**THE INTERNATIONAL OCEAN CARBON COORDINATION PROJECT (IOCCP)**

*A joint project of SCOR and IOC and an affiliate program of the Global Carbon Project.*

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## Workshop on Best Practices for Ocean Acidification Research Planned

The need for standardized protocols and reporting of data has been highlighted at numerous ocean acidification workshops over the past few years. Common methods are crucial if we are to identify differences (or lack thereof) in calcification among various taxa, regions, and over time. It is also imperative that data be reported in a manner that will be comprehensible and accessible to scientists several decades from now if changes are to be detected. Specifically, the international research community needs to establish agreed protocols for calcification rate measurements and mesocosm / perturbation experiments, as well as for protocols for data reporting.

At its kick-off meeting from 10-13 June, the European Project on Ocean Acidification (EPOCA) agreed to merge several standards and protocol activities into a single activity, and the IOCCP agreed to work with EPOCA to develop an international workshop on standards for ocean acidification research and data reporting. The advisory group includes Ulf Riebesell (IfM-GEOMAR, Germany), Deborah Iglesias-Rodriguez (NOC, UK), Richard Bellerby (Uni Bergen, Norway), Kitack Lee (Pohang Uni, Korea), Victoria Fabry (California State Uni., USA) , and Dick Feely (PMEL, NOAA, USA).

The meeting will be held tentatively at the end of November at IfM-GEOMAR in Kiel, Germany in order to meet EPOCA deliverable dates. The workshop will produce short technical reports for each major topic covered (e.g., perturbation experiments, calcification experiments, etc.), as well as a Guide to Best Practices for Ocean Acidification Research and Data Reporting. Participants at the kick-off meeting pointed out that many experimental aspects of ocean acidification research are still in the development stages and it may be too early to set agreed standards or protocols for many things. It is also clear that one workshop under tight deadlines may not be sufficient to produce a comprehensive Guide. However, participants noted that research is moving forward rapidly and a dialogue about protocols and standards must begin now. There are already many aspects of carbon chemistry applicable to acidification research that have been thoroughly documented in the Guide to Best Practices for Oceanic $CO_2$ Measurement, and

application of these protocols to acidification research would greatly improve the current situation. In the end, the first version of the Guide will most likely end up being a mixture of standards, guidelines, and, most critically, reporting and documentation requirements, so that individual experiments are fully comprehensible and reproducible. To ensure full community participation and input, drafts of the Guide will be made available on-line for open community review period before publishing.

***For more information:*** visit the EPOCA web-site at: http://epoca-project.eu/ or contact Maria Hood at m.hood@unesco.org.

## Surface Ocean $CO_2$ Atlas (SOCAT) Project - 2nd Technical Meeting

At the "Surface Ocean $CO_2$ Variability and Vulnerability" (SOCOVV) workshop at UNESCO, Paris in April 2007, co-sponsored by IOCCP, SOLAS, IMBER, and the Global Carbon Project, participants agreed to establish a global surface $CO_2$ data set that would bring together, in a common format, all publicly available $fCO_2$ data for the surface oceans. This data set is meant to serve a wide range of user communities and it is envisaged that, in the future, 2 distinct data products will be made available in this Surface Ocean $CO_2$ Atlas (SOCAT):

- a 2nd level quality controlled global surface ocean $fCO_2$ data set following agreed procedures and regional review, and
- a gridded SOCAT product of monthly surface water $fCO_2$ means on a 1° x 1° grid with no temporal or spatial interpolation.

See the IOCCP Newsletter for November 2007 for background information about the SOCAT project.

The IOCCP, along with CarboOcean and the SOLAS-IMBER Joint Carbon Group, held a 2nd technical workshop at UNESCO, Paris, from 16-17 June 2008 to discuss data flags, crossover and other checks for underway CO2 data, quality control procedures for non-carbon data, record-keeping for 2nd level quality control procedures, gridding and interpolation, Live-Access Server and shared data management strategies, and to review progress on the establishment of regional groups.

The meeting report will be available at the end of August 2008. Over the next few weeks the regional groups will become firmly established, will identify and submit missing data sets to CDIAC for inclusion in the SOCAT project (deadline 1 September 2008). After 15 September 2008 the regional groups are asked to carry out 2nd level quality control on the SOCAT data and address key process-related scientific questions requiring large-scale joint synthesis efforts, while aiming for scientific presentations at ICDC-8 (International Carbon Dioxide Conference) in September 2009 and a first public release of the two SOCAT products by late 2009. Marine $CO_2$ scientists and modelers keen in to participate in the above activities are encouraged to contact regional or global group leaders (*Atlantic*: Ute Schuster and Nathalie Lefevre; *Pacific*: Dick Feely + co-chair to be named; *Indian Ocean*: V.V.S.S. Sarma; *Southern Ocean*: Bronte Tilbrook and Nicolas Metzl; and *Coastal Ocean*: Arthur Chen and Alberto Borges).

***For more information:*** download the November 2007 Newsletter article about the SOCAT project (http://ioc3.unesco.org/ioccp/Newspdfs/Nov2007.pdf) or download the report from the 1st SOCAT technical workshop (http://ioc3.unesco.org/ioccp/Docs/SOCAT1Rpt.doc). The report of the 2nd technical workshop will be available on-line by the end of August.

## The Carbon in the North Atlantic (CARINA) Project Holds its Final Meeting

(contributed by Toste Tanhua and the CARINA team)

The project "Carbon in the North Atlantic" (CARINA) held its final meeting at UNESCO in Paris from 18-19 June. During an intense two day meeting, 24 scientists form Europe and the US met to agree on a set of 2nd level (i.e. consistency control) adjustments of the CARINA data. The workshop was co-sponsored by the EU Integrated Project CARBOOCEAN – Marine Sources and Sinks Assessment, and the International Ocean Carbon Coordination Project (IOCCP).

CARINA was formed as an informal, unfunded project in 1999, organized by Ludger Mintrop and Douglas Wallace in Kiel. The result was the assembly of a large collection of previously unavailable carbon data. During the last couple of years, the CARINA data base has grown significantly, and three meetings have addressed data quality control and synthesis issues (Laugarvatn, Iceland, in 2006, Kiel, Germany in March 2007, and Delmenhorst, Germany in November 2007). During this time, the 1st level quality control of the data has continued, new data have been added, and the software for data processing has been further developed. Since the workshop in Kiel, 2nd level quality control has been performed on almost all the data in CARINA.

Identified data biases were subjectively compared to predetermined accuracy limits, and special consideration is given to the fact that some of the regions studied are known to have experienced real change over the time period covered by the various cruises (1982-2007). Experience with the previous GLODAP synthesis project has shown that it is essential that the results obtained by the different methods of quality control can be compared and systematically assessed. In this way, a consistent data product can be produced containing data from many different cruises by many different laboratories in very different regions of the world oceans. We have gone to great lengths to document our efforts in CARINA, and the user should be able to find information about and justifications for adjustments to the data in the documentation. This effort of secondary quality control is a key step towards reaching the goals of CARINA and CarboOcean.

The CARINA collection now includes data and metadata from more than 180 cruises. Approximately 80% of the cruise data included in CARINA has not been previously available to the community. The majority of the cruises were contributed by European CARBOOCEAN participants; however, valuable additional data is included from the U.S. CLIVAR, WOCE and NOAA programs, Japan, Canada, Australia and Russia. Attribution to the various contributors is made via a Cruise Summary table that will be available along with the data sets and in the individual cruise metadata. The value of the Cruise Summary table is enhanced by extensive reference to publications that have already used the various data sets.

The CARINA data product will consist of the individual cruise data files, with accompanying meta-data, as well as 3 merged data products (one for each region: Arctic Mediterranean Seas, North Atlantic, Southern Ocean). The merged data files will contain data adjusted accordingly to the results of the 2nd level QC. Additionally the merged data files will contain interpolated missing data and calculated carbon parameters, if possible.

During the Paris workshop, the three CARINA research groups (Arctic, Atlantic & Southern Ocean) completed secondary quality control of the CARINA data set. Parameters considered include salinity, oxygen, nitrate, phosphate, silicate, alkalinity, total inorganic carbon, pH, CFC-11, CFC-12 and CFC-113. The nature of the QC procedure is such that various data recording errors are also identified. The extraordinary amount of work completed at the meeting was possible largely because of the internet based software developed specifically for this task and both the automated and manual methods developed for the required data comparisons.

Even though the 2nd level QC is (more or less) ready, there are a few tasks that remain before the data can become publicly available. The CARINA team is working on these tasks at this moment, and we plan to have the CARINA data product ready for public release during the fall of 2008. You will find CARINA at the CDIAC and CarboOcean websites - stay tuned for the release later this year! On behalf of the CARINA-team, Toste Tanhua, IFM-GEOMAR, Kiel, Germany

***For more information***: visit the Atlantic Ocean Carbon Synthesis pages of CarboOcean (http://www.carbon-synthesis.org/) or the CARINA data pages at CDIAC (http://cdiac.esd.ornl.gov/oceans/CARINA/Carina_inv.html).

## Launch of the EU COordinated action Carbon Observing System (COCOS)

(contributed by Toste Tanhua, IfM-GEOMAR)

The EU project COCOS, coordinated by Han Dolman at Vrije Universiteit, Amsterdam, aims to develop common methodologies, standards, data management systems and protocols to increase the cost-efficiency of European (and global) carbon observations by avoiding duplication and facilitating data sharing. This will be achieved by working towards a coordinated system of integrated global carbon cycle observations, encompassing the ocean, the land and the atmosphere, and including in situ as well as, to a lesser extent, remotely-sensed observations. It will improve the interoperability of existing and new datasets. Interoperability is defined (www.ieee.org) as "the ability of two or more systems or components to exchange information and to use the information that has been exchanged"; hence the coordination action is organized around two main lines: (1) improving the exchange of datasets between projects, and (2) facilitating the use datasets between different continental and basin scale projects and programs. The coordination activities of COCOS will contribute to an effective monitoring of the carbon cycle at the global level as recommended by GEO and GCOS in supporting the European participation to an international CO2 research monitoring project. The research and harmonization work developed in this proposal will contribute significantly to building an integrated global approach that promotes close collaboration with the international carbon cycle research community. This work builds on the Integrated Global Carbon Observing strategy developed by the the IGOS Partners.

This project will specifically bring together the ocean and land components of carbon research to make sure that we "speak the same language" and that our data are in an interoperable format. For the ocean carbon community, the results from COCOS may affect the way we report carbon data and the way it is stored, including meta-data. It will also provide important links between the ocean and land communities in carbon research. The IOCCP is a partner in the COCOS project to facilitate broad input from the ocean carbon community and to coordinated these activities with non-EU initiatives.

***For more information:*** COCOS was launched on 21 May 2008 and the web-site will be launched within the next few months.

## Three UN organizations tackle Ocean Fertilization Issues

Despite the numerous international and intergovernmental scientific reviews on ocean fertilization that caution against its use as a means of sequestering carbon, pressure from commercial groups has re-opened this issue at the intergovernmental level. In the last 6 months, three UN bodies (International Maritime Organization, Convention on Biological Diversity, and UNESCO – Intergovernmental Oceanographic Commission) have addressed this issue and have agreed to

investigate the possibility of setting up a UN interagency task force to coordinate intergovernmental activities.

On 5 February 2008, the Scientific Groups of the International Maritime Organization's Convention on the Prevention of Marine Pollution by Dumping of Wastes and Other Matter (1972) and its 1996 Protocol (also known as the "London Convention") requested scientific and technical input from the IOC on the issue of ocean iron fertilization aimed at sequestering atmospheric $CO_2$, to be presented at the 31st Session of the London Convention Scientific Groups (Guayaquil, Ecuador, 19–23 May 2008).

An informal Consultative Group of Experts was developed to respond to this request, consisting of Dr. Ken Caldeira (Carnegie Institute, Stanford, USA), Ulf Riebesell (IfM-GEOMAR, Germany), Andrew Watson (Uni East Anglia, UK), Philip Boyd (Uni Otago, New Zealand), and Chris Sabine (NOAA/PMEL, USA). This group developed a statement (http://ioc3.unesco.org/oanet/OAdocs/IOC_OF_Statement%20with%20add.pdf) in response to a series of scientific and technical questions posed by the London Convention Scientific Groups, and the Chair of the Consultative Group, Dr. Ken Caldeira, attended the meeting as an observer.

This input was considered by the Working Group on Ocean Fertilization of the London Convention Scientific Groups in order to determine the implications for the protection of the marine environment from ocean fertilization and to provide a scientific and technical basis for evaluating such activities. The decision of the London Convention Scientific Groups was, *inter alia*, that the London Convention Scientific Groups' Statement of Concern Regarding Iron Fertilization of the Oceans to Sequester $CO_2$ (November 2007) remained valid. That statement (http://ioc3.unesco.org/oanet/OAdocs/IOC_LCSGStatement.pdf) noted with concern the potential for negative environmental impacts and recommended that any such operations be evaluated carefully to ensure that they were not contrary to the aims of the Convention and Protocol. The Scientific Groups also noted that it is important to have scientific and technical expertise included in the delegations when ocean fertilization is discussed further at the next meeting of the governing bodies, and that better coordination is needed among the UN organizations, programmes, and agencies dealing with this issue.

On May 19-30 2008, the 9th Conference of the Parties to the Convention on Biological Diversity (CBD) adopted a decision concerning ocean fertilization activities, referring to the on-going legal and scientific analyses being carried out by the IMO London Convention (http://www.cbd.int/decisions/cop9/?m=COP-09&id=11659&lg=0). This decision urges governments to ensure that ocean fertilization activities do not take place until there is an adequate scientific basis on which to justify such activities, with the exception of small-scale research studies in coastal waters. The decision also called for a global transparent and effective control and regulatory mechanism for ocean fertilization activities.

The IOC ad hoc Consultative Group on Ocean Fertilization responded to this decision in an addendum to their original submission to the IMO London Convention, expressing concern about the limitation of experiments to the coastal zone, which may impede legitimate research activities, as well as the lack of distinction between legitimate research activities and those proposed to sequester $CO_2$ that may fall under the proposed global regulatory mechanism. This addendum was submitted to the London Convention Secretariat and circulated to the Chairs of the Governing Bodies, Scientific Groups, Working Group on Ocean Fertilization, and the Secretariat of the CBD.

The 41st session of the UNESCO - IOC Executive Council (June 2008) reviewed the report by the IOC ad hoc Consultative Group of Experts and recent actions and decisions by IMO and CBD (http://ioc3.unesco.org/oanet/OAdocs/INF1247-1.pdf). They agreed that proposals to use ocean fertilization to sequester carbon in the ocean is cause for concern, that there is insufficient understanding of the potential impacts of such activities on the marine ecosystem, and that a precautionary approach is appropriate until safeguards can be established. They further agreed to initiate a UN-interagency partnership with IMO, CBD, and UNEP to coordinate advice and actions on ocean fertilization, and to compile and synthesize scientific information on potential impacts from ocean fertilization for consideration at the 10th Conference of the Parties to the CBD.

The ocean fertilization working group of the IMO London Convention Scientific Groups and a Legal Intersessional Correspondence Group will continue their work to determine if ocean fertilization activities are counter to the aims of the Convention. Their next session will be held in October 2008 and will address what further action should be taken towards regulation of ocean fertilization under the Convention and Protocol.

***For more information:*** visit the Resource Library of the Ocean Acidification Network for statements and decisions related to ocean fertilization (www.ocean-acidification.net ) . See also links in text above for specific reports and decisions. The final report of the 31st Session of the London Convention Scientific Groups and the final report of the 41st Session of the IOC Executive Council will be posted on the Ocean Acidification Network site when available.

## Volunteer translators sought for the Best Practices Guide

The Guide to Best Practices for Oceanic $CO_2$ Measurements, by Andrew Dickson, Chris Sabine, and Jim Christian, was published earlier this year to update the 1994 DOE "Handbook of methods for the analysis of the various parameters of the carbon dioxide system in sea water". The guide is available on-line from the CDIAC Ocean $CO_2$ Program web-site in individual chapters or as a whole electronic document, and hardcopies are also available upon request from CDIAC. See the IOCCP February 2008 Newsletter for more details.

To increase the use of the Guide, volunteers are being sought to assist with translations of the Guide to languages other than English. The chapter "Determination of dissolved organic carbon and total dissolved nitrogen in sea water" is now available in Spanish thanks to Dr. Laura Lorenzoni (University of South Florida), with editorial assistance from Dr. Victor Camacho of the Autonomous University of Baja California.

If you would be interested in translating chapters of the guide, please contact Alex Kozyr at CDIAC.

***For more information:*** Download the Guide from the CDIAC site (http://cdiac.esd.ornl.gov/oceans/Handbook_2007.html) or contact Alex Kozyr at CDIAC for a hardcopy of the Guide (kozyra@ornl.gov).

## The IOCCP Seeks New Director for 2009

The International Ocean Carbon Coordination Project (www.ioccp.org) 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,

and 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.

The IOCCP is seeking to appoint a director for the project, located at the IOC Secretariat in Paris, France. The director will be assisted by a Ph.D.-level consultant and an administrative assistant. The responsibilities of the director are to assist the IOCCP Scientific Steering Group in developing and implementing targeted workshops; fostering the development of international agreements on global observation strategies, data-sharing practices, and standards; facilitating data collection and syntheses; maintaining an international directory of ocean carbon observations; maintaining a communication network through web and email-based publications; maintaining the Ocean Acidification Network web-site; assisting with implementation of the Ocean in a High $CO_2$ World symposium series; fund-raising and managing the project's finances; representing the IOCCP at international meetings; reporting to the sponsors regularly; and responding to ocean carbon issues in UN conventions and other intergovernmental activities as requested by IOC Member States.

For this post, we seek a candidate with a Ph.D. in chemical oceanography or closely related field with 7-10 years of experience, preferably with several years' experience in program management at the international level. The candidate should have a good knowledge of current ocean carbon observation and research priorities, and have excellent IT skills, including web design. The candidate must be fluent in English and have excellent verbal and written skills, as well as very good interpersonal skills and the ability to work in a multi-cultural environment. International travel will be required. The initial appointment is for one year, starting in January 2009, and is renewable, subject to satisfactory performance and continued extra-budgetary funding. Starting salary will be approximately US$75,000, paid in euros, and is exempt from income tax. UNESCO offers an attractive benefits package including 30 days' annual vacation, home travel, pension plan and medical insurance.

Candidates should send a Curriculum Vitae along with full contact information for 3 professional references no later than **30 September 2008** to Dr. Maria Hood by email (m.hood@unesco.org) or mail (UNESCO – IOC, 1 Rue Miollis, Paris 75732 Cedex 15, France).