I. REPORT ON THE PICES WORKSHOP ON THE OKHOTSK SEA AND ADJACENT AREAS

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1. Outline of the Workshop

The PICES Workshop on the Okhotsk Sea and Adjacent Areas was held at the Pacific Academy of Management and Business in Vladivostok, Russia, on June 19-24, 1995. Prof. W.S. Wooster, the Chairman of PICES addressed the meeting at the opening ceremony on July 19. Following the opening ceremony, a keynote lecture on Physical Oceanography of the Okhotsk Sea and Oyashio Region was given by Prof. L.D. Talley, the Chairman of the former PICES Working Group 1. Four more keynote lectures were given: Biota of the Okhotsk sea: Structure of communities, its interannual dynamics and currents by V.P. Shuntov and E.P. Dulepova; Maritime nature use problems by B.V. Preobrazhensky; Northwest Pacific paleohydrography by L.D. Keigwin; and Bank of fishery-biological and oceanographical data by L.N. Bocharov and V.K. Ozerin.

Eight parallel sessions were held under the following titles:

A) Circulation and water mass structure of the Okhotsk Sea and northwestern Pacific
B) Sea ice and its relation to circulation and climate
C) Waves and tides
D) Physical oceanography of the Japan/East Sea
E) Communities of the Okhotsk Sea and adjacent waters: composition, structure and dynamics
F) Abundance, distribution, dynamics of the common fishes of the Okhotsk Sea
G) Salmon of the Okhotsk Sea: biology, abundance and stock identification
H) Biodiversity of island ecosystems and seaside's of the North Pacific

The workshop Scientific Steering Committee (SSC) recognized that many of the items discussed in the biodiversity session would be outside of the present scope of PICES, but gave consent to utilize the occasion if it was beneficial to Russian scientists. 97 oral papers (including sixteen papers by overseas investigators) were presented and 44 were presented in the poster sessions. 144 scientists attended the various sessions. A rapporteur was nominated for each session during the first meeting of the SSC and time was allowed for discussion at the end of each session. Free discussions were held, on a one day excursion on the R/V Academik M.A. Lavrentiev, that proved very useful for creating mutual understanding among participants. A second meetings of SSC was held on the vessel in order to discuss and prepare a draft workshop report for Science Board to review at the Fourth Annual Meeting in Qingdao. Additionally, a special meeting on data management was held.

A plenary session was held to present summary reports of the eight sessions and approve the outline of the workshop report. Finally, Prof. W.S. Wooster provided closing remarks to the workshop.

2. Summary reports from sessions

The summary reports from the workshop sessions given by the rapporteurs are below. Additional recommendations from discussion in the SSC meetings, in the meeting on data management and in the

plenary session are added at the end of each report and at the end of this document in the recommendations of the workshop.

A. Circulation and water mass structure of the Okhotsk Sea and northwestern Pacific
Rapporteur: S.C. Riser (University of Washington, U.S.A.)

From the wide variety of talks and posters presented at this session the following main themes emerged:

a) There is a great deal of research activity taking place in the Okhotsk Sea and its adjacent waters, perhaps more than at any time in recent history. There is interest in the Okhotsk Sea in many of the countries that are members of PICES, due to both local economic and social issues and to questions concerning the impact of the Okhotsk Sea on the larger-scale North Pacific circulation. Included in this research are efforts to synthesize historical data sets into a larger picture of the flow in and around the Okhotsk Sea, such as Talley's large-scale picture of Okhotsk Sea-North Pacific interaction and Luchin's attempts to characterize the tides over a large portion of the Okhotsk Sea.

b) Rapid progress is being made to improve the Okhotsk Sea data bases (i.e., water masses, tides, ice cover, atmospheric parameters). Important zero-order problems remain, such as determining the long-term exchange between the Okhotsk Sea and the North Pacific Ocean.

c) As the data bases continue to improve, more quantitative studies should be initiated. Some models of the Okhotsk Sea circulation are already operational and the improved data bases should help to constrain these models. Quantitative studies of many kinds, including inverse models, box models, and process-oriented models should now begin, and should be compared and contrasted with the new data, in an attempt to fully exploit the observational data base.

Related discussion in the SSC meetings and the plenary session:

a) This workshop was built on past PICES activities, especially the work of WG 1/POC and its issue of the PICES Scientific Report No. 2, 1995 on the Okhotsk Sea and Oyashio Region. This workshop was also very successful not only as it reviewed the recent investigations on physical oceanography in the region but also facilitated information exchanges among nations, agencies, and individual investigators. This is an important step for future international, bilateral and individual investigations.

b) Further understanding of the physical processes in the regions and their impacts on world climate is urgent. Organized international cooperative studies are suggested, such as:

i) the dense water formation in the shelf regions of the northwest Okhotsk Sea,
ii) water exchanges between the Okhotsk Sea and the North Pacific Ocean,
iii) the role of the Soya Current on physical processes in the Okhotsk Sea,
iv) the detailed formation processes of the North Pacific Intermediate Water including water mass modification in the Oyashio and Mixed Water Regions.

Modeling efforts might move in the direction of combining with the larger subarctic region, which influences the circulation and properties of the Okhotsk Sea.

c) There is no reason to maintain a steering committee for studies of the Okhotsk Sea and adjacent areas in POC or in the Science Board after the final report of the meeting is produced. We recommend for POC, however, to maintain interest in this region, and to organize a well focused symposium or a new working group in future. The next

symposium may be held around 1998 on the Okhotsk coast of Hokkaido, Japan (e.g. Nemuro or Mombetsu), or at the time of the PICES Annual Assembly.

d) In order to study the important physical processes, we need much more detailed data, which we hope that TCODE can assist in obtaining. For example, high resolution CTD data of 1 to 2-decibar interval in the Oyashio and Mixed Water Regions are essential to clarify the formation mechanisms of the North Pacific Intermediate Water, but such data are not routinely archived.

B. Sea ice and its relation to circulation and climate
Rapporteur: M. Aota (Hokkaido University, Japan)

There were seven presentations during this session that can be classified into four groups:

a) Characteristics of sea ice in the Okhotsk Sea; Dr. Yakunin provided statistical evidence of the peculiarities of the sea ice in the Okhotsk Sea, and Dr. Polomoshnov reported on the behavior of sea ice off the east coast of Sakhalin from point of view of oil development.

b) Relationship among magnitude of sea ice in the Okhotsk Sea and atmospheric and oceanic conditions; Dr. Sekine suggested that a teleconnection exists among the variations in sea ice areas in the Okhotsk Sea, from the intensity of the subarctic circulation in the North Pacific, and from the air temperature on the Asian continent. Dr. Petrov reported the interaction between the hydrological structure in the active layer and the ice cover in the Okhotsk Sea. Dr. Dashko pointed out that the monthly mean temperature and precipitation over the South Far East Region is linearly connected with atmospheric parameters over the Okhotsk region in summer.

c) Wind waves and surges in the Okhotsk Sea and Kuril Islands region, Dr. Polyakova described the nature of wind waves and surges in the Okhotsk Sea and Kuril Island Region by using synoptic data and,

d) Technical method in studies of sea ice dynamics; Dr. Lebedev reported that acoustic methods are useful for studies of sea ice dynamics.

C. Waves and tides
Rapporteur: Y. Nagata (Mie University, Japan)

Four papers were presented: satellite observation of surface and internal waves, paleo-tsunami investigation by analyzing sediment columns in marshes, and computational techniques of tsunamis and tides. Several papers on forecasting wind waves and storm surges were given in the poster session. In addition, several papers on tides and tidal mixing appeared in session A and one paper on oceanic waves in the session D.

Tidal currents are strong enough to destroy oceanic stratification in the Okhotsk sea Region and to create thick homogeneous layers especially in the shelf and bank regions and in straits of the Kuril Islands. Further investigation is warranted as the mixing plays an important role in water mass modification in the Okhotsk Sea and adjacent areas. It was also pointed out that typhoons and strong cyclones may produce strong vertical mixing in the subarctic oceans where the oceanic stratification is relatively weak.

Importance of nonlinearity and baroclinicity structures has not yet been clarified, thus, there is still a need for more elaborate observational efforts.

Participants agreed that modeling and forecasting of tsunamis is an important subject in the region and PICES should support the activities of the relevant organizations such as ITSU, the IUGG Tsunami Commission.

D. Physical oceanography of the Japan/East Sea
Rapporteur: C.N.K. Mooers (Miami University, U.S.A.)

Two main topics were discussed concerning observations and models:

a) The circulation of the Japan/East Sea; Prof. Kozlov presented a new (quasi-geostrophic) theory for "background currents" (or, mean circulation) for semi-enclosed seas, was applied to the Japan/East Sea. The "background currents" consist of three components: planetary, topographic and "running" (or throughflow). As a result, two-to-three main gyres (and one of the Tsushima branch currents) occur, depending upon an unknown parameter (alpha) for a two-layered regime. This model can assist the interpretation of both observations and numerical simulations.

Dr. Goncharenko (for Drs. Danchenkov, Kim, and Takematsu) summarized the studies of the subpolar front, "chimney" region (off Vladivostok), and of Japan/East Sea Proper Water by the joint Japanese, South Korean and Russian CREAMS Program, including CTD/ADCP cruises and current meter moorings from 1993 to 1995 and for future plans.

Dr. Ro described studies of the East Korean Warm Current (and, especially, of a recurrent anticyclone) by a consortium of (South) Korean universities.

Prof. Mooers presented results on the 10-day spin-up of the high-resolution [about 10 km and 20 sigma (terrain-following) levels], wind-and-inflow-driven Japan/East Sea Princeton Ocean model, noting the barotropic adjustment (including strong subsurface jets and deep flow) due to a strong JEBAR (topography/pressure gradient) interaction associated with the coarse, over-smooth Levitus climatology. The most notable feature is the development of a strong cyclonic circulation poleward of the subpolar front. The fully spun-up model, and then the annual cycle, will be of considerable interest in comparison with observations and other models.

Overall, there is now an improved bases for close coordination between observations and modeling to rapidly increase our understanding of the circulation.

b) The ventilation of the Japan/East Sea; Prof. Yakunin presented his analysis of salt flux as a by-product of ice production in the Tartarski Strait, Dr. Ponomarev presented his analysis of mixing as a by-product of ice production in Peter the Great Bay, and Dr. Goncharenko presented his analysis of the pre-conditioned, cyclonic eddy (and suspected "chimney") region over the seamount near the continental slope and surface front off Vladivostok. Though the chemists estimate about 1% of the deepwater is produced each year, the physicists cannot (yet) account for that much from these three sources.

Overall, there is a lack of observations (temperature, salinity, dissolved oxygen, etc.) in wintertime near the coast, and over the continental shelf and slope in general. It may be necessary to integrate along all the coastal bays (and over the shelf/slope) of the Primorye Coast. Not much addressed yet, is the interannual variability in the ventilation processes.

Discussions:

There was lively discussion, making it clear that there is both great interest and controversy on these topics, which indicates a strong basis for scientific collaboration and rapid progress in the near future.

Recommendations:

a) An international, long-term (about 10 yrs) study is needed of the Japan/East Sea circulation and ventilation processes, including coordinated observational and modeling efforts.

b) A special emphasis is needed on the subpolar front, annual cycle, interannual variability, and coastal ocean processes.

c) Air-sea interaction processes (especially associated with ventilation) need to be addressed on an (atmospheric) synoptic time scale with daily resolution, rather than with monthly averages on events. For example, establishment of a meteorological buoy near 42°N, 132°E would be particularly revealing of ventilation events and help to qualify the rate of deepwater formation.

d) There is a need for observations of jet trapped continental margin and seamount topography as indicated in various numerical models.

e) Deployment of numerous Lagrangian drifters, especially subsurface (RAFOS) floats at intermediate depths and vertically cycling (ALACE) floats (to sample the mass field in the (pycnocline) for two or more years would be very revealing of the general, mesoscale, and transient circulation.

f) There is a need to organize a high-resolution (about 1/4 degree) seasonal ocean climatology to support both observational and modeling studies. For this, an international effort is needed to aggregate and manage both physical and chemical data.

g) It is important for all interested countries and institutions to be involved in both the observational and modeling studies so that model-data and model-model comparisons can be made. In particular, it is important that POI become directly involved in the numerical modeling studies; for this, one or more powerful PCs or (preferably) workstations dedicated to modeling would be needed.

h) Finally, creation of PICES Working Group on the Japan/East Sea circulation and ventilation could facilitate the support and integration of CREAMS and other observational campaigns with several ongoing modeling efforts.

E. Communities of the Okhotsk Sea and adjacent waters: composition, structure and dynamics
Rapporteur: O.S. Temnykh (TINRO, Russia)

Twelve oral presentations were made at this session. The range of interest was very wide and concerned all organisms from microorganisms to whales. However, the main questions, considered were the composition, structure and dynamics of plankton and nekton communities of the Okhotsk Sea and the changes in ecosystems related to climatic-oceanological conditions.

The changes in epipelagic fish communities of the Okhotsk Sea are though to be caused by climatic-oceanological changes. Total abundance of epipelagic fishes in the Okhotsk Sea decreased by about 1.5 times and there is an obvious change in the ratio of the most common species such as walleye pollock and herring.

Significant changes were also noted in nekton communities of the Pacific waters of the Kuril Islands. Biomass of the epipelagic fishes decreased while the share of squids increased. Data on species composition, abundance of the mesopelagic fishes as well as the interannual dynamics of the trophic relations between plankton and mesopelagic nekton were investigated. The decrease of abundance of predominant mesopelagic fish such as deep-sea smelt has been established. Total plankton consumption by nekton also decreased.

Some presentations concerning plankton communities were made at the session:

a) An anomalous oceanological situation in 1993 in comparison with 1991-1992 is assumed to have caused the high phytoplankton abundance in the Sakhalin-Kuril region.
b) No observed changes in plankton and benthic communities in the northeastern Sakhalin shelf, where oil extraction occurs, was found. However, an oil spill appears to have cause a large-scale death of zooplankton.

It was hypothesized that a high bioproductivity in northeastern Okhotsk Sea is conditioned by the high concentration of mercury, which stimulates hydrobionts vitality and prolongs their life. Therefore, current climatic-oceanological changes are presumed to initiate considerable changes in the plankton and nekton communities of the Okhotsk Sea and adjacent water. A mechanism of this influence is not clear and it appears to be a goal of further explorations.

Recommendations:

a) Mesopelagic fishes are very important in the functioning of an ecosystem. We propose to conduct a special workshop "Mesopelagic fishes as the sea communities component"

b) Some fish species are important internationally (herring, pollock, sardine, saury, mackerel, anchovy, salmon). Representatives at this workshop should form a working group to collect and change all information on catch, size and age of these fishes.

c) A lot of information on composition, structure and long-term dynamics of the pelagic and demersal communities has been collected in TINRO over more than ten years. Therefore, we propose to form a editorial board to prepare a review monograph on the biological resources of the Okhotsk Sea (tentative name of this monograph may be "Ecosystems of the Okhotsk Sea and Adjacent Waters")

F. Abundance, distribution, dynamics of the common fishes of the Okhotsk Sea
Rapporteur: T. Nishiyama (Hokkaido Tokai University, Japan)

The eight papers in this session dealt with the commercially important fish species in the Okhotsk Sea. These included walleye pollock, herring, Greenland turbot and many other flatfishes. Most of the papers have analyzed catch, abundance, migration, depth distribution, spawning, and associated biological aspects. These papers were presented by Drs. Fadev, Zolotov, Pushnikova, Dyakov and Nikolenko. Dr. Nishiyama reported Japanese fisheries activities on the Okhotsk Sea side of Hokkaido.

The historical data on several fish species were analyzed, and the long-term fluctuation of abundance and the characteristics of population structures were discussed. The strong yearclass and weak yearclass of fish were pointed out in pollock and herring, and the effects of both natural and human factors were analyzed. The results of presented papers show that the spawning, transport and dispersion of early life stages, depth distribution, and other biological aspects were strongly influenced by the changes in circulation, flow pattern, eddies, water

temperature, and other oceanographic conditions. The studies also suggested some possible ocean-atmosphere causes on the ecosystem dynamics.

Age determination of fish is an essential technique for the analysis of population structure in fish stock assessment and management. Dr. McFarlane raised a question on the validity of the present employed methods. The burnt otolith section method has indicated significant discrepancies in annual count from the scale reading method, otolith surface method, and other methods. Therefore, the necessity of re-examination of the age data previously determined by the traditional methods is emphasized, and implication for pollock population dynamics and environmental influence was addressed.

Walleye pollock is not only a major target species in many fisheries, but also a key species in marine ecosystem. This fish is prey for marine mammals, sea birds and other large predatory fishes. The partitioning of pollock resource to the human use and to the other animals is a serious concern in the Bering Sea. Based on the analyses of biomass abundance, Dr. Wespestad clarified the present status of pollock resources in different regions. The results suggest the appropriate size for the pollock resource, the survival and abundance of the higher trophic animals in the Bering Sea.

Some papers focused mainly on fluctuation in abundance of single species, but the changes in fish community structure in relation to the abundance fluctuation of mixed species are of serious concern. Therefore examining the changes in fish community structure should be encouraged.

The presented papers and discussion in this session came to the following conclusions that future research should be directed towards:

i) conducting comparative research on the causes of year-class variation of walleye pollock around the Pacific rim,
ii) examining possible ocean atmosphere causes and effects on ecosystem dynamics,
iii) examining changes in fish community structure, and
iv) establishing an appropriate age determination method.

Recommendation:

Several papers have shown a common trend in abundance fluctuation of walleye pollock between the Okhotsk and Bering Sea. Specific year-classes were strong and weak in both areas, especially the very strong 1977-78 and 1988-1989 year-classes. Thus, participants in this session believe it would be beneficial to hold a specific workshop on the causes of year-class variation of walleye pollock around the Pacific rim.

G. Salmon of the Okhotsk Sea: biology, abundance and stock identification
Rapporteur: R.J. Beamish (Pacific Biological Station, Canada)

There were six oral presentations relating to salmon in this session. Topics ranged from growth, survival and stock identification to new concepts of the factors affecting the dynamics of pink salmon populations. Kamchatka pink salmon stocks were shown to be separate from Sakhalin-Kuril region pink stocks in the ocean but overlapped during periods of higher abundance. Using stock identification techniques to develop stock composition models, it was observed that a small percentage (~6%) of the juvenile pink salmon in the Sea of Okhotsk originated from Alaska stocks.

Feeding studies of pink, chum and sockeye indicated that feeding was mainly on zooplankton during the day and not at night. Pink salmon fed principally on nekton and decapod larvae, sockeye on hyperiids and chum on pteropods. River lamprey in Canada and Russia were identified as major predators of salmon in some areas of the ocean, indicating that similar but distinct species of salmon predators have common impacts on the marine survival of salmon. The marine survival of hatchery-reared pink and chum salmon fry can be improved by releasing smaller numbers earlier at the end of April and larger numbers in mid-May followed by smaller releases at the end of the release period.

A new approach to forecasting the returns of pink salmon using chaos theory in a basic production model allows for a more realistic way of incorporating the non linearity of the "natural system".

There were no recommendations made after the session but later discussions identified the need for a workshop on the behavior and population dynamics of pink salmon.

Recommendations:

Fish species that are important internationally are salmon and walleye pollock. The management issue related to pollock is the relative importance of fishing and natural changes in abundance. Papers presented at the workshop provided information that pollock stocks may not be overfished, may be overfished in some areas, or may fluctuate with trends in carrying capacity.

a) Representatives at this workshop should form a working group to collate all information on catch, size and age information of pollock in the Sea of Okhotsk.

b) Any future workshop should address the issue of the impact of short-term and long-term changes in the climate/ocean environment on abundance trends of pollock.

   The major issue in salmon was related to factors affecting marine survival and behavior of pink salmon. At the southern part of the range, in the Amur and Fraser Rivers, returns in recent years have been below forecasts; while in the more northerly areas, returns are approximating historic high levels. In addition, there are suggestions by some scientists that pinks may be straying more than in the past.

c) A special workshop (PICES sponsored) would bring together experts to determine what is affecting pink salmon abundance and if the increased straying is real.

H. Biodiversity of island ecosystems and seaside's of the North Pacific
Rapporteur: B.I. Semkin (Pacific Institute of Geography, Russia)

In Vladivostok, the main center of marine, ecological and biological studies is located (Pacific Institute of Oceanography, Pacific Institute of Geography, Institute of Marine Biology, Institute of Biology and Pedology FEB RAS, etc.).

In this session scientists were involved in discussions on various aspects of the biodiversity problem. 20 papers and a keynote lecture (B.V. Preobrazhensky, opened the session) were discussed. The two days session was divided into four parts, and chaired by B.I. Semkin (2), B.V. Preobrazhensky, A.G. Ablajev. Abstracts of twenty nine papers were published.

Scientists from Vladivostok (26), Magadan (3), Khabarovsk (2) and St. Petersburg (2) took part in the workshop.

The main topics presented were:

a) biodiversity of marine, brackish water and terrestrial (coastal) ecosystem (salt marshes, dry coastal ecosystems wetlands, forests, etc.),

b) biodiversity of shelf landscapes and their mapping,

c) biodiversity of terrestrial floras,

d) taxonomic diversity of vascular plants, lichens and fungi of Pacific sea coasts and islands (Kurils, Commander Islands, Okhotsk Sea islands, Peter the Great Bay Islands (Japan/East Sea),

e) application program for biodiversity conservation,

f) productivity forecasts of cultivated marine organisms,

g) vitality assessment of rare and endangered species in the island microrefuges,

h) flora and vegetation of Pacific islands,

i) natural ecological framework for territories and aquatories,

j) halophytic plants of the Northwest Pacific coast: chromosomes, ecology and protection,

k) taxonomic diversity and relationships in major and important groups of plants in the Northwest Pacific area,

l) rare plant species in the Russian Far East and their protection,

m) Pacific basin biodiversity protection,

n) plant communities diversity in wildlife areas of the Russian Far East,

o) mathematical methods of comparative study and assessment of biodiversity, and

p) databases of biodiversity components.

Proposals:

a) The biodiversity problem is of a great importance and must be placed among priorities in the framework of PICES.

b) Coastal ecosystems determine bioproductivity of marine ecosystems, but there is a lack of information about them, because terrestrial and marine ecosystems have, for a long time, been investigated separately. We stress that studies on biodiversity of island and coastal ecosystems are growing in importance.

c) Nature use and nature conservancy problems are the most urgent in coastal ecosystems.

Future actions and recommendations

The participants of the workshop are grateful to PICES for providing the opportunity to present and discuss their work. Many participants hope consideration will be given to have the proceedings as the workshop published. The workshop asked for a volunteer group of Russian scientists (contact person: V. Lobanov) to plan to publish the proceedings, with the cooperation of PICES Secretariat. The proceeding would be a good supplement to the PICES Scientific Report No.2, 1995 on the Okhotsk Sea and Oyashio Region, which does not fully include recent Russian work.

As the PICES Scientific Report No. 2 focuses on physical oceanographic items, another report on biological and fisheries aspects of the Okhotsk Sea region would be desirable. In addition, translation of Russian monograph, Hydrometeorological Conditions of the Okhotsk Sea, Gidrometeoizdatt, St. Petersburg, 1995 the Okhotsk Sea (in press) would be useful for us, and we hope that the book will be published as soon as possible. After it is published, we suggest that PICES support translation into English and publish its English version.

3. Recommendations of the Workshop

a). PICES publish the workshop proceedings. PICES should also take the initiative to publish the other reports mentioned above.

b). POC should take the lead on research in this region and assists to create relevant international cooperative studies to solve the urgent problems. POC should hold another more focused workshop on the Okhotsk Sea Region in the near future.

c). POC should organize a Working Group on the circulation and ventilation of the Japan/East Sea. The Working Group should further discuss the recommendation items given in the session D summary above.

d). BIO and/or FIS should focus on the biological and fisheries aspects of the Okhotsk Sea and adjacent areas, through the medium of a report or workshop.

e). FIS should discuss recommendations proposed in the sessions E, F and G above and take the appropriate action.

f). The workshop recommends that PICES member countries bordering the Okhotsk Sea facilitate access to investigators to cooperate on scientific research in the region. PICES should endorse and support international research programs such as CREAMS in the Japan/East Sea and the Soya/La Perouse Project.

g). The workshop recommends that CCCC Implementation Group coordinate an international cooperative project on the Okhotsk Sea area as one of its key projects.

h). TCODE should consider amassing the data necessary for the special process oriented studies. Complete data inventories from relevant institutions and individuals need to be identified. It is recommended that TCODE takes an initiative to solve these problems.

i). POC should takes the initiative to prepare for publication a complete list of nomenclature of bays, straits, currents in all languages of PICES member countries.

4. Acknowledgments

On behalf of all those who attended the Workshop, the Scientific Steering Committee would like to express their thanks to the Local Organizing Committee, Workshop Secretariat, conveners of the paper sessions and the PICES Secretariat for their tremendous efforts in making the workshop a success. We also express thanks to the Russian government agencies for their supported.