

Report of the Fifth Session of the Scientific Steering Group of the International Ocean Carbon Coordination Project

Viterbo, Italy
5 October 2010

The International Ocean Carbon Coordination Project (IOCCP) promotes the development of a global network of ocean carbon observations for research through technical coordination and communication services, international agreements on standards and methods, advocacy, and links to the global observing systems. The IOCCP is co-sponsored by the Intergovernmental Oceanographic Commission of UNESCO and the Scientific Committee on Oceanic Research.

IOCCP Report No. 22

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I. AGENDA

IOCCP SSG MEETING Domus La Quercia Viterbo, Italy 5-Oct-2010 13:00-17:30	
13:00	Welcome and Logistics
13:15-15:15	Review of Major Activities
	Repeat Hydrography – Sabine/Fukasawa
	VOS - Monteiro
	Time Series - Gonzalez
	Surface Flux Maps/Data Assimilation - Schuster
	SOCAT - Bakker
	Ocean Interior Data Synthesis - Tanhua
	Surface/Interior Meeting - Gruber
	<i>Break</i>
15:30-17:00	Information and Updates
	Ocean Obs09 - Monteiro
	Data Management - Kozyr
	Ocean Acidification – Tedesco/Nojiri
	SSG Rotations - Sabine
	IOCCP Budget - Tedesco
17:00-17:30	Closing Remarks

II. PARTICIPANT LIST

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III. REPORT

1. Introduction

The Fifth IOCCP Scientific Steering Group meeting was held 5 October 2010 in conjunction with the COCOS-RECAPP Workshop in Viterbo, Italy. Chris Sabine (Chair-NOAA/PMEL, USA) was joined by members Dorothee Bakker (UEA, UK), Melchor Gonzalez (U. Las Palmas, Spain), Alex Kozyr (CDIAC, USA), Pedro Monteiro (CSIR, South Africa), Yukihiro Nojiri (NIES, Japan), Ute Schuster (UEA, UK), and Toste Tanhua (IfM-Geomar, Germany). Nicolas Metzl (LOCEAN-IPSL, France) and Nicolas Gruber (ETH, Switzerland) attended as representatives of the SOLAS-IMBER Carbon Working Groups. Masao Fukasawa (JAMSTEC, Japan), Jean-Pierre Gattuso (CNRS-UPMC, France), and Ed Urban (SCOR) were unable to attend.

The SSG welcomed new members Jean-Pierre Gattuso (CNRS-UPMC, France), Masao Ishii (MRI-JMA, Japan), Are Olsen (Univ. Bergen, Norway), and Bernadette Sloyan (CSIRO, Australia) and thanked Dorothee Bakker and Masao Fukasawa who rotated off after 6 years of dedicated service to the IOCCP. In addition, Toste Tanhua will serve as co-Chair along with Chris Sabine for 2011 and then take over as Chair in 2012.

Sabine opened the meeting by welcoming the Scientific Steering Group members. He reminded the group of the many on-going coordination activities of IOCCP including hydrographic survey cruises, surface observations on volunteer observing ships, and time series observations. IOCCP is also actively involved in helping to develop standards and methods such as the recently completed GO-SHIP: Repeat Hydrography Manual (revision of the WOCE manual) and the Guide to Best Practices for Ocean acidification research and data reporting. In the 8 years since its inception, IOCCP has held 18 workshops or meetings and has published and/or co-sponsored the publication of 21 reports, guides, and strategy documents.

Each of the steering group members reported on the on-going activities and needs of the community for their specialty including Repeat Hydrography, VOS, Time Series, Surface Flux Maps/Data Assimilation, Surface Ocean CO₂ Atlas Project (SOCAT), Ocean Interior Data Synthesis, Greenhouse Gas Networks, and Data Management. In 2011, IOCCP will continue to support these important community efforts.

For more information: Visit <http://www.ioccp.org>

2. Review of Major Activities

2.1 Repeat Hydrography – Sabine/Fukasawa

Chris Sabine presented the Repeat Hydrography agenda item with input from Masao Fukasawa, who was unable to attend.

The IOCCP and CLIVAR, in collaboration with the joint SOLAS-IMBER carbon working group, developed the Global Ocean Ship-based Hydrographic Investigations Panel (GO-SHIP) to bring together interests from physical hydrography, carbon, biogeochemistry, Argo, OceanSITES, and other users and collectors of survey data to consider how future global ship-based hydrography can build on the foundations established by the global surveys of GEOSECS, WOCE, JGOFS, and CLIVAR.

GO-SHIP held its first meeting in November 2007 with the following Panel members: Masao Fukasawa (JAMSTEC, Japan), Chris Sabine (NOAA, USA), Bernadette Sloyan (CSIRO, Australia), Gregory Johnson (NOAA, USA), Nicolas Gruber (ETH, Switzerland), Toste Tanhua and Arne Koertzinger (IfM-GeoMar, Germany). The Panel agreed to the following Terms of Reference:

- i. To develop the scientific justification and general strategy for a ship-based repeat hydrography network, building on existing programs and future plans, that will constitute the core global network, post-CLIVAR; OceanObs'09 conference in September 2009, where the guidelines would be published as a Community White Paper.
- ii. To develop guidelines for a single global information and data center for ship-based repeat hydrography; go-ship.org
- iii. To review and provide guidance on the need to update the WOCE hydrographic programme operations manual, including a review and update of data quality control issues. guidelines for a coordinated repeat hydrography network and information center and the updated operations manual

The Global Ocean Ship-based Repeat Hydrographic Investigations Panel (GO-SHIP) strategy was presented at the OceanObs'09 conference in September 2009 and published as a Community White Paper (Hood, M., Fukasawa, M., Gruber, N., Johnson, G., Koertzinger, A., Sabine, C., Sloyan, B., Stansfield, K. and Tanhua, T., (2010). "Ship-based Repeat Hydrography: A Strategy for a Sustained Global Program." in *Proceedings of OceanObs'09: Sustained Ocean Observations and Information for Society (Vol. 2)*, Venice, Italy, 21-25 September 2009, Hall, J., Harrison, D.E. & Stammer, D., Eds., ESA Publication WPP-306, doi:10.5270/OceanObs'09.cwp.44).

Central to this coordination is ensuring that measurements made by different groups are comparable, compatible, and of the highest quality possible. One early priority for GO-SHIP was to revise the 1994 WOCE Hydrographic Programme manual. In the 15 years since the original publication of the manual, many methods and techniques have changed

and new sensors have been developed. “The GO-SHIP Repeat Hydrography Manual: A Collection of Expert Reports and Guidelines” provides detailed instructions for the high quality collection and analysis techniques of numerous ocean parameters, both physical and biogeochemical. Sixteen chapters covering CTD methods, discrete samples, and underway measurements were reviewed and revised by more than 50 experts. Chapters went through a period of open community review and comment and have also been reviewed through an informal peer-review process. For more information please visit: www.go-ship.org/HydroMan.html

At the OceanObs’09 meeting there were requests for the formation of a GO-SHIP Program. This effort was supported by JCOMM. The GO-SHIP SSG is currently working on identifying official program sponsors and a program office. Regardless of how the GO-SHIP program develops, IOCCP will continue to coordinate hydrographic section work and help sponsor workshops to advance large-scale carbon observations in the water column.

Action Item 1

Organize a GO-SHIP SSG meeting in 2011. (*Responsible: Sabine and Sloyan. Timeframe: Spring/Summer 2011. Financial Implications: Medium*)

2.2 VOS - Monteiro

The IOCCP provided coordination support for a community white paper on the VOS network for the OceanObs’09 meeting. The paper entitled “A global sea surface carbon observing system: assessment of sea surface CO₂ and air-sea CO₂ fluxes” by Monteiro et al., 2009 outlines a strategy for carbon measurements on commercial Volunteer Observing Ships.

The paper highlights the highest priorities for the next ten years

- i. Deliver seasonally unbiased annual assessments for the regional and global trends in ocean-atmosphere fluxes
- ii. Implement an effective and integrated multi-platform pCO₂ observing network that will reduce uncertainty
- iii. Advance sensor and instrumentation to strengthen the VOS lines
- iv. Understand and resolve the biogeochemical and physical mechanisms driving surface carbon, natural and anthropogenic,
- v. Strengthen the capabilities of coupled climate-carbon models
- vi. Further strengthen, as in SOCAT, international coordination of carbon observations

Discussion of this topic revolved around whether the group had any plans for the first iteration of SOCAT (v. 1.3) to feedback to the VOS questions. It was strongly suggested that the two groups need to work in parallel. To this end, a workshop was proposed to bring together the SOCAT, VOS, ocean acidification and data reporting communities (see Section 2.4).

2.3 Time Series Network -Gonzalez

Melchor Gonzalez led the discussion of time series. He pointed out that time series are critical because they provided information about temporal trends. However, many time series stations are moving to observatories that collect only surface measurements. As a result, stations do not have full profiling on seasonal or monthly time scales. In addition, lack of funding for ship time does not permit the regular service of stations.

The future of EuroSITES (the European component of OceanSITES network of deep water reference stations) is very uncertain. Many of the observatories are reporting problems with continuing the maintenance of their sites:

- PAP funding is currently very uncertain
- ESTOC buoy lost the aerial sensors and solar panels
- Spanish Institutions assure 1 visit/yr to keep ESTOC buoy maintenance
- Most of the sites have become surface biochemistry observatories including some of them pCO₂ and pH (ESTOC) sensors, without monthly or even seasonal full profile sampling

EuroSITES is a core component of GOOS (Global Ocean Observing system) and contributes to the development of the Global Earth Observation (GEO), its infrastructure is also contributing to the ESFRI list through the EMSO PP (European Multidisciplinary Seafloor Observation Preparatory Phase) which is focused on developing a formal organisation in Europe to operate fixed-point *in situ* ocean observatory infrastructures, and data are open access, linked to the CORIOLIS Global Data Assembly Centre (GDAC), and physical datasets are fed into the GTS (TESAC). Temperature and salinity data are also sent as daily deliveries to MyOcean *in situ* TAC.

American Ocean Time Series Stations (HOT, BATS, CARIACO) continue with their monthly/bimonthly sampling plus sensor implementation.

Suggested contributions by the IOCCP could include the development of a list of parameters to be measured at time series stations, standardization of approaches, and encouragement of researchers to test new sensors at time series sites. This will demonstrate their value to larger community and may increase ship time devoted to servicing the sites.

Action Item 2

Develop an updated list of international time series stations and relevant carbon measurements. (*Responsible: Monteiro and Tedesco. Timeframe: by end 2010. Financial Implications: None*)

2.4 Flux Maps/ Data Assimilations- Schuster

The development of flux maps for the COCOS-RECAPP effort will rely heavily on the SOCAT data set (v.1.3). However, there are different approaches for making global estimates of air-sea CO₂ fluxes including MLR, neural network, proxy techniques with satellite data, and model-data fusion approaches. The different approaches produce very different estimates of the spatial patterns in CO₂ flux, but there has never been a coordinated effort to try and evaluate which techniques provide the most reasonable maps and whether there are lessons to be learned from the different approaches.

A surface CO₂ observational meeting was proposed for fall 2011 (see section 2.2) for the surface CO₂ observing network. It was suggested that this meeting should devote some attention to the issue of CO₂ flux maps and their evaluation.

Action Item 3

Organize a surface CO₂ observational meeting to include SOCAT, ocean acidification, flux map intercomparison and metadata reporting, perhaps in conjunction with the Surface/Interior synthesis workshop. (*Responsible: Schuster, Monteiro and Telszewski. Timeframe: September 2011. Financial Implications: Medium*)

2.5 Surface Ocean CO₂ Atlas (SOCAT) - Bakker

The Surface Ocean CO₂ Atlas (SOCAT) aims to produce and regularly update:

- i. A 2nd level quality controlled (QC) global surface ocean fCO₂ data set, and
- ii. A gridded global SOCAT product of monthly surface water fCO₂ means, with no temporal or spatial interpolation (i.e. bin averages).

These data products will be made publicly available. The methods followed in SOCAT will be transparent and fully documented in a technical article. High profile scientific articles using SOCAT will be written.

In the past year two regional group meetings have taken place: The Pacific group met in February 2010 at NIES (Tsukuba, Japan). The Indian and Southern Ocean groups met in June 2010 at the CSIRO Marine Laboratories in Hobart, Australia. Meeting reports are available on the IOCCP website. At the meetings the progress of data quality control (QC) in these regions was discussed, while expertise on data QC tools was passed around. In Hobart a data QC deadline of 1 October 2010 and a public release in April/May 2011 were suggested. These dates were approved a few days later by all regional groups.

Data QC is carried out on the Live Access Server (LAS). Improvements and new tools for data QC are continuously being added to the LAS (by Jeremy Malczyk and Heather Koyak). A SOCAT website was created in late 2009 (by Benjamin Pfeil). A cookbook with data QC procedures was put on the SOCAT website in late 2009 and was updated

with a 'U flag' (Updated cruise data) in September 2010 (by Are Olsen and Nicolas Metzl). Matlab routines for data QC (by Denis Pierrot and Are Olsen) were made available via the SOCAT website in June 2010.

Much data QC has been carried out to date by SOCAT participants. Many cruise data and metadata data have been updated in SOCAT (by Benjamin Pfeil). The deadline for data QC has been postponed to 31 October 2010.

Planning is necessary now for the first public SOCAT release, the prompt publication of many high-level scientific articles on SOCAT, and the organization of future SOCAT products.

SOCAT does not have dedicated funding, but has the support of IOCCP, Benjamin Pfeil (data manager of the EU CarboOcean project, which ended in 2009), Jeremy Malczyk/Heather Koyak (Life Access Server manager), and marine carbon scientists around the world. Visibility of SOCAT releases in high profile scientific articles by SOCAT contributors and other scientists is extremely important in view of the major international effort put into SOCAT, the uncertain funding of future SOCAT releases, and encouragement for marine carbon scientist for continued public data submission and support of SOCAT.

Action Item 4

Encourage continued SOCAT data submission. (*Responsible: Telszewski. Timeframe: Ongoing. Financial Implications: None*)

Action Item 5

Assist with SOCAT public release of v. 1.3 and future releases. (*Responsible: Telszewski. Timeframe: Ongoing. Financial Implications: None*)

Action Item 6

Organize meetings of the SOCAT Regional Groups (*Responsible: Telszewski. Timeframe: Ongoing. Financial Implications: None*)

2.6 Ocean Interior Data Synthesis - Tanhua

Toste Tanhua presented a summary of ocean interior data synthesis activities including CARINA and PACIFICA.

- **CARINA: Carbon in the Atlantic Ocean.**
The CARINA project is done. The data products have been publicly available since early 2009. Shortly before the meeting the last of the 20 articles in the special issue of Earth System Science Data (ESSD) was published, so that the CARINA special issue is complete.

- **PACIFICA:**
The PACIFICA project has collected more than 260 cruises for the Pacific Ocean, and the secondary QC is currently under way. The project also includes the Indian Ocean and some Southern Ocean Cruises.

The joint effort of GLODAP/CARINA/PACIFICA is the subject of an article to EOS that will be published in November 2010.

2.7 Surface/Interior Meeting-Gruber

The SOLAS-IMBER Working Groups 1 and 2 led by Nicolas Metzl and Niki Gruber plan to organize a Surface/Interior carbon workshop in September 2011 at UNESCO Headquarters. They will form an organizing committee to set the agenda and choose speakers. All relevant documents will be submitted prior to the workshop and data from GLODAP2 and SOCAT should be released before the workshop is held.

Action Item 7

Form an organizing committee for the Surface/Interior workshop at UNESCO (*Responsible: Metzl and Gruber. Timeframe: by end of 2010. Financial Implications: None*)

Action Item 8

Reserve room and coffee breaks for 100 participants at UNESCO Headquarters for the Surface/Interior workshop. (*Responsible: Tedesco. Timeframe: By the end of 2010. Financial Implications: Low*)

Action Item 9

Plan a dinner for workshop participants. (*Responsible: Tedesco. Timeframe: summer/fall 2011. Financial Implications: None*)

3. Updates

Action Item 10

Recommendations based on the intercomparison experiment to be posted on the IOCCP Web-site. (*Responsible: Nojiri will write up recommendations. Tedesco will post on the Web-site. Timeframe: By March 2011. Financial Implications: None*).

3.1 OceanObs'09 - Monteiro

Pedro Monteiro presented as update on the OceanObs'09 publications and the formation of a working group tasked to develop a framework for Ocean Observations (FOO).

All papers from OceanObs'09 were published electronically in 2010 and can be found at <http://www.oceanobs09.net/>. Volume 1 contains the Plenary Papers, Volume 2 has the Community White Papers, and the Annex holds the Additional Contributions. Print versions will be published in 2011.

A Working Group was formed to consider the outcomes and recommendations from the OceanObs'09 Conference in consultation with the international organizations and expert advice. The Terms of Reference of the Working Group are

- i. Recommend a framework for moving global sustained ocean observations forward in the next decade; integrating feasible new biogeochemical, ecosystem, and physical observations while sustaining present observations; considering how best to take advantage of existing structures,
- ii. Foster continuing interaction between organizations that contribute towards and are in need of sustained ocean observations, and
- iii. Report back to its sponsors and disband by 1 October 2010.

The Framework is currently being developed and will include consideration of

- How to establish technical specifications and implementation plans
- How to fund the observing system and liaison with potential funders
- How to periodically evaluate and alter the specifications and plans in the light of new knowledge, new user needs, and technology
- How to develop metrics to permit tracking of implementation progress
- Integration and coordination of current and planned ocean observation activities

The IOCCP SSG discussed contributing to the FOO in biogeochemistry, standards and best practices, and International cooperation. The members read and comment on the draft report and return their comments to Pedro Monteiro.

Action Item 11

Circulate a draft of the Framework for Ocean Observations to the IOCCP SSG for their comments to be submitted to Monteiro. (*Responsible: Tedesco and Monteiro. Timeframe: Spring 2011. Financial implications: None*)

3.2 Data Management - Kozyr

Alex Kozyr presented an update on new data acquired by CDIAC since the last SSG meeting. The CARINA Database was published in November 2009 (WAVES) and the LDEO V2009 database was published in August 2010 (WAVES).

New data for Repeat Sections:

1. P18_2007 – final and public online
2. I06_2008 – final and public online

3. I08_2007 – final and public except TALK from Dickson
4. I05_2009 – final and public except TALK and pH from Dickson

New data from VOS Lines:

1. Argentina Shelf Data: ARGAU and GEF Patagonia, final and public online
2. Trans Future 5 Line 2006-2008 data – online
3. Pyxis Line 2001-2006 data online
4. Ronald Brown underway measurements 2001-2008 data online
5. Ka'imimoana data 2007-2008 online
6. Falstaff data 2005 – online
7. Atlantic Companion 2006-2007 – online
8. Pacific Celebes 2007-2010 - online

New Moorings and TS data:

1. Munida – NZ TS data online
2. TAO 155W mooring data 1997-2008 online
3. TAO 170W 2S mooring data online
4. Gulf of Main cruise TS data 2004-2009 online
5. Station P line data 1973-2003 underway data online and 2004-2008 bottle data online
6. PAPA 2007-2008 - online
7. KEO 2007-2009 – online
8. JKEO 2007 – online
9. WHOT 2007-2009 - received

New Coastal data:

1. Mc Arthur II 2006-2007 surface data online
2. David Starr Jordan 2006-2007 surface data online
3. HCMR-Aegean Sea 2006 data online
4. ESTOC TS surface 1995-2004 data online

3.3 Ocean Acidification- Nojiri/Tedesco

Impacts of Ocean Acidification on Marine Biology and Ecosystems - Nojiri

A joint IPCC Expert Meeting of WG1 and WGII entitled “Impacts of Ocean Acidification on Marine Biology and Ecosystems” will be held on 17-19 January 2011, in Okinawa, Japan. Since the publication of the Fourth Assessment Report (AR4), ocean acidification research, especially experimental studies of the impact of increased concentrations of seawater CO₂ on marine biology in different regions, and modeling studies of future ocean environments, has been advancing rapidly. Given this progress and increasing interest from stakeholders in understanding the implications of ocean acidification, an IPCC Expert Meeting will discuss the rapidly advancing scientific findings on ocean acidification and its impacts since the publication of IPCC AR4, and to provide scientific information as input to Fifth Assessment Report (AR5).

Third Symposium on the Ocean in a High-CO₂ World - Tedesco

A consortium of institutions and organizations from Monterey, California has successfully bid to host the third symposium on The Ocean in a High-CO₂ World in September 2012. The symposium aims to attract more than 300 of the world's leading scientists to discuss the impacts of ocean acidification on marine organisms, ecosystems, and biogeochemical cycles. It will also cover socio-economic consequences of ocean acidification, including policy and management implications.

The symposium is sponsored by the Scientific Committee on Oceanic Research (SCOR), Intergovernmental Oceanographic Commission (IOC) of UNESCO, and International Geosphere-Biosphere Programme (IGBP), which selected the Monterey consortium from eight bids to host the meeting. The international Planning Committee is led by Prof. Dr. Ulf Riebesell of the Leibniz Institute of Marine Sciences (Germany), and the local organization is led by Dr. Jim Barry of Monterey Bay Aquarium Research Institute and supported by a consortium of institutions.

The symposium is the third in a series and will build on the successes of the Paris and Monaco symposia in 2004 and 2008, respectively. The Paris meeting was seminal in identifying the magnitude of ocean acidification for marine ecosystems and the outcomes of the Monaco symposium, focusing on the advances in knowledge of the affects on marine organisms, also made an impact on a broader audience through a Summary for Policymakers and the Monaco Declaration.

The international planning committee will meet in December 2010 to develop the scientific program for the symposium. Please contact Ed Urban (Ed.Urban@scor-int.org) if you would like to provide ideas for symposium topics. Inputs will be collated and provided to the planning committee.

More information: <http://www.ocean-acidification.net/>
To subscribe to email updates: secretariat@scor-int.org

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Guide to Best Practices in Ocean Acidification Research and Data Reporting - Tedesco

As the study of ocean acidification gains momentum, representatives of coordinated research projects, international scientific organizations, funding agencies, and scientists in this field felt the need to provide guidelines and standards for ocean acidification research. To initiate this process, the European Project on Ocean Acidification (EPOCA) and the Intergovernmental Oceanographic Commission (IOC) jointly invited over 40 leading scientists active in ocean acidification research to a meeting at the Leibniz Institute of Marine Science (IFM-GEOMAR) in Kiel, Germany on 19-21 November 2008. At the meeting, which was sponsored by EPOCA, IOC, the Scientific Council on Oceanic Research (SCOR), the U.S. Ocean Carbon and Biogeochemistry Project (OCB) and the Kiel Excellence Cluster “The Future Ocean”, the basic structure and contents of the guide was agreed upon and an outline was drafted.

The final version of the guide is now published:

Riebesell U., Fabry V. J., Hansson L. & Gattuso J.-P. (Eds.), 2010. Guide to best practices for ocean acidification research and data reporting, 260 p. Luxembourg: Publications Office of the European Union.

It is available free of charge on the EPOCA Web-site (<http://www.epoca-project.eu/index.php/Home/Guide-to-OA-Research/>). It is envisioned to revisit and possibly revise the guide to accommodate new developments in the field in a few years time.

Please contact Lina Hansson (hansson@obs-vlfr.fr) at the EPOCA project office or Kathy Tedesco at IOCCP (k.tedesco@unesco.org) to obtain print copies of the guide.

Ocean Acidification Summary for Policymakers- Tedesco

The “Summary for Policymakers on Ocean Acidification” (2009) was translated into French and Spanish and is now available at <http://www.ocean-acidification.net>. A Portuguese version is due out in early 2011.

3.4 Scientific Steering Group Rotations

The IOCCP SSG Terms of Reference state that member’s terms are three years with the opportunity to renew for a second term. The SSG thanked Dorothee Bakker and Masao Fukasawa who rotated off after six years of dedicated service to the IOCCP and

welcomed new members Jean-Pierre Gattuso (CNRS-UPMC, France) as the ocean acidification representative, Are Olsen (Univ. Bergen, Norway) who will replace Dorothee Bakker , Bernadette Sloyan (CSIRO, Australia) to replace Masao Fukasawa, and Masao Ishii (MRI-JMA, Japan) to replace Toste Tanhua. Toste Tanhua will serve as co-Chair with Chris Sabine in 2011 and take over as Chair in 2012. Chris will rotate off but remain with IOCCP as emeritus.

Action Item 12

Organize the next IOCCP SSG meeting for Summer/Fall 2011. (*Responsible: Tedesco. Timeframe: Fall 2011. Financial Implications: Medium*)

4. Project Office

A renewal proposal was submitted to NSF in September 2010. This 3 year renewal proposal will provide salary support for a full time director and a consultant for IOCCP from 1/1/2011 to 31/12/2013.

Program support for the IOCCP is provided by NSF through a grant to SCOR. A new continuing grant was approved beginning 1 October 2009 and provides \$40,000 per year to the program. The IOC also provides funding from its regular budget for the IOCCP project office and for ocean acidification activities. This money is received at the start of each year.

Given this level of available funding for 2011, Action Items are assigned a financial implication level based on “low” (<\$5,000), “medium” (<\$15,000), and “high” (>\$15,000).

IV. Action Item List

Action Item 1

Organize a GO-SHIP SSG meeting in 2011. (*Responsible: Sabine and Sloyan. Timeframe: Spring/Summer 2011. Financial Implications: Medium*)

Action Item 2

Develop an updated list of international time series stations and relevant carbon measurements. (*Responsible: Monteiro and Tedesco. Timeframe: by end 2010. Financial Implications: None*)

Action Item 3

Organize a surface CO₂ observational meeting to include SOCAT, ocean acidification, flux map intercomparison and metadata reporting in conjunction, perhaps with the Surface/Interior synthesis workshop. (*Responsible: Monteiro and Tedesco. Timeframe: September 2011. Financial Implications: Medium*)

Action Item 4

Encourage continued SOCAT data submission. (*Responsible: Telszewski. Timeframe: Ongoing. Financial Implications: None*)

Action Item 5

Assist with SOCAT public release of v. 1.3 and future releases. (*Responsible: Telszewski. Timeframe: Ongoing. Financial Implications: None*)

Action Item 6

Organize meetings of the SOCAT Regional Groups. (*Responsible: Telszewski. Timeframe: Ongoing. Financial Implications: None*)

Action Item 7

Form an organizing committee for the Surface/Interior workshop at UNESCO (*Responsible: Metzl and Gruber. Timeframe: by end of 2010. Financial Implications: None*)

Action Item 8

Reserve room and coffee/lunch for 100 participants at UNESCO for the Surface/Interior workshop. (*Responsible: Tedesco. Timeframe: By the end of 2010. Financial Implications: Low*)

Action Item 9

Plan a dinner for workshop participants. (*Responsible: Tedesco. Timeframe: summer/fall 2011. Financial Implications: None*)

Action Item 10

Recommendations based on the intercomparison experiment to be posted on the IOCCP Web-site. (*Responsible: Nojiri will write up recommendations. Tedesco will post on the Web-site. Timeframe: By March 2011. Financial Implications: None*).

Action Item 11

Circulate a draft of the Framework for Ocean Observations to the IOCCP SSG for their comments to be submitted to Monteiro. (*Responsible: Tedesco and Monteiro. Timeframe: Spring 2011. Financial implications: None*)

Action Item 12

Organize the next IOCCP SSG meeting for Summer/Fall 2011. (*Responsible: All. Timeframe: Fall 2011. Financial Implications: Medium*)