

Appendix C.

Results of Working Group 13 data integration workshops

A necessity to identify available and suitable data sets on the oceanic CO₂ system and recommend the mechanisms of data and information exchange was explicitly included in the terms of reference at the establishment of the PICES Working Group 13 on *CO₂ in the North Pacific*. At the international *North Pacific CO₂ Data Synthesis* Symposium, co-sponsored by PICES and the JST/CREST Program and hosted by the National Institute of Environmental Studies in October 2000, in Tsukuba, Japan, a need to discuss the procedures for developing a North Pacific CO₂ database was re-instated. It was agreed that this project should be the primary activity of the Working Group during 2001, and in coordination with the PICES Technical Committee on Data Exchange, two workshops should be held in this direction to:

- review status of national/international CO₂ data inventories;
- discuss technical aspects involved in the development of a common database for CO₂ and CO₂-related data; and
- outline a possible mechanism for the international cooperation needed to realize this.

The first *CO₂ Data Planning* Workshop was held January 22-24, 2001, at the Institute of Ocean Sciences in Sidney, Canada (Fig. 20), to discuss the likely technical issues involved in developing of the North Pacific CO₂ database and to plan a second more detailed workshop. The participants included both CO₂ research scientists and specialists in oceanographic data from various Data Centers (JODC - Japan Oceanographic Data Center, MIRC - Marine Information Research Center of Japan Hydrographic Association, NODC - National Oceanographic Data Center of the United States, CDIAC - Carbon Dioxide Information and Analysis Center of the United States, and MEDS - Marine Environmental Data Service of Canada).

A series of presentations reviewed the present status of North Pacific CO₂ data in the participating PICES member countries, and essentially indicated that many of the recent and historic data holdings remain within individual laboratories, though steps are being undertaken to transfer the data to national and international Data Centers. It was also noted that even when such data resides at the Data Centers, integrating them into a coherent picture is a large task which requires a great deal of time and expertise. A common problem is that such data sets are often inadequately documented, making an objective assessment of their reliability very difficult. The workshop participants thus spent time developing draft guidelines for metadata (documentation of the methods, quality control procedures, etc.) that should accompany archived CO₂ data sets. Although it was recognized that in a number of cases, this information was perhaps unavailable, it was felt that such guidelines would help Data Centers to better assess the comprehensiveness of the metadata accompanying their data products. However, ultimately the most important part of the workshop was the opportunity it gave the participants to articulate a long-range vision for the future of CO₂ data sets for the North Pacific, and suggest approaches for the international coordination and cooperation needed to implement it.

To make the integration of both historic and future North Pacific CO₂-related data a reality, the workshop participants recommend that the Working Group 13 and TCODE:

- Work together with the Data Centers (JODC, MIRC, NODC, CDIAC, MEDS, etc.) and the JGOFS North Pacific Task Team to compile an international North Pacific data inventory for CO₂ and CO₂-related data, to be available as a web site by MIRC, and mirrored at the other Data Centers. Priority should be given to North Pacific open-ocean data; however, marginal seas will also be included.



Fig. 20 Participants of the PICES CO₂ Data Planning Workshop held October 22-24, 2001, at the Institute of Ocean Sciences, Sidney, British Columbia, Canada.

- Encourage PICES and non-PICES countries to contribute information on their North Pacific data holdings to this inventory.
 - Persuade the Data Centers to adopt the proposed pH, $p\text{CO}_2$, DIC and TALK metadata guidelines.
 - Prepare and distribute a list of key stations for future replicate and shore-based analysis of deep-water samples, and to encourage the re-sampling of these stations in future national and international North Pacific CO₂ surveys. This would aid the assessment of the quality and utility of the historical databases.
 - Use the quality-checked historical surface ocean $p\text{CO}_2$, data from Japan, Canada and the United States to test the Live Access Server concept for the display and distribution of combined data sets via the Internet.
 - Promote the development of near real-time data exchange/data integration approaches for underway $p\text{CO}_2$, measurements in preparation for future observational programs, to ensure that timely repeated assessments of CO₂ exchange can be made.
 - Support the continuation of underway $p\text{CO}_2$ inter-comparison studies to test the comparability of $p\text{CO}_2$ methods.
- The second *CO₂ Data Integration* Workshop held at the Japan Oceanographic Data Center

(Tokyo, Japan) from July 31 to August 2, 2001, aimed at (i) developing strategies for the exchange of CO₂ and related data at the international level; and (ii) examining in more detail, the technical issues in integrating presently available data into a uniform data structure or database. Again this workshop was attended by a variety of PICES scientists and managers from existing Data Centers. The participants further explored the combined data set and debated a strategy for assessment and correction of systematic discrepancies. They also evaluated a proposed common data format and discussed the future home for a North Pacific database and plans for its accessibility.

A number of issues were agreed on at this meeting:

- a draft data format for future CO₂ data;
- the importance and success of the PICNIC (PICES CO₂ Related Data Integration for the North Pacific) data inventory developed by MIRC and now available on line at <http://picnic.pices.jp>; This web site incorporates the extensive information about Japanese cruises and information about Canadian (IOS) and U. S. cruises (linked to CDIAC holdings). At present, the inventory is linked to original data (at other locations

on the Internet) wherever practical, and serves various historical data sets as they are digitized. However work is in progress to host some datasets at MIRC;

- the use of the Live Access Server (LAS) approach to serve distributed data sets so as to provide for improved data visualization over the Internet, and an agreement to share technical expertise to ensure this could be achieved; and
- the need to continue this project in future years.

Both workshops met their goals, and PICES now has a unified plan for submission and exchange of CO₂ and CO₂-related data at the international level. This work will be continued by the PICES Working Group 17 on *Biogeochemical data integration and synthesis*, established in 2002, to retain a scientific focus on the carbon cycle within PICES. The Working Group 17 declared collating historical, present day and future CO₂, carbon isotope and hydrographic data into an internationally accessible North Pacific database as one of its key activities. This effort will be conducted in collaboration with the existing national and international Data Centers and the Ocean Carbon Coordination Project of a joint IGBP/IHDP/WCRP Global Carbon Project.