

PICES XIV S10-2525 Oral

Problems of satellite data delivery and their solution by the FEB RAS Centre for Regional Satellite Environment Monitoring

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Delivery of satellite information (data and metadata) is actual and difficult problem. Decisions realized by Global Earth Observation Information Systems such as INFEO/EOPortal (ESA) and EOSDIS (NASA) provide a reasonable solution for terminal users. It is necessary to adopt existing software for integration in these systems and to generate data and metadata according to formats needed. It is also necessary to develop new methods for satellite data processing and to expand GIS technologies. FEB RAS Centre has abilities to receive and to process high-resolution data from polar-orbiting satellites NOAA, FY-1C, FY-1D, and SeaStar/SeaWiFS, as well as geostationary satellites FY-2B, FY-2C and MTSAT-1R, for satellite monitoring of ocean and atmosphere. The methods used permit realization of image navigation with sub-pixel accuracy, creation of time-spatially averaged sea surface temperature, and estimation of sea surface current velocity and sea surface temperature structures. The site was constructed (www.satellite.dvo.ru) for access to satellite data of the FEB RAS Centre. The user interface has been developed, as well as a request registration and user notification facility. The interface allows a remote user to make a request for satellite data processing. The interface has features both interactive and automatic access to metadata.

PICES XIV S10-2416 Poster

About the scope of Grid technologies for support of complex oceanographic research in the northern Pacific

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During recent years, the world scientific community's interest to Grid technologies essentially has increased. Grid is a system that integrates and provides its users with common informational, computational, analytic and telecommunication resources. Today, there are successful applications of Grid technologies in some scientific disciplines – high-energy physics, biology, chemistry, bio-medicine. We should note that practically all Grid-projects are being developed using common standards proposed by the Grid community – OGSA (Open Grid Services Architecture). Grid standardization should ensure the possibility of subsequent integration of separate small projects into larger ones up to the project level of world-wide scientific Grid application. Taking into account these circumstances, we consider expedient deployment of the regional oceanographic Grid-project for the northern Pacific. Participants will get effective access to distributed oceanographic data, a wide spectrum of techniques for analytical processing and common computational resources. For this purpose, obviously, pre-created technologies for shared access to oceanographic data should be adapted to OGSA standards, and all subsequent development should be done according to these standards. In POI, FEB RAS started work on a prototype of the regional oceanographic Grid-project. It's based on a pre-existing corporate oceanographic GIS of FEB RAS. Development of the prototype is being done using the Globus Toolkit, which is recommended as a main tool for development of OGSA-compatible Grid projects. In particular, we've developed and are now testing technology providing remote access to distributed oceanographic resources of the FEB RAS corporate network and technology providing users with distributed computational resources of the network including supercomputers for execution of several difficult computing tasks.

PICES XIV S10-2622 Oral

NEPTUNE and VENUS: Data management and archival system for cabled ocean observatories

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NEPTUNE and VENUS are cabled ocean observatory projects in coastal (VENUS) and offshore (NEPTUNE) waters. These cabled observatories offer the capability for high bandwidth (100 Mb/s) bi-directional data transmission using the same fibre-optic cable technologies used in the commercial telecommunications industry. These observatories depend on advanced data managing and archiving systems that provide interfaces to a diverse set of instruments and their data. These systems must enable control of and collect data from instruments, store data securely, perform preliminary quality control, generate processed data products and deliver useful data to end users. To operate effectively within the growing community of ocean observatories, it is imperative that these systems conform to standards for ocean observing systems (*e.g.*, for data exchange, data cataloguing and web services) and support both expert and non-expert users.

PICES XIV S10-2415 Poster

Web-based technology of CTD data visualization in FEB RAS corporate oceanographic GIS

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Oceanographic GIS at the Far Eastern Branch of the Russian Academy of Sciences (FEB RAS) provides more than 30 kinds of oceanographic data pertaining to the northwestern Pacific. One of the most important kinds of data in GIS is CTD data. The CTD database now includes information from more than 1.6 million oceanographic stations. It is regularly updated with data from new FEB RAS marine expeditions and data from open oceanographic sources available through the internet, in particular, from sites of the NEAR-GOOS project (<http://near-goos1.jodc.go.jp/>) and the US National Oceanographic Data Center (<http://www.nodc.noaa.gov/>). The web-based technology that allows GIS users to select necessary CTD data and build visual images useful for data interpretation is described. The main advantage of this technique, in comparison with desktop visualization programs, for example, Ocean Data View, is that it makes possible simultaneous work by many users accessing a common data archive using a simple and intuitively understandable web interface. Another advantage of this technology *versus* other web-based visualization systems, for example, the well-known system Java OceanAtlas (<http://odf.ucsd.edu/joa/jsindex.html>), is that CTD data can be displayed and analyzed together with other kinds of oceanographic data, for example, with the climatic or satellite data in GIS. It expands the scientific possibilities for doing substantial interpretation of oceanographic information. Though this visualization technology of CTD data is intended for scientists of FEB RAS now, potentially it can be used by other internet users.

PICES XIV S10-2426 Invited

Data exchanges, XML, and why the exchange problem is still unsolved

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The exchange of data between systems continues to provide obstacles to many collaborative programs. The introduction of XML and efforts in metadata standardization, have helped with many issues. However, obtaining successful and unambiguous data exchange is still a difficult process. This presentation will explore exchange models, the role of XML and efforts underway to address current exchange problems. The presentation will begin with descriptions of models that support combining data from multiple sources. A model supported by a data structure, as well as one supported by a full database, will be described. The marine community efforts thus far have involved data structures and as such, data structure examples will be given.

These will include the efforts of the ICES/IOC Study Group on XML (SGXML) development of the Keeley Bricks, Geography Markup Language (GML), and the efforts of the JCOMM Expert Team on Data Management Practices (ETDMP). The XML implementation of these data structures allows easy transfer, but this shifts the problem to an issue of 'data understanding' or semantics. Typical semantic problems include parameter code issues, units and metadata standards. Focusing on the parameter code issue, the Marine Metadata Interoperability (MMI) Project is attempting to provide interoperability between data terms by mapping and harmonizing parameter usage and parameter discovery vocabularies. This effort is utilizing Web Services to provide users with access to mapped vocabularies.

PICES XIV S10-2410 Oral

A system development for near-realtime data exchange between ship and shore-based analysts in Japan's Fisheries Research Agency (FRA)

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In this decade, more than half of FRA's research vessels (R/Vs) are intranet equipped at a time when the internet system has changed the world with its utility. Despite FRA R/V's intranet capabilities, connections linking them to shore-based analysts have been limited because of low-speed and high-cost communications. A system to enable near-realtime and inexpensive data exchange between R/Vs and shore-based laboratories was developed. Now, PC-type servers on R/Vs 1) produce TESAC/BATHY messages from CTD (conductivity, temperature, depth sensor) data and send them to the Japan Meteorological Agency, 2) archive CTD data to the database (IBM-DB2), and 3) synchronize the database with a counterpart in an on-land server. The database synchronism is controlled by http protocol, and only the updated data are exchanged through high data compression. The data transfer is performed by IMMARSAT-B with HSD (High Speed Data Service), 64 kbps, communication. There are automated and manual modes for the database synchronism. For the automated mode with 8 hours interval synchronism, the cost for communication is less than 80 thousand yen per month. From the synchronized database, both the on-R/V and on-land server are able to provide temperature, temperature gradient, and temperature front maps on several depths through the web. This system will enable common data sharing, not only between R/V and land, but also between R/Vs. Therefore, this system enables efficient multi-ship surveys. Also, this system will help provide initial conditions for prediction models.

PICES XIV S10-2477 Oral

Merging Argo data and ship CTD observations to study mesoscale patterns in the Japan/East Sea

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The growing activity in the development of the Global Ocean Observing System (GOOS) and its components Argo and GODAE is causing huge amounts of information on the state of the ocean-atmosphere system on global and regional scales. The rapidly growing Argo profiling float array is now the largest source of CTD profile data from the open ocean. Over the last 5 years (1999-2004), a large amount of profiling floats was released in the Japan/East Sea region under national and international programs, and the number of ship hydrographic observations has been essentially increased. Much hydrographic data became easily available through the internet under the NEAR-GOOS project. Thus, it becomes possible to use the Argo drifters data array for merging and augmentation of *in situ* observations obtained from specific and regular cruises in the mentioned region. Information from ship observations is available from various sources provided by different countries and agencies. Exploiting this information requires an adequate tool that allows users to acquire, merge and process available data.

The goal of this work is to show an example of such a tool for integrating information to study mesoscale features within the area of the Japan/East Sea. For this purpose, we use the Virtual Database (VDB) technology implemented through the World Wide Web network. Thus, we merge available hydrographic data obtained by ships and Argo drifters in the Japan/East Sea during 1999-2004. Obtained fields represent quite well the basin-scale and, in some cases, mesoscale features and allow tracing of the features' seasonal variability and evolution of mesoscale eddies structure. However, our implementation of VDB-technology has some limitations owing to the data exchange problems still remaining in the region, network conditions and principles of data storing at the national oceanographic data centers. In that regard, the future development of such system of merging information is the subject for discussion.

PICES XIV S10-2561 Oral

The Mercury Metadata Search System and Web-Accessible Visualization and Extraction System (WAVES) for oceanographic data

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Mercury (a.k.a. Beija-flor) is a Web-based system to search for metadata and retrieve associated data. Developed at Oak Ridge National Laboratory, Mercury incorporates a number of important features. Mercury invokes a new paradigm for managing dynamic distributed scientific data and metadata; puts control in the hands of investigators or other data providers; is inexpensive to implement; is implemented using Internet standards, including XML; supports international metadata standards, including FGDC; is compatible with Internet search engines; is based on COTS software, including Blue Angel Technologies' MetaStar® products and Hummingbird's Fulcrum SearchServer®; and adds value to the COTS software. Mercury is based on Internet standards; its core software works with these non-proprietary Internet standards. Mercury supports the following protocols and markup languages: HTTP (hypertext transfer protocol), Z39.50, FTP (file transfer protocol), HTML (hypertext markup language), and XML (extensible markup language).

WAVES is an Internet-based, data delivery mechanism that automates the process of delivering oceanographic data to the Carbon Dioxide Information Analysis Center (CDIAC) user community. The Web-Accessible Visualization System (WAVES) provides a system whereby users can view a graphical summary of data collection points (cruise paths), and *via* provided metadata viewing tools and graphing options, identify and download data sets of interest. WAVES automates the distribution of oceanographic data *via* the Internet by satisfying the following objectives. The web interface consists of a search function allowing the user to perform a sub-setting search by any combination of metadata parameters. WAVES provides users with a graphic depicting the world's oceans and all cruise paths, and it provides users with the ability to zoom on particular geographic extents containing selected data, cruises, or geographic areas of interest. It also provides users with a dynamic on-screen display of summary metadata elements associated with each sampling location along the zoomed geographic extent. The on-screen display will automatically be updated as the user moves her mouse over different points on the cruise path graphic. Summary metadata elements for underway measurements and discrete measurements are a subset of the full metadata. WAVES provides users with links from the full metadata to the data set containing the selected data point of interest. It contains a seamless, on-the-fly method for creating scatter plots, single station plots for property *versus* depth, and property *versus* property plots. In addition, the graph contents are available to save to an image file in .jpg, .gif, and .ps formats for use in other applications. Additionally, WAVES provides users with the ability to download the current data and metadata selection as ASCII, CSV, and NetCDF formatted files.

PICES XIV S10-2564 Poster

Metadata catalogue service based on the preliminary national standard

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Our ability to access, integrate and use spatial data from disparate sources (across jurisdictions) in guiding decision making is dependent on the implementation of Spatial Data Infrastructures (SDI). The key components of SDI are: geospatial data catalogues and geomatics standards (data exchange standards).

The Pacific Institute of Geography (Vladivostok, Russia) has completed implementation of Catalogue Service-Web with restricted capabilities. A client software for metadata creation is based on the Russian profile of ISO 19115 standard as designed. This software program is used to assist entry of information. Specifically, it checks the syntactical structure of the file; modifies the arrangement of information, and repeats this process until the syntactical structure is correct. Finally, it verifies that the information describes the subject data completely and correctly. Metadata are exchanged in Extensible Markup Language (XML).

PICES XIV S10-2505 Oral

Federated metadata of PICES member nations: Information sharing across international boundaries

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PICES metadata federation will provide tools for multi-national sharing of information on marine ecosystems. The tools are based on the proven ANSI Z39.50-1995 (ISO 10163-1995) protocol for delivery and sharing of information in a common format. The Z39.50 protocol includes client and server software modules that establish a connection, pass a formatted query, return query results, and present identified documents to the client in one of several formats. Using XML-coded metadata (conforming to the Federal Geographic Data Committee standard) with easily obtained, no-cost, open-source iSite software, and a publicly accessible web server, any data center can join in a federated system. A good example of such a system is the National Spatial Data Infrastructure clearinghouse that presently has nearly 400 nodes. Ultimately, this PICES partnership will include all member countries (Canada, Peoples Republic of China, Indonesia, Japan, Republic of Korea, Russian Federation and the U.S.A.) that will share with the world the wealth of marine ecosystem information available from eastern Asia and western North America. In progress now is a proof-of-concept data sharing collaboration between the North Pacific Ecosystem Metadatabase and the metadata archives of the Korea Oceanographic Data Center; the project has also opened discussions with the Japan Oceanographic Data Center.

PICES XIV S10-2390 Poster

Tools for the visualization of gridded oceanographic data

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Special software for different kinds of oceanographic data visualization has been created. It is used for development of new on-line products of POI data bases (DB) applications. The first versions of POI information products were created as static systems and electronic atlases. Evolution of information and development technologies (World Wide Web, programming languages and relational DB management systems) provide effective methods to develop tools for data processing in dynamic mode and data presentation in comfortable electronic format. These tools are web-based applications and released on PHP-technology with support of the DB management system MySQL. The tools allow users to query and to search data rationally, and to select different variables such as time and location. All of these actions can be executed in interactive mode within the Internet browser.

PICES XIV S10-2286 Oral

Oceanographic data base applications for the Far Eastern Region of Russia

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For many years POI has provided development of technologies for the collection, accumulation, processing and long-time storage of data on the ocean environment to maintain POI studies in the western Pacific. With the help of the relational DB management system several problem-oriented oceanographic data bases have been created. Using modern information technologies ensures the efficient creation of capacious electronic oceanographic information-reference systems, thematic data bases, atlases and their delivery to users through computer networks and on CD-ROM.

The several versions of POI information products on CD-ROM are partly presented on the site <<http://www.pacificinfo.ru>>. The most recent products are “Atlas of the hydrophysical characteristics of a region off the southeastern part of the Kamchatka Peninsula”, “Guide to identifying marine mammal species of Pacific waters of Russia” and “Ice conditions of the Bering Sea”.

The systems provide quick access to raw data, gridded data and information specially selected and stored on CD-ROMs, as well as to other on-line or general reference information disseminated among different sources.

PICES XIV S10-2317 Oral

Use of diverse database aggregation for the study of variability in oceanographic parameters of the Japan/East Sea

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Using diverse databases from multiple sources represents a powerful and synergistic approach for oceanographic study. However, data can be voluminous, and can be difficult to provide prompt access to various data groups. The basis of our approach is the idea of uniting all required data into a database of the relational type and with a unified system.

Here is a review of the information resources. There are multi-source oceanographic databases of temperature and salinity (MODB) for the Japan/East Sea from POI, daily sea surface temperature (SST) on a 15-min grid, daily data of some meteorological parameters from several coastal meteorological stations, and monthly SST on a 1-deg grid. Considered are technologies for projecting and realizing the automated oceanographic database. We present analysis of logical models for arranging the marine data and discuss their relational structure that allows adequate presentation of the initial data from all used sources.

Aggregated data bases allow study of a marine area using a united information field, making it easy to compare the very different data to reveal relationships or independent behavior of oceanographic parameters and forces in a region. Such concatenated databases enable analyses of variability of SST, thermohaline structure, and geostrophic currents in the Japan/East Sea, and meteorological characteristics over the sea and adjacent area. Large-scale oceanographic features are generally found in all datasets.

PICES XIV S10-2420 Oral

Research and development of ubiquitous information services for integrated fisheries activities in the offshore around Japan

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This paper presents an overview of a newly developed ubiquitous fisheries information system using satellite remote sensing and geographical information system (RS/GIS). The system was developed to aim for providing high value-added fisheries oceanographic information in anytime and at anywhere. We also made this system for a wide range of users, especially fishermen and managers in fisheries cooperation or fisheries experimental stations. This system consists of four subsystems; a MODIS (Moderate Resolution Imaging Spectroradiometer) receiving subsystem, a database subsystem, an analysis subsystem, and a GIS subsystem (WebGIS and onboard-GIS). The MODIS system provides sea surface temperature, chlorophyll-*a* concentration and sea ice distribution. The database manages all products under Oracle software. The analysis subsystem produces level 1 to level 5 products, which include fishing ground forecasts of Japanese common squid, Pacific saury and Albacore tuna. These procedures run automatically, so that fishermen can 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 offshore using GEOBASE. All users can operate all products dynamically such as overlaying, measuring distance from the nearest port or fishing grounds on the GIS. This system can help to support effective fishing activities such as determining the quickest route to a fishing ground destination or the nearest landing port.

PICES XIV S10-2521 Poster

Oceanographic data in the Japan Fisheries Oceanography DataBase (JFODB)

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Fisheries research in Japan stands on a history of more than one hundred years. A large number of oceanographic and marine biological data were obtained and archived during this long history. Most of the data face many difficulties for preservation, as they were printed or handwritten on paper. The request for long-term data to support global warming research and marine-resources change research is getting strong year by year. Therefore, the plan for database construction for oceanographic and marine biological data was accelerated. By getting a three-year budget from the Japan Science and Technology Agency (JST), the National Research Institute of Fisheries Science (NRIFS) started the Japan Fisheries Oceanography DataBase (JFODB) project in the autumn of 2001. An organized suite of oceanographic observations by research institutions for fisheries science was initiated in the 1910s. About 70 repeated observation lines in the adjacent seas of Japan and about 100 coastal stations existed already before World War II. However, most of the data from these observations were not used effectively for a long time. In the project, we newly digitized oceanographic data for the period from the 1910s to the 1950s and merged them into the existing digital dataset for the period after the 1960s. Though we are still tackling some problems in order to complete the data set, the JFODB will provide useful data for investigation of long-term variability in oceanographic conditions of the western North Pacific in the near future.

PICES XIV S10-2539 Oral
Marine data exchange prototype based on XML

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Argo floats are a kind of measuring device for the special purpose of building the global ocean observation net. In this paper, a prototype system for Argo data exchange is discussed. The system was designed based on XML technology, taking the internet as the data exchange platform and XML as the data medium. This system is a key technological development for marine data integration and exchange.