Working from deep-sea stable platforms both in the Arctic (the polar ice cap) and the open ocean (FLIP), recent data suggest that much of the continuous nature of the internal wave frequency spectrum results from simple Doppler spearing of a few principal spectral constituents. The apparent role of the vortical field is dependent on the reference frame in which observations are made. Such observations encourage revision of our view of the spectral cascade of energy from large to small scales.

OS61B-0222 0830h INVITED POSTER

Biogeochemical and Bio-optical Measurements from Stable Platforms and the Coming Ocean Observatories

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Problems such as global climate change, carbon and biogeochemical cycling, upper ocean ecology, biomass and bio-optical variability, waning fisheries, population dynamics, and generally ocean prediction are hindered by insufficient time series data. These problems and others require interdisciplinary data that need to be collected simultaneously and effectively span ten orders of magnitude in time. New technologies are enabling interdisciplinary sampling of the ocean at unprecedented time and space scales. Autonomous sampling of interdisciplinary variables using platforms including stable platforms such as R/P FLIP, moorings, drifters, profiling floats, gliders, and autonomous underwater vehicles (AUVs) has become a major emphasis of observational oceanography. Autonomous measurements now include several key chemical, bio-optical, and biological variables. Moorings and R/P FLIP have been used to test sensors and systems, which have been, or likely will be, transitioned to other autonomous sampling platforms. A natural extension of this work is to future stable platforms and observatories. Some examples of interdisciplinary time series results obtained during with suites of sensors are presented. Visions of new sensor technologies and a network of integrated, interdisciplinary, global-scale, three-dimensional time series observations using multiple platform-types including stable platforms and observatories and modeling are presented. Ongoing international efforts and plans for implementation of an array of platforms and observatories equipped with interdisciplinary sensors will be described.

URL: http://www.opl.ucsb.edu

OS61B-0223 0830h INVITED POSTER

Stable platform designs for global DEOS moorings

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Oceanography has been dominated for at least two centuries by an expeditionary approach and examples include the voyage of the Beagle in 1831-1836 and the Challenger Expedition in 1872 - 1876. In the U.S., the capabilities for expeditionary research were greatly amplified during and especially following WW II. Today the U.S. alone has established a research fleet of 28 vessels organized through UNOLS. While experimental oceanography has made enormous contributions over the decades and centuries, this approach has not been well suited to investigating processes in which transients are important. The Dynamics of Earth and Ocean Systems (DEOS) program was developed in 1997 to promote the idea of making long-term observations in the oceans - to establish a long-term presence in the oceans. DEOS, now under the sponsorship of the Consortium for Ocean Research and Education (CORE) with support from the NSF, advocates the collection of long-term time-series data with the recognition that this is the only viable approach to observe transients and changes and to enhance the signal-to-noise ratio of weak signals. Moored ocean buoys are a technically feasible approach for making sustained time series observations in the oceans and will be an important component of any long-term ocean observing system. Scripps and Woods Hole developed the ocean mooring systems, designed for decadal time scales, in an NSF-sponsored design study. One of the designs bears a strong familial resemblance to R/P FLIP and is especially well suited for maximizing system life as well as ensuring robust Internet connectivity. I will review this design and describe feasibility experiments conducted to test communications feasibility. Because of the broad spectrum of scientific needs identified during planning, it is clear that there is no single buoy or mooring design that will meet all of these needs while at the same time minimizing costs. An alternative British design may be particularly well suited for high latitude deployments. Ongoing experiments to demonstrate components of the mooring program will be discussed.

URL: http://roadnet.ucsd.edu

OS61B-0224 0830h INVITED POSTER

FLIP II - Concept Designs to Meet Future Scientific Mission Requirements

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R/P FLIP has successfully operated for 40 years in support of important oceanographic research missions. The simple platform, which has the unique ability to provide a heave-stable operating location in open ocean environments, has over time been modified and upgraded. Its capability has been extended to the physical limits imposed by buoyancy and stability constraints. Nonetheless, there are oceanographic research operations that can use FLIPs unique characteristics, but which exceed its capabilities. Over the years researchers at the Marine Physical Laboratory of Scripps Institution of Oceanography have led investigations into second generation heave-stable ocean platforms with capabilities substantially exceeding those of R/P FLIP. This paper discusses several design concepts that have been developed. The designs are presented in terms of the ability to meet current and future scientific mission requirements.

URL: http://www.glosten.com

OS61C MCC: 274 Saturday 0830h

Data Integration, Publication, and Archival (DIPA) I *(joint with GP, V)*

Presiding: **J Helly,** University of California, San Diego**; D Chayes,** Lamont-Doherty Earth Observatory of Columbia University

OS61C-01 0835h INVITED

Data Integration Across the Geoscience Disciplines: Challenges and Opportunities

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As geoscience research becomes more interdisciplinary and integrative, it is also becoming increasingly dependent on rapid access to reliable information. Some of these data sets are extremely large and new data sets are being developed. Interoperability among data sets is of paramount importance and researchers are pushing for the development of new analytical tools. To better understand the full range of earth processes, community models and new theoretical frameworks are being developed that require increased computational capabilities. Within the NSF Geoscience Directorate, the three divisions (Earth, Atmospheric, and Ocean sciences) are working with their communities to formulate informatics programs. Whereas each division serves distinct communities, the various subdisciplines have overlapping informatics needs that require a mechanism to serve both their specific requirements as well as one that promotes syngerism among the sciences.

For the Earth Sciences community, there is a natural division into at least four earth science-based informatics groups: 1) solid earth geophysics and active tectonics; 2) continental crustal evolution and architecture; 3) surficial processes and hydrologic sciences; and 4) sedimentary and ancient life systems. In addition, education-outreach and computational technology are critical parts of the overall system. Each of these components encompasses several ongoing or developing informatics efforts, such as those by IRIS, EarthScope, several NSF Information Technology Research (ITR) grants, GERM, NAVDAT, the Hydrologic Information System (CUAHSI), the Community Sediment Model (CSM), CHRONOS, and many others. GEON (A Research Project to Create Cyberinfrastructure for the Geosciences) is an ITR NSF project that perhaps forms a core part of the computational facilities for the earth sciences and it includes some science-based projects that are encompassed in the respective discipline based groupings.

Neither the names or the "membership" in these topical groups are firmly establish. Furthermore, because informatics must reflect and serve the community needs, everyone who has an interest in or need for informatics must be provided an opportunity to become part of the effort. On the other hand, we must have a limited number of science-based categories or the funding and coordination of efforts becomes untenable.

It is important to emphasize that there are clear overlaps between these earth science-based efforts and similar to parallel ones in the ocean and atmospheric sciences. The PETDB and ODP's Janus databases are two such academic-based examples that connect the earth science and oceanographic communities. Atmospheric and hydrologic scientists are working to bridge their information systems. Similarly, a need to cross the interface between the geosciences and the ecosystem and modern life sciences is being articulated. Representatives from federal and state agencies and industry sit on many of subdiscipline organizing and steering committees. The important point is that the scientists are the ones articulating the need for this informatics integration, and therefore it appears that informatics is becoming a bottom-up driver for better overall science integration.

OS61C-02 0850h INVITED

Data Collection and Distribution within the IRIS Data Management System: Embracing New Technologies

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The IRIS Data Management Center in Seattle has been instrumental in addressing the needs of a global community as it relates to the collection and distribution of seismological data. We will focus on approaches that support distributed models of data management that leverage local expertise and resources.

We will offer examples of how effective archiving can be accomplished when standards are first adopted and accepted by a large international scientific community, and what the time scale was to accomplish this. We will offer suggestions on topics such as how to manage real time data streams, managing restricted data, how to insure proper credit is given to data providers and data versioning.

We will discuss our current Information Technology (IT) initiatives that directly relate to distributed data access, including observational time series and metadata. We will summarize the concept of Networked Data Centers (NetDC), which connects globally distributed data centers with common interface utilities and eliminates the need to know where data are archived. We will also highlight the FISSURES initiative that includes the Data Handling Interface (DHI), a comprehensive effort to leverage industry-standard CORBA technology to standardize the interfaces to information in distributed data centers.

URL: http://www.iris.washington.edu

OS61C-03 0905h

User-Friendly Data Servers for Climate Studies at the Asia-Pacific Data-Research Center (APDRC)

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The APDRC was recently established within the International Pacific Research Center (IPRC) at the University of Hawaii. The APDRC mission is to increase understanding of climate variability in the Asia-Pacific region by developing the computational, data-management, and networking infrastructure necessary to make data resources readily accessible and usable by researchers, and by undertaking data-intensive research activities that will both advance knowledge and lead to improvements in data preparation and data products. A focus of recent activity is the implementation of user-friendly data servers.

The APDRC is currently running a Live Access Server (LAS) developed at NOAA/PMEL to provide access to and visualization of gridded climate products via the web. The LAS also allows users to download the selected data subsets in various formats (such as binary, netCDF and ASCII). Most of the datasets served by the LAS are also served through our OPeNDAP server (formerly DODS), which allows users to directly access the data using their desktop client tools (e.g. GrADS, Matlab and Ferret). In addition, the APDRC is running an OPeNDAP Catalog/Aggregation Server (CAS) developed by Unidata at UCAR to serve climate

data and products such as model output and satellite-derived products. These products are often large (> 2 GB) and are therefore stored as multiple files (stored separately in time or in parameters). The CAS remedies the inconvenience of multiple files and allows access to the whole dataset (or any subset that cuts across the multiple files) via a single request command from any DODS enabled client software. Once the aggregation of files is configured at the server (CAS), the process of aggregation is transparent to the user. The user only needs to know a single URL for the entire dataset, which is, in fact, stored as multiple files. CAS even allows aggregation of files on different systems and at different locations. Currently, the APDRC is serving NCEP, ECMWF, SODA, WOCE-Satellite, TMI, GPI and GSSTF products through the CAS.

The APDRC is also running an EPIC server developed by PMEL/NOAA. EPIC is a web-based, data search and display system suited for in situ (station versus gridded) data. The process of locating and selecting individual station data from large collections (millions of profiles or time series, etc.) of in situ data is a major challenge. Serving in situ data on the Internet faces two problems: the irregularity of data formats; and the large quantity of data files. To solve the first problem, we have converted the in situ data into netCDF data format. The second problem was solved by using the EPIC server, which allows users to easily subset the files using a friendly graphical interface. Furthermore, we enhanced the capability of EPIC and configured OPeNDAP into EPIC to serve the numerous in situ data files and to export them to users through two different options: 1) an OPeNDAP pointer file of user-selected data files; and 2) a data package that includes meta-information (e.g., location, time, cruise no, etc.), a local pointer file, and the data files that the user selected. Option 1) is for those who do not want to download the selected data but want to use their own application software (such as GrADS, Matlab and Ferret) for access and analysis; option 2) is for users who want to store the data on their own system (e.g. laptops before going for a cruise) for subsequent analysis. Currently, WOCE CTD and bottle data, the WOCE current meter data, and some Argo float data are being served on the EPIC server.

URL: http://apdrc.soest.hawaii.edu/

OS61C-04 0920h

GERM in EarthRef.org: A reference model approach to data bases

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The geochemical earth reference model (GERM) initiative is a grass-roots effort that works towards a chemical characterization of the whole earth, from the core to the atmosphere. This reference model aims to provide the currently best possible geochemical constraints that characterize every geochemical reservoir, as a reference point for comparison with data from future studies to improve these estimates. The GERM reference model approach defines a scientific process with a well structured, overarching scientific goal in geochemistry that is central to how geochemistry works and interacts with neighboring disciplines. This goal of a reference model prescribes a clear path that helps optimize a data model and a data structure that makes it easy to find, use and compare data.

Earthref.org has designed a hierarchical metadata scheme and developed a data base structure for GERM that is modular and optimized for the GERM process. We recently began applying these techniques to other data bases such as in paleomagnetism and it is quite obvious that same approach can be rather widely applied. Most geoscience disciplines have central reference models that define a discipline in its scientific approach and data base needs. Such models may include e.g., bio- and magnetostratigraphy, plate motion, or the physical structure of the earth. The contents and structure of these reference models may vary dramatically between earth science disciplines but they all have in common that they offer basis for a meaningful information technology infrastructure that is transparent and tailored to specific science goals, and makes data accessible to neighboring disciplines

In our presentation, we will summarize the structure and contents of GERM data base and the learning path it took to realize this data base. There are many lessons learned and many concepts developed that are useful in the development of other data bases to serve their community. Key aspects of this GERM learning process included:

- Community involvement is essential to define the scientific focus of data base development, to establish widely accepted data and metadata formats, to enable and encourage the community to use and contribute online tools and database contents. - Data base efforts have to interface with data publication in order to allow for publication of important data that would be otherwise not published and to shift data publication methods away from traditional printed data tables towards database ready data and metadata files. - Metadata and data and their archiving infrastructure have to be modular, transparent and maximally transportable between data bases. - Databases have to involve the community in the maintenance of legacy data, through the encouragement of publication and through uploading features in the data base.

The EarthRef.org database architecture and metadata structure has a very modular character and is organized in a hierarchical fashion, such that they can be easily described in a canonical database structure and easily transported to other disciplines. EarthRef.org has used these structures to jump-start a database initiative in palaeomagnetism.

OS61C-05 0935h

New Magnetic Database Initiatives: Exploitation of and Integration with other Developments.

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The steadily increasing collection of paleo, rock, and environmental magnetic data necessitates a community effort to ensure its timely electronic archival and allow appropriate exploitation of research tools from an IT perspective. This will ensure that scientific data gathered with public funds can be readily accessible to the broadest possible range of researchers. Although paleomagnetic databases providing a limited digital archive of legacy data have existed for some time, they lack the interoperability and generality required for the breadth of modern scientific endeavors.

Drawing on expertise represented in both the Geochemical Earth Reference Model (GERM) and its parent body EarthRef.org protocols are being developed within the magnetics community that will provide the range of information needed for paleo and rock magnetic databases. The goal in establishing these databases is to provide an enduring digital archive that can be exploited for current scientific investigations, and permit new and interdisciplinary studies that can explore combinations of measurements not previously considered. While strategies for harvesting legacy data are also desirable, a strong focus on gathering newly collected data at the publication stage is necessary, so that these data become broadly available in a timely fashion.

The ongoing dialog on minimal and desirable metadata suitable for magnetic databases has a strong basis in the traditional geophysical areas in which magnetic data are applied, and must also include fundamental rock magnetic information. The metadata must be designed to allow flexible syntheses of magnetic data into the standard kinds of models (such as magnetostratigraphic time scales, geomagnetic field models, plate reconstructions, etc.) and be sufficiently general to enable cross-fertilization with communities involved in related geophysical enterprises such as stratigraphy, petrology, radiometric dating, tectonics and paleoclimate studies.

This magnetic database effort lies within the more general hierarchy defined for EarthRef.org, and will exploit both an external and internal modular structure that is intended to facilitate database interoperability. Features that are part of the more general database structure will be illustrated as well as those that are unique to the magnetics database.

OS61C-06 0950h

SIOExplorer: Overview, Initial Results and Next Steps

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Data, documents and images from 795 expeditions by the Scripps Institution of Oceanography (SIO) since 1903 are becoming web-accessible for both education and research through the new SIOExplorer project (http://SIOExplorer.ucsd.edu), which is a collection in the overall NSF-funded National Science Digital Library (www.nsdl.org). The collaborative effort includes researchers at SIO, computer scientists from the San Diego Supercomputer Center (SDSC), and archivists and librarians from the UCSD Library. The co-authors of this paper tested a shipboard prototype during a Floating Digital Library Workshop from New Zealand to Samoa on R/V Melville in March, 2002. General purpose tools have been developed to automate collection development, manage metadata, and geographically search the library, as discussed in other presentations in this session.

In the initial year of operation, the biggest challenge has been wrestling with the volume and variability of data and documents. Shipboard sensors, data volumes, and organizational structures have evolved greatly over the decades, particularly with 244 multibeam expeditions since 1982. Considerable success came after introducing the concept of a Canonical Cruise Data Structure (CCDS) with nine basic categories that seem to capture the essential characteristics of data practices since the 1960s. Automatic software pulls data into the CCDS from diverse source directories and media, guided by a template with rules for priority and filenames. Almost all metadata are harvested automatically into simple metadata interchange format (.mif) files, one for each arbitrary digital object (ADO) in the CCDS. The metadata are placed in an Oracle database, and the associated data are managed by the SDSC Storage Resource Broker on various disk and automatic tape silo systems. The system is extensible to various domains and data types, including geochemistry, image archives, multibeam bathymetry, reports and publications. A Java Metadata Object Browser and Editor (MOBE) expands or hides the complexity for each domain, as needed. A prototype interactive CruiseViewer with both Java and html approaches will be demonstrated.

As the second year of the project begins, greater emphasis will be placed on search and display tools. At-risk data on shipboard magnetic tapes will be migrated to RAID systems and tape silos. Public outreach will begin at the Birch Aquarium and other locations. A workshop will be held at Scripps in September 2003, coinciding with the hosting of the Oceans 2003 meeting and the 100th Anniversary of SIO. These efforts are supported by the NSF NSDL and ITR programs and by SIO institutional funds.

URL: http://SIOExplorer.ucsd.edu

OS61C-07 1005h INVITED

Processing, Archiving, and Disseminating Large Swath Mapping Datasets Using MB-System

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MB-System is an NSF and MBARI-funded open source software package for the processing and display of swath mapping sonar data.

Version 5.0 of MB-System is structured to enable the management of large datasets. The new software integrates editing and analysis tools with a single program, mbprocess, which outputs processed data files. This parallel approach now allows processing to proceed in a more flexible, efficient fashion. An additional important benefit is that the data management structure allows the active processing environment to be embedded within the overall data archive. Within this structure, bathymetry grids, sidescan mosaics, maps, images, GIS layers, and other data products are generated using the most up-to-date processed data. If one layers data dissemination tools and environments on top of the data archive, the served data products will also automatically reflect the latest processing efforts.

MBARI, L-DEO, and NOAA-NOS are currently developing web-served swath data archives that use MB-System for processing, data product generation, and low-level data management. The aims of these efforts vary, and are reflected in differing high-level data server architectures. We will present and discuss the current state of these swath data archives.

URL: http://www.ldeo.columbia.edu/MB-System

OS61C-08 1040h

The Evolution of Global Oceanic Crust From Jurassic to Present Day: A Global Data Integration

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Understanding the interplay between oceanic crustal production, mid-ocean ridge volumes, mantle convection, and long-term sea level changes is one of the first-order goals of Earth science. In order to investigate whether the oceanic crustal production varied through time we created complete digital paleo-seafloor age grids for the last 180 million years. A combination of methods and datasets were used to map and reconstruct preserved and subducted oceanic regions. Magnetic anomalies and gravity anomaly derived from satellite altimetry were used to derive the age of oceanic crust, spreading rates, geometry and grain of seafloor. We have created an extensive GMT database for the magnetic and gravity data and have also used the magnetic database of GSC for North Atlantic magnetic data. In addition we have used the predicted bathymetry and the ETOPO5 bathymetry grids for mapping various tectonic features of the ocean floor. Available seismic data have been also used to constrain the geometry of some parts of the oceanic basins. A compilation of geological data from published studies (type and ages of dredged rocks, evidence of subduction related magmatism and metamorphism, ophiolites) in conjunction with published results from ODP and DSDP cruises were employed to constrain and groundtruth our models. A subduction related set of geological data is partially compiled in a database(Microsoft Access). The tectonic history of various oceanic areas has been revisited using both quantitative and qualitative methods. We have used a quantitative method based on Hellinger's criteria of fit to derive the evolution of North Atlantic and other small basins east of Australia (Tasman and Coral seas). For regions with sparse magnetic data coverage or complicated seafloor spreading pattern we have used qualitative methods, that usually involve visual fit reconstructions (PLATES software). This method has been used to derive the evolution of a series of backarc basins in the SW Pacific and SE Asia and in the Indian Ocean. The new results have been integrated in a global tectonic model and newly constructed isochrons were used to update the present day oceanic agegrid. Paleo-oceans are modelled by creating synthetic plates whose locations and geometry is established on the basis of preserved M-sequence magnetic lineations, paleogeography, regional geological data and the rules of plate tectonics. Plate boundaries, which are introduced and modified in time and space, give only little room for alternative plate model solutions. These plate limits are governed by rheological laws, which provide stable constraints for reconstructions when geological information is scarce. This method has been used to reconstruct subducted Neo-Tehys ocean and the Izanagi/Kula, Farallon and Phoenix plates. The relative plate motion models used to derive isochrons were linked to an absolute plate model to reconstruct isochrons in a desired framework, in order to produce gridded paleo-age maps of the ocean floor that will provide an accurate estimation of seafloor spreading/subduction rates, as well as the global distribution of oceanic crust ages for the last 180 million years. The paleo-age grids illustrate where subduction zones were located in time and provide constraints for geodynamic models, for the heat loss of the Earth, and for estimates of plate driving forces through time.

OS61C-09 1055h INVITED

Interoperability Among Spatial Data Resources Along a Continuum: "Data-to-Data", "Data Models" and "Data-to-Interpretation

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While there is clearly a wealth of digital and analog data from the oceans to facilitate interdisciplinary studies, the diversity, volume, and complexity of these data sets makes it extremely difficult to efficiently and intelligently transform the data into information, and further to synthesize knowledge from studies over large geographic areas. Presented is a brief overview of four projects in progress that seek to promote the interoperability of data and software to, in turn, facilitate the leap from scientific data access to knowledge discovery. The projects range in their focus from a system with simple access to metadata and data, as well as linkages between disparate data sets (data to data), to a standard object-oriented data model for the structure of databases with "rules" for behavior and placeholders for analytical functions, to a complex computational environment (consisting of web mapping, relational database management, and analytic tool composition by the user) that facilitates refinement of numerical simulations, quantitative evaluation of scientific hypotheses, and exploration of new relationships between observables (data to interpretation).

OS61C-10 1110h

A design for the geoinformatics system

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Informatics integrates and applies information technologies with scientific and technical disciplines. A geoinformatics system targets the spatially based sciences. The system is not a master database, but will collect pertinent information from disparate databases distributed around the world. Seamless interoperability of databases promises quantum leaps in productivity not only for scientific researchers but also for many areas of society including business and government. The system will incorporate: acquisition of analog and digital legacy data; efficient information and data retrieval mechanisms (via data mining and web services); accessibility to and application of visualization, analysis, and modeling capabilities; online workspace, software, and tutorials; GIS; integration with online scientific journal aggregates and digital libraries; access to real time data collection and dissemination; user-defined automatic notification and quality control filtering for selection of new resources; and application to field techniques such as mapping.

In practical terms, such a system will provide the ability to gather data over the Web from a variety of distributed sources, regardless of computer operating systems, database formats, and servers. Search engines will gather data about any geographic location, above, on, or below ground, covering any geologic time, and at any scale or detail. A distributed network of digital geolibraries can archive permanent copies of databases at risk of being discontinued and those that continue to be maintained by the data authors.

The geoinformatics system will generate results from widely distributed sources to function as a dynamic data network. Instead of posting a variety of premade tables, charts, or maps based on static databases, the interactive dynamic system creates these products on the fly, each time an inquiry is made, using the latest information in the appropriate databases. Thus, in the dynamic system, a map generated today may differ from one created yesterday and one to be created tomorrow, because the databases used to make it are constantly (and sometimes automatically) being updated.

OS61C-11 1125h

Designing Extensible Data Management for Ocean Observatories, Platforms, and Devices

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The Monterey Bay Aquarium Research Institute (MBARI) has been collecting science data for 15 years from all kinds of oceanographic instruments and systems, and is building a next-generation observing system, the MBARI Ocean Observing System (MOOS). To meet the data management requirements of the MOOS, the Institute began developing a flexible, extensible data management solution, the Shore Side Data System (SSDS). This data management system must address a wide variety of oceanographic instruments and data sources, including instruments and platforms of the future.

Our data management solution will address all elements of the data management challenge, from ingest (including suitable pre-definition of metadata) through to access and visualization. Key to its success will be ease of use, and automatic incorporation of new data streams and data sets. The data will be of many different forms, and come from many different types of instruments. Instruments will be designed for fixed locations (as with moorings), changing locations (drifters and AUVs), and cruise-based sampling. Data from airplanes, satellites, models, and external archives must also be considered.

Providing an architecture which allows data from these varied sources to be automatically archived and processed, yet readily accessed, is only possible with the best practices in metadata definition, software design, and re-use of third-party components. The current status of SSDS development will be presented, including lessons learned from our science users and from previous data management designs.

OS61C-12 1140h

Viewing and Editing Earth Science Metadata MOBE: Metadata Object Browser and Editor in Java

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Metadata is an important, yet often neglected aspect of successful archival efforts. However, to generate robust, useful metadata is often a time consuming and tedious task. We have been approaching this problem from two directions: first by automating metadata creation, pulling from known sources of data, and in addition, what this (paper/poster?) details, developing friendly software for human interaction with the metadata. MOBE and COBE(Metadata Object Browser and Editor, and Canonical Object Browser and Editor respectively), are Java applications for editing and viewing metadata and digital objects. MOBE has already been designed and deployed, currently being integrated into other areas of the SIOExplorer project. COBE is in the design and development stage, being created with the same considerations in mind as those for MOBE.

Metadata creation, viewing, data object creation, and data object viewing, when taken on a small scale are all relatively simple tasks. Computer science however, has an infamous reputation for transforming the simple into complex. As a system scales upwards to become more robust, new features arise and additional functionality is added to the software being written to manage the system. The software that emerges from such an evolution, though powerful, is often complex and difficult to use. With MOBE the focus is on a tool that does a small number of tasks very well. The result has been an application that enables users to manipulate metadata in an intuitive and effective way. This allows for a tool that serves its purpose without introducing additional cognitive load onto the user, an end goal we continue to pursue.

URL: http://sioexplorer.ucsd.edu

OS61C-13 1155h

The CompreHensive collaborativE Framework (CHEF)

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Data integration, publication, and archiving have become important considerations in most fields of science as experiments and models increase in complexity, and the collaborations necessary to conduct the research grow broader. The development of well thought out strategies and standards for such data handling, however, only goes part way in supporting the scientific process. A primary driving force for such efforts is the need of scientists to access and work with data in a timely, reasonable, and often collaborative fashion. Internet-based collaborative environments are one way to help complete this picture, linking scientists to the data they seek and to one another (e.g., Towards a Robust, Agile, and Comprehensive Information Infrastructure for the Geosciences: A Strategic Plan For High Performance Simulation, NCAR, 2000, http://www.ncar.ucar.edu/Director/plan.pdf).

The CompreHensive collaborativE Framework (CHEF, http://chefproject.org) is a generic, extensible, web-based, open-source environment for collaboration. CHEF's goal is to provide the basic building blocks

from which a community can assemble a collaborative environment that fits their needs. The design of CHEF has been influenced by our experience developing the Space Physics and Aeronomy Research Collaboratory (SPARC, http://www.si.umich.edu/SPARC), which provides integrated access to a wide variety of heterogeneous data sources, including community-standardized data bases. The design has also been heavily influenced by our involvement with an effort to extract and codify the broad underlying technical and social elements that lead to successful collaboratories (http://www.scienceofcollaboratories.org). A collaborative environment is in itself also not the complete answer to data handling, rather, it provides a facilitating environment in which community efforts to integrate, publish, archive, and share data using standard formats and practices can be taken advantage of by the end-users, the scientists. We present examples of how CHEF and its predecessors are utilized in a wide variety of scientific communities, including engineering, chemistry, and the geosciences. In particular, we focus on CHEF's utilization by the earthquake engineering community, whose Network for Earthquake Engineering Simulation (NEES, http://www.nees.org) involves a community effort to develop data standards and practices. In this context NEES is using CHEF as the "integration" environment in which to place the "tools" that bring together scientists and data; this includes data browsers, meta-data search engines, real-time and archival data viewers, etc. By developing these tools within the CHEF framework and exposing the community-developed data standards to the framework, they automatically gain the features, functionality, and capabilities offered by the collaborative environment. We also explore how a collaborative environment, in conjunction with community developed standards and practices for data integration, publishing, and archiving, could benefit the ocean science community.

URL: http://chefproject.org

OS61D MCC: 270 Saturday 0830h

Wind-Driven Processes Along the U.S. West Coast Continental Shelf I

(joint with B, T)

Presiding: **T Garfield,** San Francisco State University**; P A Wheeler,** Oregon State University

OS61D-01 0830h INVITED

Investigation of the Wind-Driven Coastal Ocean off Oregon: A COAST Overview

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The Coastal Ocean Advances in Shelf Transport (COAST) project seeks to understand and quantify cross-shelf transport and transformation processes in the strongly wind-driven coastal ocean off central Oregon. Two intensive field efforts were conducted in summer 2001 together with coordinated ocean circulation/ecosystem and atmospheric modeling. A primary goal is to contrast the coastal ocean response in a region of relatively simple alongshore bottom topography versus that associated with a substantial submarine bank. Heceta Bank (44.3N) rises to over 50% of the surrounding continental shelf water depth and widens the shelf to 60 km from the relatively narrow, straight 25-km wide shelves both to the north and south. High ocean production is associated with Heceta Bank and cold, chlorophyll-rich upwelled water has been observed well seaward of the continental shelf break south of the Bank.

During May-June and August 2001, two vessels conducted interdisciplinary research off central Oregon. One ship conducted rapid, high spatial resolution surveys of the three-dimensional thermohaline, bio-optical, zooplankton and velocity fields using SeaSoar, shipboard ADCP and a towed, multi-frequency acoustics instrument. Surface maps of nutrients, pCO2 and iron were also made. A second ship collected high-vertical resolution cross-shelf profiles of water properties: temperature, salinity and turbulence parameters from a loosely tethered microstructure profiler; nutrients, carbonate species, phytoplankton photosynthesis parameters, and particulate and dissolved organic material from a pumped profiling system. An instrumented aircraft measured properties of the lower atmosphere and upper ocean during and between the month-long intensive field experiments. A set of moorings measured physical and bio-optical parameters from May-August and a land-based radio system continuously measured surface currents hourly over a region encompassing the Bank. A high-resolution, three-dimensional shelf circulation and coupled ecosystem ocean model and a mesoscale atmospheric model are being used to investigate the dynamics of the system.

During summer 2001, upwelled water was present near the coast and a wide ($\geq$ 75 km) cold region over the Bank showed elevated surface chlorophyll with peak values in excess of 15 mg m^{-3}. In the north, upwelling over simple bottom topography exhibited a classic response with a mid-shelf baroclinic coastal jet accompanied by upwelled isopycnals. On the southern edge of the Bank, the flow is highly three-dimensional including a strong baroclinic, equatorward jet near or seaward of the shelfbreak, a region of northward recirculation flow over the Bank and a small area of weaker upwelling adjacent to the coast. Lastly, although the COAST program is scheduled to study wintertime downwelling in Jan-Feb 2003, strong summertime downwelling was experienced during August 2001 when a remnant tropical typhoon transited the area with southerly winds in excess of 40 knots. The thermohaline, bio-optical and velocity response to this event are contrasted to those observed during relaxation, i.e. periods with weak or no wind forcing when pressure forces can drive inshore northward flow but isopycnals remain upwelled.

URL: http://damp.coas.oregonstate.edu/coast

OS61D-02 0850h

Atmospheric Forcing of the Oregon Shelf During COAST 2001

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During the COAST summer 2001 field program off central Oregon, detailed observations of the coastal atmosphere were made using moored buoys, land stations, satellites, ships and an aircraft. These observations reveal the structure and variability of the atmosphere in the study region, and they provide insight into the processes that give rise to the atmospheric forcing of the ocean there. We present an overview of the COAST atmosphere throughout the summer, relating local winds and thermal structure to the synoptic conditions over the eastern Pacific and northwestern North America. Coastal orographic effects and air-sea heat exchanges are found to modify the prevailing conditions locally, sometimes giving rise to enhanced or reduced near-surface winds and cool air temperatures along the coast. Although the winds are predominantly upwelling favorable (northerly) during summer in this region, southerly winds were experienced 25 percent of the time during COAST. We will describe the atmospheric thermal and wind structure during typical northerly and southerly wind episodes, relate these to synoptic conditions and local processes, and give brief examples of the oceanic circulations that these differing wind regimes create.

URL: http://www.marine.unc.edu/cool/COAST

OS61D-03 0905h

Upwelling Along the Oregon Coast is a Sink for Atmospheric CO2

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High-resolution cross-shelf sections of nutrient and PCO2 measurements made during May and August of 2001 off the Oregon Coast show the effects of strong upwelling of nutrient-and CO2-rich water, followed by rapid uptake of these chemicals by biological productivity. Photosynthetic production draws nitrate from over 30 micro mol/kg to undetectable levels; along with this nitrate uptake, PCO2 is drawn down from values of 300 micro atm above, to 200 micro atm below, atmospheric saturation. High PCO2 surface waters are confined to a narrow region near the coast; low PCO2 conditions persist seaward over areas covering most of the shelf. If these conditions are representative of other upwelling areas in the Eastern North Pacific over the duration of the upwelling season, CO2 transfer into such waters may represent a significant contribution to the total summer-time uptake of CO2 by the entire North Pacific.

This phenomenon makes the Oregon Coast unique among upwelling regions of the world oceans, which are typically sources of CO2 to the atmosphere. Three factors appear to contribute to this singularity: 1) Upwelled source waters have high preformed nitrate relative to total CO2 (TCO2), which allows for the necessarily high alkalinity:TCO2 ratios implied by the observed low PCO2; 2) Productivity is able to rapidly consume all upwelled nitrate, along with a stoichiometric proportion of TCO2; and 3) upwelled waters are only moderately warmed in comparison to lower-latitude upwelling regions.

OS61D-04 0920h

Bottom Boundary Layer Behavior during COAST

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Rapidly-repeated transects of currents, and density and turbulence through the bottom boundary layer across a relatively uniform stretch of the continental shelf off Oregon reveal the response of the bottom boundary layer to a sequence of strong upwelling followed by relaxation and thence a resumption of upwelling. Dense, near-bottom fluid was observed to move upslope with upwelling and back down the slope with relaxation from upwelling. By tracking the intersection of near-bottom isopycnals with the bottom over successive transects, we estimate the cross-shore speed of fluid in the bottom boundary layer. This agrees well with simple estimates of bottom Ekman velocity from alongshore currents. Modifications to both the Ekman velocity due to buoyancy forcing and to the speed at which locations of isopycnal intersection with the bottom move down the slope due to turbulent mixing improve agreement, but they are small. Boundary layer thickness is greater during the relaxation from upwelling and turbulence in the bottom boundary layer is more intense at this time. Evidence exists for convectively-driven mixing in the bottom boundary layer during the relaxation. This is presumably forced by the downslope movement of lighter bottom fluid beneath dense fluid. During upwelling, fluid in the bottom boundary layer which has been drawn up the slope is observed to become isolated from its downslope source. It is argued that this is due to divergence of the Ekman bottom flow beneath a cross-shore varying current. TS properties of this water are similar to TS properties of isolated dense pool observed 90 km further south over the broader shelf, and it appears that the water is connected all the way along the coast.

URL: http://mixing.coas.oregonstate.edu

OS61D-05 0935h INVITED

Wind Events and Shelf Transport (WEST): Understanding the Role of Wind-Driven Transport in Shelf Productivity.

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