

REPORT OF THE SECTION ON CARBON AND CLIMATE



The first meeting of the Section on *Carbon and climate* (CC-S) was held from 09:00-16:00 hours on November 17, 2005, at Shonan International Village, Kanagawa, Japan, in conjunction with the International Repeat Hydrography Workshop (co-sponsored with JAMSTEC, CLIVAR and IOCCP). It was attended by most of the Section members (*CC-S Endnote 1*). Drs. James Christian (Canada) and Toshiro Saino (Japan) acted as Section Co-Chairmen, and were subsequently unanimously elected to the positions during the meeting. Dr. Vedula Sarma served as rapporteur. The proposed meeting agenda was reviewed and adopted (*CC-S Endnote 2*).

PICES perspective: What is the purpose and function of CC-S? (Agenda Item 3)

Dr. Alexander Bychkov, PICES Executive Secretary, gave a brief presentation on the history of the establishment of CC-S and its evolution from the former PICES Working Groups 13 (*CO₂ in the North Pacific*) and 17 (*Biogeochemical data integration and synthesis*), the role of each in the overall structure of PICES, the reporting structure (co-supervision by POC and BIO), and the Science Board's expectations for the Section.

Final report of WG 17 on *Biogeochemical data integration and synthesis* (Agenda Item 4)

Dr. Andrew G. Dickson, WG 17 Co-Chairman, reported on the history and accomplishments of WG 17 (now disbanded). The terms of reference (ToR) of WG 17 were reviewed and the status of each outlined. Dr. Dickson also highlighted the similarities and differences between ToR of CC-S and those of WG 17. The major item of unfinished business from WG 17 is the publication of a "Guide to best practices for oceanic CO₂ measurements and data reporting". The

recommendation is to publish this guide online as soon as possible in draft form to speed-up the process of review by members of WG 17, CC-S, and other interested experts. This website is expected to be operational in early 2006, and the various chapters finalized within a year. More detailed information should appear in the final report of WG 17 to be completed by December 1, 2005.

Science topic presentation (Agenda Item 5)

Dr. Richard A. Feely (NOAA/PMEL, U.S.A.) gave a presentation on "*Changes in anthropogenic CO₂ in the North Pacific*". The talk generated lively and interesting discussion, and it was generally agreed that future CC-S meetings should include as many such talks as possible.

Publications arising from the June 2004 NOAA/GCP/PICES Workshop (Agenda Item 6)

A joint NOAA/GCP/PICES Workshop on "*Understanding North Pacific carbon cycle changes*" was held June 2-4, 2004, in Seattle, U.S.A. It led to the distribution of numerous data sets for general access (available through the US data center at the Oak Ridge National Laboratory, CDIAC,) and the submission of scientific publications. Dr. Christopher L. Sabine provided an update on the progress of a special *Journal of Geophysical Research* section that arose from this workshop. Most papers have been reviewed and some have been revised and re-submitted. The publication is expected in 2006.

New POC Working Group on *Evaluation of climate change projections* (Agenda Item 7)

Dr. Christian gave a brief presentation on the new PICES Working Group (WG 20) on *Evaluations of climate change projections*

established under POC. Dr. Christian is a member of this group and will serve as its liaison to CC-S. More information on WG 20 and its terms of reference can be found in the report of the POC Committee (Agenda Item 5d and *POC Endnote 5*). A 1-day Inaugural Workshop for the new Working Group will be convened at PICES XV.

Data management: What did we achieve in WG 17 and what are our expected future needs? (Agenda Item 8)

Each of the three data centre representatives, Drs. Hernan Garcia (NODC, U.S.A.), Toru Suzuki (MIRC, Japan) and Alex Kozyr, (CDIAC, U.S.A.), gave a brief presentation on what their respective centers have accomplished and what their future plans are. There was a lively discussion of the exact pathways for data sharing among the various centers, the permanence of the data archives, and how users can avoid obtaining the same data from more than one center. All of the centers have made impressive progress in making data easily available to users, and improved integration among these systems is planned.

CC-S terms of reference: Review and discussion of possible revisions (Agenda Item 9)

There was an extensive discussion of the terms of reference (ToR) for CC-S (*GC Appendix B*). Prior to the meeting there were several suggestions for revisions to the original ToR from members of the Section and the BIO Committee (BIO Agenda Item 4). The terms of reference were revised and adopted by the consensus of the group (*CC-S Endnote 3*).

CC-S membership: Are there gaps in expertise that need to be filled? (Agenda Item 10)

There were several issues regarding CC-S membership. At PICES XIV, the BIO Committee recommended adding/replacing members to the Section so that more biologists and maybe a BIO member liaison can be

added. The CC-S members did not achieve consensus on how to deal with this proposal. It was suggested that BIO itself should select one of its members and recommend that person to his or her government for appointment to the Section. It was agreed that when inter-sessional meetings are held, a BIO member from the host country should be invited.

It was also proposed that CC-S should try to recruit a biologist who works directly on CO₂ impacts on biota, since this is discussed in the revised terms of reference. Some suggestions were tabled but the question of who it should be was not resolved. Members will attempt to find possible appointees with relevant expertise, and this person need not necessarily be a BIO member.

CC-S Workplan: Discussion of various national initiatives and CC-S priorities (Agenda Item 11)

It was suggested to establish two sub-groups within the Section. One to carry on the work on the methodology of CO₂ measurements (ToR 4), while the other would address data integration (ToR 5). It was agreed that these should not be formal bodies, but that these two streams should represent the expected activities of CC-S reasonably well. Individual CC-S members designated as informal leaders for these two streams of activity are Drs. Dickson and Christian, respectively.

Under the first stream, it was noted that reference materials for nutrients and CO₂ are being developed at the Japan Meteorological Agency in collaboration with JAMSTEC (4-year project, just started). CC-S can, and should, play an advisory role in this project. It was suggested that a presentation from these investigators be invited at PICES XV.

Inter-comparisons of several methods were conducted by WGs 13 and 17 but never published (for pCO₂(sw) led by Dr. Yukihiro Nojiri, and DI¹³C led by Dr. Paul Quay). Dr. Kozyr volunteered to take responsibility for completing and publishing the results of

the pCO₂ inter-comparison, if Dr. Nojiri can provide necessary information.

With respect to data synthesis, the previous efforts and future directions were discussed. It was noted that, of the papers that were submitted to the *Journal of Geophysical Research* (Oceans) special section on “*North Pacific carbon cycle variability and climate change*”, arising from the June 2004 workshop, the majority were primarily about air-sea CO₂ fluxes, while others considered only oxygen or were focused on a particular location. There is still a great deal of synthesis to be done (*e.g.*, on the subsurface distribution of dissolved inorganic carbon (DIC) and nutrients). The Section decided to press ahead with trying to consolidate as many data sets as possible in a single location in accessible formats to accelerate the process, and to attempt to have this done well in advance of PICES XV so that preliminary syntheses of these data can be presented at the meeting. It was agreed to request a 2-day CC-S meeting at PICES XV if possible. It was also suggested that a POC/BIO Topic Session be organized at PICES XVI in October 2007, in Victoria, Canada. Dr. Bychkov commented that it would be desirable to get the proposal for the Topic Session (describing the title, outline of the session, names of conveners and invitees) by mid-March 2006. The tentative title of the session is “*Decadal changes in carbon and biogeochemical systems in the North Pacific*”. The necessity to have the integrated dataset well in advance to the Victoria meeting was pointed out.

Data collation will begin with bottle data such as DIC, nutrients and O₂. Fields with unusual space/time structure, such as primary production, will be addressed as time permits. It was emphasized that many data are already available via JODC, NODC, *etc.*, and that time should not be wasted on recovering data sets from their native formats unless those data are truly “new”. It was also suggested that the community be informed on the existence of

these data sets so that biogeochemists, especially those who are not primarily interested in carbon, are aware that they are available. We should aim to attract such people to PICES Annual Meetings and diversify the biogeochemistry component of PICES. The MIRC data set catalogue is not completely up to date (in many cases data sets are listed, but the data are not necessarily available), but will serve as a starting point. Dr. Toru Suzuki will serve as the primary contact person for this.

As for ToR 2, the current membership includes Dr. Christopher Sabine, the Chairman of IOCCP and an SSC member of GCP; Drs. Kitack Lee, and Toshiro Saino, both members of SOLAS/IMBER Implementation Group for carbon research, and Dr. Richard Feely, a member of CLIVAR Pacific Basin Panel, and hence the two-way communication with those activities could be maintained.

Dr. Saino introduced a plan for a Pacific regional study of GCP. The idea behind the plan was to cover ToR 1 and 3 in the planning phase, and to fulfil ToR 5, 6 and 7 in the implementation phase. The members felt that the plan does not fit well with PICES because it aims at the actual implementation of field studies. It was pointed out that the proposed Topic Session at PICES XVI will cover ToR 1, 3, 6 and 7.

With regard to PICES Annual Meetings, CC-S has the following action items:

- Request an extension from a 1-day to 2-day meeting/workshop at PICES XV (October 2006, Yokohama, Japan);
- Formulate a proposal for a 1-day Topic Session at PICES XVI (October 2007, Victoria, Canada) by mid-March for presentation to the April 2006 inter-sessional Science Board meeting. A suggested working title is “*Decadal changes in carbon and biogeochemical systems in the North Pacific*”.

CC-S Endnote 1

Participation list

Members

Andrey Andreev (Russia)
James Christian (Canada, Co-Chairman)
Andrew G. Dickson (U.S.A.)
Richard A. Feely (U.S.A.)
Hernan E. Garcia (U.S.A.)
Alex Kozyr (U.S.A.)
Tongsup Lee (Korea)
Lisa Miller (Canada)
Tsuneo Ono (Japan)
Christopher L. Sabine (U.S.A.)
Toshiro Saino (Japan, Co-Chairman)
Toru Suzuki (Japan)
Shuichi Watanabe (Japan)
Yutaka Watanabe (Japan)

Observers

Alexander Bychkov (PICES Exec. Secretary)
Stephen Diggs (U.S.A.)
Masao Fukasawa (Japan)
Maria Hood (IOCCP)
Akihiko Murata (Japan)
Kazuyoshi Oichi (Japan)
Keith Rogers (U.S.A.)
Vedula Sarma (Japan)

CC-S Endnote 2

CC-S meeting agenda

1. Welcome and introductions
2. Approval of agenda
3. PICES perspective: What is the purpose and function of Section on *Carbon and climate*?
4. Final report of WG 17 on *Biogeochemical data integration and synthesis*
5. Science topic presentation: “*Changes in anthropogenic CO₂ in the North Pacific*” by Richard Feely
6. Publications arising from the June 2004 NOAA/GCP/PICES Workshop
7. New PICES Working Group (WG 20) on *Evaluation of climate change projections*
8. Data management: What did we achieve in WG 17 and what are our expected future needs?
9. CC-S terms of reference: Review and discussion of possible revisions
10. CC-S membership: Are there gaps in expertise that need to be filled?
11. CC-S Workplan: Discussion of various national initiatives and CC-S priorities

CC-S Endnote 3

Revised terms of reference for the Section on *Carbon and climate*

1. Coordinate and encourage ongoing and planned national and international syntheses of carbon cycle research studies in the North Pacific and, where necessary and appropriate, for the larger Pacific basin;
2. Ensure effective two-way communication with other international scientific groups that have a responsibility for the coordination of ocean carbon studies, such as the International Ocean Carbon Coordination Project (IOCCP), CLIVAR/CO₂ Repeat Hydrography and the SOLAS/IMBER implementation group for carbon research.
3. Review the existing information on carbon cycling in the North Pacific, including anthropogenic carbon, the biological pump, impacts of increasing levels of carbon dioxide on marine biota, and

- possible feedbacks to atmospheric greenhouse gases; identify gaps in our knowledge, and make prioritized recommendations for future research;
4. Periodically review the status of the methodology of CO₂ measurements including the preparation of standards and reference materials, and advise on inter-calibration and quality control procedures;
 5. Identify suitable data sets on the oceanic CO₂ system in the Pacific region as they become available, and recommend the mechanisms of data and information exchange;
 6. Carry out and publish (in the refereed literature) basin-scale syntheses of carbon cycling in the North Pacific, including new data whenever appropriate, and encourage scientific interpretation of these evolving data sets;
 7. Organize symposia, workshops, or Annual Meeting sessions on carbon cycle and climate studies in the North Pacific.

