

PICES XV W6-3024 E-poster

Implementation of distributed oceanographic data management and data processing technologies in FEBRAS

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Substantial amounts of oceanographic data have been collected in Far Eastern Branch of Russian Academy of Sciences (FEBRAS) scientific institutes. It is necessary to provide easy and up-to-date access to these distributed data for all interested scientists. It is also necessary to provide them with the most effective program tools for analytical processing of corresponding data types. Many of such programs are computation-intensive and it is reasonable to utilize the distributed computational resources of FEBRAS. Such problems are being solved in FEBRAS corporate oceanographic research and information system (ORIS) which is being developed in Pacific Oceanological Institute (POI) using distributed data management and distributed computation technologies. Universal services were developed that translate users requests into corresponding requests to data servers located in POI, other FEBRAS institutes and marine experimental stations. To operate with distributed data more comfortably and effectively, we use data caching and replication. To perform the particular user's request ORIS uses the "nearest" data server with required data. There are also data processing tools in ORIS and some of them are computation-intensive. These techniques utilize institute's distributed computational resources or shared FEBRAS supercomputer resources. To implement user access to distributed data and computational resources we use software compliant with OGSA (Open Grid Services Architecture) wherever possible. It allows us to transform ORIS into FEBRAS regional oceanographic Grid project. These informational, computational and analytical resources are potentially available to users of other PICES oceanographic grid-systems.

PICES XV W6-3255 Oral

A pilot data system for the Pacific Coast Ocean Observing System (PaCOOS)

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PaCOOS is a developing national ocean observing system for the California Current with participants from federal and state government agencies, academic institutions, NGO's and Integrated Ocean Observation System (IOOS) Regional Associations. Its role is as an integrator of the ocean observing system along the entire California LME with its initial focus on ecosystem information collected by NOAA. To date, data access and management as well as pilot ecosystem models and assessments are under development. Two pilot projects were carried out to develop the methods for accessing and transporting two distributed data sets of differing types and formats, and to demonstrate how integration and interoperability of distributed data sets can be accomplished. These pilot projects were designed to incorporate physical, geological and biological data from a variety of sources and formats into a single data system. One pilot is GIS based, and uses seafloor bathymetry, sample data, sidescan sonar, and surficial geology, combined with fish and invertebrate data to develop a relational database that can be spatially queried to identify relationships between geologic and biologic datasets. The other pilot focused on implementing an OPeNDAP server for physical and biological data from California Cooperative Fisheries Investigations (CalCOFI). Important features of the PaCOOS data system are that it integrates a variety of datasets and allows them the transparency and interoperability to be integrated within a larger context of the national IOOS data system.

PICES XV W6-2854 Invited

Simplifying data integration and interoperability through standardized data access and transport protocols

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Elaborate visualization tools have become an important aspect of scientific analysis, providing interesting ways to view data, but often making it more difficult to retrieve data for purposes other than those configured into a particular tool. The sophistication of these tools often causes data providers to lose sight of one of the primary goals of serving scientific data: to provide a means for scientists and other end users to easily browse, subset, and download data for integration into their own research. Application of current data transport and storage technologies can enable data managers to serve data without expending a major effort in web page development. By taking advantage of standard data formats and rapidly developing transport technologies such as OPeNDAP and THREDDS, as well as emerging OGC standards, data can quickly be made available over the Internet for scientists to import directly into their favorite desktop applications such as Matlab, or can easily be served by open-source packages such as the Live Access Server and DChart. Standardization and compatibility of data formats and transport mechanisms is especially essential for projects such as studies of large marine ecosystems, where there is need for integration of disparate data collected from a variety of platforms. This presentation will highlight some of the current data format, transport, and serving technologies that ERD has found to be most useful, discuss their implementation, and demonstrate how these technologies have been used to meet the needs of a variety of projects.

PICES XV W6-2877 Poster

The World Ocean Database and Atlas 2005

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We present the newly released World Ocean Database 2005 (WOD05) and World Ocean Atlas 2005 (WOA05) products as tools for ocean climate studies. WOD05 is a collection of scientifically quality-controlled ocean profile and plankton data that includes temperature, salinity, oxygen, phosphate, nitrate, silicate, chlorophyll, alkalinity, pH, pCO₂, TCO₂, Tritium, $\Delta^{13}\text{C}$, $\Delta^{14}\text{C}$, $\Delta^{18}\text{O}$, Freons, Helium, $\Delta^3\text{He}$, Neon, and plankton measurements. WOD05 includes additional data and variables not available in previous releases. WOA05 is an analysis of all quality-controlled historical profile data for temperature, salinity, dissolved oxygen, apparent oxygen utilization, percent oxygen saturation, and nutrients (phosphate, nitrate, silicate) available from the National Oceanographic Data Center (NODC) and World Data Center (WDC) for Oceanography, Silver Spring, Maryland, U.S.A. The data have been analyzed in a consistent, objective manner on a one degree latitude longitude grid at standard oceanographic levels between the surface and ocean bottom to a maximum depth of 5500 m. Annual, seasonal, and monthly analyses have been computed. Data distribution maps and seasonal and monthly difference (from the annual mean) fields are also presented at selected standard depth levels. We acknowledge the scientists, technicians, and programmers who have collected or submitted data to national and regional data centers as well as the managers and staff at data centers. WOD05 allows for the storage of metadata including information about principal investigators and institutions to recognize their efforts. WOD05 and WOA05 data are available from <http://www.nodc.noaa.gov>.

PICES XV W6-3018 E-poster

About scope of OpenGIS technology in oceanographic data management and visualization

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GIS-technologies provide efficient tools for management, visualization and analysis of spatial data. Consequently they are very applicable in oceanography where almost all data are spatial. GIS based on web-technologies are especially effective. Such systems allow a large number of specialists to work with the same data storage archives using a shared and unified web-interface, reducing the need for installation and upgrade of special software. Such web-based oceanographic data systems are becoming widespread in different oceanographic organizations, and have already contributed to general progress in oceanography. A useful next step would be access to and integration of the wide range of oceanographic GIS-resources that are being developed by participants of large international projects. Such GIS resources integration would be exceptionally useful, and PICES is well placed to provide international coordination.

The international GIS-community has developed a set of OpenGIS-standards which specify main GIS-services. Systems which meet these standards can easily interact by internet–exchange of data, visual images of data, *etc.* An especially useful feature is the capability to provide broadly available representations of proprietary GIS resources through user interfaces of professional OpenGIS-compliant systems like NASA World Wind (<http://worldwind.arc.nasa.gov/>) and Google Earth (<http://earth.google.com/>). Such systems allow users to combine their own data layers with a huge number of third-party data layers, offer global coverage, and provide very effective tools for 3D visualization.

A corporate oceanographic GIS-system has been under development by POI FEBRAS since 2001. It covers the northwestern part of the Pacific Ocean. Currently we are working on implementation of OpenGIS specifications, which will provide interaction with NASA World Wind, Google Earth and other standard-compliant GIS.

PICES XV W6-3137 Oral

Modification of the OI parameters for effective introduction *in situ* data obtained by Japanese local fisheries research institutions into the JCOPE Ocean forecast system

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Japanese local fisheries research institutions constitute a horizontally close-arranged monitoring system around the coastal region off Japan in the western North Pacific. Most of these *in situ* data (hereafter FRDATA), however, have not been distributed to the global network; consequently they were not used for current operational ocean predictions. Fisheries Research Agency (FRA) and Frontier Research Center for Global Change (FRCGC) cooperatively incorporate FRDATA into the JCOPE (Japan Coastal Ocean predictability experiment) ocean forecast system developed by FRCGC, composed of an OGCM assimilated with satellite SSH/SST and hydrographic data of Global Temperature-Salinity Profile Program (GTSP) designed by NOAA. The present system focuses on reproducing the Kuroshio, which succeeded in prediction of the Kuroshio large meander event 2004-2005. In this study, in order to introduce FRDATA efficiently into the JCOPE, the parameters (*i.e.* decorrelation scales) of optimum interpolation (OI) in the first process of the data assimilation were modified. Consequently, the decorrelation scales were properly reduced, and hydrographic structures were represented more precisely. For example, the position, temperature gradients and temperature values of warm water eddies and the First Oyashio Intrusion east of Japan was properly reproduced. The FRDATA incorporation and the OI parameter modification improved initial values of ocean forecasts, and then hindcast experiments indicated remarkable increase of the prediction accuracy especially in the region east of Japan.

PICES XV W6-3141 E-poster

Web-Accessible Visualization and Extraction System (WAVES) for oceanographic data

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WAVES V1.0, a web-based, database driven tool for oceanographic data (discrete measurements only at this time) extraction, allows users to choose data types and formats. The interface has one front page and all on-screen results are shown in a new window. The main page is divided in sections that help to navigate and keep different types of parameters grouped. In the Query Parameters section, users can set up search criteria and limits. Single parameters, for example temperature from/to: 25°C, can be used as well as a range of parameters, e.g. temperature from: 20°C to: 25°C. Data location coordinates can be entered manually or dragging a box on the map. The map is fitted to Geographical Region, Section, and Cruise ID as drop-down-menus and all changes are reflected on the map. The output parameters section lists all the variables that can be extracted from the database. The data format is set up in the Output Form section. Users have options to obtain an on-screen table, a downloadable file (CSV, TSV, NetCDF formats) or on-screen property-property plots. The interactive map is designed to provide the metadata information displayed in the clickable Metadata section by using an Information mode. Users can receive metadata information by clicking on a cruise line, or dragging a box in the research area of the map. The map also has a Navigation mode. In the Navigation mode users can move map around, zoom in and out and see the entire map extent. WAVES is available at <http://cdiac.ornl.gov/oceans/search.html>

PICES XV W6-3144 E-poster

Web-based system to study mesoscale water dynamics and structure by merging satellite and *in situ* data

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Mesoscale features are important components of circulation in the Japan Sea and adjacent areas. Sustained monitoring of mesoscale eddies and meanders would require detailed and repeated surveys which are not feasible for major part of the world ocean. However for the area of the Japan Sea an existing flow of hydrographic data available through Internet might be enough to resolve mentioned structures. Our work describes the principles of web-based system of data merging and assimilation for study mentioned problems. The system is based on virtual merging of CTD data obtained in POI cruises of 1999-2004 with the data available through the NEAR-GOOS databases and data of Argo profiling floats. These *in situ* CTD data are combined with satellite information obtained from TOPEX/POSEIDON and ERS-2 satellites (altimetry, sea surface height), NOAA AVHRR satellites (sea surface temperature, SST) and merged SST based on infrared and microwave satellite data (New Generation SST project). An organizing and linking of some parts of specific data and archives was made using the Virtual Data Base (VDB) technology by the technique of forming integrated database from the sources of data distributed at different locations. The obtained results allow analyzing kinematics, dynamic and a water mass characteristic of mesoscale eddies in the Japan Sea and in the area of Kuroshio-Oyashio confluence zone. In this way more detailed quantitative analysis of these peculiarities is the subject of future development this system.

PICES XV W6-3143 Oral
A federation of PICES member country metadatabases

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Shared ecosystems (*e.g.*, the Sea of Japan/East Sea ecosystem is shared by China, Russia, Japan and Korea) are often a source of conflict due to the national interests of the countries attempting to manage them and extract their resources. To manage marine ecosystems effectively, access to data about them must occur across human-imposed political boundaries. We seek to create a “metadata federation” of member countries (Canada, Peoples Republic of China, Japan, Republic of Korea, Russian Federation, and U.S.A.) of the North Pacific Marine Science Organization (PICES). Through English-language coding of metadata using the Federal Geographic Data Committee standard; acquisition, installation and configuration of Z39.50 communications software on a public-access server and registration with a clearinghouse, it is possible for any metadata-serving agency to become part of the PICES Metadata Federation. The federation enables an Internet user to search the collected metadata holdings of any or all members, thus providing access to information across national holdings in a single search. To date, metadata collections from the Russian Federation, Republic of Korea and U.S.A. are federated. Japan is in the process of joining. This activity supports PICES’ goals: (1) to promote and co-ordinate marine scientific research in the northern North Pacific and adjacent marginal seas, particularly northward from 30 degrees north; (2) to advance scientific knowledge about the ocean environment, global weather and climate change, living resources and their ecosystems, and the impact of human activities on them; and (3) to promote the collection and rapid exchange of scientific information on these issues.

PICES XV W6-3026 Poster

Optical properties of marine particles around the Southwest Sea of the Korean peninsula

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Studying the upwelling light field is important in Ocean Color Remote Sensing (OCRS) because it brings immense information concerning the ocean environmental properties. This quantity emerges from the sea-surface after incidence light energy has been absorbed and scattered by sea water constituents. In this process, the amount of scattering is a lot smaller than that of absorption relatively. So the understanding of Inherent Optical Properties (IOP), especially absorption, is very important in OCRS. Many studies have been accomplished in various seas around the world. In optically more complex waters around Korea, we have found only a few investigations on the IOP. Thus, in this study we analyze the absorption coefficient of sea water constituents such as phytoplankton, Suspended Sediment (SS) and Dissolved Organic Matter (DOM). For this study 107 water samples were collected in the Southwest Sea of Korea during 2001 to 2005. Phytoplankton exhibited pronounced absorption features at 440nm, 465nm and 675nm. Some cases had the absorption features at 550 nm. Absorption coefficient values of phytoplankton at 443nm are appeared ranged of 0.02 to 0.11 m⁻¹. That result is little lower than other sea waters comparatively. The absorption spectral shape of SS and DOM showed exponentially decreasing pattern. Each graph’s slope includes information of absorption characteristics. Our result shows that slope of SS is 0.065nm⁻¹ and that of DOM is 0.013nm⁻¹. The results were also compared with those from other sea waters. Our future study will concentrate on application of these results to inverse-forward ocean optical models.

PICES XV W6-3240 Oral

The Alaska Marine Information System – A collective database for Alaska’s large marine ecosystems

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The North Pacific Research Board (NPRB) is supporting the development of the Alaska Marine Information System (AMIS) which is a web-accessible information system covering the North Pacific with emphasis on data collected in three large marine ecosystems – Arctic Ocean (Beaufort and Chukchi Seas), Bering Sea and Aleutian Islands, and the Gulf of Alaska. AMIS was commissioned by NPRB in 2004 and its original purpose was to be a long-term archive of marine data easily retrievable by the science community and public alike. In the past year, the conceptual scope of AMIS has evolved through leadership provided by the Alaska Ocean Observing System (AOOS), the Arctic Region Supercomputing Center (ARSC) at the University of Alaska (UAF), and NPRB. Data derived from NPRB projects still will be available via a project browser on the NPRB web page at www.nprb.org. The project browser allows searches for projects, data, publications, contacts, and investigators.

The enhanced AMIS will go beyond NPRB data and provide a coordinated database based on a collaboration of NPRB, AOOS, ARSC-UAF and NOAA. The database will be housed at ARSC-UAF and the current vision is to make historical, real-time, and forecast data available via an easy-to-use web-based interface to provide the best information to Alaskan and national stakeholders. Data collected by major research organizations off Alaska including NPRB, NOAA, AOOS, Alaska Department of Fish and Game, U.S. Fish and Wildlife Service, and U.S. Geological Survey, will be made available in a timely manner. Software programs will be available to map the data and to relate databases. AOOS will provide data and information products from observation platforms including weather stations, oceanographic surveys and mooring, satellites, and surface current radars. Other data on fish, birds, and marine mammals, along with environmental effects of human activities, will be available also. It is hoped that the new AMIS eventually will become a single site with sponsorship from many agencies providing data that will meet national data standards and be highly useful to both the science and stakeholder communities.

PICES XV W6-2799 Oral

Real-time monitoring experiences in the coastal waters in Korea: Implementation and scientific application

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This study describes the history of the realtime monitoring experiences in the Kangjin Bay, South Sea, Korea in terms of the system components and its implementation and maintenance, data quality control and analysis and oceanographic applications.

The system consists of three major parts: a data logger with an array of sensors for water quality, current and meteorological conditions; a wireless data communication device equipped with cdma module; and a local power source (solar panel and battery).

The system has been operating continuously starting from early 2001 and the data array is published on the web page (<http://oceaninfo.co.kr>) on a realtime basis. The data quality is controlled and checked both in realtime and delayed mode to ensure the best possible quality.

Time series of numerous oceanographic parameters are being produced and analyzed for scientific and practical applications including the generation of realtime warning messages. From short term to intra-annual periods, variability of oceanic conditions such as water temperature, salinity, dissolved oxygen, current, and many others are analyzed in term of spectra and multiple correlation. These data are also utilized for numerical model initialization and validation. Ultimately the data array will be a basis for comprehensive understanding of the local ecosystem dynamics. One important application now being emphasized is the generation mechanism of the anoxia in the Kangjin Bay in summer season.

PICES XV W6-2903 Poster
Web-based sea ice data bases application

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Initial version of the data bases on sea ice of the Far Eastern Seas was developed as static-type information-analytical system. The system provides quick access to raw data, gridded data, analytical means and attributive information. Basing on the system different ice condition characteristics were calculated and described. There is no any dynamic with data output in this static-type system. So it makes process of the systems extremely inefficient on data search and sorting. Possible solution of this problem is to make Internet oriented fully dynamic output, with quite new level of interaction with user. Modern web technology allows successful transfer of all GIS advantages to web applications.

Creation of dynamic web-systems means development information products, which have complicated structure and make multistage data processing. The dynamic web-system of data displaying demands use various web-technologies, means of processing vector and raster graphics, languages web-programming, DB-management systems and others special tools. System development is conducted by principle of "modules" which allows improving a product while in service. System "Ice conditions of the Far Eastern seas. The Bering and Okhotsk Seas" has been developed in 2005-2006. They contains following original decade and processed sea ice data for the period 1963-2004: closeness, age/thickness, prevailing form, hummocking, snow-cover. The developed system allows building dynamic images of maps on the basis of characteristics specified by the user and dates.

PICES XV W6-3261 Oral
Giant jellyfish monitoring system in Japan

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In 2005, giant jellyfish (*Nemopilema nomurai*) became abundant in Japanese waters, causing damage to the fisheries of Japan. This damage was especially severe in coastal areas of the Sea of Japan. In 2006, Japan Fisheries Agency started to a new program for assessment and monitoring of giant jellyfish damage. Giant jellyfish monitoring system was constructed with National Federation of Fisheries Co-operative Associations, Japan Fisheries Information Center and Fisheries Research Agency. This system consists of six sub-systems, including ocean monitoring, market monitoring, remote sensing, biological monitoring (migration and decomposition), a forecast system, and a network of buoys. The ocean monitoring system is divided into two networks (an offshore monitoring network and the coast monitoring network). The collected data is used for a current state diagnostic analysis, and for a forecast analysis. The analyzed data is promptly delivered to fisherman and their fisheries association by the Internet, fax, and cellular phone. Web-GIS (geographical information system) is an important feature of the Internet information service.

PICES XV W6-3206 Oral

Research and development of ubiquitous information services for sustainable fisheries operation and management in the offshore around Japan

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This paper presents an overview of a newly-developed, broad-coverage fisheries information system that combines satellite remote sensing with geographical information system (RS/GIS). The system was developed to provide high value-added fisheries oceanographic information for anytime and at any ocean location. This system is designed for wide use by fishermen and managers in fisheries cooperation or fisheries experimental stations, as well as by scientists. The system consists of four subsystems; MODIS (Moderate Resolution Imaging Spectroradiometer) receiving subsystem, database subsystem, analysis subsystem, and GIS subsystem (WebGIS and onboard-GIS). MODIS provides sea surface temperature, chlorophyll-a concentration and sea ice distribution. The database manages the all products under Oracle software. The analysis subsystem produces level 1 to level 5 products, including fishing ground forecasting for Japanese common squid, Pacific saury and Albacore tuna. All procedures run automatically, so that the fishermen could receive information in near real time through communications satellites (maritime satellite internet services). The GIS subsystem contains two parts, one is WebGIS (ArcGIS) on land, and the other is GIS on offshore using GEOBASE. Users can generate dynamically products such as graphic overlays, and measuring distances to nearest port or between fishing grounds. This system can help to support effective fishing activities by optimizing time and cost of travel to fishing ground destinations or to nearest landing port, and will promote sustainable fisheries operation and management in the offshore around Japan.

PICES XV W6-3187 Oral

Japanese Argo Program

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Japanese Argo Program is being implemented successfully through tight collaboration of several ministries, agencies, and universities supervised by the Japan Argo Promotion Committee. The functions of national Argo data center are shared between Japan Meteorological Agency for real time data and JAMSTEC for delayed mode data, and fulfilled efficiently. JAMSTEC is the principal organization of Japanese Argo Program and has been making a great contribution to the international Argo Program in the following aspects;

1) JAMSTEC has been deploying about 100 Argo floats every year in the Pacific, Indian and Southern Oceans totaling up to 471 since 2001.

2) JAMSTEC improved delayed-mode quality control methods, edited and released new climatological databases for the Pacific and Indian Oceans to make quality control level much higher. JAMSTEC manages the Pacific Argo Regional Center (PARC) in cooperation with CSIRO and IPRC. The function of PARC is monitoring delayed-mode quality control level of all Argo data obtained in the North and South Pacific and inform the principal investigators when the quality control level has some doubts.

3) JAMSTEC is developing a new float with a gear pump which enables to make float size much smaller than conventional ones and to make float working at a depth deeper than 2000 m. JAMSTEC has developed a profiling system for the Arctic Ocean (an Arctic Argo float) which was deployed near the North Pole in April 2006 and sending data to GTS and the Argo Global Data Center.

Design and operation of offshore observing platform in the Yellow Sea

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Establishment of an Operational Oceanographic System is needed for the prevention of natural disaster, development of coastal regions, development and management of ocean resources, preservation of ocean environments, and ocean service for the sea-based industry. The integrated and systematic ocean observing system is a base and a first important step to construct an operational oceanographic system, since it will produce real-time information on the ocean environmental parameters for various applications. Recently, China and Republic of Korea governments signed an agreement to construct a real-time offshore observing system in the Yellow Sea.

China and Korea both Governments already agreed to integrate their offshore observing platforms in the Yellow Sea to set up a regional real-time observing system of the Yellow Sea. The system constitutes of three platforms, one is No. 15 Buoy that belongs to China, the second is Jeodo Ocean Station of the Republic of Korea, and both governments will invest to construct a new buoy to fill the gap between Chinese No. 15 Buoy and Korean Jeodo Ocean Station. The data will BE collected in real through satellite communication and all THE data collected from three platforms will BE shared fully. The observing platforms are also a part for Global Ocean Observing System (GOOS). The paper will present the technical design of the new buoy and study on the operation of real-time observing system through cooperation between SOA, China and KORDI, Republic of Korea.

Real-time oceanographic information for pelagic fishery based on Argo data

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Oceanographic information from the open ocean is useful in searching for new fishing grounds of pelagic fisheries. Although the data obtained by satellite, fixed buoy and research vessel are available for pelagic fisheries, their spatial coverages have been restricted to few locations or within narrow depth limits. Pelagic fishery operations have an additional need for real-time global and continuous subsurface information from subsurface layers of the open ocean. Fortunately, Argo floats now deliver temperature and salinity profiles for the upper 2000m of the ocean plus velocity at depth. Argo is an international program with purposes of examining the global scale ocean circulation program and air-sea interaction. The Argo array should approach 3000 floats by the end of 2006. All Argo data are relayed and made publicly available within hours after collection.

As the number of profiles obtained by Argo floats in the open ocean increases, temperature information becomes more useful for pelagic fisheries. In order to aid pelagic fisheries KODC has distributed the real-time oceanographic information for pelagic fisheries based on Argo data through the KODC website (<http://kodc.nfrdi.re.kr>). The system displays vertical profiles, horizontal distribution maps, and vertical sections of temperature with various methods of visualization.

NEAR-GOOS and Japanese operational oceanographic observations

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NEAR-GOOS, a regional pilot version of GOOS in the North East Asian Region, were initiated in 1996. NEAR-GOOS efforts have been focused on the enhancement of oceanographic observational data exchange for daily mapping of oceanographic condition, in its initial stage. The data exchange system was successfully established and is now operational, and many users have recognized it as a source of various oceanographic data and products. The amount of observational data has been increasing with cooperation among various Japanese ocean-related organizations/institutes. One of the keys of success of NEAR-GOOS was a good coordination of institutes and agencies which carry out operational oceanographic observations. The variety of oceanographic products provided by the NEAR-GOOS partners has also increased.