to be found at: [www.eeza.csic.es/igbp/default.htm](http://www.eeza.csic.es/igbp/default.htm). Including a report, in Spanish, of JGOFS-like activities, capacities, expenditure, and plans at [www.eeza.csic.es/igbp/actividades2.htm](http://www.eeza.csic.es/igbp/actividades2.htm).

The list of JGOFS-relevant Spanish and European projects, along with the PI’s involved has been updated and is attached below. Items for future action include: a Spanish IGBP Newsletter, which will include a monographic issue on JGOFS activities in Spain, and the development of research infrastructure, such as a oceanographic data centre, which is presently lacking in Spain.

### 5.8. China-Beijing (Hong)

For JGOFS/LOICZ, Natural Science Foundation of China (NSFC) funded three projects in the East China Sea (ECS), South China Sea (SCS) and the Taiwan Strait, respectively. Among them, two have ended, while that of SCS is still going on.

The East China Sea (ECS): “Land-Ocean Margin processes in the ECS and environmental effects” is the first important project on ocean-continent interaction done by the Science Institute of China. This project incorporates field investigation, information collection, data arrangement and analysis, land-based laboratory experiments, numerical modelling and theoretical study. Twenty-one papers as well as one monograph have been published.

Here are some results. The temporal variability of DIN and DIP in the Yangtze River since the 1960’s has been shown through this research to be closely coupled with fertilization in this drainage area. This study is the first to reveal this link. Through this research, formation mechanisms of the sludge areas in both the region offshore Zhejiang and the Okinawa Trough have been put forward. It is suggested that the sludge in the Okinawa Trough comes mainly from the old Yellow River estuary in northern Jiangsu. In addition, field observations taking place during this study have provided, for the first time, a boundary location representing primary productivity limitation factor near the Yangtze River estuary in spring and autumn. The numerical model shows that there is an elliptic cyclonic circumfluence to the west of the Kuroshio current and an anti-clockwise mesoscale eddy in the northern part of the Taiwan Strait during autumn, winter and spring. The results of numerical modelling of sediment transport in the ECS are relatively consistent with the observed distribution of suspended material and surface sediments in the Yellow Sea and the ECS. This field data further validates the theoretical model, which hypothesises that the sludge in the Okinawa Trough is mainly formed due to the vertical circumfluence driven by wind in winter. A concept model is now put forth, showing that the distribution of suspended material in the cold eddy area in the ECS is closely connected with upwelling and downwelling. Sample analysis shows that the Taiwan warm current invades north with the strongest intensity in winter, a finding completely contrary to the reported conclusion that the invasion is strongest in summer. It is
pointed out that the anoxia in Pearl River Estuary bottom water is a potential danger, which may be described as a “chemical time bomb”.

The South China Sea: The project “Biogeochemical Carbon Cycling in the Pearl River Estuary and South China Sea” is run by the Environmental Science Research Centre (ESRC), Xiamen University. The main emphasis of this project is to look at carbon dynamics within this region and to investigate the interaction between the biological, physical and chemical influences on these processes. One goal of this project is to be able to elucidate the fate of carbon within the Pearl River Estuary and the surrounding coastal region. This is in part dependent on the rate of particle sinking, the remineralisation of particulate to dissolved species as well as the flocculation of dissolved organic matter (DOM) to particles. The cycling between dissolved organic carbon (DOC), colloidal organic carbon (COC) and particulate organic carbon (POC) is being investigated, as well as air-sea carbon transfer rates. In addition, the link between nutrient dynamics and primary production is being investigated in order to gain insight into the important influence on carbon cycling within the region. Remote sensing is used as a tool to study the chlorophyll-a distribution in this area. Data collected through remote sensing will be used in conjunction with discrete samples and fluorometric data gathered on research cruises. Projects on these cruises have utilized isotopes as tracers in order to quantify sources of organic carbon, export rates and biogenic cycling rates. The group is also focusing on transformation rates between dissolved inorganic carbon (DIC), COC and DOC, in order to further investigate Carbon cycling in the region. The ultimate goal of this ambitious project is to create a model of biogeochemical cycling for this region.

Two research cruises have taken place; one in July-August 2000 and the second in May-June 2001. These two investigations have involved collaborations between the ESRC and the Fujian Province Oceanographic Institute, as well as the Ocean Research Centre of Taibei University. Collaborators from the University of Georgia, USA and the University of Massachusetts, USA, have also participated in this project. A third cruise is scheduled to take place in December 2001, in order to gain seasonal data, thus providing a more comprehensive view of these processes.

Data completed to date includes the measurement of DOC concentrations from samples collected along transects from the mouth of the Pearl River to offshore stations, as well as water column profiles taken at offshore stations, from surface waters to depths of 300 meters. In addition, data has been analysed in order to study the spatial distribution of chromophoric material within the estuary and coastal area, the picoplankton dynamics within the Pearl River Estuary and South China Sea, nutrient dynamics as well as DIC and Dissolved Oxygen levels. Further samples have been processed in order to measure natural levels of Thorium within the water column. Those Thorium data are critical in determining the cycling rates of dissolved, particulate and colloidal carbon.

Taiwan Strait: A NSFC key programme, “Study of Biogeochemical Processes of Bioactive Elements in the Taiwan Strait” was also done by the Environmental Science Research Centre (ESRC), Xiamen University. During three cruises from 1997 to 1998, it was found that occurred some irregular marine hydrodynamic changes and responsive signals of relevant biological and chemical factors, as well as variations in fishery resources. Because the period of this study represents an ENSO year, it may be worthwhile to investigate the connections between marine eco-environmental changes and ENSO event.

(1) Coastal upwelling weakening in summer 1997: During the investigation in August 1997, it was found that southern coastal upwelling within the Taiwan Strait, especially around Nan’ao Island, was much weaker than that observed in this region during the same time in past years, such as August 1988 and 1994. Similarly, areas of surface high-temperature, and-low-salinity water were smaller than those in August 1988 and 1994, and surface water temperature in the upwelling region, at 26°C, was 3 degrees higher than that measured in August 1988. Studies of plankton indicator species also provide evidence to support the observed changes in upwelling intensity. Moreover, measured nutrient levels were found to be generally lower than those during the same season in previous years. The supplement from upwelling and coastal water seems decreasing.
Because the summer coastal upwelling in the Taiwan Strait is mainly driven by monsoon, the strength of upwelling is correlated with the Southwest monsoon. It is widely presumed that the 1997 El Niño served to weaken the Chinese monsoon, to increase surface seawater temperature, to decrease the frequencies of typhoons, and to decrease river runoff. So, we are left with the question: “Are the observed weakening of coastal upwelling and that of influences of dilution water in this region, some reflections of the El Niño irregularity during the same periods?”

(2) Warm water input in winter 1998 and its ecological impacts: In the winter 1998, the input of Kuroshio water to the Strait was greater than that in the past, so that 18°C isotherm moved north to about 26°N. Satellite Sea Surface Temperature data (AVHRR SST) also show warm water moving north and steadily strengthening during mid-February to mid-March. Nutrient concentration levels were also found to be much lower than those of the same time period in 1995. For example, in the North-central region of the Strait, surface phosphate concentration was measured at roughly 0.2 mg m⁻³, while the concentration in the same location and time period in 1995 is 0.5 mg m⁻³.

SeaWiFS images from March 27 1998 show telemetric Chl α values generally less than 1 mg/m³ over the entire eastern Taiwan Strait. And these images clearly show paths through which oligotrophic warm water current flowing from the North-east South China Sea through Peng-Hu water passage into the southern Taiwan Strait, where telemetric Chl α is at less than 0.2 mg m⁻³.

Variations of plankton size-fraction and zooplankton species also show a strong warm water input. In brief, the intensity of Kuroshio water input into this sea area is out of the ordinary. Corresponding chemical and biological factors are different from the usual either. These may be related to the El Niño event during 1997 to 1998 and the winter monsoon weakening.

(3) Low-temperature, high-salinity water distributes wider in summer 1998: Underway CTD observations show an inverse relationship between water temperature and salinity, with water temperature low in the west and high in the east, while salinity low in the east and high in the west. Furthermore, three obvious low-temperature, high-salinity areas along the coast were observed.

Northeastern areas of Taiwan shallow are relatively easy to be defined as a low-temperature, high-salinity region, where temperature < 26°C and salinity > 34. Compared with past studies of coastal upwelling in this region, our result shows more significant T–S gradient over the whole marine area, as well as more obvious phenomena of low-temperature, high-salinity in the coastal area. These may be related to enhanced southwest monsoon and northward warm current caused by El Niño decline and La Niña arising during the period of investigation.

The variation of marine eco-environment may affect primary production and introduce changes in the biotic population structure as well. For example, pico-plankton abundance and individual abundances of three categories of the pico-plankton within the Strait were all higher during summer 1998 than during summer 1997.

All these variations in marine environmental conditions in the Taiwan Strait during 1997 to 1998, as well as associated changes in ecological processes, probably had somehow teleconnection with global ENSO events, that needs to be further explored in the future.

5.8.1. Activity Report (Hu)
The Chinese Committee for JGOFS has been combined with LOICZ called Chinese LOICZ/JGOFS Committee since 1998. Annual Committee meeting took place with workshop.

Through the committee effort, LOICZ and JGOFS have become quite popular in China. The NFSC has funded JGOFS studies with its four Key Projects and a number of general projects since 1992. The Chinese Academy of Sciences (CAS) funded LOICZ research with its Major Project on LOICZ Study in China Seas from 1997 and its Innovation Project on LOICZ study from 2000.
Within CAS, scientists are proposing a big CAS programme on carbon cycle including the land and ocean surrounding now, as synthesis procedure.

Four books on LOICZ/JGOFS have been published (in Chinese):
Margin Flux in the East China Sea (D. Hu and S. Tsunogai, 1999)
Land-Ocean Interactions in Major Chinese Estuaries (J. Zhang et al., 2000)
Key Processes of Ocean Fluxes in the East China Sea (D. Hu et al., 2001)
Land-Ocean Interactions in the Yangtze, Pearl Estuaries and the Adjacent Area (D. Hu et al., 2001)

New findings and conclusions:
The East China Sea is a weak sink of atmospheric carbon dioxide, absorbing about 4.3 MtC from the atmosphere annually.

The mud in the Okinawa Trough is transported by wind-driven vertical circulation during wintertime, instead of summer and mainly from abandoned Yellow River mouth, instead of the Yangtze.

6. SCIENTIFIC STEERING COMMITTEE

6.1. Business Issues
Ducklow reviewed the terms of the at-large members and the chairs of the groups and teams (APPENDIX 25). He noted that 5 members (Anderson, Tilbrook, Falkowski, Hong and Wallace) were scheduled to rotate off the SSC this year and that all needed to be invited back as at-large member until the sunset date of 31 December 2003. He would decide on a replacement, if anyone elects to rotate off, pending the need(s) of JGOFS synthesis and modelling efforts. At this late time in the projects life span, Hanson suggested that JGOFS seeks sponsors’ approval to extend all at-large members to the sunset, regardless of the number of terms or time served. Following the response of the at-large members and assessment of JGOFS future needs, the Executives will seek sponsors’ approval of new members, and block extension of all at-large members to 31 December 2003.

6.2. Other Matters Arising: Executive and SSC Meetings
Ducklow summarised the plans for the remaining SSC meetings (2002 and 2003). This year, the SSC is being held alongside the IGBP OSC in Amsterdam. As agreed in 2000, the 2002 SSC meeting will be held alongside a planned Training Course on ocean biogeochemistry in Concepción, Chile, during the austral spring (September-November). Quiñones will host and organise the meeting and training course.

Because of the long period between SSC meetings (summer 2001 and austral spring 2002), Ducklow suggested that SSC members attending the AGU/ASLO OSM in February 2002 meet with the 3rd JGOFS OSC Planning Committees and assist with the organisation of the final OSC in Washington DC, 5-8 May 2003. He also suggested that the final SSC meeting would be held alongside the 3rd JGOFS OSC. The committee agreed to hold the final SSC meeting in Washington DC along the final Open Science Conference.

Because of other obligations, the Executive meeting will not be held this year. Ducklow also announced that Lochte has resigned from the Executive Committee due to new responsibilities at the University of Kiel and internationally (SC-IGBP), and that he accepted her resignation with regrets and thanked her for her long service on the Executive Committee. In the spring 2001, Ducklow invited Véronique Garçon on the Executive Committee, and she kindly accepted. With departure of Lochte off and acceptance of Garçon on the Executives, Ducklow plans to select a new Vice-Chair after of the SSC meeting.

7. INTERNATIONAL PROJECT OFFICE
Since the last report, Hanson reported that the Office staff focused considerable effort and time in the support of SSC synthesis activities, such as travel support for 2000/01 meetings, publication of the AMBIO article (May 2001) and the IGBP Science Series No. 2 (July 2001), assistance with the Springer-Verlag textbook (expected publication date is summer 2002), production of two posters and
presentations at the IGBP Open Science Conference (Amsterdam) and printing several JGOFS Reports. The latter two items will be placed on online at the JGOFS web site for easy access to information and downloading of figures and illustrations. Printed copies are also available. The Springer-Verlag book expenses for 2001 are estimated at US$28K and remaining ICSU funds will go to cover the publication cost of the AMBIO article and support new global synthesis activities. He also reported that the Office staff has changed, as many of you aware. Beatriz Baliño moved to the Bjerknes Centre for Climate Research at the University of Bergen, Norway, as the new project coordinator for the Centre, and a search for a new Assistant Executive Officer in February 2001 was successfully completed in March this year. The new Assistant EO is Dr. Bernard Avril from France. The Office also hired a half time financial officer, Ms. Reidun Gjerde, to assist Judy Stokke, who has returned half time after an extended illness. Ducklow welcomed Avril and Gjerde to their first JGOFS SSC meeting.

7.1. Data Management Activities (Avril)

As JGOFS completes the synthesis phase, the Data Management Task Team (DMTT) and the JGOFS International Project Office (IPO) are in the process of documenting and compiling all data collected under the JGOFS umbrella. Avril has taken over the work started by Baliño and the DMTT, in compiling all JGOFS research projects and cruises from each contributing country since 1988. This inventory also includes aspects of national data management, i.e., the whereabouts and archival of JGOFS data collected during the fieldwork. This information will also assist the DMTT in their activities directed at securing the long-term stewardship of the JGOFS data sets. Avril is also building upon the metadata catalogue started by Baliño of the datasets from those national activities lacking data management support. The metadata will be archived in the Global Change Master Directory (GCMD) at NASA. The steering committee and project office has given high priority to building this catalogue. The ultimate purpose is to provide scientists with a comprehensive biogeochemical data set, in a common file and data format. The product is called the JGOFS Master Data Set, for use not only in current synthesis activities, but also as a JGOFS legacy for future global change studies. It is the responsibility of the DMTT and IPO to ensure the future availability and long-term archiving of these valuable data sets. It is planned that the Master Data Set will be deposited in the ICSU’s World Data Centres System. Principal investigators (and their institutions) who submit data will be given full credit for their data within the Master Data Set and will have priority access to it.

**ACTION:** Conkright and Avril will prepare a letter, signed by Ducklow, to request that all SSC members and National Contacts to help and assist the DMTT and IPO to develop and expand the international cruise inventory (data and metadata).

Since the JGOFS project began its final phase, the international JGOFS website ([www.uib.no/jgofs/jgofs.html](http://www.uib.no/jgofs/jgofs.html)) is currently being revised, updated and formatted with two main concerns in mind: first, to be more directly useful to all within and outside the JGOFS community at the present time, and second, when JGOFS will come to an end, to facilitate the forthcoming handover of the website to the IGBP secretariat with minimal support needed in the future.

The Norwegian JGOFS database project, fostered by the IPO and financed by the Research Council of Norway, continues with the aim to centralise all JGOFS data gathered by Norway at the Institute of Marine Research (IMR) and further publication on CD-ROM. Quality-controlled data sets derived from JGOFS-Norway research in the Nordic Seas since 1990 will be archived in a database developed by IMR. Datasets to be included are from the following projects: Carbon profiles in the Nordic Seas (CARNOR); Carbon dioxide and deep water formation circulation in the Nordic Seas (CARDEEP); the carbon cycle in the Greenland Sea from ESOP-2; Carbon Time-Series in the Norwegian Sea at Station M and the Norwegian contribution to Continental Margins Studies (OMEX I). A steering group supervises the database project with representatives from IMR, the Norwegian JGOFS Committee and the IPO. Avril will assist Baliño and IMR in the collection of those datasets.

7.2. Review Budget and Expenses (Hanson)

In Year 2000, Hanson reported that the project completed an operating budget from the Research Council of Norway (NRC), SCOR, University of Bergen (UiB) and IGBP of US$328,955 (APPENDIX
Total expenses were US$308,754 (This figure is exclusive of the Open Science Conference in Bergen, which costs US$167,000). A budget excess of US$20,201 resulted from holding the SSC alongside of the JGOFS OSC, which encumbered some SSC expenses, and several groups and task teams secured significant cost sharing in holding meetings, particularly the DMTT and SOSG in 2000. Project funds covered administration costs, overheads for the project and facilities, publications, committee and group meetings, workshops and symposia.

In Year 2001, Hanson reported that the project funds from NRC, SCOR, IOC, ICSU, UiB, and IGBP, including the carry over of Year 2000 assets, totalled US$437,346 (APPENDIX 27). With changes in project activities, such as the cancellation of the JGTT Workshop, cost reduction of the CO2 Transport Workshop and other activities, the expected expenditure for Year 2001 is US$437,108. As of July 2001, the balance is US$238 and remaining funds will be carried over to Year 2002.

Hanson reported that Year 2002 requests for JGOFS support exceed present allocations for Year 2002 from NRC, SCOR, UiB and IGBP (APPENDIX 28). He reviewed and summarised the budgetary impact of all requests made during the SSC meeting. The SSC decided on the final priorities for 2002 fund allocations. After the 2001 budget is closed, the Executives will make the necessary allocations and adjustments to balance the 2002 budget.

8. OTHER BUSINESS

Ducklow asked for any other new or old business items. None were offered.

8.1. Next SSC Meeting

Ducklow reminded everyone that the venue for the 17th JGOFS SSC meeting is in Concepción, Chile. In 2000, Quiñones offered to host the SSC meeting alongside of the training course/workshop in Chile. The best time is during the austral spring (September-October 2002). Past SSC meetings were held in Bergen, Norway (2000), Yokohama, Japan (1999), Cape Town, South Africa (1998), Oban, Scotland (1997), and Bad Münstereifel, Germany (1996). It is now time to return to the Southern Hemisphere, again before JGOFS shuts down. In May 2003, the 18th and final JGOFS SSC Meeting will held alongside the final Open Science Conference in Washington DC, USA.

9. MEETING ADJOUNES

Ducklow thanked all those attending the meeting and how he valued and appreciated their input during the discussions. He closed the meeting at 1600 on Sunday, 8 July 2001. Following the SSC meeting, the Executives met immediately to wrap up any unfinished business from the meeting.
10. ACRONYMS

AESOPS – Antarctic Environment Southern Ocean Process Study –
www.usjgofs.whoi.edu/research/aesops.html

AGU – American Geophysical Union – www.agu.org

AMT – Atlantic Meridional Transect – www.npm.ac.uk/amt/index.htm

ARGO – Array for Real-time Geostrophic Oceanography – www.argo.ucsd.edu/

ASLO – American Society of Limnology and Oceanography – www.aslo.org/

AVHRR – Advanced Very High Resolution Radiometer –
www.ngdc.noaa.gov/seg/globsys/avhrr.shtml

AWI – Alfred-Wegener Institute for Polar and Marine Research –
http://www.awi-bremerhaven.de/

BATS – Bermuda Atlantic Time-series Study – www.bbsr.edu/cintoo/bats/bats.html

BOBPS – Bay of Bengal Process Studies – www.indian-ocean.org/bobps/bobps.htm

CARDEEP – Carbon dioxide Cycles and Deep Water Formation in the Greenland and Norwegian Seas

CARNOR – Carbon profiles in the Nordic Seas

CAS – Chinese Academy of Sciences – www.cas.ac.cn

CBD – UN Convention on Biological Diversity – www.biodiv.org

CDIAC – Carbon Dioxide Information Analysis Center – www.cdiac.esd.ornl.gov

CEOS – Committee on Earth Observation Satellites – www.ceos.org

CICESE – Centro de Investigación Científica y de Educación Superior de Ensenada – www.cicese.mx

CJP – Carbon Joint Project – www.gaim.sr.unh.edu/cjp

CLIVAR – Programme on Climate Variability and Predictability – www.clivar.org

CMMACS – Centre for Mathematical Modelling and Computer Simulation – www.cmmacs.ernet.in

CMTT – Joint JGOFS/LOICZ Continental Margin Task Team – www.ncor.ntu.edu.tw/cmtt


CNRS – Centre National de la Recherche Scientifique – www.cnrs.fr

COASTS – Coastal Ocean Advanced Scientific and Technical Studies –
www.ioc.unesco.org/icam/coasts.htm

COC – colloidal organic carbon

CONICYT – Comisión Nacional de Investigación Científica y Tecnológica – www.conicyt.cl

COOP – Coastal Ocean Observations Panel –
www.ioc.unesco.org/goos/COOP.htm,
www.skiop.peatm.net/coop

CREST – Core Research for Evolutionary Science and Technology –
www.jst.go.jp/jst/crest-e.htm

CSIC – Consejo Superior de Investigaciones Científicas –
www.csic.es

CSIRO – Commonwealth Scientific and Industrial Research Organization – www.csiro.au

DIC – dissolved inorganic carbon

DIVERSITAS – International Programme of Biodiversity Science – www.ctsu.org/DIVERSITAS

DMS – Dimethyl Sulphide

DMTT – Data Management Task Team

DOC – dissolved organic carbon


EBC – Eastern Boundary Current

EISENEX – Second Iron Enrichment Experiment –
www.awi-bremerhaven.de/Biomeer/eisenex-e.html

EPSG – Equatorial Pacific Synthesis and Modelling Group

ESOP – Thermohaline Circulation in the Greenland Sea –
www.smr.uib.no

ESRC – Environmental Science Research Centre –
www.ois.xmu.edu.cn/oc/eng/igjz3.htm

FONDAP – Fondos de Estudios Avanzados en Areas Prioritarias –
www.conicyt.cl/fondap

FONDECYT – Fonl Nacional de Desarrollo Científico y Tecnológico –
www.conicyt.cl/fondecyt

GAIM – Global Analysis, Integration and Modelling –
www.gaim.unh.edu/

GCM – General Circulation Model

GCMAPS – Global Carbon Cycle and related Mapping based on Satellite imagery

GCMCD – Global Change Master Directory –
www.gcmd.gsfc.nasa.gov/

GCOS – Global Climate Observing System –
www.wmo.ch/web/gcos/gcoshome.html

GCTE – Global Change and Terrestrial Ecosystems –
www.gcte.org

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GED – Global Ecosystem Dynamics
GEF – Global Environment Facility – wwwgefweb.org/
GEOHAB – Global Ecology and Oceanography of Harmful Algal Blooms –
www.ioc.unesco.org/hab/GEOHAB.htm
GFDL – Geophysical Fluid Dynamics Laboratory – www.gfdl.gov
GLOBEC – Global Ocean Ecosystem Dynamics – www.pml.ac.uk/globec
GOOS – Global Ocean Observing System – www.ioc.unesco.org/goos
GSWG – Global Synthesis and Modelling Working Group
HNLC – High Nutrient Low Chlorophyll
HOT – Hawaii Ocean Time series station – hahaha.soest.hawaii.edu/hot/hot_jgofs.html
IABO – International Association of Biological Oceanography
IAPSO – International Association for the Physical Sciences of the Oceans – www.olympus.net/IAPSO
ICES – International Council for the Exploration of the Sea – www.ices.dk/
I-GOOS – Intergovernmental IOC-WMO-UNEP Committee for GOOS –
www.ioc.unesco.org/goos/i_goos.htm
IHDP – International Human Dimensions Programme on Global Environmental Change –
www.ihdp.org
IMAGES – International Marine Global Change Study – www.images.pclab.ifg.uni-kiel.de/start.html
IMR – Institute of Marine Research – www.imr.no
IODE – International Oceanographic Data and Information Exchange – www.ioc.unesco.org/iode
IOSG – Indian Ocean Synthesis and Modelling Group
IPCC – Intergovernmental Panel on Climate Change (WMO-UNEP) – www.ipcc.ch
IPO – International Project Office – www.uib.no/jgofs/IPO_descript.html
IRD – Institut de recherche pour le développement – www.ird.fr
JAMSTEC – Japan Marine Science and Technology Center – www.jamstec.go.jp/jamstec-e/index-e.html
JGTT – Joint JGOFS-GAIM Ocean Carbon Modelling Task Team
JRC – Joint Research Centre – www.jrc.it
KNAW – Koninklijke Nederlandse Akademie van Wetenschappen – www.knaw.nl/
KNOT – Kyodo North Pacific Ocean Time Series
LOICZ – Land-Ocean Interactions in the Coastal Zone – www.nioz.nl/loicz
LORECS – Long-term Observation & Research of the East China Sea –
MAFLECS – Material Flux in the East China Sea
MASFLEX – East China Sea-Marginal Sea Flux Experiments in the West Pacific
11. APPENDICES

11.1. APPENDIX 1: List of Participants

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11.2. APPENDIX 2: Interim Report (USJN article)

As JGOFS draws to a close, its participants are focusing their attention on the synthesis of results from interdisciplinary field studies conducted over more than a decade in most of the major biogeochemical provinces of the global ocean. Over the last three years, various JGOFS planning and oversight groups have concentrated their efforts on synthesis at regional, program-wide and global levels.

At its annual meeting in Cape Town, South Africa, in April 1998, the members of the JGOFS Scientific Steering Committee (SSC) accepted responsibility for integrating regional synthesis and modelling activities and for maintaining links to other ocean observing programmes. The JGOFS planning groups responsible for coordinating field studies were transformed into regional synthesis groups responsible for encouraging data submission and sharing, meetings and publications and the development of regional biogeochemical ocean models.

Later that year JGOFS initiated a coordinated programme of synthesis at a workshop held at the Southampton Oceanography Centre in the United Kingdom. At that meeting, the JGOFS SSC under the leadership of then chairman Michael Fasham laid out a plan for international synthesis of JGOFS field observations and for participation in the program-level synthesis planned by the International Geosphere-Biosphere Programme along with other IGBP core projects.

At its annual meeting in Durham, New Hampshire, in October 2000, the executive committee of the JGOFS SSC assessed progress and plotted its course toward the final synthesis goals for the JGOFS concluding years. Figure 1 presents the overall structure of the JGOFS synthesis programme and some of its current and planned products.

As Figure 1 shows, the work is divided into three phases. The first of these covers the completion of regional and thematic syntheses by JGOFS synthesis groups. The second comprises program-wide synthesis events and activities that are designed to blend the products of the regional syntheses. The third is intended to focus on a global synthesis that will conclude JGOFS efforts to develop an integrated and quantitative understanding of the biogeochemical fluxes of carbon in the ocean and their role in the global carbon cycle.

JGOFS groups responsible for regional and/or disciplinary syntheses are the North Atlantic Synthesis Group (NASG), the Equatorial Pacific Synthesis Group (EPSG), the Indian Ocean Synthesis Group (IOSG), the Southern Ocean Synthesis Group (SOSG), the North Pacific Synthesis Group (NPSG), the Continental Margins Task Team (CMTT) and the Paleo-JGOFS Task Team (PJTT). Several of these groups are working on synthesis volumes or special issues of Deep-Sea Research Part II.

Other activities include a series of continental margins workshops on specific coastal systems like the Eastern and Western Boundary Currents, each to culminate in a book. This ambitious project is directed by the CMTT, which is a joint JGOFS and Land Ocean Interactions in the Coastal Zone (LOICZ) committee. This project is supported in part by an award from the International Oceanographic Commission (IOC), a valuable supplement to the core funding that the Scientific Committee on Oceanic Research (SCOR) provides to JGOFS for synthesis work.

Later this summer thematic synthesis will continue with a workshop on the transport of carbon dioxide (CO₂) in the ocean, to be held at Southampton Oceanography Centre. This event, hosted by the international project office of the World Ocean Circulation Experiment (WOCE), is a joint JGOFS/WOCE activity with additional financial support coming from IOC, NOAA, WCRP, and UK Global Environmental Committee (Royal Society). It is intended to build on WOCE results and on the global survey of CO₂ in the ocean, carried out by JGOFS scientists on WOCE Hydrographic Programme cruises. This workshop will launch a unique effort to blend diagnoses of ocean circulation with extensive analyses of ocean dissolved inorganic carbon to estimate intra- and inter-basin carbon transports.
Program-wide synthesis began at the Southampton Synthesis Workshop and was defined at the JGOFS open science conference "Ocean Biogeochemistry: A New Paradigm" in Bergen, Norway, in April 2000. Keynote speakers at the Bergen conference have submitted draft chapters for a book to be edited by Fasham and published by Springer-Verlag in the IGBP Global Change series in early 2002. As this article goes to press, most of the chapters have been or are being reviewed.

The Bergen conference attracted 218 participants from 27 countries and a large number of presentations and posters reporting on models and other synthesis projects. Even though few national JGOFS programmes have formal synthesis and modelling projects, the large turnout of such presentations in Bergen indicates that synthesis has become the intellectual core of JGOFS.

There are several other notable products of the program-wide synthesis phase. Two general JGOFS publications are coming out as part of the IGBP-wide synthesis effort. At its Southampton workshop, the SSC commissioned a number of JGOFS scientists to draft brief synthetic reports on the components of the program: its regional process studies, the CO₂ survey, remote sensing, the time-series programmes, data management and modelling.

A longer version, directed at the wider scientific audience, was published in May as a special report in AMBIO. A shorter version of the AMBIO report is being published as the second volume in the IGBP Science series. This version, intended for policymakers and the interested public, describes the operation and role of the ocean carbon cycle in global change. Both documents provide an in-depth summary of more than a decade of JGOFS research and lay the groundwork for planning new efforts in ocean biogeochemistry.

A final piece of the program-wide synthesis will be the third JGOFS open science conference, which will be hosted by the U.S. JGOFS Planning and Implementation Office. It will be held at the National Academy of Sciences in Washington, D.C., in May 2003. As with first and second conferences, a final book is expected and published by Springer-Verlag in the IGBP Global Change series.

A new synthesis group that is currently being formed under the leadership of Reiner Schlitzer of the Alfred-Wegener Institute for Polar Research, Bremerhaven, Germany, will lead the third phase of JGOFS synthesis activity. The idea for this group came out of discussions among JGOFS scientists attending the IGBP Global Carbon Cycle Synthesis Workshop in Durham, New Hampshire, last fall.

While exploring different ideas around which the JGOFS global synthesis could begin to focus, JGOFS executive committee member Robert Anderson of Lamont-Doherty Earth Observatory described a talk that Schlitzer had presented at the Southern Ocean Synthesis Workshop in Brest, France, last summer. Schlitzer showed the results of inverse solutions to a global model of ocean biogeochemistry, focusing on export production in the Southern Ocean.

The inverse solution Schlitzer described reproduces a very large data set of measurements of nutrients, CO₂ and oxygen in the full water column. Its representation of the distribution and magnitude of the export flux differs significantly, however, from that given by estimates of export derived from maps of primary productivity based on remote-sensing measurements and algorithms relating export and primary production.

Which set of maps is correct? In the sense that each is derived from and shows fidelity to one or more of the largest global biogeochemical datasets, they are both "right". The reasons why they do not agree are not obvious. JGOFS scientists decided that this problem was intriguing and certainly central to the original programme goals.

The JGOFS executive committee asked Schlitzer to consider chairing a new Global Synthesis Working Group (GSWG), whose initial charge would be to explore the problem of export in various global models. He agreed, and the newly constituted group will meet in July in connection with the IGBP Open Science Conference "Challenges of a Changing Earth" in Amsterdam, The Netherlands. Group
members are Reiner Schlitzer, Andreas Oschlies, Andrew Yool, Ed Laws, Gerhard Fischer, Mike Behrenfeld, Nicolas Gruber, Patrick Monfray, Richard Jahnke, Richard Matear, and Yasuhiro Yamanaka.

The GSWG will also work with the JGOFS Data Management Task Team (DMTT), which is responsible for amassing JGOFS data sets in national repositories and facilitating access to them and with the International Ocean Colour Coordinating Group (IOCCG). Another new task team has been formed jointly between JGOFS and another IGBP programme element, the Global Analysis, Integration and Modelling (GAIM) initiative, to support global synthesis efforts on ocean carbon modelling. The JGOFS-GAIM Task Team (JGTT) oversees the ongoing effort of the Ocean Carbon-cycle Model Intercomparison Project (OCMIP), which focuses on advancing the development of ocean biogeochemical models.

In closing, I want to stress another important JGOFS synthesis achievement. Recently we were asked by IGBP to identify JGOFS greatest achievements and failures during the past decade. The programme successfully carried out a series of large-scale, international and truly interdisciplinary process studies that incorporated physical, biological and geochemical observations.

As I write this, I am sailing into the northeast Atlantic on the British ship RRS Discovery to carry out a study of the transport of dissolved organic carbon and nitrogen with co-investigator Dennis Hansell of the University of Miami. The goal of the cruise, planned by Raymond Pollard and headed by John Allen of the Southampton Oceanography Centre, is to conduct a high-resolution study of the circulation and hydrography of the Iceland-Faroes-Shetland region.

Although this is in some sense a physical oceanography cruise, it includes substantial ecological and biogeochemical components. This sort of multidisciplinary cruise was not really possible before JGOFS. In the synthesis of physical, biological and chemical oceanography into ocean biogeochemistry, JGOFS has made its most enduring contribution to ocean science.

(USJN Editor's note: Hugh Ducklow, chairman of the JGOFS SSC, sent this report on May 6 from 54°N, 12°W.) 6/19/01, US JGOFS News 11, 2. International section with one figure.)
11.3. APPENDIX 3: Activity Calendar & Timeline (updated November 2001)

Year 2001

January 15-16  North Atlantic Synthesis Group Meeting, Arcachon, France. Contact: Véronique Garçon, Laboratoire d'Etudes en Géophysique et Océanographie Spatiales, Centre National de la Recherche Scientifique / CNES / UPS, 18 av Edouard Belin, F-31055 Toulouse Cedex, FRANCE, Tel. +33 5 6133 2957, Fax. +33 5 6125 3205, (PROOF Cost Share) (Completed)

March  JGOFS/GAIM Task Team on Ocean Carbon Modelling: Workshop on 3D Ocean modelling and analysis, Contact: Patrick Monfray, Laboratoire des Sciences du Climat et de l'Environnement, Centre National de la Recherche Scientifique / CEA / IPSL, Bât. 709, Orme des Merisiers, F-91191 Gif-sur-Yvette, FRANCE, Tel. +33 1 6908 7724, Fax. +33 1 6908 7716 (Deferred to 2002)

May 5-11  JGOFS/LOICZ/IOC Continental Margins Workshop III on Polar Margins, Institute of Ocean Sciences, B.C., Canada. Contact: Robie Macdonald, Institute of Ocean Sciences, Department of Fisheries and Oceanography, Canada, P.O. Box 6000, Sidney, B.C. V8L 4B2, CANADA, Tel. +1 250 363 6409, Fax. +1 250 363 6807 (Completed)

June 7-9  Indian Ocean Synthesis Group Meeting (closed), Miami, USA. Contact: Peter Burkill, Plymouth Marine Laboratory, Natural Environment Research Council, Prospect Place, West Hoe, Plymouth, PL1 3DH, UNITED KINGDOM, Tel. +44 175 263 3422, Fax. +44 175 263 3101, (Completed)

June 27-29  JGOFS/WOCE/IOC CO2 Transport Workshop, Southampton Oceanography Centre, Southampton, UK. Contact: Paul Robbins, Physical Oceanography Research Division, Scripps Institution of Oceanography, Mail Stop 0230, SIO/UCSD, 9500 Gilman Dr., La Jolla, CA 92093-0230, USA. Tel: (858) 534-6366, (Completed)

July 7-8  16th JGOFS Scientific Steering Committee Meeting, Amsterdam, the Netherlands. Contact: Roger Hanson, JGOFS International Project Office, University of Bergen, SMR, High Technology Centre, Post Box 7800, N-5020 Bergen, NORWAY, Tel. +47 5558 4244, Fax. +47 5558 9687, (Completed)

July 10-13  IGBP Open Science Conference, Amsterdam, the Netherlands. Theme: Challenges of a changing Earth. Contact CONGREX HOLLAND BV, P.O. Box 302, 1000 AH Amsterdam, The Netherlands, Tel: +31 20 504 0200, fax: +31 20 504 0225, Speaker: Professor David Karl, University of Hawaii (Completed)

Sept. 28-30  JGOFS/LOICZ/IOC Continental Margins Workshop II on Marginal Seas, Taipei, Taiwan, R.o.C.; International Symposium on Biogeochemical Fluxes in Marginal Seas and Tropical Coastal Zones, International Conference Centre (Taipei). Contact: Kon-Kee Liu, Institute of Oceanography, National Taiwan University, P.O. Box 23-13, Taipei 106, TAIWAN, R.o.C., Tel. +886 2 2363 1810, Fax. +886 2 2362 6092, (Completed)

October 21-28  Joint IAPSO-IABO Assembly, Mar del Plata, Argentina. An Ocean Odyssey. Symposium session. Contact: Hugh Ducklow, Virginia Institute of Marine Science, College of William and Mary, Route 1208-Greate Road, Box 1346, Gloucester Point, VA 23062-1346, USA, Tel. +1 804 684 7180, Fax. +1 804 684 7293, or Karin Lochte, FB Marine Biogeochemie, Institut für Meereskunde an der Universität Kiel, Düsternbrooker weg 20, D-24105 Kiel, GERMANY, Tel. +49 431 600 4250, Fax. +49 431 565 876 (Completed)
October 5-7 North Pacific Synthesis Group Meeting. Contact: Alexander Bychkov, North Pacific Marine Science Organization, c/o Institute of Ocean Sciences, 9860 West Saanich Road, P.O. Box 6000, Sidney B.C. V8L 4B2, CANADA, Tel. +1 250 363 6364, Fax. +1 250 363 6827, (Completed)

October Data Management Task Team, Business Meeting, Washington, DC. Contact: Margarita Conkright, Ocean Climate Laboratory, National Oceanographic Data Center / National Oceanic and Atmospheric Administration, 1315 East-West Highway, OC/5, Silver Spring, MD 20910, USA, Tel. +1 301 713 3290 ext. 193, Fax. +1 301 713 3303, (Cancelled)

Nov. 12-17 Paleo JGOFS Task Team Meeting. Contact: Karin Lochte, FB Marine Biogeochemie, Institut für Meereskunde an der Universität Kiel, Düsternbrooker weg 20, D-24105 Kiel, GERMANY, Tel. +49 431 600 4250, Fax. +49 431 565 876 (Completed)

Year 2002 (Meetings planned as of December 2001)

January 23-25, Southampton, UK. Continental Margin Task Team Workshop on Subpolar Regions. Contact: Jonathan Sharples, School of Ocean and Earth Science, Southampton Oceanography Centre, European Way, Southampton SO14 3ZH, United Kingdom. Tel. +44 23 8059 649; Fax +44 23 8059 3059

January 29-30, Washington DC, USA. Data Management Task Team Meeting. Contact: Margarita Conkright, Ocean Climate Laboratory, E/OC5, 1315 East-West Highway, Silver Spring, MD 20910, USA. Tel.: 1(301) 713-3290 ext 193, Fax: 1(301) 713-3303

February 11-15, Honolulu, HI, USA During the forthcoming 2002 Ocean Sciences Meeting organised by AGU and ASLO, special sessions or meetings are sponsored by JGOFS for the SOSC (OS04. The Cycle of Carbon in the Southern Ocean", chaired by Paul Tréguer, Ulrich Bathmann, Tom Trull, Phillip Boyd, and Stéphane Blain), the EPSG (Robert Le Borgne) and the NASG (Véronique Garçon).

April 22-26, Nice, France. During the forthcoming European Geophysical Society 27th General Assembly, a special session "OA8. Biogeochemistry of the carbon cycle of the Atlantic Ocean", chaired by W. Koeve, J. Aiken and V. Garçon is sponsored by JGOFS for the NASG.

May or June, Ispra, Italy. Joint Workshop of the Global Synthesis Working Group and JGOFS-GAIM Task Team on 3D Ocean Carbon Modelling and Analysis. Contacts: Reiner Schlitzer, Alfred Wegener Institute for Polar and Marine Research, Dept. of GeoSystem, P.O. Box 120161, D-27515 Bremerhaven, GERMANY, Tel. (49) 471 48311559, Fax. (49) 471 48311149; Patrick Monfray, Institut Pierre Simon Laplace, Laboratoire des Sciences du Climat et de l'Environnement, Orme des Merisiers, F-91191 Gif sur Yvette, FRANCE, Tel. (33) 1 69 08 77 24, Fax. (33) 1 69 08 77 16

Summer, Orono, ME, USA. Equatorial Pacific Synthesis Meeting and Workshop. Contact: Robert Le Borgne, Centre IRD, B.P. A5, F-98848 Nouméa Cedex, Tel. (33-4) 9104 1657, Fax. (33-4) 9104 1635, FRANCE; Fei Chai, School of Marine Sciences, University of Maine, Orono, ME 04469-5741, USA, Tel. (1-207) 581 4317, Fax. (1-207) 581 4388

Sept. / October, Concepción, Chile. 17th JGOFS Scientific Steering Committee Meeting. and capacity building / training course on ocean biogeochemistry. Contact: Roger Hanson, JGOF International Project Office, SMR, University of Bergen, PO Box 7800, 5020 Bergen, Norway. Tel: (+47-555) 84244, Fax: (+47-555) 89687.

Fall, Nagoya, Japan. North Pacific Synthesis Group Meeting and Symposium for the North Pacific synthesis. Contact: Toshiro Saino, Institute for Hydrospheric-Atmospheric Science, Nagoya University, Furo-cho, Chigusa-Ku, Nagoya 464-8601, Japan, Tel. (81-52) 789 3487, Fax. (81-52) 789 3436
Late Fall, Sidney, B.C., Canada. North Pacific Synthesis Group editorial meeting for an issue of the Journal of Oceanography on JGOFS NP synthesis. Contact: Toshiro Saino, Institute for Hydrospheric-Atmospheric Science, Nagoya University, Furo-cho, Chigusa-Ku, Nagoya 464-8601, Japan, Tel. (81-52) 789 3487, Fax. (81-52) 789 3436

early Winter, place to be determined. Continental Margin Task Team Workshop for the Global Synthesis of the 5 Regional Syntheses. Contact: Renato Quiñones, Departamento de Oceanografia, Universidad de Concepción, Casilla 160-C, Concepción CHILE Tel. +56-41-203861, Fax. +56-41-256571; Larry Atkinson, Center for Coastal Physical Oceanography, Old Dominion University, Norfolk, VA 23529-0276, USA, Tel. (1-757) 683 4926, Fax. (1-757) 683 5550

Year 2003

Archival of all JGOFS data sets at the World Data Centres (WDC) System!

May 18th JGOFS Scientific Steering Committee Meeting, Washington DC, USA. Contact: Roger Hanson, JGOFS International Project Office, University of Bergen, SMR, High Technology Centre, Post Box 7800, N-5020 Bergen, NORWAY, Tel. +47 5558 4244, Fax. +47 5558 9687

May 5-8 Final JGOFS Open Science Conference. National Academy of Sciences, Washington DC, USA. Contact: Ken Buesseler, Department of Marine Chemistry and Geochemistry, Woods Hole Oceanographic Institution, WHOI, Clark Laboratory, Mail Stop #25, Woods Hole, MA 02543, USA, Tel. +1 508 289 2309, Fax. +1 508 457 2193

Fall JGOFS Executive Meeting. Contact: Roger Hanson, JGOFS International Project Office, University of Bergen, SMR, High Technology Centre, Post Box 7800, N-5020 Bergen, NORWAY, Tel. +47 5558 4244, Fax. +47 5558 9687 (pending)
11.4. APPENDIX 4: Practical Information (provided before the Meeting)

Hotel Arrangements

Because of arrangements provided by the IGBP in Amsterdam, we ask that you log onto the IGBP OSC web site and make your own hotel arrangements and register for the conference. The JGOFS IPO will reimburse your travel costs after the meeting or provide an advance before the meeting. For advances, please contact Reidun Gjerde early. As always, you are responsible for all incidental costs attributed to your hotel room (phone, minibar, etc.).

City and Airport Connections

For people flying into Amsterdam Airport (Schiphol), you need to catch a train from the airport to Central Station (CS)/Amsterdam/City Centre. The train costs NGL 6.50 and leaves from platform 3, approximately every 15-20 minutes. It takes approximately 15 minutes to arrive at CS. From there, you make you way to your hotels by foot, tram, or taxi. Check with the Information Centre if you are unsure (direction or best mode of transportation)

Meeting Venue and Room

We reserved the library (Room 4) at The Royal Netherlands Academy of Arts and Sciences (Kloveniersburgwal 29, Amsterdam, The Netherlands) for the meeting. The numbers and web site are Tel: 31-20-551-0862, Fax: 31-20-620-49-41, and www.knaw.nl/. Coffee/Tea breaks and lunch will be provided by KNAW each day (Saturday and Sunday).

SSC Dinner
A dinner for the SSC and guests was held at the Restaurant Sluizer on Saturday evening.

IPO Contact (travel expenses)

Ms. Reidun Gjerde
Administrative Assistant
JGOFS IPO (before and after you travel)
Tel: +47-5558-4246
Fax: +47-5558-9678

Hotel Aalborg (during the meeting)
Sarphatipark 106-108
EC Amsterdam
Tel: +31 (0) 20-676-0310 or +31 (0) 20- 679-9057

11.5. APPENDIX 5: Draft Agenda (provided before the meeting)

Opening (09:00, 7 July 2001)
Welcome and Opening Address
Announcements and Local arrangements
Adoption of Agenda

Old Business
Minutes of the 15th Meeting of the SSC (Bergen, 2000): Approval
Second Open Science Conference (Bergen, 2000): Expense Report
AMBIO Special Report, May 2001: Published
IGBP Science Series No. 2: Status

IGBP/Springer-Verlag Book: Status

Synthesis and Modelling Plans
Executive Meeting (Durham, 2000): Global Synthesis & Modelling
THIRD JGOFS Open Science Conference (Washington DC, May 2003)
Other Matters Arising

Synthesis Groups & Task Teams Business
Brief Activity Reports
Terms of References and Members: New and Revised
Requests for Year 2002 Activities
Other JGOFS and Related Meetings
Brief Activity Reports
Scientific Steering Committee Business
  Scientific Steering Committee
Executive Committee
International Programmes
  IGBP (Broadgate)
  SCOR (Urban)
  Carbon Advisory Panel (Wallace)
  IOCCG (Hoepffner)
POGO (Sathyendranath)
National Programmes
  US JGOFS (Anderson)
Others Programme Reports
International Project Office and JGOFS Budgets
  IPO Activities (Hanson)
Data Management (Avril)
Funds and Expenses (Gjerde/Hanson)
Other Business
  Next SSC Meeting
Adjourn (1700, Sunday, 8 July 2001)
11.6. APPENDIX 6: Status of Actions from the 15th SSC (Bergen 2000)

Action 1: Garçon agreed that model codes are a very important issue. Schlitzer felt that the value of having codes depends on the complexity of the model and emphasised that the need for more documentation along with the codes. It is extra work and not always possible. Ducklow added that it is an on-going process.

Action 2: JGOFS moved the synthesis phase forward with the creation of the GSWG. Publications, outcome, and visibility are now sought.

Action 3: IGBP Science Series No. 2 will be placed on the IGBP and JGOFS web sites.

Action 4: done, no comment

Action 5: done, no comment

Action 6/7: done, no comment

Action 8: Le Borgne commented that EPSG workshop/meeting is scheduled next year with modellers at the University of Maine. The host is Dr. Fei Chai, and the approximate time is Aug.-Oct. 2002 period. Funds (US$20,000) will be requested to supplement the costs.

Action 9/10: Hanson mentioned that the IPO has not received the revised ToR for SOSG. An email request was sent to Uli and the SOSG for action/revision at the Brest Symposium. Travel funds were approved for all SOSG members to attend and meet together at the Brest Symposium.

Action 11/12: Discussion deferred to Burkill report on IOSG activities.

Actions 13/14: done, no comment

Actions 15/16: Ducklow felt that the acquisition of Station P data was moving forward, but Conkright thought otherwise. Station P data are not complete. NODC received only hydrography and nutrient data for Station Papa, which are available on Canada-JGOFS CD-ROM

Action 17: done, no comment

Action 18: Monfray mentioned possible interactions with OCMIP and the new GSWG, possible joint workshop in 2002, which will be open to a wider ocean community (modellers, observationalists and users of remote sensing information). Schlitzer added that GSWG needs JGOFS data to be more accessible and encourages DMTT representation. Monfray mentioned that JGTT plans to meet 1 day next week (12/07/01) in Amsterdam and requested Schlitzer’s attendance, if possible.

Action 19: done, no comment

Action 20: IGBP deferred the Nature paper til later

Action 21: done, no comment

Action 22: With JGOFS winding down, SSC recommended that GLOBEC seek a strong link with the new ocean biogeochemistry project.

Action 23: Haugan mentioned that he would address CO₂ and GOOS in the Carbon Advisory Panel and GOOS-OOPC reports.

Action 24: Ducklow emphasised the importance to maintain continuity in membership during the final phase of JGOFS.

Action 25-32: done, no comment

Actions 33/34: Deferred to budget discussion

Action 35: Anderson mentioned that Buesseler has begun to organise the Final OSC, now set for 5-8 May 2003 at the National Academy of Sciences in Washington DC, USA.
### APPENDIX 7: Conference Funds and Expenses (Final Report)

<table>
<thead>
<tr>
<th>Funds</th>
<th>Credit (US$)</th>
<th>Expenses</th>
<th>Debit (US$)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>A) Conference Support</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Norwegian Research Council</td>
<td>$10,500</td>
<td>Announcements/Posters</td>
<td>$13,846</td>
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<tr>
<td>Norwegian Polar Institute</td>
<td>$1,200</td>
<td>Promotional Effects</td>
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<td>Fisheries Commission</td>
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<td>Social Events</td>
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<td>Nansen Centre</td>
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<td>Conference Facilities</td>
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<td>SCOR Funds 1999 (printing)</td>
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<td>PLUS Conference Organizers</td>
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<tr>
<td>Conference Fees</td>
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<td>Miscellaneous Expenses</td>
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<td>Sub Total</td>
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<td><strong>B) Travel Support</strong></td>
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<tr>
<td>EU (for young European scientists)*</td>
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<tr>
<td>SCOR (developing countries)</td>
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</tr>
<tr>
<td>IOC (developing countries)</td>
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<tr>
<td>University of Bergen</td>
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<tr>
<td>JGOFS (support for Speakers)</td>
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<tr>
<td>US JGOFS (support for 10 US Scientists)**</td>
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</tr>
<tr>
<td>NASG Fund (support for one French Scientist)</td>
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<tr>
<td>IGBP (support for SSC travel)</td>
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<tr>
<td>Sub Total</td>
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<td><strong>TOTAL</strong></td>
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<td><strong>C) Nominal Support</strong></td>
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<tr>
<td>Institute of Marine Resources (Aquarium Rental)</td>
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<tr>
<td>City of Bergen (Conference Reception)</td>
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<td>Sub-Total</td>
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<tr>
<td><strong>TOTAL OSC Funding</strong></td>
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* Karin Lochte and staff administered these funds
** US JGOFS administered these funds
11.8. APPENDIX 8: IGBP/Springer-Verlag Book (updated July 2001)

Title: Ocean Biogeochemistry: a JGOFS synthesis
Editor: M.J.R. Fasham
Associate Editors: J. Field, T. Platt, & B. Zeitzschel
Contents:
Preface (Peter Brewer?)
Chapter 1: Biogeochemical provinces (Hugh W. Ducklow) – delivered
Chapter 2: The role of physical processes in biological production (Richard G. Williams and Michael J. Follows) – delivered
Chapter 3: Continental margin exchanges (Chen-Tung Arthur Chen, K.K. Liu and Rob MacDonald) – delivered
Chapter 4: Regional and global primary, new and export production (Paul Falkowski and Jim Murray) – Barber providing input to the chapter, still waiting
Chapter 5: Carbon dioxide fluxes in the global ocean (Andrew J. Watson, James Orr and D. W. R. Wallace) – expecting it soon
Chapter 6: The role of community structure in regulating export fluxes (Michael R. Landry, Ulrich Bathmann, Paul Falkowski, Thomas Kiorboe and Frede T. Thingstad) – still waiting
Chapter 7: Water column biogeochemistry below the euphotic zone (Paul Tréguer) – delivered
Chapter 8: The impact of climate change and feedback processes on the ocean carbon cycle (Philip Boyd and Scott Doney) – still waiting
Chapter 10: An emerging paradigm for global ocean carbon and ecosystem modelling (Scott C. Doney) – delivered
Chapter 11: Temporal studies of biogeochemical processes in the world’s oceans (D.M. Karl, S. Emerson, P.J. Harrison, A. F. Michaels, and Y. Nojiri) – delivered?
Chapter 12: What has JGOFS achieved and what are the lessons for future research? (Michael J.R. Fasham) – waiting on the delivery of ALL chapters before writing

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11.9. APPENDIX 9: Equatorial Pacific Synthesis Group (Le Borgne)

Le Borgne, Robert. Chair, Institut de Recherche pour le Développement, FRANCE
Barber, Richard. Duke University, USA
Chai, Fei. University of Maine, USA
Feely, Richard. PMEL, NOAA, USA
Karl, David. University of Hawaii, USA
Lewis, Marlon. Dalhousie University, CANADA
Mackey, Denis. CSIRO, AUSTRALIA
Murray, James. University of Washington, USA
Nozaki, Yoshiyuki. University of Tokyo, JAPAN

Fieldwork. Most of the cruises involving process studies ended in 1996, except for the JAMSTEC cruises which are organized every year in January-February in the western and central Pacific (145°E-160°W). Carbon dioxide observations are routinely made by PMEL along the TAO mooring lines, with two cruises per year on board R/Vs Ron Brown and Ka‘imimoana. Two time-series works, involving CO₂ and bio-optical measurements on TAO moorings (155°W and 170°W) started in 1997 and are being carried on. Finally, ships of opportunity measurements of CO₂, pigments and nutrients have been on since the end of 1999 in the frame of PROOF (formerly France-JGOFS). All these on-going activities are planned to continue during the next few years.

Data CD-ROM’s. Since its first meeting in 1998, EPSG decided to gather all data collected during oceanographic cruises on CD-ROMs. M.P. Labaied, from DMTT agreed with doing this work and has already received all the data from Australian, U.S. and French cruises. However, the Japanese policy in terms of biogeochemical data release is different and needs a different approach. One of the solutions that may be envisaged in this case, is to present only the cruise plans, measured parameters with PI’s and methods, station positions and time. Such a presentation of Japanese data would be a good start for future developments.

Modelling activities. Most of the present activities on the equatorial Pacific are devoted to modelling within two groups: US JGOFS SMP (Synthesis and Modeling Program) and PROOF Modélisation. In addition, the region is part of global models developed by various organizations. The models consider the following points: new and export productivity regulation by Si and Fe, ecosystem and carbon cycle responses to physical variability on various time-scales, evaluation of marine primary productivity using satellite ocean colour, food-web regulation of particulate export flux in HNLC regions, and plankton community structure and export flux.

Synthesis publications. Le Borgne, Feely and Mackey are editing a Deep-Sea Research Part II volume. Most of the 17 manuscripts are now ready for publication, which should come out at the beginning of 2002. The Introductory chapter of the volume was written during a meeting of the editors in Hobart (December 2000) and aims at being a « synthesis of the synthesis ». A modified summary of the Introductory paper has been submitted to Scientific American and, provided it is accepted, will lead to a general article about the carbon budget of the equatorial Pacific.

EPSG future activities. The entire Group has not met since its first meeting in 1998 and there is a need for direct contacts. E-mail communications appears unreliable. During the meeting of some members of the group in Bergen (April 2000), it was suggested that a joint meeting between EPSG and young modellers would be a good opportunity to transmit knowledge and the conclusions of the synthesis work, which has been achieved recently. The idea progressed and Fei Chai proposed to host such a meeting at his institute (University of Maine, Orono, USA) in August-October 2002. The meeting would include EPSG members plus other observationalists and modellers, 25-30 participants in total.
11.10. APPENDIX 10: North Atlantic Synthesis Group (Garçon)

Véronique, Garçon. Chair, LEGOS, FRANCE
Drange, Helge. NRSC, NORWAY
Ducklow, Hugh. VIMS, USA
Fasham, Michael. SOC, UK
Fernandez, Emilio. University of Vigo, SPAIN
Koeve, Wolfgang. IfM-Kiel, GERMANY
Lowry, Roy. BODC, UK
Mémery, Laurent. LODYC, FRANCE
Siegel, Dave. UCSB, USA
Wallace, Douglas. IfM-Kiel, GERMANY

Achievements in 2000-2001
Third and final NASG meeting in Arcachon, 15-16 January 2001 (Report available on the JGOFS International web site) followed by the Annual Synthesis and Modelling Meeting of the French PROOF programme.
Invitation of KK Liu at LEGOS, Toulouse, France, 6-7 August 2001 to foster links with Continental Margins Task Team and to encourage submission of data from French continental margins studies to the international CMTT data centre.

Which actions to encourage NA synthesis in late 2001-early 2002?
Joint synthesis work under way and planned publication for 2002
Joint North Atlantic Biogeochemistry (JGOFS Synthesis-AMT-POMME) during the next 2002 EGS Meeting (Nice, France, 22-26 April 2002), convenors: W. Koeve and J. Aiken

Membership
Doug Wallace and Helge Drange have expressed a desire to be replaced.

Terms of Reference (ToR)
Proposed Modifications:
Delete the sentence « Present a paper on the results of the group’s activities at the 2000 JGOFS Science Conference »
Add the sentence « Foster links with the recently formed Global Synthesis Working Group »
NASG expected to finish its work mid 2002 and therefore to disband.
Strong links with the new JGOFS Global Synthesis Working Group chaired by Reiner Schlitzer

Budget status
Arcachon Meeting Expenses: Ducklow, Koeve, Lowry, Wollast, Mémery, Garçon: ~ US$ 9,000
11.11. APPENDIX 11: Indian Ocean Synthesis Group (Burkill)

Burkill, Peter. Chair, PML, UK
Amjad, Shahid. National Institute of Oceanography, PAKISTAN
Baars, Martien. NIOZ, THE NETHERLANDS
Banse, Karl. University of Washington, USA
Kindle, John. NRL-SSC, USA
Naqvi, Wajih. CSNIO, INDIA
Rixen, Tim. Universität Bremen, GERMANY
Sathyendranath, Shubha. Dalhousie University, CANADA
Smith, Sharon. RSMAS, USA
Yajnik, Kirit. CMMACS, INDIA

The IOSG has three matters to report.

Synthesis Report on Arabian Sea Biogeochemistry
This report originated through discussion at the last meeting of the IOSG (Bangalore in 1999). IOSG identified key topics and authors to produce an updated but personal view on advances in Arabian Sea biogeochemistry during the period of JGOFS Process Studies. This report brings recent literature together in an integrative way and will be used as a stepping-stone towards publications in the peer-reviewed literature. Agreement by the JGOFS SSC in 2000 to allocate some travel funds, has allowed editing of the chapters. Sharon Smith, Louisa Watts and Peter Burkill met in Miami in June 2001 to bring the report together. The report is largely complete thanks largely to the tremendous work put in by Louisa Watts. One chapter is incomplete and some minor editorial work remains to be done. This will be completed in the next few months. We ask for any comments from the JGOFS SSC, and endorsement that this report is published in the JGOFS/SCOR Series. A time-line for peer-reviewed publications co-ordinated by IOSG is identified in the report.

National Activities
Canada: Shubha Sathyendranath reports that there are no national activities. However, Louisa Watts’ contribution to the Synthesis Report is particularly noteworthy.

Germany: Tim Rixen reports that the second synthesis phase started in March 2001 and will lasts until February 2003. German data are available via [www.ifm.uni-kiel.de/jgofs/dm/](http://www.ifm.uni-kiel.de/jgofs/dm/). A new data manager has been recently appointed (Joachim Herrmann) at the Institut für Meereskunde in Kiel.

India: Wajih Naqvi reports that the JGOFS-India programme involved extensive observations during five cruises of the R/V Sagar Kanya during 1994-97 in the eastern and central parts of the Arabian Sea. The results of these surveys were presented in about 40 research papers including those published in a special issue of Current Science (Vol. 71, No. 11, 10 December, 1996). The synthesis of these results is under final stages. Apart from providing an account of the productivity and carbon flow, the synthesis efforts are expected to culminate in the development of a model for carbon emissions/absorption in the eastern Arabian Sea.

The JGOFS-India team is now extending its studies to the Bay of Bengal. The Bay provides hydrographical conditions quite different from the Arabian Sea primarily as a consequence of the huge amounts of freshwater input (~1.5 x 1012 m3 y-1) and associated sediment load (~1.5 billion tones). However, it remains as one of the least studied areas of the oceans. The upper layer is strongly stratified, but frequent tropical cyclones occurring in this region are expected to bring about substantial nutrient injection to the euphotic zone stimulating primary production. Oxygen concentrations in intermediate waters approach but do not reach suboxia even though the organic carbon fluxes to deep sea appear to be higher than those in the Arabian Sea.

A major project termed the Bay of Bengal Process Studies (BOBPS) has recently been approved for funding (INR 16.5 millions) by the Department of Ocean Development (DOD), New Delhi. This multi-
institutional endeavour involving the National Institute of Oceanography (NIO), Goa, Physical Research Laboratory (PRL), Ahmedabad, Centre for Mathematical Modelling and Computer Simulation (CMMACS), Bangalore, and Goa University, will be formally initiated in July 2001. Field studies, similar to those undertaken in the Arabian Sea, will be carried out utilizing the R/V Sagar Kanya (5 cruises) over a 2-year period with an additional year for synthesis. Samplings at 1-degree interval are planned along 89oE longitude north of 5oN latitude up to the Bengal coast. In addition, several stations over the shelf along the east coast of India will also be worked during each cruise.

Post-JGOFS studies in the Arabian Sea have largely been focused over the western Indian shelf and have led to some exciting findings of seasonal development of anoxia with an unprecedented build-up of nitrous oxide in the inner and mid-shelf regions. In addition to this work, studies on nitrogen cycling have been undertaken with emphasis on direct measurements of denitrification rate using 15N-labelled substrates. Finally, an effort is being made to develop a multi-national programme involving India, Oman and USA. A tri-lateral Workshop organized at Muscat in November 2000, has led to the formulation of a research proposal to be submitted to the US National Science Foundation. As a follow-up of this Workshop, a research cruise of the R/V Sagar Kanya is planned for September-October, 2001. A trans-Arabian Sea section with re-occupation of the US JGOFS Southern Leg in the west and the 15oN transect frequently worked during the previous Indian cruises is planned for this cruise.

UK: Peter Burkill reports that since the 1994 field campaign, a series of papers have been published including two Special Issue of Deep Sea Research II and one in Progress in Oceanography. There is no national JGOFS Arabian Sea Synthesis activity although individual papers will continue to be published. A major cruise (AMBITION) will investigate microbial functional biodiversity in the Arabian Sea in September 2001.

Ukraine: Karl Banse reports that S.A. Piontkovski and his colleagues are producing a CD-ROM. This involves the collation of Russian and Ukrainian oceanographic data (CTD, nutrients, heterotrophic bacteria, phytoplankton, micro-, meso-, and macro zooplankton, mesopelagic fishes, and squids) from the Indian Ocean (including the Arabian Sea) collected on 19 expeditions of the former Academy of Sciences of the Soviet Union between 1959 and 1990. The master copy of the CD is ready for dissemination. At present, S. Piontkovski is looking for funds to manufacture 100 copies of the CD. He also plans to ask JGOFS and GLOBEC to assist with the announcement and dissemination of the CD.

USA: Sharon Smith reports that four issues of Deep Sea Research II have now been published with a 5th volume in revision. The national Synthesis and Modelling Project has started with two proposals funded. One is for a 1-D Arabian Sea model that is posted on a test-bed site for all to use. The other is to integrate all the Process Study models into a common format and ensure they are available for the communities use. The US-JGOFS database is being updated to allow data extraction and plotting of variables. The Arabian Sea Process Study was the first data set to be chosen for this since it is the most complete, high quality data set in the US JGOFS database.

Karl Banse reports on important developments on bringing Russian literature to our attention, including that of the R/V Professor Vodyanitsky, 30th cruise, February/March 1990. Banse and S. A. Piontkovski are finishing the editing of a book about the last comprehensive expedition of the Institute of Biology of Southern Seas (IBSS), Ukrainian National Academy of Sciences, in Sevastopol, Ukraine. In contrast to work by the other nations who sampled along sections in the Arabian Sea, the Soviet and later Ukrainian colleagues worked on polygons or station grids that permit three-dimensional interpretations of physical, chemical and biological parameters measured simultaneously. The present cruise covered 77 principal stations, 55 km apart, in a 275-375-km wide strip between 15o and 21.5oN outside the Omani EEZ. With emphasis on the processes in the upper 200 m, 15 chapters describe the observations extending from hydrography and nutrients through concentration and production of heterotrophic bacteria and phytoplankton, to distributions of micro-, meso-, and macro-zooplankton, to mesopelagic fishes and squids. A few earlier cruises are also treated. Besides discussing the results, the book provides an entry into the Russian-language literature, which is largely unknown to the English-writing scientific world. The tentative title of the book is The Structure of the Epipelagic Ecosystem of the
Arabian Sea on the Synoptic Scale (with 184 figures and 29 tables). Universities Press (India) in Hyderabad (Deccan) wishes to print the work.

Banse expects to complete a paper on the renewal of the well-ventilated salinity maximum in the top of the pycnocline in the northern Arabian Sea, which is distinct from the common salinity maximum of the central and southern Arabian Sea and, together with colleagues in Goa, India to complete the study of the short-term variability (days) and long-term stability (4 decades) of the oxygen minimum along 65°E.

Translations of two small monographs were edited by Banse and submitted to Universities Press (India): L. I. Sazhina, Breeding, Growth Rates, and Production of Marine Copepods (with 54 figures and 40 tables), originally published in 1987 and mostly based on observations at warm temperatures, and E. V. Pavlova, Movement and Energy Metabolism of Marine Planktonic Organisms (with 60 Figures and 41 tables), a somewhat updated version of the 1987 edition, which is also mostly based on data from warm water.

Banse has begun editing the English translation of a book edited by T. S. Petipa, Mechanisms of Formation of Aggregation and Functioning of Plankton in Ecosystems of the Indian Ocean (with 134 figures and 53 tables), with an appended Atlas of Bio-Oceanographic Characteristics of the Indian Ocean at the Boundaries of Water Masses (with 199 charts). The book of 16 chapters focuses on a comprehensive IBSS expedition to equatorial divergences in the spring of 1980 (similar to the Ukrainian 1990 cruise), with additional information on three other cruises in the early 1980s. The Russian text had been typeset by 1993, but the deterioration of the economy in Ukraine prevented publication.

Finally, a monograph with keys for all six stages of 85 dominant marine pelagic copepods by L. I. Sazhina (1985), Nauplii of Mass Species of Pelagic Copepods of the World Ocean (Kiev: Nauk. Dumka), with 2 tables and 100 plates, has been translated. K. Banse will edit it.

Chairmanship
Peter Burkill wishes to step down from the chair of this Group. This is due to too many other commitments rather than changing interests. A new chair that will bring fresh impetus will be required to carry forward the Arabian Sea synthesis.
11.12. APPENDIX 12: Southern Ocean Synthesis Group (Tréguer)

Members
Tréguer, Paul. Chair, Université de Bretagne Occidentale, FRANCE
Bathmann, Uli. Vice Chair, AWI, GERMANY
Hall, Julie. NIWA, NEW ZEALAND
Monfray, Patrick. LSCE, FRANCE
Pollard, Raymond. SOC, UK
Smith, Walker. VIMS, USA (alternate: Robert Anderson, LDEO, USA)
Trull, Tom. University of Tasmania, AUSTRALIA

Synthesis and modelling

The 3rd SO-JGOFS Symposium on Climatic changes and the cycle of carbon held in Brest, France, 8-12 July 2000. 210 scientists originating from 19 nations attended the Symposium. Hereafter are major conclusions and questions (detailed report available via Paul Tréguer).

Due to the juxtaposition of the cooling effect on warm subtropical waters and the biological utilization effect on nutrient-rich sub-Antarctic waters the Southern Ocean (S.O.) acts as a significant net sink (0.6 GTC yr-1 >50°S) for atmospheric CO2. South of 30°S the total annual export of particulate organic carbon is estimated at 3 Pg C yr-1 (about 1/3 of the world total). There is a big gap between studies, which consider export fluxes out of photic layer (especially using 234Th techniques), and those concerned by the measurements of biogenic matter in deep waters and at the water-sediment interface. To take into account the processes that control the fluxes of remineralisation and recycling in the « twilight » zone (100-1000 m) should be a high priority for future programmes.

The importance of the physical-biological coupling at mesoscale in the S.O. has been demonstrated both from SeaWiFS images and from circulation models (e.g., OCCAM).

Since the beginning of the 1990s, numerous sophisticated biogeochemical models have emerged. They remain preliminary tools to account for the complexity of the Antarctic ecosystems. Attention is to be put on the role of key species in the key ecosystems, on the community structure and on the dynamics of the higher trophic levels, if we want to improve the models outputs in terms of carbon retention and/or export.

The sea ice has definitely to be approached as a unique system. In the Seasonal Ice Zone (SIZ) in addition to the classical export pathway based on diatoms, the carbon export flux associated with Phaeocystis antarctica represents another important pathway for carbon sequestration. Because blooms of P. antarctica cause intense DMS emissions, the role of P. antarctica may be more important than previously thought with respect to the S.O. biological pump. Large deviations from the classical Redfield ratios have been reported in the SIZ, which has many implications for modellers. We still have to fill in the gap of the linkage between the ice and the adjacent water column ecosystem to better understand the SIZ dynamics.

The biogeochemistry of the S.O. is clearly very sensitive to climate change, but depending on the proxies the authors referred to, much disagreement is remaining about what happened to the biological pump of CO2 during the past, and especially during the Last Glacial Maximum. To reconcile contradictory interpretations, multiproxies studies that take into account the glacial boundary conditions of wind stress, ocean circulation, sea-ice extension and temperature, are encouraged.

We already have some indications of the biogeochemistry of the modern S.O. is changing. Global physical-biogeochemical coupled models are now available, indicating the S.O. might become the main oceanic sink for atmospheric CO2, if atmospheric CO2 concentration continues to increase exponentially. Nevertheless, this capacity could be counteracted by an induced stratification of S.O. in a
warmer climate. To improve our predictive capacity, however coupling models and observations is yet a high priority.

Thirty-two peer-reviewed papers issued from this 2000 Symposium are to be published in Deep-Sea Research II (Guest editors: Paul Tréguer et al.). The review process is being finalized and this special volume should be published in 2002.

2-Meetings in Honolulu, Hawaii, USA, February 2002: To pursue with synthesis and modelling a special session dedicated to the cycle of carbon in the S.O. is requested during the Ocean Science Meeting, 11-15 February 2002 (Co-convenors: Paul Tréguer, Uli Bathmann, Tom Trull, Philip Boyd, Stéphane Blain). Following the OSM we also plan to organise a SO-JGOFS workshop in Honolulu, 16-17 Feb. 2002.

National/international efforts

Australia has been focused on completion of the Sub Antarctic Zone (SAZ) Project organized by the Antarctic Cooperative Research Centre (www.antcrc.utas.edu.au/). The main fieldwork for the SAZ Project occurred in the 1997-1998 austral summer. A compilation of 16 papers presenting the main results from the SAZ Project is currently being finalized for publication as a special section of JGR-Oceans (Tom Trull). Some aspects of the SAZ Project are continuing – in particular, the annual deployment of sediment trap moorings in the SAZ and Polar Front Zone (PFZ) has continued since 1997 and is planned to continue until at least 2003. Future research plans include a major field programme (Nov.-Dec. 2001) onboard the R/V Aurora Australis, involving the participation of ~80 marine scientists (Australia, New Zealand, Europe, North America, and Japan) for studying the carbon cycle in the Sub-Antarctic Front, in the PFZ and near and in melting sea-ice. This cruise includes process studies aboard the ship and deployment of moorings fitted with sediments traps. This work is being coordinated with Japan, which will undertake a series of voyages later in the 2001-2002 austral summers in the same region.

France is assessing what has been done during the last 10 years under the umbrella of PROOF (the French contribution to JGOFS). A specific report about the major issues of the ANTARES/KERFIX programme (French contribution to SO-JGOFS) is available via Jacques Lefèvre. In relation with SOLAS/IGBP process studies in the Indian sector of the S. O. are envisaged for the next years using the R/V Marion-Dufresne as an international scientific platform (Stéphane Blain).

In December 2000, in the frontal systems of the Atlantic sector of the S.O., along the 20°E meridian, Germany (U. Bathmann, V. Smetacek) has organised the EISENEX cruise (October-November 2000) aboard the R/V Polarstern. This cruise included scientists from 15 countries (including UK and NL). Using iron sulphate, they seeded a water body extending over 100 km2. EISENEX did show that addition of Fe led to quadrupling the phytoplankton biomass within a period of 3 weeks, despite heavy grazing and poor light conditions in spring. Results should be presented soon, especially during the 2002 OSM.

Italy has three on-going programmes that are related to SO-JGOFS. The two first programmes focuses on the Terra Nova Bay (Ross Sea); the first (Letterio Gugliemo) deals with the pack-ice ecosystems dynamics (algal communities and nitrogen cycling), and the second (Riccardo Cattaneo-Vietti) with the short and long term variability of the benthic communities. The third (Mariangela Ravaioli) also involves access to US facilities for studying subsystems located between New Zealand and the Ross Sea; it deals with biogenic sedimentation and its relation with biogeochemical processes, the CO2 cycle and climate changes, also using remote sensing and modelling (1999-2001). References of relevant papers are available via Giulio Catalano.

The US efforts (usjgofs.whoi.edu/mzweb/syn-mod.htm) are along two lines: synthesis and modelling of Southern Ocean processes and the upcoming SOFeX cruise. AESOPS (W. O. Smith, Robert Anderson) is planning 3 DSR II volumes (the first was published in Dec. 2000, the second is now being processed.
at the publishers). SOFeX is a new iron-fertilization experiment. The two study areas are located (1) north of the polar front around 170°W for low Si, low Fe waters, and (2) south to ca. 65°S, 170°W for high Si, low Fe concentrations. SOFeX plans to involve three ships and enough time to know about the export production aspects that both SOIREE and EISENEX have missed.
11.13. APPENDIX 13: North Pacific Synthesis Group (Bychkov)

Bychkov, Alexander. Chair, IOS, CANADA
Chen, Arthur. NSYSU, CHINA-TAIPEI
Denman, Ken. DFO-MPO, CANADA
Harrison, Paul. University of British Columbia, CANADA
Jiao, Nianzhi. NIES, JAPAN
Kim, Kyung-Ryul. Seoul National University, KOREA
Kishi, Mishio. Hokkaido University, JAPAN
Riser, Stephen. University of Washington, USA
Saino, Toshiro. Vice Chair, Nagoya University, JAPAN

Waiting for Bychkov's report!
APPENDIX 14: Paleo-JGOFS Task Team (Lochte)

Lochte, Karin. Co-Chair from JGOFS, IfM-Kiel, GERMANY
François, Roger. Co-Chair from IMAGES, WHOI, USA
Holbourn, Ann. Christian Albrechts Universität, GERMANY
Jahnke, Rick. Skidaway Institute of Oceanography, USA
Labeyrie, Laurent. LSCE, FRANCE
Shimmield, Graham. DML, UK
Stocker, David. UNIBe, SWITZERLAND
Tréguer, Paul. Université de Bretagne Occidentale, FRANCE
Vernal, Anne de. UQàM, CANADA

The Paleo JGOFS Task Team met for the first time on 13-14 June 2000 in Hamburg, Germany at the Institut für Meereskunde. Participants of the first meeting were: Roger François, Rick Jahnke, Ann Holbourn, Laurent Labeyrie, Karin Lochte, Graham Shimmield and Paul Tréguer. During this meeting, Terms of Reference, membership and future tasks were discussed. Two main topics to be considered by this group were identified:

Refining and developing new paleo-oceanographic proxies by studying their systematics within integrated multidisciplinary process studies in the modern ocean;

Test the hypotheses of the role of the ocean in controlling atmospheric pCO₂ on time scales of decades to millennia, and under recent anthropogenic impact.

The SSCs of JGOFS and PAGES subsequently endorsed the PJTT. The membership was generally accepted, but an open question is still the participation of an Asian member, as suitable candidates were suggested.

At a follow up of this meeting, a small ad-hoc German group met on 5 April 2001 in Hamburg to discuss how the tasks of PJTT could be promoted. Topic 1, concerning the further development of proxies, requires multidisciplinary fieldwork and relies on future international projects. Topic 2, analysing the role of the oceans in controlling atmospheric CO₂ fluxes on different time scales, is less bound to new data but rather requires synthesis of existing data and concepts. This may be achieved in form of a SCOR working group. Plans for this are underway but need to be worked out in more details.

There will be an informal meeting of members of PJTT during the Global Change Open Science Conference in Amsterdam (if an appropriate time can be found). A workshop open to all interested scientists is planned for late Fall 2001.
11.15. APPENDIX 15: Continental Margins Task Team (Quiñones)

Quiñones, Renato. Co-Chair from JGOFS, Universidad de Concepción, CHILE
Atkinson, Larry. Old Dominion University, USA
Gao, Shu. Co-Chair from LOICZ, Chinese Academy of Sciences, CHINA – P.R.C.
Liu, K.-K. National Taiwan University, TAIWAN - R.o.C.
Macdonald, Robie. Institute of Ocean Sciences, CANADA
Talaue-McManus, Liana. RSMAS, USA

Overall goal of the CMTT
Assess the contribution of continental margins and seas to CO2 sequestration and horizontal flux of carbon, nitrogen and phosphorus across ocean-continental margin boundaries.

Main activities of the CMTT for the 2000/01 period
During this period, the CMTT has allocated most of its efforts in producing an overall synthesis and assessment of carbon, nitrogen and phosphorus fluxes on and across continental margins to feed into IGBP. This synthesis will be given to the international community as a comprehensive book, which is expected to be published in 2003.

In order to write this book, five working groups were created (lead scientists in brackets): Tropical Margins (Liana McManus), Marginal Seas (KK Liu and Shu Gao), Eastern Boundary Currents (Renato Quiñones), Western Boundary Currents (Larry Atkinson), and Polar Margins (Robie MacDonald).

Two meetings were already conducted to plan the outline of the sections of the book as well as to organize a common structure for constructing the biogeochemical budgets. A final meeting will take place in September 2001. In what follows, a brief description of each of the meetings is given:

A) Workshop on Eastern and Western Boundary Current Systems
The joint meeting of the EBC/WBC System Groups was held at the Center for Coastal Physical Oceanography (Old Dominion University, Norfolk, Virginia), 27-29 November 2001. Both JGOFS and LOICZ sponsored the workshop. Larry Atkinson (U.S.A.) and Renato Quiñones (Chile) hosted the meeting. The attendees were: Francisco Chávez (USA), Lei Chou (Belgium), Lou Codispoti (USA), George Cresswell (Australia), Rick Jahnke (USA), K.-K. Liu (Taiwan), John Moisan (USA), Pedro Monteiro (South Africa), Wajih Naqvi (India).

The main objective of the workshop was to produce a general outline of the CMTT Synthesis Book, especially in relation to the EBC/WBC sections. The proposed outline for the EBC/WBC Section of the book can be found in Appendix 1. In addition, an extensive analysis was conducted on: definition of the geographic limits of EBC/WBC systems, relevant spatial and temporal scales of variability, main fluxes and processes to be considered in the synthesis, identification of major gaps and uncertainties in the current understanding of continental margin biogeochemistry.

The EBC/WBC System Group strongly suggests to the JGOFS and LOICZ SSCs the creation of a new group for Sub-Polar Ecosystems. The EBC/WBC group has opted to define its subject of study as those currents lying equatorward of the westerlies and poleward of the tropics. This operational definition is proposed, taking into account the stated goal of the CMTT synthesis. However, this definition may cause significant parts of the oceans to be missed. The areas that may not be considered include the following:

North Pacific: Oyashio, Kamchatka, Alaska Coastal Current, Kuroshio Extension
South Atlantic: Malvinas Current
South Pacific: Cape Horn Current, Chilean fjords
B) Workshop on Arctic Margins
The meeting was held at Sidney, BC, Canada, 7-11 May 2001. It was convened by Robie Macdonald and attended by Leif Anderson, Ruediger Stein, John Christensen, Igor Semiletov and Lisa Miller. The objectives of the meeting were to organize a common structure for constructing Arctic shelf budgets for freshwater, particulates, carbon, nitrogen and phosphorus, and for combining these into a complete Arctic Ocean budget. Each participant accepted a particular shelf or shelves as their special assignment. The first task identified was to produce up-to-date areas and hypsometry for the shelves using common, well-defined boundaries. Electronic charts have only recently become available to allow an accurate – and consistent – assignment of these fundamental properties. Sources of data were discussed for inputs of P, N, C (dissolved and particulate) from rivers and coastal erosion. Other components for the development of a comprehensive budget were discussed, including: ocean inflows and outflows; atmospheric exchange; ice transport; and transformations within system components (boxes). A great deal of the discussion centred on the uncertainties in the properties, the sources of data, and how to approach the construction of budgets using LOICZ and other models. The structure of (an) ensuing paper(s), amassing this information and producing the individual shelf budgets together with the whole Arctic Budget, was determined. Although the group felt that a preliminary draft could be produced by early next year, it was noted that a comprehensive book on the organic carbon cycle in the Arctic Ocean is already planned under the guidance of Ruediger Stein and that our approach in this budget would be to use the material in that book as a source of information and to avoid duplication of effort. Logically, therefore, the budgets produced by this group will follow the completion of the preliminary draft of the organic carbon book.

C) International Symposium and Workshop on Carbon and Nutrient Fluxes in Marginal Seas and Tropical Coastal Zones
The Symposium/Workshop will be held in Taipei from 27 to 29 September 2001 in conjunction with the 2001 Joint Geoscience Assembly sponsored by the Chinese Geoscience Union, Taipei, R.o.C. The purpose is to facilitate information exchange, and to promote synthesis and modelling for the marginal seas and tropical coasts as a part of the CMTT global synthesis. The potential areas to be covered and attendees to the meeting are:

1. Overview (CTA Chen)
2. Australia’s Shelf Seas (Gregg J. Brunskill)
3. Baltic Sea
4. Black Sea (T. Oguz)
5. Caspian Sea
6. Coral Reefs (Brad Opdyke)
7. Great Lakes (Val Klump)
8. Japan/East Sea (Kyung-Ryul Kim)
9. Mediterranean, Coastal and Shelf Areas of the (André Monaco)
10. Bay of Bengal (M.M. Sarin)
11. North Seas (Helmut Thomas)
12. Sea of Okhotsk (Shizuo Tsunogai)
13. SE Asian Archipelagos (Robert Aller)
14. South China Sea (K.K. Liu)
15. Tropical coasts of the Americas (Frank Muller-Karger)
16. Sediment transports (Shu Gao)
CMTT Schedule for accomplishing the synthesis
A working session of the CMTT will be conducted during the IGBP Global Change Open Science Conference (Amsterdam, the Netherlands, 10-13 July 2001) to analyse: (i) the final outline of the book, (ii) the progress achieved to date, and (iii) to make adjustments to the schedule, if needed. Until now the official schedule is:

September 2001: all CMTT Subgroups meetings finished
December 2001: final drafts of individual and collective papers.
February 2002-April 2002: peer review process
June 2002: Synthesis meeting
Book published by January 2003
News on recent CMTT publications

APPENDIX A
BOOK OUTLINE
EBC/WBC Section
1) Introduction
It will describe the general approach taken including the main definitions used, the scope and the limitations of the EBC/WBC Section of the book.

In addition, it will present a review of fluxes of carbon and other elements in the eastern and western boundary currents of the ocean margins. The emphasis is on the sequestration of carbon with reference to N and P as needed for clarity. Sequestration refers here to burial in sediments that are not eroded on century time-scales or export into the deep waters below the main thermocline.

2) Comparative Chapter on EBC/WBCs (Atkinson et al.)
This chapter sets the stage. A short exposition on physical and biogeochemical processes in eastern and western boundary currents relevant to understanding carbon fluxes and sequestration. Schematic diagrams imperative.

3) Regional Analysis - Description of the system, important processes and flux estimates with documentation
The carbon and other fluxes are presented for each EBC and WBC region. All values will be documented. Flux values should be referenced or the method(s) used to derive the flux documented. Each section should use the same basic format:

Each region will be described in a short paper focused on the specific fluxes and processes needed to generate the carbon synthesis. It is important to note that each paper will not be a complete review of each of the described systems but a directed analysis of the main carbon fluxes with reference to nitrogen and phosphorous fluxes in the system. The horizontal extent of the boundary system will be defined by considering processes such as upwelling and other mesoscale physical processes, primary productivity, grazing, deposition and sinking fluxes.

(*The named scientist has the responsibility to find the specialist who will write the chapter on the region)
3.1 Eastern Boundary Currents
California (Chávez)
Humboldt (Quiñones)
Benguela (Monteiro)
Iberian (Chou)
Northwest Africa (Quiñones*/Bremen)

3.2 Western Boundary Currents
Kuroshio (KK Liu)
Gulf Stream (Jahnke)
East Australia Current (Cresswell)
Brazil Current (Eduardo Marone, Bastiaan Knoppers)

3.3 Indian Ocean Region
Monsoon region (Naqvi and Lou Codispoti)
Western Australia (Cresswell*)
Agulhas (Monteiro)

4) Synthesis (Shu Gao, Quiñones, KK Liu, Atkinson etc.)
A summary of all the fluxes in EBC/WBC systems that is suitable for further global synthesis.

5) Coupled Circulation/Biogeochemical Models to Estimate Carbon Flux (Moisan).

6) Outlook (Climate change, denitrification, suboxic, etc.) (Codispoti/Chairs)
This chapter will be focused on concepts and/or processes that need to be revisited as well as the main future perspectives of continental margin biogeochemical research. It will also incorporate a discussion on what aspects of climate change may affect the eastern and western boundary currents. For example: increased buoyancy and nutrient fluxes as runoff increases or changes in wind stress (speed and direction).
Conkright Gregg, Margarita. Chair, NOAA/National Oceanographic Data Center, USA
Glenn, Graham. Marine Environmental Data Service, CANADA
Griffiths, Brian. CSIRO Marine Research, AUSTRALIA
Hammond, Christine. U.S. JGOFS Data Management Office, USA
Herrmann, Joachim. German JGOFS Data Management, GERMANY
Labaied, Marie-Paule. Observatoire Océanologique de Villefranche, FRANCE
Lowry, Roy. British Oceanographic Data Centre, UNITED KINGDOM
Miyake, Takeharu. Japan Oceanographic Data Centre, JAPAN
Sarupria, Jaswant. Indian NODC, INDIA

STATUS

The German JGOFS Data Manager has received support for the next two years. Thanks to Hugh Ducklow for writing a letter to the Director of Institut für Meereskunde in support of maintaining the Data Management Office at Kiel.

Next DMTT meeting should be held 2-3 October 2001 in Washington, D.C., USA. The US JGOFS DMO will provide some support ($5,000) for this meeting. Topics of discussion will be the long-term archive of JGOFS data and exploring the preparation of an International JGOFS Data Product.

JGOFS Canada Data Sets 1989-1998 CD-ROM Version 1.0, Dec. 2000 was published and is currently being distributed.

Australian OZGOFS CD-ROM is under preparation.

FUTURE PLANS

The focus of the DMTT in the next years will be (1) preservation of JGOFS data for future generation of scientists by archiving in the ICSU World Data Centres System; (2) documentation of JGOFS data in NASA Global Change Master Directory which will increase its future use; (3) attempt to consolidate all available JGOFS data into one common data format. Currently exploring available resources that will facilitate and make this a doable task; and (4) distribution of data to national data centres.

PUBLICATIONS AND PUBLIC RELATIONS


REPORT FROM DMTT MEETING IN KIEL, GERMANY, JUNE 2000

Items of discussion

National reports were presented from members representing JGOFS activities in Australia, Canada, Germany, India, Japan, Norway, United Kingdom and the United States. Emphasis was placed on data availability from these countries.

Recommendations

The DMTT should identify the cruises and other data activities that form the JGOFS legacy. Criteria used for selection should be:

Activities from a clearly identified national JGOFS programme;
Activities with JGOFS "credentials" that have measured Level 1 (=Core) parameters other than T, S, O₂ and nutrients;
The JGOFS Executive SSC should ratify the resulting list of activities. This will become the official JGOFS cruises list.

All JGOFS level 1 data to be stored at the World Data Centres System for long-term stewardship.

Support from DMTT members and the IPO for synthesis activities: DMTT members are encouraged to participate in Synthesis Groups (SG) meetings, e.g., Labaied (France) to the EPSG, Griffiths (Australia) to the SOSG, Lowry (UK) to NASG, and Miyake to NPSG. Participation at the IOSG will depend on the venue.

JGOFS data legacy and long-term stewardship: This will be the focus of the DMTT for the next few years. Data from JGOFS cruises in the countries represented by the DMTT will be archived at the World Center A for Oceanography and described in NASA's Global Change Master Directory. The JGOFS IPO Assistant will help the DMTT in the collection of the data from countries not represented in the DMTT. Funding will be sought in the U.S. or elsewhere to compile a JGOFS Master Data Set that will seek the data not covered by the DMTT as well as data of interest to the JGOFS project.

Action Items
The DMTT will identify JGOFS Level 1 (core) cruises based on the definition to be ratified by the SSC Executive.
Each DMTT member will gather core data from their national programmes.
DMTT members to deliver Level 1 cruise data to the WDC System for long-term stewardship as CSV files when possible.
IPO will mirror the CMTT website, as a way of supporting the synthesis activities of the Continental Margins Task Team (CMTT).
The PMTT disbanded in 1999, and the final product, The Photosynthesis Measurement Manual, will be available later this year. The outline is as follows:

I. Photosynthesis - irradiance curves
   A. Sources of variability in photosynthetic parameters
   B. Estimation of photosynthesis
   C. Recommendations

II. From P vs. E curves to productivity vs. depth profiles
   A. Differences between P vs. E and productivity-depth profiles (theory)
   B. Practical problems in deriving P vs. Z profiles from P vs. E curves
   C. Sensitivity analysis of photosynthetic parameters
   D. Relation of P vs. E curves to JGOFS core measurements of P vs. Z profiles
   E. Relation of both core profiles and P vs. E curves to satellite maps of ocean colour

Sections I.A, most of I.B and II.C are now complete.
Terms of Reference

Objective
The objective of this joint task team is to bring together the expertise of JGOFS on ocean biogeochemical processes and of GAIM on global carbon budget changes. The aim is to apply new insights into biogeochemical processes, as co-limitations, that we have gained through the JGOFS programme to improve our representation of global carbon dynamics by models, and to evaluate them with new data synthesis. In a broader way, this Task Team will set up bridges between ocean physics and ocean biology to better our knowledge on ocean geochemistry variability and changes induced by human activities. Particularly, focus will be on:

Oceanic CO₂ uptake during the industrial era (past and future)
Climate change impact on marine productivity and carbon cycle.

Goals
Building up the connection between JGOFS and GAIM;
Identifying key issues to be addressed by this group;
Organizing larger joint GAIM / JGOFS workshops dedicated to these specific foci;
Producing reports or publications on the major findings of these workshops.

Tasks
Foster interactions between JGOFS and GAIM activities for a global integration of regional aspects;
Create synergy with WCRP/CLIVAR and others IGBP related projects (GLOBEC, LOICZ, Carbon Synthesis, SOLAS);
Stimulate improvement of global ocean carbon cycle models (OCCMs), by integrating JGOFS biogeochemical processes in 3-D ocean general circulation models;
Evaluate OCCMs with available JGOFS-WOCE synthesis datasets, including seasonal to inter-decennial variability;
Inter-compare available OCCMs both for natural cycle and anthropogenic perturbation, using experiments with common boundary conditions and protocols.
Hold regular meetings, improve the exchange of information and data between the scientific communities of ocean biogeochemistry, and publish the results of the joint workshops.
The JGOFS Global Synthesis Working Group (GSWG) was established and currently consists of 11 members representing different fields of marine biogeochemical research. The list of group members (above) and a draft version of the Terms of Reference are included below and submitted for JGOFS SSC review, comment and approval. The first meeting of the GSWG was held on 6 July 2001 at the Royal Netherlands Academy of Arts and Sciences (Library), Kloveniersburgwal 29, Amsterdam, The Netherlands. The agenda for the GSWG meeting is also included below.

Bremerhaven, June 26, 2001
Reiner Schlitzer

Terms of Reference
(approved October 2001)

The objective of the GSWG is to review our current knowledge on the fluxes of dissolved and particulate material in the global ocean and the biogeochemical processes that affect these fluxes. Of particular importance are the comparisons of the different observational and modelling approaches and the identification of controversies, methodological weaknesses and knowledge-gaps. This should influence the planning of future marine research programmes and should lead to the development of new, improved biogeochemical models that make use of the emerging biogeochemical data.

Specific goals of the GSWG are:
To compare and evaluate estimates for marine productivity, downward particle fluxes and respiration rates in the water column and the sediment from different observational techniques as well as from modelling.
To foster interactions between observationalists and modellers and to stimulate joint research projects.
To liaise and link GSWS activities with the JGOFS-GAIM and Data Management Task Teams and the regional synthesis groups under JGOFS.
To promote the development of new, improved biogeochemical models that utilize the emerging and diversity of marine biogeochemical data.
To identify potential biogeochemical and physical changes under global warming conditions.
To organize a workshop on the measurement and modelling of global ocean productivity and biogeochemical fluxes.
To promote a joint publication of synthesis papers on marine biogeochemical fluxes.

Draft Meeting Agenda
09.00 Welcome, Introduction
09:15 Rationale for GSTT, Terms of Reference
09:45 Overview Presentations: Marine Production and Downward Material Fluxes
Satellite-based estimation of marine primary production: current status and future directions (J. Campbell)
Model estimates of new and primary production: influence of model physics and numerics (A. Oschlies)

Bremerhaven, June 26, 2001
Reiner Schlitzer

Terms of Reference
(approved October 2001)

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Model estimates of new and primary production: influence of model physics and numerics (A. Oschlies)
Export production in the Southern Ocean derived from dissolved nutrient distributions: comparison with satellite based estimates (R. Schlitzer)

11:00 Coffee break

The relationship between primary and export production in the open ocean -Theory and observations (E. Laws)

Particle fluxes to the deep ocean: recent findings, problems and Strategies (G. Fischer)

The Distribution of Deep Biogenic Fluxes and Their Relation to Surface Processes as Estimated from Benthic Studies (R. Jahnke)

Summary

12:30 Lunch break

13:30 Overview Presentations: Process Studies and C, N, Si Cycles

“The dynamics of the marine nitrogen cycle” and “Redfield ratios: The holy grail of ocean biogeochemistry” (N. Gruber)

Modelling focused on Chemical Components: A Biogeochemical Cycle Model Coupled with Ecosystem (Y. Yamanaka)

Ecological Control of Marine Biogeochemical Cycles: Carbon vs. Silicate (A. Yool)

Summary

15:00 Overview Presentations: Anthropogenic Influence and Future Change

The role of the ocean as a sink for anthropogenic CO2 (N. Gruber)

Modelling Marine Biogeochemical Cycles: Present Status and Future Plans (P. Monfray)

Future Changes in Marine Biogeochemical Cycles: Modelling and Observational Evidence (R. Matear)

Summary

16:30 Status and Future Plans (Meetings, Workshops, Publications; Links with other TT)

18:00 End of meeting
APPENDIX 20: The Amsterdam Declaration on Global Change

Challenges of a Changing Earth: Global Change Open Science Conference
Amsterdam, the Netherlands 13 July 2001

The scientific communities of four international global change research programmes - the International Geosphere-Biosphere Programme (IGBP), the International Human Dimensions Programme on Global Environmental Change (IHDP), the World Climate Research Programme (WCRP) and the international biodiversity programme DIVERSITAS - recognise that, in addition to the threat of significant climate change, there is growing concern over the ever-increasing human modification of other aspects of the global environment and the consequent implications for human well-being. Basic goods and services supplied by the planetary life support system, such as food, water, clean air and an environment conducive to human health, are being affected increasingly by global change.

Research carried out over the past decade under the auspices of the four programmes to address these concerns has shown that:

The Earth System behaves as a single, self-regulating system comprised of physical, chemical, biological and human components. The interactions and feedbacks between the component parts are complex and exhibit multi-scale temporal and spatial variability. The understanding of the natural dynamics of the Earth System has advanced greatly in recent years and provides a sound basis for evaluating the effects and consequences of human-driven change.

Human activities are significantly influencing Earth's environment in many ways in addition to greenhouse gas emissions and climate change. Anthropogenic changes to Earth's land surface, oceans, coasts and atmosphere and to biological diversity, the water cycle and biogeochemical cycles are clearly identifiable beyond natural variability. They are equal to some of the great forces of nature in their extent and impact. Many are accelerating. Global change is real and is happening now. Global change cannot be understood in terms of a simple cause-effect paradigm. Human-driven changes cause multiple effects that cascade through the Earth System in complex ways. These effects interact with each other and with local- and regional-scale changes in multidimensional patterns that are difficult to understand and even more difficult to predict. Surprises abound.

Earth System dynamics are characterised by critical thresholds and abrupt changes. Human activities could inadvertently trigger such changes with severe consequences for Earth's environment and inhabitants. The Earth System has operated in different states over the last half million years, with abrupt transitions (a decade or less) sometimes occurring between them. Human activities have the potential to switch the Earth System to alternative modes of operation that may prove irreversible and less hospitable to humans and other life. The probability of a human-driven abrupt change in Earth's environment has yet to be quantified but is not negligible.

In terms of some key environmental parameters, the Earth System has moved well outside the range of the natural variability exhibited over the last half million years at least. The nature of changes now occurring simultaneously in the Earth System, their magnitudes and rates of change are unprecedented. The Earth is currently operating in a no-analogue state.

On this basis the international global change programmes urge governments, public and private institutions and people of the world to agree that:

An ethical framework for global stewardship and strategies for Earth System management are urgently needed. The accelerating human transformation of the Earth's environment is not sustainable. Therefore, the business-as-usual way of dealing with the Earth System is not an option. It has to be replaced – as soon as possible – by deliberate strategies of good management that sustain the Earth's environment while meeting social and economic development objectives.

A new system of global environmental science is required. This is beginning to evolve from complementary approaches of the international global change research programmes and needs strengthening and further development. It will draw strongly on the existing and expanding disciplinary base of global change science; integrate across disciplines, environment and development issues and the
natural and social sciences; collaborate across national boundaries on the basis of shared and secure infrastructure; intensify efforts to enable the full involvement of developing country scientists; and employ the complementary strengths of nations and regions to build an efficient international system of global environmental science.

The global change programmes are committed to working closely with other sectors of society and across all nations and cultures to meet the challenge of a changing Earth. New partnerships are forming among university, industrial and governmental research institutions. Dialogues are increasing between the scientific community and policymakers at a number of levels. Action is required to formalise, consolidate and strengthen the initiatives being developed. The common goal must be to develop the essential knowledge base needed to respond effectively and quickly to the great challenge of global change.

Berrien Moore III  Arild Underdal  Peter Lemke  Michel Loreau
Chair IGBP  Chair IHDP  Chair WCRP  Co-Chair DIVERSITAS
APPENDIX 21: SCOR-IOC Advisory Panel on Ocean CO₂ (Wallace)

Douglas Wallace (Chair), Institut für Meereskunde der Universität Kiel, GERMANY
Anderson, Leif. University of Göteborg and Chalmers University of Technology, SWEDEN
Boutin, Jacqueline. Université Pierre et Marie Curie, FRANCE
Caldeira, Kenneth. Lawrence Livermore National Laboratory, USA
Dickson, Andrew. Scripps Institution of Oceanography, USA
Francey, Roger. CSIRO Atmospheric Research, AUSTRALIA
Frankignoulle, Michel. Université de Liège, BELGIUM
Haugan, Peter. University of Bergen, Norway
Kumar, Dileep. National Institute of Oceanography, Goa, India
Le Quéré, Corinne. Max-Planck-Institut für Biogeochemie, Germany
Nojiri, Yukihiro. National Institute for Environmental Studies, Tsukuba, JAPAN
Watson, Andrew. University of East Anglia, UNITED KINGDOM
The International Ocean-Colour Coordinating Group (IOCCG) was established in 1996 to help promote international cooperation and coordination in the acquisition, distribution, calibration, validation and utilization of ocean-colour data from satellites launched by various nations. Part of the IOCCG mandate includes capacity building. Over the past few years, the IOCCG has successfully conducted six advanced training courses on applications of ocean-colour data, providing comprehensive training to over 180 students from over 50 different nations. Plans are underway to conduct another training course in Cape Town, South Africa at the end of this year.

A major focus of the IOCCG has been the formation of specialized working groups that investigate various aspects of ocean-colour technology and its applications. The end-product of these working groups is usually the publication of a scientific report. To date, three such reports have been published by the IOCCG, covering topics such as the minimum number of bands required by an operational ocean-colour sensor (Report No. 1), complementarity of ocean colour sensors (Report No. 2) and remote sensing in coastal waters (Report No. 3).

Current IOCCG working groups are investigating topics such as the calibration of ocean-colour sensors to common standards; the comparison of atmospheric correction algorithms used by various ocean-colour sensors; the development of a common Level-3 product to facilitate merging of Level-3 ocean-colour data from different sensors and; various aspects of operational ocean-colour. These working groups are all expected to produce reports within the next few years.

Lastly, the IOCCG collaborates with a number of other scientific programmes including JGOFS, SIMBIOS, POGO and IGOS, to provide expert advice on matters pertaining to remote sensing of ocean colour.
11.23. APPENDIX 23: Global Hydrography (Gould)

Status
To those who attended the Global Hydrography meeting at Southampton: Following the Tuesday night meeting at the WOCE/JGOFS Ocean Transports workshop and subsequent discussion in the plenary sessions, the following is my summary and list of actions. Please let me know of there are other issues I have missed. Thank you for your interest. John

High quality, full depth global hydrography is seen as a necessary observational activity to provide the following:

* Defining the physical and biogeochemical "climate of the ocean" and its changes on decadal timescales. It acts as a complement to Argo (top 2000-m T and S only at present), observations from VOS (surface and upper ocean) and from satellites.

* Estimates of ocean property transports where in addition to the complementary observations above, measurements of the interior and boundary current flows are required.

There are "commitments" to approx 70% of sections that made up the WOCE/JGOFS (WHP) One Time Survey between 1990 and 1998. Commitments include sections already planned and funded and scheduled, sections that are integral parts of national and laboratory programmes and sections that have been identified as important in national and international observing strategies. (See attached map)

The scientific rationales for occupying any section vary widely and the planned suite of measurements may differ.

The consensus was that as complete a set as possible of physics, biogeochemical, transient tracer and velocity (LADCP, SADCP) measurements should be made on all sections.

Data from these sections should be collected to uniform, high standard (WHP one time plus any recent amendments) and should be rapidly processed, submitted to the appropriate data centre and made publicly available.

At present, there is no single means of co-ordinating these measurements.

Actions
CLIVAR IPO to establish a web site with information on planned sections containing – Section location, planned time of occupation, planned measurements to be made, responsible PI, number of free berths (if any), funding status.

John Gould (CLIVAR), Maria Hood (IOC), Hugh Ducklow (JGOFS), J. Swift (WHPO) and others as appropriate to explore possible co-ordination and data management mechanisms.
11.24. APPENDIX 24: POGO Activity Report (Sathyendranath)

S. Sathyendranath, POGO Executive Director, provided an announcement on the Biology Workshop.

Biology Workshop

Sponsored by POGO (Shubha Sathyendranath, Executive Director, POGO, c/o Bedford Institute of Oceanography, 1 Challenger Drive, Dartmouth, Nova Scotia B2Y 4A2, CANADA. Tel: 902-426-8044 Fax: 902-426-9388.

Venue: Dartington, UK
Dates: 28-30 June 2001

Invited Participants
John Field (Chair, S. Africa)  John Marra (IOCCG)
Peter Burkill (UK)  Gregg Mitchell (USA)
Elgar Desa (India)  Satsuki Matsumura (Japan)
Fred Grassle (USA)  Ron O’Dor (USA/Canada)
Julie Hall (New Zealand)  Howard Roe (UK)
Tony Knap (Bermuda)  Mike Sinclair (Canada)
Richard Lampitt (UK)  Shubha Sathyendranath (POGO)
Julie Laroche (Germany)

Background
With the emergence of major programmes such as GOOS, operational oceanography and global oceanic observations are becoming a reality. The physical-oceanographic side of the observational schemes has made great strides, with GODAE and the Argos programme taking the lead in their implementation. The next task is to develop the biological observations: typically, these are more complex, and more difficult to automate, than physical measurements.

Issues
Several issues must be addressed before designing a scheme for biological measurements:
Can the observational plans build on lessons learned from major international research programmes with a global perspective such as JGOFS and GLOBEC, and serve the needs of emerging programmes such as SOLAS and Census of Marine Life?
From the plethora of measurements that are of interest to biological oceanographers, what elements can be selected reasonably to form the basis of a biological observational scheme implemented at the global scale?
How can we reconcile the sometimes conflicting demands of programmes interested in climate change and carbon cycle, with those that are interested in issues related to biodiversity?
Any scheme for global observations must, of necessity, rely to some extent on remote and autonomous platforms. Yet, calibration of biological sensors is notoriously difficult. How can we ensure that biological and chemical sensors on remote platforms are calibrated to rigorous standards?
How can we take advantage of new and emerging technologies for biological observations in the oceans? (See SCOR Working Group 118 on New Technologies for Observing Marine Life pulson.seos.uvic.ca/meeting/scor2000/scor2000.html)
How can we ensure that in situ observations are tied in with remote observations of ocean colour in a way that enhances and complements interpretations of the data and their applications?
Interpretations of biological observations often require background information on the physical environment, and yet the time and space scales of interest to physical and biological oceanographers are not necessarily always the same. How can we reconcile these conflicts?

What are the implications of the UN Convention on Biodiversity, for observations and study of marine life?

How can we build the elements of a biological observation scheme on the recommendations of GOOS panels that have studied these issues?

Terms of Reference for the Biology Workshop

Provide POGO with an overview of emerging global issues in deep-ocean (and coastal) biological oceanography;

Review observational requirements that have been identified for addressing these issues;

Identify the biological measurements that could be implemented by POGO members in the near future, based on available technology and ease of implementation;

Review new opportunities for technological development that would enhance monitoring of the relevant biological parameters; and

Recommend the actions that POGO could take.
## APPENDIX 25: List of SSC Members (as of June 2001)

<table>
<thead>
<tr>
<th>Name</th>
<th>Country</th>
<th>Function</th>
<th>Executive</th>
<th>2001</th>
<th>2002</th>
<th>2003</th>
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<tr>
<td>Ducklow, Hugh</td>
<td>USA</td>
<td>At-large, North Atlantic SG</td>
<td>Chair</td>
<td>SSC</td>
<td>SSC</td>
<td></td>
</tr>
<tr>
<td>Saino, Toshiro</td>
<td>Japan</td>
<td>At-large 2nd, North Pacific SG</td>
<td>Executive</td>
<td>SSC</td>
<td>SSC</td>
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<tr>
<td>Anderson, Robert</td>
<td>USA</td>
<td>At-large SSC (ends 1st term)</td>
<td>Executive</td>
<td>SSC</td>
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<tr>
<td>Tilbrook, Bronte</td>
<td>Australia</td>
<td>At-large 2nd (ends 2nd term)</td>
<td>Executive</td>
<td>SSC</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Garçon, Véronique</td>
<td>France</td>
<td>North Atlantic SG</td>
<td>Executive</td>
<td>Chair</td>
<td></td>
<td></td>
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<tr>
<td>Haugan, Peter</td>
<td>Norway</td>
<td>At-large, CAP, OOPC</td>
<td>SSC</td>
<td>SSC</td>
<td></td>
<td></td>
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<tr>
<td>Falkowski, Paul</td>
<td>USA</td>
<td>At-large (ends 1st term)</td>
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<tr>
<td>Hong, Huasheng</td>
<td>China-Beijing</td>
<td>At-large (2nd 1-year appt.)</td>
<td>SSC</td>
<td></td>
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<td>Wallace, Douglas</td>
<td>Germany</td>
<td>At-large, CAP</td>
<td>SSC</td>
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<tr>
<td>Lochte, Karin</td>
<td>Germany</td>
<td>Paleo JGOFS TT</td>
<td>Chair</td>
<td>Chair</td>
<td>Chair</td>
<td></td>
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<tr>
<td>Monfray, Patrick</td>
<td>France</td>
<td>JGOFS-GAIM TT</td>
<td>Chair</td>
<td>Chair</td>
<td>Chair</td>
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<tr>
<td>Quiñones, Renato</td>
<td>Chile</td>
<td>Continental Margins TT</td>
<td>Chair</td>
<td>Chair</td>
<td>Chair</td>
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<tr>
<td>Tréguer, Paul</td>
<td>France</td>
<td>Southern Ocean SG</td>
<td>Chair</td>
<td>Chair</td>
<td>Chair</td>
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<tr>
<td>Schlitzer, Reiner</td>
<td>Germany</td>
<td>Global Synthesis TT</td>
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<td>Chair</td>
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<tr>
<td>Conkright, Margarita</td>
<td>USA</td>
<td>Data Management TT</td>
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<td>Burkhill, Peter</td>
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<td>Bychkov, Alex</td>
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<td>Platt, Trevor</td>
<td>Canada</td>
<td>Int’l Oc. Colour C Group</td>
<td>Chair</td>
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<td>Le Borgne, Robert</td>
<td>France</td>
<td>Equatorial Pacific SG</td>
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## APPENDIX 26: Year 2000 Budget Table (Final)

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<thead>
<tr>
<th>Status</th>
<th>SOURCES</th>
<th>Funds/year</th>
<th>Purpose</th>
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<tbody>
<tr>
<td>Confirmed</td>
<td>Research Council of Norway (NRC)</td>
<td>$177,619</td>
<td>Administration, travel, JGOFS Report Series</td>
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<td>Expected</td>
<td>SCOR Secretariat (NSF &amp; ICSU)</td>
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<td>SSC meeting and Committee activities</td>
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<td>Confirmed</td>
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<td>Confirmed</td>
<td>IGBP Secretariat</td>
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<td>SSC meeting</td>
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</table>

| Subtotal  |                                 | $328,955   |                                              |

<table>
<thead>
<tr>
<th>Status</th>
<th>ACTIVITIES</th>
<th>Expenses</th>
<th>Comments</th>
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<tbody>
<tr>
<td>Obligated</td>
<td>International Project Office</td>
<td>$208,810</td>
<td>SSC support: Staff, offices, travel, reports, etc.</td>
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<td>Obligated</td>
<td>SSC Meeting (22)</td>
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<td>Bergen Meeting/Norway (IGBP Cost Share)</td>
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<td>Committed</td>
<td>Executive Meeting (5)</td>
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<td>New Hampshire Meeting (IGBP Cost Share)</td>
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<td></td>
<td>Synthesis Groups and Task Teams</td>
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<tr>
<td>Committed</td>
<td>SOSG (10)</td>
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<tr>
<td>Committed</td>
<td>DMTT (8)</td>
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<td>Kiel Meeting (Germany Cost Share: Hotel &amp; 1 Dinner)</td>
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<tr>
<td>Committed</td>
<td>PJTT (4)</td>
<td>$2,865</td>
<td>Hamburg Meeting/Germany (PAGES Cost Share)</td>
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<tr>
<td>Committed</td>
<td>NPTT (2)</td>
<td>$750</td>
<td>One Day Session at PICES Meeting/Japan</td>
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<tr>
<td>Proposed</td>
<td>EPSG (3)</td>
<td>$6,663</td>
<td>Hobart Meeting/Australia, DSR volume and New Scientist article</td>
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<tr>
<td>Committed</td>
<td>JGTT</td>
<td>$1,630</td>
<td>OCMIP-2 Princeton Meeting/USA</td>
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<tr>
<td>Committed</td>
<td>CMTT</td>
<td></td>
<td>Workshop Easter Boundary Systems (LOICZ Funds in 2000, $20,000)</td>
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Other meetings and expenses
- Obligated PICES $3,729 JGOFS support on a topic session
- Open acct. Expenses at SCOR Secretariat $19,833 Miscellaneous programme expenses (Gross)
- Obligated Open Science Conference (12) $12,186 Conference Speakers/Norway
- Obligated Conference (Speakers and SSC) $5,806 Board
- Committed JGOFS Science Brochure editing $4,375 Mardi Bownes (Science Editor)
- Committed Non-linear Planning Meeting $1,000 Edward Laws-JGOFS representative
- Committed JGOFS Report Series $1,645 Printing
- Obligated 1999 Budget Deficit $288 Carried over from 1999

| Subtotal |                              | $308,754  |                                              |
| Year 2000 Balance |                  | $20,201   |                                              |
## APPENDIX 27: Year 2001 Budget Table (as of August 2001)

<table>
<thead>
<tr>
<th>Status</th>
<th>SOURCES</th>
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<tr>
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<td>SSC Administration, travel, misc. Reports, etc.</td>
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<td>SCOR funds</td>
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<td>JGOFS SSC meeting and Committee activities</td>
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<td>ICSU funds</td>
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<td>IGBP funds</td>
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<td>IOC funds</td>
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<td>$ 20,000</td>
<td>CO₂ Transport Workshop/Southampton</td>
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<tr>
<td>Confirmed</td>
<td>2000 Carry over</td>
<td>$ 20,201</td>
<td>$ 20,201</td>
<td>University and SCOR funds carried over from 2000</td>
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<td></td>
<td><strong>Subtotal</strong></td>
<td>$ 432,346</td>
<td>$ 417,346</td>
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<thead>
<tr>
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<th>Approved Expenses</th>
<th>Comments</th>
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<tbody>
<tr>
<td>Obligated</td>
<td>International Project Office (staff)</td>
<td>$ 183,000</td>
<td>$ 183,000</td>
<td>Administration (Salaries, fringe benefits, insurance, overhead)</td>
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<tr>
<td>Obligated</td>
<td>IPO Operations</td>
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<td>Office Supplies, gen. postal expenses, and overhead</td>
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<td>Obligated</td>
<td>IPO Travel</td>
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<td>Hanson, Avril and Gjerde</td>
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<tr>
<td>Obligated</td>
<td>IPO Mailing</td>
<td></td>
<td>$ 600</td>
<td>AMBIO/IGBP Science Series</td>
</tr>
<tr>
<td>Obligated</td>
<td>IPO Publications/Printing</td>
<td>$ 10,000</td>
<td>$ 10,000</td>
<td>AMBIO and JGOFS Report Series Expenses</td>
</tr>
<tr>
<td></td>
<td><strong>SSC Business</strong></td>
<td></td>
<td></td>
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<tr>
<td>Committed</td>
<td>SSC Meeting (19)</td>
<td>$ 40,000</td>
<td>$ 23,556</td>
<td>Amsterdam Meeting/Netherlands (IGBP Cost Share)</td>
</tr>
<tr>
<td>Committed</td>
<td>David Karl--repr. JGOFS @ OSC</td>
<td></td>
<td>$ 2,500</td>
<td>IGBP OSC Speaker</td>
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<tr>
<td>Committed</td>
<td>Larry Atkinson--repr. JGOFS @ OSC</td>
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<td>$ 1,400</td>
<td>SSC/OSC mtgs (cost shared with IGBP funds from Session)</td>
</tr>
<tr>
<td>Planned</td>
<td>IGBPOSC fees for SSC members</td>
<td></td>
<td>$ 4,000</td>
<td>SSC/Reg. Fees</td>
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<tr>
<td>Committed</td>
<td>Executive Meeting (5)</td>
<td>$ 10,000</td>
<td></td>
<td>Tentatively cancelled as of 8 July 01</td>
</tr>
<tr>
<td></td>
<td><strong>Synthesis Groups and Task Teams</strong></td>
<td></td>
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</tr>
<tr>
<td>Committed</td>
<td>CMTT (10) 2nd</td>
<td>$ 20,000</td>
<td>$ 20,000</td>
<td>Workshop II (IOC-$20K, NCOR Cost Share, Taipei)</td>
</tr>
<tr>
<td>Committed</td>
<td>CMTT (5) 3rd</td>
<td>$ 10,000</td>
<td>$ 5,711</td>
<td>Workshop Polar Margins (IOC-$5K joint c/ LOICZ-$5K, Sydney, CA)</td>
</tr>
<tr>
<td>Pending</td>
<td>CMTT (5) 4th</td>
<td>$ 10,000</td>
<td></td>
<td>Sub-polar workshop pending (IOC-$5K,Joint c/ LOICZ-$5K)</td>
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<tr>
<td>Planned</td>
<td>JGTT (50, workshop)</td>
<td>$ 20,000</td>
<td>$ 5,000</td>
<td>Changed request: now 2 small Amsterdam Meetings (2 scientists)</td>
</tr>
<tr>
<td>Committed</td>
<td>NASG (10)</td>
<td>$ 10,000</td>
<td>$ 4,773</td>
<td>Arcachon, France, Meeting (PROOF Cost Share)</td>
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<tr>
<td>Committed</td>
<td>DMTT (10)</td>
<td>$ 10,000</td>
<td>$ 10,000</td>
<td>Washington DC, USA, Meeting, US JGOFS DM with $2000</td>
</tr>
<tr>
<td>Category</td>
<td>Description</td>
<td>Planned Amount</td>
<td>Committed Amount</td>
<td>Notes</td>
</tr>
<tr>
<td>----------------------------------</td>
<td>-----------------------------------------------------------------------------</td>
<td>----------------</td>
<td>------------------</td>
<td>---------------------------------------------------</td>
</tr>
<tr>
<td>Planned</td>
<td>PJTT (9)</td>
<td>$10,000</td>
<td>$6,449</td>
<td>TT WKS-Meeting, 2-days; Shimmield-2000 Meeting Expense</td>
</tr>
<tr>
<td>Committed</td>
<td>IOSG (3)</td>
<td>$5,000</td>
<td>$2,047</td>
<td>Miami, USA, Meeting/Edit Synthesis Report</td>
</tr>
<tr>
<td></td>
<td>SOSG</td>
<td></td>
<td></td>
<td>Planning a workshop-meeting at Ocean Sciences Meeting (2002)</td>
</tr>
<tr>
<td></td>
<td>EPSG</td>
<td></td>
<td></td>
<td>Hobart Meeting/Australia, DSR volume and New Scientist article</td>
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<tr>
<td>Committed</td>
<td>NPSG (2)</td>
<td>$5,000</td>
<td>$5,000</td>
<td>Sydney, BC, Canada, in conj. w/ PICES Annual Meeting</td>
</tr>
<tr>
<td>Committed</td>
<td>GSWG (10)</td>
<td>$10,000</td>
<td>$8,550</td>
<td>Amsterdam, NL (est.)</td>
</tr>
<tr>
<td></td>
<td>Other meetings and expenses</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Committed</td>
<td>AMBIO Special Report</td>
<td></td>
<td>$7,772</td>
<td>SCOR funds</td>
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<tr>
<td>Open acct.</td>
<td>SCOR Secretariat</td>
<td>$2,000</td>
<td>$2,000</td>
<td>Conkright travel (USA), DMITT est., etc.</td>
</tr>
<tr>
<td>Planned</td>
<td>JGOFS-WOCE-IOC CO₂ Transport (13)</td>
<td>$30,000</td>
<td>$25,000</td>
<td>Southampton (IOC-$20K, JGOFS-$10K)</td>
</tr>
<tr>
<td>Committed</td>
<td>AMBIO editing</td>
<td></td>
<td>600</td>
<td>Mardi Bowles (Science Editor)</td>
</tr>
<tr>
<td>Committed</td>
<td>Edward Laws (repr. JGOFS)</td>
<td></td>
<td>1,037</td>
<td>Ocean Sciences Meeting S.F. (GCTE Non-linear Workshop)</td>
</tr>
<tr>
<td>Planned</td>
<td>JGOFS Springer-Verlag, Synthesis Book</td>
<td>$40,000</td>
<td>$40,000</td>
<td>Managing Editor &amp; SOC expenses</td>
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<tr>
<td>Planned</td>
<td>JGOFS Reports Series</td>
<td></td>
<td>5,000</td>
<td>Paris Report, IOSG Report ...</td>
</tr>
<tr>
<td>Planned</td>
<td>IAPSO-IABO Assembly</td>
<td>$12,000</td>
<td>2,500</td>
<td>IAPSO-IABO Ocean Odyssey (Karin Lochte)</td>
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<tr>
<td></td>
<td>Subtotal</td>
<td>$459,000</td>
<td>$419,308</td>
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</tr>
<tr>
<td></td>
<td>Balance</td>
<td>$(26,654)</td>
<td>$(1,962)</td>
<td>As of 31 August 01</td>
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</table>
### APPENDIX 28: Working Budget and Requests for Year 2002 Allocations

#### Sources

<table>
<thead>
<tr>
<th>Source</th>
<th>Budget</th>
<th>Funds</th>
<th>Comments</th>
</tr>
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<tbody>
<tr>
<td>Resource Council of Norway (NRC)</td>
<td>$171,415</td>
<td>$171,415</td>
<td>Administration, travel, JGOFS Report Series</td>
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<tr>
<td>SCOR Secretariat</td>
<td>$85,000</td>
<td>$85,000</td>
<td>SSC meeting and Committee activities</td>
</tr>
<tr>
<td>University of Bergen (UiB)</td>
<td>$27,000</td>
<td>$27,000</td>
<td>Office, supplies, printing, HiB overhead (offices)</td>
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<td>IGBP Secretariat</td>
<td>$20,145</td>
<td>$20,145</td>
<td>SSC meeting</td>
</tr>
<tr>
<td>IOC funds</td>
<td>$20,000</td>
<td>$20,000</td>
<td>CMTT workshop/book publication</td>
</tr>
<tr>
<td>2001 Carry over</td>
<td>$(1,962)</td>
<td>$(1,962)</td>
<td>As of 31 August 01</td>
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<tr>
<td><strong>Subtotal</strong></td>
<td>$321,598</td>
<td>$321,598</td>
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**ACTIVITIES**

<table>
<thead>
<tr>
<th>Activity</th>
<th>Budget</th>
<th>Expenses</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>International Project Office</td>
<td>$198,415</td>
<td>$198,415</td>
<td>Administration (IPO, printing, overhead, etc.)</td>
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<tr>
<td>SSC Meeting (19)</td>
<td>$40,000</td>
<td>$40,000</td>
<td>Chile (Quinones) along side of the Training Course</td>
</tr>
<tr>
<td>Executive Meeting (5)</td>
<td>$10,000</td>
<td></td>
<td>Normally in the Fall/SSC meeting now planned</td>
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<tr>
<td>Synthesis Groups and Task Teams</td>
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<td></td>
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<tr>
<td>CMTT (10-12)</td>
<td>$10,000</td>
<td>$10,000</td>
<td>Joint c/ IOC &amp; LOCIZ@$10K, Grand Synthesis workshops in 2002</td>
</tr>
<tr>
<td>JGTT (10+20)</td>
<td>$10,000</td>
<td>$10,000</td>
<td>Joint with GSWG and GAIN ($10k)</td>
</tr>
<tr>
<td>NASG (10)</td>
<td>$14,000</td>
<td></td>
<td>3 meetings (Feb@OSM, Apr@EGS, NA and GS Chairs mtg.)</td>
</tr>
<tr>
<td>DMTT (10)</td>
<td>$10,000</td>
<td>$10,000</td>
<td>General Business Mtg plans</td>
</tr>
<tr>
<td>PJTT (9)</td>
<td>$5,000</td>
<td>$5,000</td>
<td>Joint c/ PAGES</td>
</tr>
<tr>
<td>IOSG (3)</td>
<td></td>
<td></td>
<td>No information (chair change as of 8/7-01)</td>
</tr>
<tr>
<td>SOSS</td>
<td></td>
<td></td>
<td>Mtg &amp; Synthesis Workshop, Honolulu, Hawaii</td>
</tr>
<tr>
<td>EPSG</td>
<td>$20,000</td>
<td></td>
<td>Modeller workshop &amp; business mtg, misc (budget $34K)</td>
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<tr>
<td>NPSG (9)</td>
<td>$15,000</td>
<td></td>
<td>Meeting and Session @ PICES</td>
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<tr>
<td>GSWG (10+20)</td>
<td>$20,000</td>
<td>$20,000</td>
<td>Joint c/ JGTT workshop ($10K GAIM &amp; $30K JGOFS)</td>
</tr>
<tr>
<td>Other meetings and expenses</td>
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<td></td>
<td></td>
</tr>
<tr>
<td>CapacityBuilding/Training Course</td>
<td>$10,000</td>
<td>$10,000</td>
<td>Chile (Quinones) cost sharing to be determined</td>
</tr>
<tr>
<td>CMTT Book Publication</td>
<td>$10,000</td>
<td>$10,000</td>
<td>2002 IOC funds (possibly in 2003)</td>
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<tr>
<td>3rd OSC Planning Committee</td>
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<td>Possible Feb Meeting, Honolulu/ASLO OSM</td>
</tr>
<tr>
<td>SCOR Secretariat</td>
<td></td>
<td></td>
<td>Estimated miscellaneous programme expenses (USA)</td>
</tr>
<tr>
<td>JGOFS Synthesis Book</td>
<td>$2,000</td>
<td>$2,000</td>
<td>IGBP-$2K, Technical layout @ Springer-Verlag</td>
</tr>
<tr>
<td>JGOFS Reports Series</td>
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<td></td>
<td>IPO and SCOR costs</td>
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<tr>
<td><strong>Subtotal</strong></td>
<td>$374,415</td>
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<tr>
<td><strong>Balance</strong></td>
<td>$(52,817)</td>
<td>$6,183</td>
<td>As of 31 August 01</td>
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</table>
APPENDIX 29: The relationships among the JGOFS regional synthesis groups, task teams, program-wide synthesis and global synthesis (updated and redrawn, July 2001).

JGOFS Synthesis Plan


Regional/Disciplinary Synthesis  Programme-Wide  Global Synthesis

NASG  
(DSR II Volume)

EPSG  
(DSR II Volumes)

SOSG  
(DSR II & Book)

NPSG  
(DSR II Volume)

CO₂ Panel

CMTT  
(Book)

PJTT

Southampton Workshop
SECOND JGOFS CONFERENCE

AMBIO Article

IGBP Science Series #2

Springer-Verlag Book

Contributions to IGBP Synthesis

THIRD JGOFS CONFERENCE

Final Book?

DMTT
IOCCCG

GSWG

JGTT
OCMIP

NASG  
(DSR II Volume)

EPSG  
(DSR II Volumes)

SOSG  
(DSR II & Book)

NPSG  
(DSR II Volume)

CO₂ Panel

CMTT  
(Book)

PJTT

Southampton Workshop
SECOND JGOFS CONFERENCE

AMBIO Article

IGBP Science Series #2

Springer-Verlag Book

Contributions to IGBP Synthesis

THIRD JGOFS CONFERENCE

Final Book?