REPORT OF PHYSICAL OCEANOGRAPHY AND CLIMATE COMMITTEE

The meeting was opened at 14:00 on Oct. 16 by the Chairman, Prof. Paul H. LeBlond (Canada), and was held in two sessions on that day and on the next afternoon.

New members, Drs. Masahiro Endoh (Japan) and Howard J. Freeland (Canada), were welcomed. It was noted also that Dr. Vyacheslav B. Lobanov, who could not attend, had replaced Dr. Alexander Bychkov on the Committee.

Dr. H.J. Freeland (Canada) accepted to act as rapporteur.

Recommendations of WG 7

The report of WG 7, submitted last year, has been published. Its recommendations (WG 7 Report, p. 30) were reviewed and action proposed as follows:

Rec. 1.1. To make higher resolution bathymetric information available for modelers. Dr. Gennady I. Yurasov also mentioned forthcoming 1-km resolution of the Japan/East Sea prepared by Y.I. Melnichenko. Dr. Christopher N.K. Mooers mentioned that there had been talk of de-classifying US Navy data under the "dual-use" policy and suggested PICES write to the US Oceanographer of the Navy.

*Actio*n: POC Chair to draft a letter to be sent under the signature of the Chairman of PICES.

Rec. 1.2. Extension of ocean property atlases. POC members felt that others were already pursuing this goal. The need for data archival into world data centres was however strongly emphasized: too much data are unavailable.

Action: POC members to remind institutions in their respective countries of the need for formal archiving of data, including old data. Letter to be drafted by POC Chairman for circulation by Secretariat.

Rec. 1.3. Availability and quality of meteorological fields. Require identification of national efforts. Consult with MODEL Task Team on how best to guide future modeling efforts.

Action: Informal discussion between POC Chairman and MODEL Co-Chairmen.

Rec. 1.4. Strong support for satellite ocean-observing missions. POC members did not suggest specific action but rejoiced at the news that TOPEX altimetry data are likely to be available for many years thanks to the proposed continuation of the TOPEX-POSEIDON mission.

Rec. 2. PICES to express support for development of Ocean Observing System. Dr. Bruce A. Taft, Chairman of WG 9, reported that his WG is addressing that point. Dr. Mooers suggested that a representative of NE Asian Regional GOOS be invited to make a presentation at PICES VI.

Action: Conveners of PICES VI POC Symposium to be requested to include that item in their program.

Rec. 3. Encourage data exchange. This is being pursued by TCODE.

Rec. 4. PICES to encourage workshops on modeling. This is now underway within the CCCC Task Teams.

Rec. 5. Encouraging visualization of model results. POC members suggested that the best way to do this was to circulate appropriate software. Mr. Robin Brown (TCODE Chairman) also said that this point was being addressed by TCODE.

Recommendations of Vladivostok Workshop

There continues to be considerable interest and much recent work on the oceanography of the Sea of Okhotsk. POC recommends that a workshop be held in the summer of 1998 to review recent advances. Prof. Nagata outlined plans to hold such a meeting in Nemuro.

Action: To be confirmed at PICES VI.

The preparation of a multilingual (English, Japanese, Russian) nomenclature of place and oceanographic feature names in the Sea of Okhotsk is progressing. Prof. Nagata presented a preliminary draft, and will continue, with the assistance of Dr. V. Lobanov. POC thanked him for his effort and expects a final report by PICES VI.

Action: Nagata and Lobanov.

TCODE Report

Mr. Robin Brown, Chairman of TCODE, briefed POC members on recent progress by TCODE, especially in accessing data sources and other information on the PICES Website.

WG 9 Report

Dr. Bruce A. Taft, Co-Chairman of WG 9, reported on major recommendations. POC expressed support for the ecological moorings, one in the western, one in the eastern gyre. There was some discussion on the exact location of the eastern mooring and it was felt that some overlap with measurements at Station P would be required. POC also supported the idea of monitoring the E. Kamchatka Current using a submarine cable.

WG 10 Report

The Co-Chairmen of WG 10, Drs. Sang-Kyung Byun and Christopher N.K. Mooers, reported on progress of their Working Group on "Ventilation and circulation of the Japan/East Sea". POC expressed satisfaction with progress to date and supported their plans for a meeting in Fukuoka in January 1997. Anticipated completion during the summer of 1997 with report to be presented to POC at PICES VI.

Other interim recommendations put forward by WG 10 included:

i. A request that PICES should facilitate access of research vessels to the EEZ of other member countries. Supported by POC.
ii. General support for the work of the CREAMS program:
recognized by POC as an example of good collaboration between member countries.
iii. A request for translation of a book from Russian to English was held off for re-consideration upon completion of the report.
iv. Financial assistance for making Web access possible to all WG members was requested.
v. Establishment of a dynamic, periodically refreshed bibliography on the Japan/East Sea on the PICES Website. TCODE Chairman, Mr. R. Brown, suggested this could easily be achieved.
vi. A special WG 10 topic session be held at PICES VI.

Review of CCCC Recommendations for 1997

POC supported the recommendation by the MODEL Task Team that a workshop be held to develop vertical profile models for nitrate in the North Pacific and to discuss methods of adapting vertical profile models into three-dimensional models. POC emphasized that recognized modelers should be encouraged to attend.

POC declined to comment on the proposals of the REX Task Team other than to express an offer of general support for regional model development as required.

POC expressed strong support for the one-day symposium recommended by BASS for the 1997 Annual Meeting on the topic "Temporal Variability and Decadal Comparison of the Eastern and Western Gyres".

WOCE Pacific Workshop

Dr. H.J. Freeland and Prof. Y. Nagata reported on the WOCE Pacific Workshop held in August at Newport Beach, California. Dr. Freeland suggested that PICES might be interested in assisting with publication of a WOCE Pacific Atlas. He and Dr. K. Kim will investigate costs and report.

Action: Freeland and Kim.

State of the Ocean

Dr. G.I. Yurasov spoke to a suggestion that PICES produce an annual "State of the Pacific" report, mentioning that Dr. Gennady V. Khen was producing a report for the region of Russian interest. Prof. Nagata outlined plans for the SAGE (Subarctic Gyre Experiment) which will monitor the state of the subarctic gyre. It was also thought that plans for forthcoming research were also of interest. It was resolved that, on a trial basis, contributions would be requested from national members for submission at the next annual meeting.

Action: Chairman of POC to request contributions before PICES VI.

1997 Symposium

Following the request of WG 10 Co-Chairmen, POC proposes for the 1997 PICES Annual Meeting a Symposium on "Ventilation and Circulation in North Pacific Marginal and Semi-Enclosed Seas", to be co-convened by Drs. Mooers and Byun. The symposium will include an invited presentation on progress and plans of NEAR-GOOS.

Scientific Program

The following scientific papers were presented from the POC Committee sponsored part of the program. The Best Presentation Award for the POC Scientific Session was awarded to Dr. Susan E. Allen for her paper on “Shelf-break canyons: Flow patterns and deep water advection during an upwelling episode”.

Exchanges of water, organisms, and sediment between continental shelf waters and the nearby ocean. Co-convenors: Kenneth L. Denman (Canada) & Kuh Kim (Korea).

S.E. Allen
: Shelf-break canyons: Flow patterns and deep water advection during an upwelling episode

E.B. Bennett & E.C. Carmack (given by Carmack)
: The thermal curtain hypothesis: Physical basis for stationary mixing structures in the North Pacific Ocean

P.F. Cummins & L.Y. Oey
: Simulation of barotropic and baroclinic tides off northern British Columbia

K.L. Denman, M.A. Pena, J.R. Forbes, R.E. Thomson & S.E. Calvert
: The annual cycle in shelf-edge to deep ocean gradients in sinking particles and their composition off Vancouver Island, Canada

M. Foreman & R.E. Thomson
: Cross-shelf exchanges off Vancouver Island

H.J. Freeland
: Near surface changes in the mixed layer at Ocean Station Papa in the N.E. Pacific Ocean

S.V. Gladyshev & S.C. Riser
: Some features of water exchange through the Okhotsk Sea, Bussol and Kruzenshtern Straits: Evidence for deep ventilaiton of the North Pacific

A.J. Hermann & P.J. Stabeno
: A preliminary regional circulation model of the eastern Bering Sea

W.W. Hsieh
: Forecasting the sea surface temperature anomalies in the Pacific Ocean

J.M. Huthnance
Physical processes of exchange between continental shelf waters and the nearby ocean

K. Iseki, K. Okamura & Yoko Kiyomoto
Short and long-term variations of particulate fluxes at the continental margin in the East China Sea

G.V. Khen, S.A. Shershenkova & V.Y. Efimkin
Dynamics of the hydrological regions on the western part of the Bering Sea shelf in connection with meandering of the Kamchatka Current

K. Kim & Y.K. Cho
Seasonal variation of the East Korean Warm Current

D.L. Mackas, D.R. Yelland, K.L. Denman, J.R. Forbes & D.F. Moore
Horizontal exchange of plankton and nutrients between theVancouver Island continental shelf and the adjoining deep North Pacific.

C.N.K. Mooers & H.S. Kang
Numerical simulation of the Japan Sea (East Sea) circulation

C.N.K. Mooers & J. Wang
Numerical simulation of the circulation in Prince William Sound

A. Nakata, I. Tanaka, H. Yagi, G. Kantakov & A. Samatov
Origin of water in the cold water belt appearing offshore side of the Soya Warm Current near La Perouse Strait (the Soya Strait)

A.B. Rabinovich, R.E. Thomson & P.H. LeBlond
Lagrangian measurements of diurnal tidal currents near the Kuril Islands

I. Tanaka, A. Nakata, H. Yagi, A. Samatov & G. Kantakov
Result of direct current measurements in La Perouse Strait (the Soya Strait), 1995-1996

P. van Meurs & P.J. Stabeno
Evidence of on-shelf flow at the Bering Sea shelf break

F.A. Whitney & C.S. Wong
Recent changes in surface water properties along Line P in the N.E. Pacific Ocean

C.S. Wong, Y. Nojiri, T. Kimoto & J. Zeng
Monitoring of nutrients and chlorophyll-*a* in the subarctic North Pacific

H. Yagi, I. Tanaka, G. Kantakov, A. Samatov, A. Nakata & T. Watanabe
Seasonal changes of the cold water belt in the Soya Straits and adjacent areas and its chemical and biological properties

S. Yukimoto, M. Endoh & Y. Kitamura (given by Endoh)
Interdecadal variations of the Pacific Ocean as an impact of interdecadal tropical variability in an MRI coupled GCM

G.I. Yurasov
Tidal currents in the Korea Strait

O.G.Yurasov (given by Mooers)
On the properties of 3D circulation at oceanic density fronts

Endnote 1

Participants and Observers

Canada
Howard J. Freeland (Rapporteur)
Paul H. LeBlond (Chairman)
C.S. Wong

Japan
Yutaka Nagata
Masahiro Endoh

Korea
Sang-Kyung Byun
Kuh Kim
Jae-Yul Yun

Russia
Gennady I. Yurasov
Gennady V. Khen

U.S.A.
James E. Overland

Observers
Alexander Bychkov (PICES Secretariat)
Edward B. Bennett (Canada)
Robin M. Brown (Canada)
Eddy C. Carmack (Canada)
Sergey V. Gladyshev (Russia)
Kimio Hanawa (Japan)
Christopher N.K. Mooers (U.S.A.)
Bruce A. Taft (U.S.A.)

Endnote 2

Report of Working Group 10
Circulation and Ventilation in the Japan Sea (East Sea) and its Adjacent Areas

PICES WG10 Progress Report
Sang-Kyung Byun and Christopher N.K. Mooers, Co-Chairs
18 OCT 96

1. WG 10 was commissioned at the PICES IV Meeting in October 1995. By Spring 1996, members had been appointed: Russia (3), Japan (2), South Korea (4), China (1), U.S.A. (3), and Canada (0). One additional member from both China and Japan have been requested. [Dr. Makoto Terazaki (ORI/Univ. of Tokyo) has agreed to participate with WG10.] Also, (1) a contact list was developed (the latest revision is attached), (2) a tentative outline for the report was established (the latest revision is attached), and (3) a preliminary schedule of activity was developed (the latest revision is attached). In September 96, Prof. Chris Mooers traveled to South Korea, China, Russia, and Japan for discussions with WG 10 members, and to present seminars on his numerical modeling of Japan Sea/East Sea circulation (a trip report is attached).

2. Because WG 10 was asked to try to expedite its study and report for completion by the PICES VI Meeting, our principal activities are planned to be:
- a WG 10 meeting at PICES V
- a WG 10 Workshop immediately following the Second CREAMS International Symposium (Jan 31. To Feb. 2 97; Fukuoka, Japan); travel funds for Russian, Chinese, and American members will be needed
- construction of a dynamic (i.e., updatable) bibliography focused on the modern literature (post-1980) to be placed on the World Wide Web via the PICES homepage; also to be accessible via anonymous FTP over Internet
- WG 10 co-chairs to hold a retreat to finalize the report in summer 1997
- a proposed special session at PICES VI (Oct. 97; Pusan, ROK) to feature salient results from the report and research reports related to the circulation and ventilation of marginal and semi-enclosed seas of the North Pacific
- a review paper derived from the report to be submitted to an international journal.

3. A very important issue has arisen that may impede future cooperative international scientific investigations of the Japan Sea/East Sea. Under the Law of the Sea Convention, various countries bordering the Japan Sea/East Sea have recently declared EEZs (and other restricted access zones) that are in conflict. In the summer of 1996, there was an incident (on a CREAMS cruise) where foreign scientists were not allowed to make CTD casts in the Japanese EEZ. (However, permission was granted after the cruise!) Hence, there is a need for PICES to issue a statement on the importance of access to each nation's EEZ for the mutually beneficial advance of scientific understanding.

4. WG 10 recommends that, as soon as possible, the Yurasov and Yarichin book on Japan Sea/East Sea currents (outline attached) be translated (by a Russian) and edited (by an

American), and that it be published either as a PICES scientific report or a hardcover book. [Through subsequent interactions with the Physical Oceanography and Climate (POC) Committee, it was agreed to table this recommendation for a year while POC and WG 10 consider it further.]

5. WG 10 recommends increased use of (and access to) World Wide Web for scientific communication and collaboration; Russian and PRC colleagues/institutions may need financial assistance to pay Internet fees for the necessary large bandwidth.

6. Dr. Mikhail Danchenkov (FERHRI) has prepared two (of four) parts of a comprehensive, historical bibliography and has requested assistance from PICES in publishing part two (proposal attached). Part one is being published in Korea (either by SNU or KORDI). WG10 will defer recommending on this proposal until its winter 1997 workshop.

7. Importantly, the Coordinating Committee has declared NEAR-GOOS operational. It will be accessible through the IOC homepage. It will include two types of databases: (1) real-time, managed by JMA; and (2) delayed-time, managed by JODC. (Russia and China will also maintain certain associated/national databases.) The implementation of NEAR-GOOS, and its further development, are expected to facilitate extraordinarily research on the circulation and ventilation of Japan Sea/East Sea.

PICES WG 10 Report
Circulation and Ventilation in the Japan Sea (East Sea) and its Adjacent Areas

OUTLINE (DRAFT/REVISED 18 OCT 96)

Executive Summary

I. Introduction

- terms of reference
- membership
- scope of the report
- time horizons of contemporary and near-future studies
  Phase I (1981 to 1998)
  [era of JECSS/PAMS & CREAMS]
  Phase II (1999 to 2005)
  [era of CREAMS II, NEAR-GOOS prototype, PICES/GLOBEC (?), research satellite remote sensing missions, model-observations comparisons]
  Phase III (2006 to 2025)
  [era of operational NEAR-GOOS, "information age" and operational remote sensing technologies, AUVs, vast supercomputers]
- etc.

II. Summary of the Present Knowledge of the Ocean Circulation and Ventilation in the Japan Sea (East Sea) (Identify Gaps)

- general circulation (upper, intermediate, and lower layers)
- Tsushima, Warm current origin
- water masses
- inflows and outflows through straits
- air-sea transfers
- seasonal cycle
- synoptic scale variability
- mesoscale variability
- interannual variability
- transient wind-driven circulation
- tides
- deep and intermediate water formation
- recent climate state (with hydrochemical variables)
- exchange with adjacent seas
- shelf circulation and water masses
- coastal upwelling zones
- shelfbreak exchange processes
- ice formation
- cold brine formation on shelves
- "fisheries oceanography processes"
- etc.

III. Summary of Ongoing and Planned Scientific Programs (Identify Gaps)

- International Programs
  - PAMS/ JECSS
  - CREAMS
  - PICES/GLOBEC
  - IOC WESTPAC (NEAR-GOOS, etc.)
  - La Perouse Project
  - etc.

- National Programs
  - Whankyungdo (Korean oceano-graphical atlas project)
  - TINRO's periodic fisheries and oceanography surveys in Russian EEZ
  - others (?)

IV. Summary of Related Chemical, Biological, Geological, Geophysical, and Atmospheric Processes and the Potential for Interactive Multidisciplinary Studies

- chemical processes (dissolved oxygen, trace elements, CO_2 penetration, etc.)
- plankton and fish (marine ecosystems, mechanisms (and zones) of primary production (data acquisition and analysis), fish catch, fishing grounds, etc.)
- sediments (distribution, sedimentation rate, etc.)
- paleoceanography (e.g., pre-historic circulation and transports at different stages of sea level)
- air-sea interaction and ocean-atmosphere coupling
- bio-optical studies
- acoustical oceanography studies
- etc.

V. The Scientific and Logistical Opportunities and Challenges for Research in the Japan Sea (East Sea)

opportunities

- scientific
  - wintertime intermediate and deep water formation
  - biogeochemical tracer distributions (trace elements, nutrients, Chla, CFCs, etc.)
  - etc.
- logistical
  - new observational techniques applicable to circulation and ventilation
  - availability of ice-strengthened hulls
  - etc.

challenges

- scientific
  - exchanges with adjacent seas
  - combined monitoring and modeling system
  - etc.
- logistical
  - data exchange, database management
  - lack of meteorological buoys
  - quality of bottom topography
  - needed monitoring data
  - needed updated oceanic climatology, including deep waters
  - access to newly declared EEZs
  - severe winter conditions (freezing of CTD pumps, etc.)
  - sedimentation of moorings in straits
  - disruption of moorings and drifters by fishermen
  - etc.

VI. Possible Future Process Studies and Their Design

- ventilation
- wintertime deep-convection
- ice formation
- coastal boundary currents
- shelfbreak exchange
- in- and out-flows through the straits
- mesoscale flow interaction with bottom topography
- eddy-mean flow interaction
- Japan Basin cyclone dynamics
- ocean-atmosphere coupling
- coastal atmospheric boundary layers
- response to storms
- climate change detection
- intermediate and deep circulation and turbulent dispersion
- etc.

VII. Status of Numerical Modeling for Japan Sea (East Sea)

- active modeling projects
- needed model-model comparisons
- needs for model validation and verification
- role of models in designing and interpreting observations
- data assimilative models
- water-quality, marine ecosystems, etc. models
- etc.

VIII. Findings and Recommendations

Acknowledgments
Appendix - Alternative geographical names
Bibliography
WG10 Tentative Schedule
(Revised 18 OCT 96)

Spring 1996
- WG10 membership established
- achieved consensus on draft outline and tentative schedule

Summer 1996
- Dr. Chris Mooers visited WG10 members in Japan, Korea, Russia, and China
- continued to assemble bibliography
- scheduled workshop (winter 1997)

Autumn 1996
- informal meeting of those members attending the PICES V Annual Meeting
- plan workshop (make homework assignments)
- prepare homework
- begin to establish post-1980 bibliography on the PICES World Wide Web homepage

Winter 1997
- hold workshop, back-to-back with 2nd CREAMS International Symposium in Fukuoka, Japan)
- members report on their homework
- develop consensus on findings and recommendations

Spring 1997
- members complete writing assignments

Summer 1997
- co-chairs meet to complete and edit draft report
- members review draft
- final draft report submitted for review by POC (late August)

Autumn 1997
- co-chairs present draft findings and recommendations at PICES annual meeting
- receive comments from POC (late October)
- co-chairs revise and submit report for publication

Winter 1998
- submit review paper (co-authored by all WG10 members)

P.S. We consider this a “fast-track” schedule; thus, if we must accept some slippage, we can still complete the report within two years.

PROPOSAL FOR THE PUBLISHING IN PICES

Title: Bibliography of the Japan Sea (oceanography). Part 2.

PI: Dr. Mikhail A. Danchenkov (Far Eastern Regional Hydrometeorological Research Institute(FERHRI)
Dr. Gi-Hoon Hong (Korea Ocean & Research Institute)

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Abstract

The Japan Sea was called as "World Ocean in miniature" (Ichiye, 1984). This Sea reflects main features and elements of the World Ocean: warm and cold currents, warm and cold eddies, alienation of western boundary current, different water masses including the special one with extremely high dissolved oxygen content, planetary hydrological front and local fronts. The understanding of it's waters motion can be useful for the understanding of processes in the World Ocean in common.

The success of investigations of the Japan Sea waters is conditioned by knowledge of results of investigations made in different countries. By some causes the knowledge of Russian papers abroad and, in less degree, the knowledge of Korean and Japanese papers in Russia remains very weak. It is surprising: how few references (and almost the same from paper to paper) there are in Russian and foreign publications on each other. Reason of low citation of foreign papers lays not in language barrier only but in weak knowledge of such papers mainly.

First part of the Bibliography (will be printed in Korea at the beginning of 1997) contains :

a) Reference list (641 publications and manuscripts),
b) Author's list (537 names),
c) Annotations of some interesting papers published in Russian,
d) Introduction.

This second part of Bibliography will contain:

a) Brief review of the Japan sea oceanography (including the collection of the published maps of horizontal circulation),
b) History of investigation,
c) Addresses of main organizations that were worked ever in regional oceanography,
d) List of names and addresses of scientists worked on it now (Who is Who),
e) List of Conferences conducted in 1970-1995 concerning the Japan Sea oceanography,
f) Last part of Annotations of papers, published in Russian,
g) Supplement to the Reference list.

A brief review of the Japan sea oceanography contains about 150 figures with schemes of horizontal water circulation, the understanding as main sources of knowledge on regional oceanography. Last part of Annotations of papers, published in Russian helps to avoid difficulties with Russian language. Supplement to the Reference list contains about extra 200 papers.

G.I.Yurasov, V.G.Yarichin
CURRENTS OF THE JAPAN/EAST SEA
(Published in Vladivostok in 1993, 174 p.p.)

Contents:

4.1. Diagnostic model for calculations of three-dimensional currents' field
4.2. Formation of input data fields
4.2.1. Grid area
4.2.2. Depth data
4.2.3. Atmospheric pressure field
4.2.4. Boundary conditions
4.2.5. Density field
4.3. Investigations of thermal regimen of the Japan/East Sea
4.4. Technique of data processing of historical oceanographic data
4.5. Results of diagnostic calculations of currents
4.5.1. General circulation
4.5.2. Calculations of horizontal and vertical components of currents
4.5.2.1. Winter season
4.5.2.2. Summer season
4.6. Comparison of results of numerical calculations with instrumental measurements
Chap. 5. Formation of some features of geophysical fields under the influence of currents
Conclusions
References

Brief Summary of Prof. Chris Mooers' PICES WG10/CREAMS
Trip to South Korea, China, Russia, and Japan
Sept. 7 to 22, 96

General Comments

The hospitality extended was warm and generous. Members of WG10 are very enthusiastic and cooperative, and genuinely excited about the potential for further international scientific collaboration in the near future for the study of the Japan Sean/East Sea (JS/ES) circulation and ventilation.

China

In China, I met with Prof. Shuzhen Pu (First Institute of Oceanography/State Oceanic Administration) and several of his colleagues. SOA's interests in JS/ES are primarily the origin and structure of the Tsushina Warm Current and other aspects of exchange between the Yellow Sea (plus East China Sea) with the JS/ES. There is a particular interest in the Tyman River estuary (and its offshore plume) that lies on the border of China, Russia, and North Korea where a tri-national free trade zone is planned. SOA conducted a hydrographic survey of the region five years ago, and a data report and book chapter were published (both in Chinese). Prof. Dunxin Hu (Institute of Oceanology/ Academic Sineca) indicated that IOS has a strong interest in the Tsushima Warm Current, and East China Sea overall, especially shelfbreak exchange processes. Their emphasis is shifting from "blue water" studies to coastal processes, and he will be leading a multi-disciplinary, multi-institutional LOCI study in the Yellow Sea (and the remainder of China's coastal waters).

Korea

In South Korea, I met with Dr. Sang- Kyung Byun (KORDI), Prof Kuh Kim (Seoul National University), and Prof. Yong Ho Seung (Inha University), plus many others. (Later, I spoke with Dr. Sangbook Hahn (National Fisheries Research and Development Agency (NFRDA)) via telephone.) The Korean scientific interests in the JS/ES circulation are naturally strongest in the flow structure and exchange through the Korean Straits and along the east coast of Korea. (They are also interested in the origins of the inflow due to Tsushima Warm Current from the East China Sea and nearshore flows from the Yellow Sea.) In addition to the general circulation and ventilation of the JS/ES, there is interest in the subpolar front, use of chemical tracers to study the age of Japan Sea Proper Water, use of radioactive waste tracers, air-sea interaction, atmospheric climatology, acoustic tomography, circulation modeling, and paleoceanography (an emerging goal at KORDI), anticyclogeneris in the vicinity of the EKWC separation point (and southern limit of the NKCC), and the salinity minimum layer in such anticyclones. An important development is the governmental reorganization that places

KORDI and NFRDA in the new Ministry for Maritime Affairs and Fisheries; some expansion of activity is anticipated.

Russia

In Russia, I met with Drs. Mikhail Danchenkov (FEHRI), Yuri Zuenko (TINRO), and Vladimir Ponomarev (POI), plus several of their colleagues. Prof. Victor Kuzin flew in from Akademgorodok to join the discussions, and to discuss our collaboration in model comparison; for example, he has implemented his finite element model for the JS/ES and has begun to run barotropic cases on an American computer via Internet. [Dr. Danchenkov and I also met privately with Dr. Yuri Volkov (Director, FEHRI) to discuss American-Russian collaboration for CREAMS II and the possible deployment of an NDBC meteorological buoy off Vladivostok; soon the Russian Navy will provide a chart indicating permissible areas for such a moored buoy. Dr. Volkov stated that they possess about ten quasi-synoptic (ca. one month) maps based on 100 to 200 stations sampled by one-to-three ships.] The Russian scientific interests are focused on the subpolar front, the circulation and water masses of the Primorski shelf, and ice formation, ice cover, and related processes in the Tatarski Strait for fisheries and other reasons. They also have strong interests in surface thermal fronts, current-topography-eddy interaction, deep convection, ventilation over bottom topography, and atmospheric forcing. There is a special interest in the region of Pervenets Rise (off Vladivostock) and its small seamounts. They have a large amount of data (and scientific insights) that have not been reported in the formal scientific literature; thus, they are interested in participating in the synthesis of observations. Fisheries interests are greatest in the subpolar front and the Primorski coastal waters. Dr. Mikhail Danchenkov has been preparing a comprehensive, annotated four-part bibliography with over 600 entries. The first two parts focus on the Russian literature, including internal reports. The first part is awaiting publication in Korea; the second part is largely complete. However, the 1994 currency of the bibliography makes it already dated, especially considering that about 27 mss have been published per year (by his estimate) over the past decade.

Japan

In Japan, I met with Prof. Masaki Takemateu (Kyushu University) and his colleagues (especially Profs.Yoon and Ostrovskii). (I also spoke with Dr. Mitsuyuki Hirai (and Dr. Steve Riser who is visiting Hokaido University for a few months) by telephone.) The Japanese scientific interests are very broad and encompass fundamental circulation observations and modeling, with special interests in the subpolar front and circulation in their coastal waters. They are working to fulfill the aims of NEAR-GOOS and, thus, have an interest in model comparisons, data assimilation, and satellite IR and color imagery, altimetry, and scalterometry. (Dr. Ostrovskii has a collection of spectacular IR images showing seasonal and interannual variations in mesoscale variability.) There is also an interest in atmospheric pollution over JS/ES.

PostScript. On my final stop, I visited Prof. Sheng-Wen Twu and colleagues at the National Cheng Kung University in Tainan, Taiwan, where I gave my final (of five) seminars on our JS/ES circulation modeling. I had been invited by Prof. Jin Wu (on leave from University of Delaware) who had been the President of National Cheng Kung University the past few years until he was appointed Taiwan's Minister of Education three months ago! I met with Prof. Wu in Taipei and learned of the major reform (revolution) of Taiwan's education system, from top-to-bottom, he is leading. His efforts also have implications for regional interactions that should benefit ocean science. Interestingly, National Taiwan University will host the next PAMS/JECCS symposium in the autumn of 1997, while Korea will host PICES VI. Some effort is being made to schedule them back-to-back to encourage North American participation in both.