REPORT OF PHYSICAL OCEANOGRAPHY AND CLIMATE COMMITTEE

The meeting began at 8:45 am on October 13. The Chairman, Dr. Vyacheslav B. Lobanov (Russia), welcomed the POC members and observers (*POC Endnote 1*). Dr. Howard J. Freeland was elected as rapporteur. The agenda appears in *POC Endnote 2*.

Old business

Dr. Lobanov reviewed the 2nd PICES Workshop on the Okhotsk Sea and Adjacent Areas which was held in Nemuro, Japan on November 9-12, 1998. A volume of proceedings was issued in the PICES Scientific Report series (No. 12) and is available at the Secretariat.

There was discussion about whether the annotated bibliography on the Japan/East Sea, prepared by Dr. Mikhail A. Danchenkov, should be available in hard copy or on the internet. It was decided to leave this to the Secretariat to discuss with the author.

POC Strategic Plan: accomplishments and changes (Agenda Item 3)

Dr. Takeshi Uji suggested an addition to the POC strategic plan "Considering the important role of the ocean on the climate system and the shortage of data, POC should encourage and endorse the ARGO project, an important ocean observing component of GOOS and GCOS, to provide subsurface T and S data by a global array of ocean profiling floats for studies of climate variability and climate predictions." Dr. James E. Overland suggested inserting a specific reference to North Pacific and the suggestion was endorsed.

Final Report of Working Group 10 (Agenda Item 4)

Dr. Lobanov summarized the status of the final report of Working Group 10 on Circulation and Ventilation in the Japan Sea (East Sea) and its Adjacent Areas. It was completed this summer and distributed among POC members with a request to submit comments by August 20. Dr. Christopher N.K. Mooers, Co-Chairman of WG 10, submitted a new set of recommendations, and mentioned the difference in expectations between POC and the Working Group. Dr. Mooers agreed that there is a large body of new literature that can be accommodated in the report bibliography and some correction of the report would be done.

The POC thanked Dr. Mooers and the Working Group members for their very productive work and noted that the most serious problem of the report is that it does not read as a review, but rather as proceedings of a meeting. One of the reasons for this is that the Japan/East Sea is currently an area of very intensive studies, so it is difficult to set a cut off date for a review coverage. The POC members agreed that although this Working Group will be disbanded, PICES should stay interested in the Japan/East Sea studies and have a coordinating role in developing a multidisciplinary program in the area.

Regarding publication, POC asked that editorial criticisms be addressed by January 1, 2000, and that the report be published on the PICES web site. The report becomes a "living document" and may be revised at a later stage to accommodate new findings. It is recommended that PICES maintain contact with the CREAMS and ONR programs on the Japan/East Sea which are currently implementing large observational and data synthesis projects, and that PICES organize a joint symposium with ONR and

CREAMS on the Japan/East Sea in 2002, with a proceedings to be published as a review of a current knowledge.

Progress report of Working Group 13 (Agenda Item 5)

In the absence of the Co-Chairmen, the progress report of the Working Group 13 on CO_2 in the North Pacific was presented by Dr. Andrew Dickson (*POC Endnote 3*). He noted that three activities had taken place during the last year:

a. A method intercomparison study;
b. Sample exchange from WOCE line P-1 crossing the N/S lines;
c. Attendance at the SEATS (Southeast Asian Time Series) planning meeting.

Activities planned for next year include compiling data into a coherent synthesis. This is a joint activity together with TCODE and JGOFS North Pacific Task Team. For this purpose, a symposium and a workshop on CO_2 data synthesis for the North Pacific, and an intercomparison of alkalinity measurement techniques are planned for October 2000, in Tsukuba, Japan, just prior to the PICES Ninth Annual Meeting. These meetings would be co-sponsored by PICES and the CREST program of the Japan Science and Technology Agency. It is recommended that PICES support some of the logistics of the intercomparison exercise and provide travel support for attendees. The Working Group proposed to arrange a topic session for PICES IX, jointly with BIO, entitled "North Pacific carbon cycle and ecosystem dynamics". It was also recommended that PICES continue to co-ordinate carbon cycle research in the North Pacific. Dr. Lobanov expressed thanks to Dr. Dickson. POC supported these recommendations and will address them to the Science Board.

CREAMS/PICES relations and co-sponsorship for CREAMS Workshop (Agenda Item 6)

Dr. Lobanov outlined the progress of CREAMS/PICES relations and proposed that POC support the idea that PICES co-sponsor the CREAMS Workshop on "Oceanography of the East Asian Marginal Seas" to be held in May 2000, in Vladivostok, Russia. Dr. Danchenkov, a representative of the local organizing committee, provided brief information about the workshop and supported the proposal. POC supported the recommendation to co-sponsor a joint CREAMS/PICES Workshop.

Status of ARGO (Agenda Item 7)

Dr. Freeland briefed the Committee on recent developments towards the design and implementation of ARGO. Dr. Kensuke Takeuchi reported that in Japan, the situation is still liquid but will be more solid early next year; full operation will not start before 2001. The main funding would be provided by the Millennium Budget, SODA (Study for Optimum Design of ARGO) and Frontier Observational Research System. SODA is examining the behaviour of floats in 3 typical areas: a weak current region, an eddy-rich region (Kuroshio Extension) and a strong frontal region, Kuroshio.

Cooperation with CLIVAR (Agenda Item 8)

Dr. Freeland reviewed the current state of development of CLIVAR following discussions on this matter with Dr. John Gould, the Chief Scientist of CLIVAR. PICES should be an integral part of the planning for CLIVAR and should be represented, probably, by the Chairman of POC.

Dr. Overland recommended strongly that POC try to influence CLIVAR to take a stronger role in the northern North Pacific, rather than maintaining its focus on equatorial and El Niño dynamics. A letter will be written to CLIVAR.

PICES and GOOS (Agenda Item 9)

Dr. Bruce A. Taft briefly reported the results from the MONITOR Workshop that was held immediately prior to the PICES Eighth Annual Meeting. It included a discussion of the GOOS program and its various components and focused on PICES relationship with these components. The ARGO program was identified as a very effective one for PICES. The MONITOR Task Team endorsed the idea of supplying platforms for the deploying of floats. It was recommended that PICES have representation and a leading role in coordinating the North Pacific area implementation of the LMR component of GOOS and the Data Buoy Cooperation Panel.

Dr. Lobanov thanked Dr. Taft for the update on MONITOR activities. Dr. Lobanov also informed POC about the development of the NEAR-GOOS (North East Asian Regional) component of GOOS. It is one of the most advanced components of GOOS which is providing (through the internet without charge) operational and delayed-mode data on physical and hydrochemical parameters in the Japan/East Sea, East-China Sea and Yellow Sea. It is recommended that PICES develop closer collaboration with NEAR-GOOS. Dr. Taft strongly supported this suggestion.

Results of La Perouse/Soya project (Agenda Item 10)

Dr. Gennady Kantakov outlined the development of the project which is observing water exchange and ecological response in the La Perouse/Soya Strait area. It is a good example of fruitful international cooperation among the PICES member countries. A letter will be written expressing the desire of PICES/POC in seeing this program continue.

Arctic Climate Impact Assessment Program (Agenda Item 11)

Expressing a general support for the Arctic Climate Impact Assessment Program, the Committee noted that this is out of the normal line of interest for PICES. So it is expected that PICES will not become significantly involved in arctic research.

Future symposia (Agenda Item 12)

POC discussed a suggestion to have a symposium on ARGO at the PICES Ninth Annual Meeting in 2000, in Hakodate. However, it was agreed to expand the focus to climate science and long-term observations in the North Pacific using the scientific foundation for ARGO, and sponsor a topic session on "Large-scale circulation in the North Pacific". The session should have an emphasis on new techniques and new data sources, and how these will be used in the future. Convenors are Dr. Takeshi Uji (or alternate) (Japan) and Dr. Freeland (Canada).

POC endorsed the suggestion of Working Group 13 to co-sponsor a joint session with BIO on "North Pacific Carbon Cycle and Ecosystem Dynamics" for PICES IX.

Publications/travel support (Agenda Item 13)

POC recommended that the progress report of the Working Group 13 on CO_2 in the North Pacific be published in the 1999 Annual Report, and the final report of the Working Group 10 on Circulation and Ventilation in the Japan/East Sea and its Adjacent Waters be made available on the PICES web site. Travel requests are reported under Recommendations to Science Board (Agenda Item 15).

Other business (Agenda Item 14)

<u>PICES 10th Anniversary Symposium</u>

POC supported the idea of the PICES 10th Anniversary Symposium and nominated Dr. Susan E. Allen to represent POC on the steering committee for this event.

<u>Restructuring PICES Annual Meetings</u>

POC endorsed:

a. moving the Science Board Symposium to the beginning of the Annual Meeting agenda;
b. promoting inter-committee topic sessions and to upgrade the visibility of the poster sessions (however, it is recommend that the Secretariat set standards for poster presentations, both the nature of the poster and how it is handled by sessions);
c. supporting ventures that would encourage the participation of young scientists.

Best Presentation Award

The nominee receiving most votes for the Best Presentation Award is Dr. Josef Chernyawsky (Canada) for his paper (with W. R. Crawford and M. G. G. Foreman) entitled "Long-lived meanders and ocean eddies in the Alaskan stream".

POC discussed the question of the Best Presentation Awards and recommended that PICES drop all awards except for two: for best student presentation – oral, and best student presentation – poster.

Standing list of organization and programs

In reviewing the PICES standing list of organizations and programs for collaboration with PICES, POC endorsed adding ARGO and CREAMS.

Workshop on utilization of fishing vessels to advance marine ecosystem research

POC discussed a suggestion concerning a workshop on "Utilization of fishing vessels as monitoring, tracking and data collection systems to advance marine ecosystem research" and recommended that the proponents present the material at a MONITOR Workshop in Hakodate, in 2000, but not as a separate symposium.

Working Group numbers and names

POC requested that the Secretariat discontinue the practice of identifying Working Groups by number only and use words (short title) or acronyms instead.

Recommendations to Science Board (Agenda Item 15)

Financial requests

- PICES provide support some of the logistics of the alkalinity intercomparison exercise;

- PICES provide travel support for two participants from North America and for one from Russia to attend a Symposium and a Workshop on CO_2 data synthesis in the North Pacific, and a Technical Workshop on alkalinity measurements in Tsukuba, in October 2000;

- PICES co-sponsor a joint CREAMS/PICES Workshop on "Oceanography of the East Asian Marginal Seas" in Vladivostok, in May 2000.

Symposia at PICES IX

- POC sponsor a session on "Large scale circulation in the North Pacific", with an emphasis on new techniques and new data sources, and how these will be used in the future. (Co-Convenors: Howard J. Freeland and Takeshi Uji (or alternate));

- POC co-sponsor, with BIO, a session entitled "North Pacific carbon cycle and ecosystem dynamics" (Co-Convenors to be determined).

POC Endnote 1

Participation List

Canada — Susan E. Allen

Howard J. Freeland

Japan
Nobuo Suginohara
Takeshi Uji
Kensuke Takeuchi

Russia
Sergey V. Gladyshev
Gennady A. Kantakov
Gennady V. Khen
Vyacheslav B. Lobanov (Chairman, POC)

U.S.A.
Andrew Dickson
Christopher N.K. Mooers
David L. Musgrave
James E. Overland

POC Endnote 2

Agenda

1. Opening remarks and introduction
2. Approval/modification of the agenda
3. POC Strategic Plan: accomplishments and changes (V. Lobanov)
4. WG 10 final report (C. Mooers)
5. WG 13 progress report (Y. Nojiri)
6. PICES/CREAMS relations and co-sponsorship for the CREAMS 2000 Workshop (V. Lobanov)
7. ARGO/GODAE recent progress (H. Freeland/K. Takeuchi)
8. PICES/CLIVAR: how to establish close links? (H. Freeland)
9. PICES/GOOS: outcome from discussion at the MONITOR 1999 Workshop (V. Lobanov/ B. Taft)
10. Results of the LaPerouse/Soya project (G. Kantakov)
11. Arctic Climate Impact Assessment program (V. Lobanov)
12. Future symposia
13. Publications/travel support
14. Other business
15. Summary of POC recommendations for Science Board

POC Endnote 3

Report of Working Group 13 on CO_2 in the North Pacific

Meeting Summary

The Working Group was attended by representatives from Japan, Russia, and the United States of America. After a brief welcome by the Chairmen (Dr. Feely, U.S.A., and Dr. Nojiri, Japan), the first day of the meeting was devoted to a series of technical presentations (see the agenda Annex 1).

The North Pacific is an important sink for atmospheric carbon dioxide in the oceans and, consequently, plays a significant role in controlling long-term climate changes on the Earth. Some biogeochemical processes relating to the oceanic CO_2 system are peculiar to the North Pacific. This occurs because (1) the North Pacific is the final destination of circulation of the deep water that contains a high level of preformed nutrients; and (2) the North Pacific Intermediate Water stores dissolved CO_2 for more than a few tens of years. There is a considerable contrast in the ecosystems producing organic carbon and $CaCO_3$ particles, one of the factors determining the CO_2 sink strength in the ocean, between the eastern and western North Pacific. The contrast is likely due to the difference in the nutrient composition in water supplied from the subsurface to the surface euphotic layer (i.e. resulting from the physical forcing which affects mixed layer depth) and in the atmospheric input of iron and

other substances. In addition, continental shelf water is now receiving significant attention as a CO_2 sink. The extent of CO_2 exchange under heavy winter storms in high-latitude oceans is also not well known.

The presentations addressed a number of research topics concerning the oceanic carbon dioxide system in the North Pacific. Collaborative research conducted by scientists from Japan and Canada onboard the *Skaugran* from 1995-99 have determined the major seasonal variations of the sources and sinks for carbon dioxide north of 35° N. This region of the North Pacific is a large net sink for CO_2 (-0.3 PgC yr^{-1}) with large wintertime sources in the convective overturn regions of the western North Pacific and the Aleutian Islands, and large spring and summertime sinks in the northwestern Pacific and Bering Sea regions due to high nutrient concentrations and primary production. Recent studies by investigators from the United States have shown large interannual variations of pCO_2 in surface water near the equator due to the effects of the 1997-98 El Niño. The interannual variations of the CO_2 flux during this period were larger than the 1982-83 El Niño event and had a significant impact on the growth rate of CO_2 in the atmosphere during this period.

There were also descriptions of additional field programs being conducted by investigators from Russia and Japan together with some preliminary interpretations based on the data from these programs. Dr. Pavel Tishchenko of the Pacific Oceanological Institute reported on an international study of the carbon system in the Japan/East Sea in 1999. The region is dominated by mesoscale eddies and is a strong sink for atmospheric CO_2. Dr. Akihiko Murata of JAMSTEC reported on recent cruises onboard R/V *Mirai* in the northwest Pacific in which his group was able to determine the relationships between seawater pCO_2 values, temperature and salinity in the mixing zone between water masses. Dr. Alex Kozyr of CDIAC (Carbon Dioxide Information Analysis Center) provided a review of the present status of the US Global CO_2 Survey data synthesis effort, and also of the CARINA program, an international program aimed at synthesis of CO_2 data for the Atlantic Ocean.

At our last meeting in Fairbanks, the Working Group decided that a collaborative method intercomparison between the various PICES nations was a high priority to enable future CO_2 measurements by PICES nations to be comparable and correct. Dr. Andrew Dickson thus reported on the results of the PICES-sponsored international method intercomparison for carbonate parameters and the subsequent Technical Workshop held in Tsukuba, Japan in April 1999. (A brief report of this exercise was published in PICES Press earlier this year (Vol. 7, No. 2) and a detailed report will be published later – in both English and Japanese. For more details see Annex 2). After adjusting to a common calibration scale, the results showed very good agreement (better than 3 µmol kg^{-1}) for total dissolved inorganic carbon, but poor agreement for total alkalinity (23 µmol kg^{-1}). Therefore, the Working Group agreed to conduct a second study during the coming year that would be focused on alkalinity measurements, and to follow it up with a Technical Workshop in October 2000.

The second day was devoted to discussions and to the formulation of recommendations (see below) that the Working Group felt were important to achieve their overall objective of improving the degree of collaboration and communication between the various PICES nations that are making oceanic CO_2 measurements in the North Pacific. In particular, a detailed plan was developed to initiate an international North Pacific CO_2 data synthesis activity which will be planned and carried out in collaboration with the JGOFS North Pacific Task Team (NPTT) and the PICES TCODE (for further details see Annex 3).

Plans for future activities

- As a continuation of its method intercomparison activity, the working group

will plan and carry out an international intercomparison of alkalinity measurement techniques by exchanging test samples to be analyzed in the various participating laboratories before August 2000. This exercise is to be followed up by a second technical workshop in Tsukuba, Japan, which will be held in conjunction with the WG 13 meeting in October 2000;

- The Working Group will initiate a North Pacific CO_2 data synthesis activity in collaboration with the JGOFS NPTT and PICES TCODE. Activities planned for 2000 include the compilation of an inventory of CO_2 data available for the North Pacific, planning and organization of a CO_2 Data Synthesis Symposium to be held in Tsukuba, Japan in October 2000 (this symposium will be cosponsored by PICES and JST-CREST), and organization of a joint WG 13/NPTT/TCODE meeting in October 2000;

- The Working Group will collaborate with other PICES committees to organize a session at the PICES IX meeting in Hakodate in October 2000. The proposed session title is: *North Pacific Carbon Cycle and Ecosystem Dynamics*.

  Session Overview: The North Pacific is an important sink for CO_2 in the oceans and consequently plays a significant role in controlling long-term climate changes on the earth. Furthermore, there is considerable contrast in the ecosystems producing organic carbon and $CaCO_3$ particles, one of the factors determining the CO_2 sink strength in the ocean, between the eastern and western North Pacific. The session would thus aim to highlight the present state-of-the-art in our understanding of the mechanisms responsible for influencing the extent and variability of processes affecting the carbon cycle in this important ocean region. The working group believes that it will be desirable to highlight this area of PICES science by planning to publish selected papers from this meeting in an international oceanographic journal such as *Journal of Geophysical Research (Oceans)*.

- The Working Group will continue, where possible, to plan and coordinate international efforts and research programs aimed at studying CO_2 in the North Pacific. This activity is assuming an increasing importance as PICES countries such as Japan, Canada, Russia, and the United States plan new research programs into aspects of the carbon cycle. As an example of this, scientific interactions within the PICES Working Group have already started to improve collaboration between US and Japanese scientists who are working on CO_2 in the North Pacific.

Recommendations to PICES

- Support some of the logistics of the alkalinity intercomparison exercise;

- Provide travel support for two participants from North America and for one from Russia to participate in the October 2000 meetings in Tsukuba, Japan, *i.e.* the Symposium on CO_2 data synthesis in the North Pacific, and a Technical Workshop on total alkalinity measurements in Tsukuba, in October 2000. The proposed meetings will be co-sponsored by the JST/CREST program;

- Help to arrange a joint WG 13/JGOFS NPTT/TCODE meeting in Tsukuba in October 2000. This meeting will organize a CO_2 Data Synthesis Workshop that is planned for March 2001 in Tsukuba, Japan. (This joint meeting will occur immediately after the CO_2 Data Synthesis Symposium and in parallel with the Technical Workshop on alkalinity measurements (see Annex 4 for a detailed timetable.)

- Arrange a session (to be organized by POC in conjunction with BIO) at the PICES IX meeting in Hakodate, Japan, entitled: *North*

Pacific Carbon Cycle and Ecosystem Dynamics;

- Continue to provide the forum for the international coordination of ocean carbon cycle research in the North Pacific.

Proposed Schedule for Working Group 13 Activities

	Method Intercomparison	**Data Synthesis**	
October 1999			**WG 13 Meeting, Vladivostok**
	Prepare samples for alkalinity intercomparison	Prepare N. Pacific CO_2 data inventory (ongoing)	
January 2000			Plan and organize session on *North Pacific Carbon Cycle And Ecosystem Dynamics* For PICES IX in Hakodate
	Distribute samples	Plan and organize symposium	
April 2000	to participants		
July 2000		Initiate planning for workshop	
	Return results		
October 2000	**Technical Workshop, Tsukuba**	**Symposium, Tsukuba** Organize workshop	**WG 13 Meeting, Tsukuba** joint with NPTT & TCODE
January 2001			
		Workshop, Tsukuba	
April 2001			
		Continue with data synthesis activity for period of 12-18 mo.	
July 2001			
October 2001			**WG 13 Meeting**

WG 13 Annex 1

PICES Working Group 13 on CO_2 in the North Pacific
Agenda

The goals of this 2-day meeting are to: 1) review the present level of understanding of the processes controlling CO_2 in the North Pacific, and identify gaps in our understanding; 2) review the results of the CO_2 intercomparison exercise in April, and advise on future intercalibration and quality control procedures; 3) discuss planned national and international CO_2 related scientific programs in the North Pacific region, including long-term time-series observations; and 4) identify available suitable data sets on the CO_2 system, and recommend possible mechanisms of data information exchange and discuss time, venue and format for the data workshop in the year 2000.

October 8

09:00 - 09:30 Welcome and review of the agenda (Richard Feely)

09:30 - 10:00 pCO_2 monitoring by ships-of-opportunity in the North Pacific (Yukihiro Nojiri)

10:00 - 10:30 The role of the equatorial warm pool in controlling interannual variations of the air-sea CO_2 during the 1997-98 El Niño event (Richard Feely)

10:30 - 10:45 Coffee break

10:45 - 11:30 International activities of Pacific Oceanological Institute in studies of the carbonate system in the Japan /East Sea in 1999 (Pavel Tishchenko *et al.*)

11:30 - 12:00 Measurements of CO_2 species onboard R/V *Mirai* (Akihiko Murata)

12:00 - 13:30 Lunch

13:30 - 14:00 New time series station in the western North Pacific, KNOT: 44°N, 155°E (Yukihiro Nojiri)

14:00 - 14:30 Involvement of CDIAC in national and international carbon programs: GLODAP and CARINA (Alex Kozyr)

14:30 - 15:00 Coffee break

15:00 - 16:00 The 1999 PICES CO_2 intercomparison exercise: Results and lessons learned (Andrew Dickson)

16:00 - 16:30 Summary and wrap-up of first day (Richard Feely)

October 9

9:00 - 10:15 Discussion of 1999 PICES CO_2 intercomparison exercise and proposed 2000 PICES North Pacific CO_2 data synthesis activities (Nojiri and Dickson - Discussion Leaders)

10:15 - 10:30 Coffee break

10:30 - 12:00 Continuation of the discussion of 1999 PICES CO_2 intercomparison exercise and proposed 2000 PICES North Pacific CO_2 data synthesis activities (Nojiri and Dickson - Discussion Leaders)

12:00 - 13:30 Lunch

13:30 - 15:00 Discussion of planned national and international CO_2 research programs in the North Pacific - (Nojiri and Feely - Discussion Leaders)

15:00 - 15:15 Coffee break

15:15 - 16:15 Consideration, and approval of the recommendations and meeting report for POC (Richard Feely)

16:15 - 17:00 Other business and wrap up

WG 13 Annex 2

Method Intercomparison Activity

Introduction

The previous Working Group Meeting (Fairbanks, 1999) initiated a PICES activity aimed at improving the techniques used by the various PICES member countries to measure CO_2 parameters in the North Pacific. As there already had been a number of international inter-laboratory comparisons of techniques to make underway pCO_2 measurements, plans were made to exchange sea water samples between various laboratories for the measurement of total dissolved inorganic carbon (C_T) and total alkalinity (A_T). This sample exchange would be combined with a subsequent Technical Workshop to discuss the results.

1999 Intercomparison

Preparations for this exercise were started almost immediately after the Fairbanks meeting, and four samples were prepared for distribution:

- A certified reference material (CRM Batch 45) prepared at the Scripps Institution of Oceanography, U.S.A.;
- A surface sea water sample prepared at the Scripps Institution of Oceanography;
- A surface sea water sample prepared at the University of Hokkaido, Japan;

- A deep (300 m) sea water sample prepared on board the *R/V Mirai* by JAMSTEC, Japan.

The samples were distributed to the participating laboratories in January 1999 (with one exception sent out in March). In all, thirteen laboratories were involved: seven from Japan, three from the United States, and one from each of Canada, Korea, and Taiwan. Results were returned promptly from all of these laboratories!

The Technical Workshop took place in April 1999 in Tsukuba, Japan, at the National Institute for Research on the Environment (NIRE). The workshop was organized by Drs. Yukihiro Nojiri (NIES) and Koh Harada (NIRE), and was supported jointly by PICES, KEEC, and JAMSTEC. A total of thirty-one participants from the various laboratories (including an observer from Russia) enjoyed a detailed discussion of the analytical techniques used by their laboratories for the measurement of C_T and A_T. This discussion was facilitated by having the actual instruments from a number of the participating groups set up in a laboratory next to the meeting room.

The results of the actual intercomparison were discussed in detail at the workshop, and were relatively encouraging. For C_T, the results from a number of laboratories clearly reflected the effects of calibration problems. However, once the various values for C_T had been adjusted to a common calibration scale (using the measurements made on the CRM), the agreement between the various laboratories was excellent (±2 μmol kg^{-1}). For A_T, the results were more disappointing, although reduction to a common calibration scale helped to reduce the extent of disagreement there were still major inter-laboratory differences (±12 μmol kg^{-1}). A brief report describing this activity and the technical workshop was prepared for PICES Press (Vol. 7, No. 2, 1999). A full detailed report is in preparation and will be published by NIES in both Japanese and English.

2000 Intercomparison Plans

This activity will continue in the coming year with a primary focus on improving the measurement of A_T. The approach will be the same as in the last session: a sample exchange activity that will provide the basis of the intercomparison. This is planned for March 2000, and will be followed by a second Technical Workshop in Tsukuba, Japan, in October 2000.

WG 13 Annex 3

CO_2 Data Synthesis Activity

Introduction

As was agreed at WG 13's first meeting in Fairbanks (October 1999), international North Pacific CO_2 data synthesis is seen as an important activity. During the next year, the Working Group has planned a series of tasks - to be carried out in collaboration with TCODE and the JGOFS NPTT - to initiate this activity.

Year 2000 plans

- A Scientific Symposium on North Pacific CO_2 Data Synthesis, cosponsored by PICES and by JST-CREST, is planned for October 2000. The symposium will review the present status of such synthesis activities including both time series and survey work (see Annex 4 for a brief overview);

- During the next year the Working Group plans to compile an inventory of the existing CO_2 data for the North Pacific region. This inventory will be used as the basis for planning a CO_2 data synthesis workshop described below;

- A joint meeting between WG 13, TCODE, and the JGOFS NPTT (in October 2000) to organize a data synthesis workshop that will bring together the major scientists involved in North Pacific CO_2 synthesis activities to discuss their joint data sets.

- A CO_2 data synthesis workshop (provisionally planned in March 2001).

WG 13 Annex 4

Proposed Timetable for October 2000 Meetings in Tsukuba, Japan

NIES is planning a symposium on North Pacific CO_2 Data Synthesis to be held in Tsukuba, Japan, under co-sponsorship by PICES and JST-CREST. This symposium is planned to occur in conjunction with the PICES Ninth Annual Meeting in Hakodate, Japan, in October 2000. The symposium will be held in the Tsukuba International Congress Center (EPOCAL Tsukuba).

To take advantage of the number of scientists that will be present at this symposium, the Working Group agreed that it would be desirable to schedule the proposed Technical Workshop on alkalinity measurements and the proposed joint WG 13/JGOFS NPTT/TCODE meeting(s) in Tsukuba at the same time.

A proposed timetable follows (possible project representation is shown in parentheses):

Day 1 Scientific Symposium Session
Ocean Time-Series Observations of the Carbon Cycle (HOT, PAPA, KNOT, SEATS, NOPP, SEATS)
North Pacific Ocean CO_2 Data (NOPACCS/COSMIC, JAMSTEC, JMA, CO_2 mapping project, NIES/IOS)

Day 2 Scientific Symposium Session
Global ocean models for the carbon cycle (FRONTIER, US Model, French Model)
Global Synthesis of Ocean CO_2 Data (LDEO, US Global Survey, AOML)

Day 3 Joint WG 13 / NPTT / TCODE session to design and organize data synthesis workshop for March 2001

Day 4 Joint PICES WG 13/NPTT session to discuss (i) The status of North Pacific CO2 Data Synthesis; (ii) Plans for future observation programs; and (iii) Report and discussion of 1999 and 2000 method intercomparisons (This is a travel day for TCODE members to move from Tsukuba to Hakodate.)

Day 5 Travel for WG 13 and NPTT participants from Tsukuba to Hakodate;

Day 6 Opening Day for PICES IX in Hakodate, Japan.