U41A-08 0945h

Dynamically Causes and Consequences of an Ultralow Viscosity Zone

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The Core-Mantle-Boundary may be viewed in a first order approach as the thermal boundary layer of the convecting lower mantle. Many studies have, however, indicated structures which deviate from those, as expected from a 'simple' thermal boundary layer. Chemically induced density differences have been assumed to explain the various phenomena , ranging from observed topography of the Core-Mantle-Boundary to the existence of a zone characterized by an ultra-low viscosity. Chemically induced contributions to both, density and viscosity can basically arise by either a recharge of the material at the CMB through subducting slabs or through interactions of the mantle and the core leading to a material exchange between both systems. I a series of two- and three-dimensional numerical experiments, possible dynamical causes of an ultra-low viscosity zone were investigated. Especially the case of a chemically dense layer, resulting from interactions with the core, together with viscosity depending on temperature and composition is explored. This configurations leads to the existence of a layer of low viscosity on top of the Core-Mantle-Boundary. Further the influence of radioactive elements, depth dependence of the thermal expansion coefficient and also of pressure dependence of the viscosity, on the stability and on the temporal evolution of this ultra-low viscosity layer has been studied.

U41B MCC: Level 1 Thursday 0830h

New Advances in Data and Service Access for Support of Science Research and Decision Support Posters

Presiding: **R Pfister,** NASA Goddard Space Flight Center**; R Ullman,** NASA Goddard Space Flight Center

U41B-0001 0830h POSTER

Bringing Selected MODIS Vegetation Indices Over to an Open GIS Consortium Web Map Server Environment

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Over the past few years, the Open GIS Consortium, OGC, has been building specifications to enable open data use across platforms and software packages. The OGC specifications have reached a maturity level that enables an alternative means for distributing satellite remotely sensed data acquired by NASA's Earth Observing System, EOS, particularly data products from the Moderate Resolution Imaging Spectroradiometer, MODIS. A spatially-seamless, time-series dataset of the MODIS vegetation normalized difference vegetation index, NDVI, covering the conterminous United States was made accessible through a world-wide-web interface to enable exploratory data visualization. User-specified spatial and/or temporal subsets of these data may be retrieved electronically as map graphics. The standard NDVI data are a 1 km grid product in the Sinusoidal projection that is organized as a set of non-overlapping tiles, 10^{o} latitude by 10^{o} longitude, consisting of a composite of observations for a 16-day period. To facilitate user-specified map compositions, or data extractions of the standard NDVI products, required several preprocessing steps including data mosaicking, data reprojection and resampling, and metadata compilation. Once the MODIS NDVI were compiled into a seamless mosaicked dataset and hosted on an OGC compliant data server, the data became accessible through web-based mapping services and applications.
By hosting the MODIS NDVI data over on an OGC compliant data server, the accessibility and usability of the data through a wider variety of users' applications became possible. This not only enables the use of all the OGC tool sets, but also enables greater flexibility for data visualizations and map rendering, independent of the end-users' system and software packages. Different data sets from any number of sources are automatically co-registered, independent of the initial map projections of the originating datasets. The net results are faster and more efficient web-based access to data spanning different sources, spatial scales, and time periods.

U41B-0002 0830h POSTER

Integrating NASA Earth Science Enterprise (ESE) Data Into Global Agricultural Decision Support Systems

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Monitoring global agricultural crop conditions during the growing season and estimating potential seasonal production are critically important for market development of U.S. agricultural products and for global food security. Two major operational users of satellite remote sensing for global crop monitoring are the USDA Foreign Agricultural Service (FAS) and the U.N. World Food Programme (WFP). The primary goal of FAS is to improve foreign market access for U.S. agricultural products. The WFP uses food to meet emergency needs and to support economic and social development. Both use global agricultural decision support systems that can integrate and synthesize a variety of data sources to provide accurate and timely information on global crop conditions. The Goddard Space Flight Center Earth Sciences Distributed Active Archive Center (GES DAAC) has begun a project to provide operational solutions to FAS and WFP, by fully leveraging results from previous work, as well as from existing capabilities of the users. The GES DAAC has effectively used its recently developed prototype TRMM Online Visualization and Analysis System (TOVAS) to provide ESE data and information to the WFP for its agricultural drought monitoring efforts. This prototype system will be evolved into an Agricultural Information System (AIS), which will operationally provide ESE and other data products (e.g., rainfall, land productivity) and services, to be integrated into and thus enhance the existing GIS-based, decision support systems of FAS and WFP. Agriculture-oriented, ESE data products (e.g., MODIS-based, crop condition assessment product; TRMM derived, drought index product) will be input to a crop growth model in collaboration with the USDA Agricultural Research Service, to generate crop condition and yield prediction maps. The AIS will have the capability for remotely accessing distributed data, by being compliant with community-based interoperability standards, enabling easy access to agriculture-related products from other data producers. The AIS? system approach will provide a generic mechanism for easily incorporating new products and making them accessible to users.

U41B-0003 0830h POSTER

Merging Air Quality and Public Health Decision Support Systems

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The New Mexico Air Quality Mapper (NMAQM) is a Web-based, open source GIS prototype application that Earth Data Analysis Center is developing under a NASA Cooperative Agreement. NMAQM enhances and extends existing data and imagery delivery systems with an existing Public Health system called the Rapid Syndrome Validation Project (RSVP). RSVP is a decision support system operating in several medical and public health arenas. It is evolving to ingest remote sensing data as input to provide early warning of human health threats, especially those related to anthropogenic atmospheric pollutants and airborne pathogens. The NMAQM project applies measurements of these atmospheric pollutants, derived from both remotely sensed data as well as from in-situ air quality networks, to both forecasting and retrospective analyses that influence human respiratory health. NMAQM provides a user-friendly interface for visualizing and interpreting environmentally-linked epidemiological phenomena. The results, and the systems made to provide the information, will be applicable not only to decision-makers in the public health realm, but also to air quality organizations, demographers, community planners, and other professionals in information technology, and social and engineering sciences. As an accessible and interactive mapping and analysis application, it allows environment and health personnel to study historic data for hypothesis generation and trend analysis, and then, potentially, to predict air quality conditions from daily data acquisitions. Additional spin off benefits to such users include the identification of gaps in the distribution of in-situ monitoring stations, the dissemination of air quality data to the public, and the discrimination of local vs. more regional sources of air pollutants that may bear on decisions relating to public health and public policy.

U41B-0004 0830h POSTER

Web Service-based Interoperable Geospatial Modeling for Earth Science Research and Decision Supporting

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It is estimated that more than 80 percent of data that human beings have collected so far are the geospatial data. In order for the geospatial data to be useful, information has to be extracted from the data and converted to knowledge. However, currently it is very difficult for users to obtain the geospatial data and to turn them into useful information and knowledge for scientific research and decision support. This paper presents a standard-based web service framework that enables the interactive construction and running of interoperable geospatial models over the web. The models and their components can be reused in construction of other geospatial models and are sharable with peers. The framework is built on the top of the common data environment provided by Open GIS Consortium (OGC) Web Coverage Service (WCS), Web Feature Service (WFS), and Web Registries Service (WRS) Specifications, so that the models can access petabytes of geospatial data without worrying about details of the data formations and data preprocessing. The full implementation of the framework will allow anyone equipped with an Internet-connected PC to conduct large-scale projects on Earth science research and applications with great easiness. This paper also discusses a prototype system that implements the framework.

URL: http://laits.gmu.edu

U41B-0005 0830h POSTER

NASA's Global Change Master Directory: It's not just data any more.

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NASA's Global Change Master Directory (GCMD) is best known for its offerings of Earth science data set descriptions. However, over the last two years, the GCMD has added descriptions of Earth science tools, resources, and services to the database for users to search and retrieve information. These tools are used in analyzing, processing and evaluating Earth science data sets. Users can search for tools from the following categories: data analysis and visualization, data handling, hazards management, metadata handling, models, Earth science educational resources, environmental advisory services, and information services. Through the GCMD, users are provided a direct link to these tools and services from the data set descriptions, and, where possible, a link to data sets that can be utilized with the tools. The GCMD services database is available from the GCMD homepage, http://gcmd.nasa.gov.

URL: http://gcmd.nasa.gov

U41B-0006 0830h POSTER

Sharing Community Data, Services and Tools using the EOS Clearinghouse (ECHO)

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Sharing data with a broader community is now simplified. Streamlined data access interfaces tailored to community-specific needs is now possible. The framework provided by the EOS Clearinghouse (ECHO) enables the interoperability of diverse, distributed data, services and data access tools enabling members of the science community to share their data, services and tools with the rest of the community. The result is streamlined data access for the science community. As a metadata clearinghouse, ECHO supports multiple data access paradigms that make data access more efficient for end users. New options also can serve to eliminate zero-hit and mega-hit results sets. An open well documented, message based interface allows various providers to build their own user interfaces so they are not limited by any single integrated data search and order system. This exchange is available via application program interfaces (APIs) based on eXtensible Markup Language (XML) and web service technologies. The ECHO framework is reusable for non-Earth science applications that also have a need to bring together diverse and distributed systems, services and tools.

URL: http://eos.nasa.gov/echo

U41B-0007 0830h POSTER

Investigation of IO Performance in a Weather Model

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WRF (Weather and Research Forecasting Model) is a limited-area weather model that has been used intensively for both weather research and prediction. Due to the heavy computational volume, WRF is using multi-layer domain decomposition method to run the model in parallel supercomputing environments. Although there are several performance metrics to measure the overall model behavior; the IO performance has never been thoroughly evaluated. The Hierarchical Data Format (HDF) developed at the National Center for Supercomputing Application (NCSA) at University of Illinois at Urbana-Champaign has become the primary standard file format for storing data from NASA's Earth Observing System (EOS). Since 1999, NCSA has developed a more general and robust data format, called HDF 5, which will support the future demands of Earth Science. HDF5 provides chunking storage of the data, which improves the performance. HDF5 is also easily to hook with external compression packages and make the data storage more efficient and flexible. Furthermore, HDF5 supports the Message Passing Interface (MPI-I/O) standard, which is capable of performing I/O efficiently in parallel computing environments. Currently NCSA is developing an implementation of WRF sequential and parallel I/O modules that reads and writes HDF5 datasets. The module will be available to anyone using WRF as a new option for I/O. In this poster, we report three case studies to compare the performance among NetCDF IO module, sequential HDF5 IO module and parallel HDF5 IO module. In other work, Unidata and NCSA are collaborating to design netCDF4, a new netCDF built on top of HDF5. We hope the current study will provide some insights for scientists, researchers and developers to make decisions in choosing the best file I/O in their computational applications. For more information: HDF Home Page: http://hdf.ncsa.uiuc.edu WRF Home Page: http://wrf-model.org

URL: http://hdf.ncsa.uiuc.edu/apps/WRF-ROMS

U41B-0008 0830h POSTER

HDF-EOS HDFLook Data Processing and Visualization Applications at GES DAAC

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HDFLook is a new multifunctional data processing and visualization tool developed to work with MODIS Land, Ocean and Atmosphere, and AIRS HDF-EOS products. Features include: (1) accessing and visualization of all swath (Levels l and 2) MODIS and AIRS products, and gridded (Levels 3 and 4) MODIS products; (2) re-mapping of swath data to a world map; (3) geo-projection conversion; (4) interactive, batch mode and operational processing capabilities; (5) subsetting and multi-granule processing; and (6) data conversion from HDF-EOS to ASCII, binary, JPEG, GeoTIFF. The versatility of HDFLook resulted in the integration of the tool in several Goddard Earth Sciences (GES) Distributed Active Archive Center (DAAC) subsystems for data distribution and production. HDFLook is the backend engine for the GES DAAC MODIS Ocean Level 2 on-demand parameter subset system. Further, the tool is used for the on-the-fly spatial subsetting of the MODIS Ocean Level 3 gridded data from the GES DAAC Data Pool. The MODIS browse images (Level 1B true-color for daytime, and brightness temperature for nighttime), available for quick review under EOS Data Gateway and GES DAAC Search and Order, are routinely generated by HDFLook as part of the GES DAAC production system. HDFLook future applications include generating daily global MODIS images and backend engine for MODIS L3 Atmospheric products Online Visualization System (MOVAS). HDFLook for AIRS and MODIS is the result of a joint collaboration between the GES DAAC, Laboratoire d'Optique Atmosphérique (LOA), University of Lille, France and University of Maryland/ MODIS Land team.It is based on the Motif Satellite Process Handling Images under XWindows (MSPHINX) system, and works on all major Unix/Linux/Mac/Win platforms. It is free and available from the NASA GES DAAC web-site http://daac.gsfc.nasa.gov/MODIS/HDFLook and LOA http://www-loa.univ-lille1.fr/Hdflook/hdflook_gb.html

U41B-0009 0830h POSTER

NetCDF-4: Combining netCDF and HDF5 Data

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Unidata's netCDF data model, data access libraries, and machine independent format are used in the creation, access, and sharing of much geoscience data. NCSA's HDF5 data model, libraries, and format have also been used in high-performance computing that require parallel I/O and very large data volumes. HDF5 is used by the NASA Earth Science Enterprise to archive and distribute remote sensing data and is used in many large computational models. In a NASA sponsored project, Unidata and NCSA are collaborating to merge netCDF and HDF5 to achieve gains in performance and interoperability. The project aims to create and deploy software that will preserve the desirable characteristics of netCDF and HDF5 while taking advantage of their separate strengths: the widespread use and simplicity of netCDF and the generality and performance of HDF5. When completed, users of netCDF will benefit from support for packed data, large datasets, and parallel I/O, and users of HDF5 will benefit from the availability of a simple high-level interface suitable for array-oriented scientific data, wider use of the HDF5 data format, and additional software for data management, analysis and visualization. We summarize the current status of the work, including new software that uses the current netCDF interface with the HDF5 format to provide backward compatibility with current data and application software. We also describe how the software under development will make use of advanced features of HDF5 including scalable access to very large datasets, parallel I/O, and compression.

URL: http://my.unidata.ucar.edu/content/software/netcdf/netcdf-4/index.html

U41B-0010 0830h POSTER

Tools for Manipulating, Processing and Browsing HDF-EOS - Based Data

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Community usage of HDF-EOS has reached a complex state of affairs. HDF4 - based products from EOS Terra and Aqua instruments are mature and there is a growing availability of applications. New products are continuously being produced and applications need to be upgraded. HDF5 - based, HDF-EOS is being used by EOS Aura product developers and HDF5 is essentially a different data format than HDF4. It has become necessary to provide functionality for accessing, reformatting, subsetting, reprojecting, and so for data based in both HDF formats. When EOS Aura becomes operational next year, it will be important to provide tools for accessing data in both formats simultaneously for comparison purposes. Our goal will be to provide tools that render the details of the internal structure of HDF-EOS files transparent to users, whether they are HDF4 or HDF5 - based. We will summarize the functionality in various freeware tools provided by the EOS Project. For example, HDFView is a new tool which can access and browse HDF4, HDF5. A version of HDFView with an HDF-EOS plug-in will be available in late 2003. The HDF-EOS to GeoTIFF (HEG) tool can convert HDF-EOS to GeoTIFF and also provides subsetting, reprojection, subsampling and resampling functionality. The tool provides these functions on-demand as part of the ECS Data Pool and is also available as a downloadable desktop version. In 2004, an OpenGIS Web Coverage Service will be provided for HDF-EOS products through the HEG interface. We will discuss conversion of HDF4 to HDF5 - based products and additional applications.

U41B-0011 0830h POSTER

EOS Data Usability Tools for Support of Science Research and Applications

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The Earth Observing System (EOS) Data and Information System (EOSDIS), as NASA's overall Earth Science discipline data system, presently holds nearly two petabytes of Earth observation data products. The data format standard used for EOS standard products is Hierarchical Data Format (HDF) for EOS (HDF-EOS) or HDF-EOS 5 for future missions, and the metadata format used is Object Description Language (ODL). To facilitate the use of EOS data for different scientific research and applications, we have developed a series of data and metadata tools to enhance the usability of EOSDIS data products. These tools can be categorized as 1) data format conversion tools, 2) an XML representation of HDF-EOS5 with related utility tools, 3) an XML representation of ODL metadata with viewing tools, and 4) data and metadata standard validation and update tools. This poster presents different usability tools we have developed for EOS data products. Use cases of these tools for support of the research and application community and EOS missions are illustrated.

U41B-0012 0830h POSTER

New Technologies for Improving Earth Science Data Usability

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The Information Technology and Systems Center (ITSC) at the University of Alabama in Huntsville (UAH) is performing research in advanced applications with the goal of improving data usability in the next generation of distributed science data and information systems. These research areas include: **data mining** and **subsetting** in real time and for post-run analysis, **interchange technologies** for improved data exploitation, and the use of **semantics** to transform data exploitation via intelligent automated processing. Taken together, these technologies will be an important contribution to an evolving standards-based network of interoperable data and services. In addition, ITSC is investigating the role of a variety of infrastructure improvements for improved data usability, such as **grid technologies** for seamless access to multiple computational and data resources in a virtual computing environment; **cluster technologies** for high-speed parallel computation, multi-agent computations, and other applications; **high-performance networking** for high-speed connectivity among advanced applications; and next generation technologies in **videoconferencing** and **electronic collaboration**. This presentation will highlight several current ITSC research projects and collaborations which focus on advanced tools and services for such high-performance infrastructures, and which illustrate new approaches to improving data usability.

URL: http://itsc.uah.edu

U41B-0013 0830h POSTER

Applications of Bayesian Classification to Content-based Data Services

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The high volume of Earth Observing System data has proven to be challenging to manage for data centers and users alike. At the Goddard Earth Sciences Distributed Active Archive Center (GES DAAC), about 1 TB of new data are archived each day. Distribution to users is also about 1 TB/day. A substantial portion of this distribution is MODIS calibrated radiance data, which has a wide variety of uses. However, much of the data is not useful for a particular user's needs: for example, ocean color users typically need oceanic pixels that are free of cloud and sun-glint. The GES DAAC is developing several experimental data services based on scene content for near-real-time MODIS calibrated radiance products (from Direct Readout stations). Content-based subsetting would allow distribution of, say, only clear pixels to the user if desired. Content-based subscriptions would distribute data to users only when they fit the user's usability criteria in their area of interest within the scene. Content-based cache management would retain more useful data on disk for easy online access. All of these services rely on a content characterization that must be performed immediately after production to be helpful. We use a simple Bayesian classification scheme, trained on other MODIS science products (such as cloudmask), to rapidly classify each pixel in the scene. The classification mask is then added to the calibrated radiance product to support the above content-based services.

U41B-0014 0830h POSTER

Subsetting AMSR-E Data and Products

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The Advanced Microwave Scanning Radiometer for EOS (AMSR-E) is a Japanese passive microwave radiometer flying aboard NASA's Aqua satellite. The AMSR-E is designed to observe and detect hydrologic and atmospheric geophysical parameters (e.g., precipitation, sea surface temperature, water vapor, sea ice, snow cover, etc.) in the Earth's environment. The AMSR-E Science Investigator-led Processing System (SIPS), located in Huntsville, Alabama, is the data center responsible for generating daily data products for the US AMSR-E science team and the global Earth science user community. In addition to generating standard daily data products, the AMSR-E SIPS supports field experiments and validation projects by subsetting product sets tailored to the needs of the individual scientist. AMSR-E standard data products are produced in HDF-EOS format, making them a perfect candidate for subsetting using the HEW Subsetting Engine developed by the Information Technology and Systems Center at the University of Alabama in Huntsville. This subsetting software, written for use with the HDF-EOS data format, is integrated into the SIPS processing system. The HEW Subsetting Engine has also been integrated into the data order filling systems at two EOS Distributed Active Archive Centers. HEW allows parametric, temporal, and geographic subsetting of both satellite swath and gridded data sets. The SIPS has generated near real time subsets for scientists involved in remote field experiments in the Arctic, Antarctic, and northern Canada. Subsetting more precisely fulfills the scientist's requirements, minimizes file transfer volumes, and reduces analysis time. A review of the components and features of the HEW Subsetting Engine software and how they are integrated into the SIPS is provided.

U41B-0015 0830h POSTER

The SEEDS Standards Process

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NASA's Earth Science Enterprise (ESE) has initiated a new process for developing recommendations for adoption of standards for application to ESE data systems. The process, modeled after the Internet Engineering Task Force (IETF), and other similar standards bodies, and tailored for NASA's unique concerns is designed to guide NASA to adoption of standards that have demonstrated implementations and successful operational experience in the context of Earth Science Data Systems. This process was proposed by the Strategy for Evolution of ESE Data Systems (SEEDS) effort and begins operation this fall. It is guided by a new Standards Process Group that leverages the broad expertise of NASA funded data systems in NASA new Earth Science Research, Education, and Applications Solutions Network (REASoN) together with the experience of the ESE's other data system implementation projects. Successful candidate standards for adoption by the ESE will have the following properties: They will be "Community" interoperable. That is, they will respond to and by guided by the needs of particular and specified "communities of interest" so that only needed standards are adopted, and unnecessary standards avoided. They will be "Working edge" rather than "Leading edge". The ESE will adopt only standards that are proven to work in the ESE context. They will be understood. The process requires adequate specification and proof of implementation. And the will be reliable in the sense that science, applications and software developers will have confidence in the standard. This poster outlines the Standards Process and explains how the process will produce standards adoption recommendations that fulfill the standards qualities listed above.

U41B-0016 0830h POSTER

Hydrologic Ontology for the Web

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This poster presents the conceptual development of a Hydrologic Ontology for the Web (HOW) that will facilitate data sharing among the hydrologic community. Hydrologic data is difficult to share because of its predicted vast increase in data volume, the availability of new measurement technologies and the heterogeneity of information systems used to produced, store, retrieved and used the data. The augmented capacity of the Internet and the technologies recommended by the W3C, as well as metadata standards provide sophisticated means to make data more usable and systems to be more integrated. Standard metadata is commonly used to solve interoperability issues. For the hydrologic field an explicit metadata standard does not exist, but one could be created extending metadata standards such as the FGDC-STD-001-1998 or ISO 19115. Standard metadata defines a set of elements required to describe data in a consistent manner, and their domains are sometimes restricted by a finite set of values or controlled vocabulary (e.g. code lists in ISO/DIS 19115). This controlled vocabulary is domain specific varying from one information community to another, allowing dissimilar descriptions to similar data sets. This issue is sometimes called semantic non-interoperability or semantic heterogeneity, and it is usually the main problem when sharing data. Explicit domain ontologies could be created to provide semantic interoperability among heterogeneous information communities. Domain ontologies supply the values for restricted domains of some elements in the metadata set and the semantic mapping with other domain ontologies. To achieve interoperability between applications that exchange machine-understandable information on the Web, metadata is expressed using Resource Description Framework (RDF) and domain ontologies are expressed using the Ontology Web Language (OWL), which is also based on RDF. A specific OWL ontology for hydrology is HOW. HOW presents, using a formal syntax, the main concepts of hydrologic data and the semantic mappings with other domain ontologies. Using the RDF model and syntax so-called agents, or other specific applications, are able to transverse the domain ontologies and perform semantic queries providing "intelligent results" from heterogeneous information systems.

URL: http://www.pages.drexel.edu/~leb27/research.html

U41B-0017 0830h POSTER

A future Outlook: Web based Simulation of Hydrodynamic models

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Despite recent advances to present simulation results as 3D graphs or animation contours, the modeling user community still faces some shortcomings when trying to move around and analyze data. Typical problems include the lack of common platforms with standard vocabulary to exchange simulation results from different numerical models, insufficient descriptions about data (metadata), lack of robust search and retrieval tools for data, and difficulties to reuse simulation domain knowledge. This research demonstrates how to create a shared simulation domain in the WWW and run a number of models through multi-user interfaces. Firstly, meta-datasets have been developed to describe hydrodynamic model data based on geographic metadata standard (ISO 19115) that has been extended to satisfy the need of the hydrodynamic modeling community. The Extended Markup Language (XML) is used to publish this metadata by the Resource Description Framework (RDF). Specific domain ontology for Web Based Simulation (WBS) has been developed to explicitly define vocabulary for the knowledge based simulation system. Subsequently, this knowledge based system is converted into an object model using Meta Object Family (MOF). The knowledge based system acts as a Meta model for the object oriented system, which aids in reusing the domain knowledge. Specific simulation software has been developed based on the object oriented model. Finally, all model data is stored in an object relational database. Database back-ends help store, retrieve and query information efficiently. This research uses open source software and technology such as Java Servlet and JSP, Apache web server, Tomcat Servlet Engine, PostgresSQL databases, Protégé ontology editor, RDQL and RQL for querying RDF in semantic level, Jena Java API for RDF. Also, we use international standards such as the ISO 19115 metadata standard, and specifications such as XML, RDF, OWL, XMI, and UML. The final web based simulation product is deployed as Web Archive (WAR) files which is platform and OS independent and can be used by Windows, UNIX, or Linux. Keywords: Apache, ISO 19115, Java Servlet, Jena, JSP, Metadata, MOF, Linux, Ontology, OWL, PostgresSQL, Protégé, RDF, RDQL, RQL, Tomcat, UML, UNIX, Windows, WAR, XML

U41B-0018 0830h POSTER

Streamlining Metadata and Data Management for Evolving Digital Libraries

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What began two years ago as an effort to stabilize the Scripps Institution of Oceanography (SIO) data archives from more than 700 cruises going back 50 years, has now become the operational fully-searchable "SIOExplorer" digital library, complete with thousands of historic photographs, images, maps, full text documents, binary data files, and 3D visualization experiences, totaling nearly 2 terabytes of digital content. Coping with data diversity and complexity has proven to be more challenging than dealing with large volumes of digital data. SIOExplorer has been built with scalability in mind, so that the addition of new data types and entire new collections may be accomplished with ease. It is a federated system, currently interoperating with three independent data-publishing authorities, each responsible for their own quality control, metadata specifications, and content selection. The IT architecture implemented at the San Diego Supercomputer Center (SDSC) streamlines the integration of additional projects in other disciplines with a suite of metadata management and collection building tools for "arbitrary digital objects." Metadata are automatically harvested from data files into domain-specific metadata blocks, and mapped into various specification standards as needed. Metadata can be browsed and objects can be viewed onscreen or downloaded for further analysis, with automatic proprietary-hold request management.

URL: http://nsdl.sdsc.edu/

U41B-0019 0830h POSTER

The IRIS Model: Building the Infrastructure for Seismology

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The IRIS Consortium began a global, cooperative development in the mid-1980's, with the goal of being able to provide the necessary infrastructure (system) that would bring expensive, globally distributed geophysical data into the arena of open access, and to make these data available through a streamlined system of accessing that has profoundly improved the science of seismology. Historically, geophysical data were generated by scientists studying a particular problem, were limited in both the spatial and the temporal scales, and were self-managed and in native formats that hindered exchange. Data had little chance of being used again. The IRIS Data Management Center, located in Seattle, WA and affiliated with the University of Washington, operates an NSF-funded facility that is charged with acquiring, archiving, and distributing over 30 years (and counting) of geophysical time series data. Even though this volume exceeds 50 terabytes of dual-sorted data, these data can be requested on any spatial or temporal time scale. If you are studying the movement of mantle convection cells over decadal time scales, or studying aftershocks of a local earthquake, you can access these data from your workstation, convert these into your analysis format, and begin the process of doing hard science without ever having to burden yourself with acquiring the data, or drafting a detailed proposal justifying your area of interest. You can proceed directly to doing science. In the last two years, the IRIS DMC has targeted the problem of handling real time data generated in the field, forwarding it to a unified disk buffer, thereby eliminating all heterogeneity, and providing open access to large volumes of data which can be immediately utilized, providing the back-end for decision making in human time scales, not scientific time scales. We have now pushed this to the final step, closing the data loop and providing robust utilities that enable information-to-application functionality, where applications can now access these disk buffers through what we call the "Data Handling Interface (DHI)", so you no longer have to cache data locally. This has shortened the timeline for doing high quality research considerably. It's a community-driven system, is focused directly with dealing with end users, and is truly, end to end. This poster will outline the standards and the methods for how cooperative initiatives are drafted and supported, and give an overview of the process that allows homogeneous, globally distributed tools to function, and in the end, illustrate that this has been successfully integrated into the science of seismology, creating the fabric of modern seismology.

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

U41B-0020 0830h POSTER

Tailoring Access to Earth Science Data and Information Using ECHO

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Today, users may find it difficult to use the existing interfaces to find, acquire, and use Earth Science data and information. Experience has shown that one size doesn't fit all. We have learned that diverse user communities can leverage information much more efficiently if they have discipline-specific user interfaces tailored to their needs. Earth Observing System ClearingHOuse (ECHO) allows anyone to build their own, personalized client for targeted science and application goals, based on the same interoperable clearinghouse of metadata and services. This enables more varied and flexible data access options and capabilities. A variety of science and application goals can be met through clients built on the same, common ECHO application program interface (API) framework. This poster highlights a set of existing clients based on this common framework and the potential for reuse of existing capabilities in new tools.

URL: http://eos.nasa.gov/echo

U41B-0021 0830h POSTER

An Integrated Data Acquisition / User Request/ Processing / Delivery System for Airborne Remote Sensing Data

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Airborne science data has historically played an important role in the development of the scientific underpinnings for spaceborne missions. When the science community determines the need for new types of spaceborne measurements, airborne campaigns are often crucial in risk mitigation for these future missions. However, full exploitation of the acquired data may be difficult due to its experimental and transitory nature. Externally to the project, most problematic (in particular, for those not involved in requesting the data acquisitions) may be the difficulty in searching for, requesting, and receiving the data, or even knowing the data exist. This can result in a rather small, insular community of users for these data sets. Internally, the difficulty for the project is in maintaining a robust processing and archival system during periods of changing mission priorities and evolving technologies. The NASA/JPL Airborne Synthetic Aperture Radar (AIRSAR) has acquired data for a large and varied community of scientists and engineers for 15 years. AIRSAR is presently supporting current NASA Earth Science Enterprise experiments, such as the Soil Moisture EXperiment (SMEX) and the Cold Land Processes experiment (CLPX), as well as experiments conducted as many as 10 years ago. During that time, it's processing, data ordering, and data delivery system has undergone evolutionary change as the cost and capability of resources has improved. AIRSAR now has a fully integrated data acquisition/user request/processing/delivery system through which most components of the data fulfillment process communicate via shared information within a database. The integration of these functions has reduced errors and increased throughput of processed data to customers.

U41B-0022 0830h POSTER

Tools Developed and Implemented by the U.S. JGOFS Data Management Office

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The Joint Global Ocean Flux Study (JGOFS), was organized under the aegis of the Scientific Committee on Oceanic Research (SCOR), as a core project of the International Geosphere-Biosphere Programme (IGBP). The U.S. JGOFS Data Management Office (U.S. JGOFS DMO) operates specifically to meet the needs of U.S. JGOFS and is funded by the United States National Science Foundation (NSF). U.S. JGOFS includes field studies conducted between 1989 and 1998 and brings together biological, chemical, physical and geological oceanographers and modelers in multidisciplinary investigations of the pools and fluxes of carbon and associated biogenic elements in the ocean. The U.S. JGOFS research program comprises four basin-scale process studies, two long-term time-series programs, participation in a global survey of carbon dioxide (CO_2), a synthesis and modeling project and data management. A prominent aspect of U.S. JGOFS is the sharing of information between program participants, program managers in Washington, as well as with the larger scientific community in the U.S. and abroad. Data and documentation are stored and organized in the JGOFS database system and the U.S. JGOFS data server utilizes the World Wide Web (WWW) to allow investigators to easily exchange information. Selected data submitted by process study cruise participants have been combined into a collection of comprehensive data objects. The merging process is an attempt to "put the ocean back together again" after all the samples have been analyzed by U.S. JGOFS investigators. As part of the U.S. JGOFS legacy, the DMO has published volume 1 of the final U.S. JGOFS CD-ROM data report which contains data acquired during the four U.S. JGOFS process studies, conducted in the North Atlantic, equatorial Pacific, Arabian Sea and Southern Ocean. During the Synthesis and Modeling Project, a new access and visualization interface was required. The Live Access Server (LAS) interface, customized for U.S. JGOFS in situ data sets, provides a means of navigating, visualizing, selecting, reformatting and exporting subsets of multidimensional data sets. Aspects of how this data sharing enhances the flow of data to earth scientists and decision makers via the World Wide Web (WWW), merged data products, and published CD-ROM data reports will be presented.

URL: http://usjgofs.whoi.edu/

U41B-0023 0830h POSTER

SIOExplorer: Modern IT Methods and Tools for Digital Library Management

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With more geoscience disciplines becoming data-driven it is increasingly important to utilize modern techniques for data, information and knowledge management. SIOExplorer is a new digital library project with 2 terabytes of oceanographic data collected over the last 50 years on 700 cruises by the Scripps Institution of Oceanography. It is built using a suite of information technology tools and methods that allow for an efficient and effective digital library management system. The library consists of a number of independent collections, each with corresponding metadata formats. The system architecture allows each collection to be built and uploaded based on a collection dependent metadata template file (MTF). This file is used to create the hierarchical structure of the collection, create metadata tables in a relational database, and to populate object metadata files and the collection as a whole. Collections are comprised of arbitrary digital objects stored at the San Diego Supercomputer Center (SDSC) High Performance Storage System (HPSS) and managed using the Storage Resource Broker (SRB), data handling middle ware developed at SDSC. SIOExplorer interoperates with other collections as a data provider through the Open Archives Initiative (OAI) protocol. The user services for SIOExplorer are accessed from

CruiseViewer, a Java application served using Java Web Start from the SIOExplorer home page. CruiseViewer is an advanced tool for data discovery and access. It implements general keyword and interactive geospatial search methods for the collections. It uses a basemap to georeference search results on user selected basemaps such as global topography or crustal age. User services include metadata viewing, opening of selective mime type digital objects (such as images, documents and grid files), and downloading of objects (including the brokering of proprietary hold restrictions).

URL: http://sioexplorer.ucsd.edu

U41B-0024 0830h POSTER

Metadata, Long-Term Archiving and Arctic System Science (ARCSS) Data Coordination Center (ADCC) Management Services.

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The ARCSS Data Coordination Center (ADCC) at the National Snow and Ice Data Center (NSIDC), University of Colorado at Boulder, is the permanent, long-term data archive for all components of the ARCSS Program. Funded by the National Science Foundation's Office of Polar Programs, our focus is to archive and provide easy access to ARCSS-funded research data and information. The concept of System Science research depends on the accessibility and exchange of data and information within the scientific community. The ADCC strives to be a catalyst to facilitate that accessibility and synergism. Metadata is a significant ingredient in insuring the long term usefulness of data archived on our Web site. A major concern of the research community is the availability of reliable data for research. Working directly with ARCSS investigators, the ARCSS Committee and NSF, the ADCC is continually acquiring data and developing metadata products appropriate and useful for long-term archival of these research data. Integration of the data and the associated metadata from ARCSS projects as described on this poster is a high priority at the ADCC. Metadata is the "who, what, where, when, why and how" of data sets and are crucial to an investigator looking for suitable data to answer specific research questions. Metadata comprise information about the data, and preserve the usefulness of the data over time. Preparation of complete metadata is the primary requisite for all long-term archiving activities at ADCC. The ADCC home page (http://arcss.colorado.edu) has become an important tool for data accessibility and integration within the ARCSS program.

URL: http://arcss.colorado.edu

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Data Access Tools And Services At The Goddard Distributed Active Archive Center (GDAAC)

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As one of the largest providers of Earth Science data from the Earth Observing System, GDAAC provides the latest data from the Moderate Resolution Imaging Spectroradiometer (MODIS), Atmospheric Infrared Sounder (AIRS), Solar Radiation and Climate Experiment (SORCE) data products via GDAAC's data pool (50TB of disk cache). In order to make this huge volume of data more accessible to the public and science communities, the GDAAC offers multiple data access tools and services: Open Source Project for Network Data Access Protocol (OPeNDAP), Grid Analysis and Display System (GrADS/DODS) (GDS), Live Access Server (LAS), OpenGIS Web Map Server (WMS) and Near Archive Data Mining (NADM). The objective is to assist users in retrieving electronically a smaller, usable portion of data for further analysis. The OPeNDAP server, formerly known as the Distributed Oceanographic Data System (DODS), allows the user to retrieve data without worrying about the data format. OPeNDAP is capable of server-side subsetting of HDF, HDF-EOS, netCDF, JGOFS, ASCII, DSP, FITS and binary data formats. The GrADS/DODS server is capable of serving the same data formats as OPeNDAP. GDS has an additional feature of server-side analysis. Users can analyze the data on the server there by decreasing the computational load on their client's system. The LAS is a flexible server that allows user to graphically visualize data on the fly, to request different file formats and to compare variables from distributed locations. Users of LAS have options to use other available graphics viewers such as IDL, Matlab or GrADS. WMS is based on the OPeNDAP for serving geospatial information. WMS supports OpenGIS protocol to provide data in GIS-friendly formats for analysis and visualization. NADM is another access to the GDAAC's data pool. NADM gives users the capability to use a browser to upload their C, FORTRAN or IDL algorithms, test the algorithms, and mine data in the data pool. With NADM, the GDAAC provides an environment physically close to the data source. NADM will benefit users with mining or offer data reduction algorithms by reducing large volumes of data before transmission over the network to the user.

URL: http://eosdata.gsfc.nasa.gov/conference/agu_fall2003/gdaacts.html

U41B-0026 0830h POSTER

Tools and Services available from the Atmospheric Sciences Data Center

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Two of the primary functions of the NASA Langley Research Center (LaRC) Atmospheric Sciences Data Center (ASDC) are to distribute data to a wide variety of user communities such as scientists, researchers, and educational and commercial professionals and to provide expert assistance on the use of data holdings. In addition, ASDC provides "value-added" capabilities such as subsetting data products and data visualization and tools to assist users in obtaining and working with the data products. Some of the key features of these tools available from the ASDC follow. Several tools for searching and ordering available data products are provided. These include the Langley Web Ordering Tools in Java and HTML and the EOS Data Gateway (EDG) tool which is a multi-DAAC ordering system. Subsetting of the Clouds and the Earth's Radiant Energy System (CERES) is integrated directly into the Java ordering tool and subsetting of Multi-angle Imaging SpectroRadiometer (MISR) data products is available once an EDG order is placed. The capability to quickly and easily download select data products from the EOS Data and Information System (EOSDIS) Core System (ECS) Data Pool is also available. Several tools are available to aid the user in visualizing specific data products. The on-line MISR Browse Tool provides quick and easy search capabilities to view MISR browse images with a few "clicks" of a mouse. The misr_view tool is written in IDL and was developed for MISR and AirMISR data products (HDF-EOS "Grid") to allow selection of specified orbits, paths or observational dates and to enable translation between these modes of identification. The misr_view tool supports simultaneous viewing of 3 data planes and colorizes different planes having different native number types and spatial resolution. This tool was developed by and is distributed by NASA's Jet Propulsion Laboratory. The view-hdf tool is written in Interactive Data Language (IDL) for use with the CERES data products to allow selection and subsetting of variables within the data structures, to render two and three-dimensional graphics, to plot geolocated data onto various map projections and to export data to a file in ASCII or HDF format. The view-hdf tool was developed by the CERES Data Management Team (DMT). The Measurements Of Pollution In The Troposphere (MOPITT) Level 2 Viewer is written in IDL and was provided by the MOPITT DMT to create plots of data from MOPITT Level 2 files. The Virtual Global Explorer and Observatory (vGeo) Software was developed by VRCO, Inc and provides an immersive 3-D environment. This 3-D visualization capability can be used as a tool to combine and visually analyze data from multiple sources (e.g., model, airborne and ground based measurements and satellite observations). vGeo's capability to merge measurements with model, aircraft and other data fields in a 3-D world allows a more realistic contextual representation of the model/measurement results. Information about all of the available data products, tools and services can be found at the ASDC web site, http://eosweb.larc.nasa.gov

URL: http://eosweb.larc.nasa.gov

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ECHO Data Partners Join Forces to Federate Access to Resources

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During the past year the NASA's Earth Science Data and Information System (ESDIS) project has been collaborating with various Earth science data and client providers to design and implement the EOS Clearinghouse (ECHO). ECHO is an open, interoperable metadata clearinghouse and order broker system. ECHO functions as a repository of information intended to streamline access to digital data and services provided by NASA's Earth Science Enterprise and the extended Earth science community. In a unique partnership, ECHO data providers are working to extend their services in the digital era, to reflect current trends in scientific and educational communications. The multi-organization, inter-disciplinary content of ECHO provides a valuable new service to a growing number of Earth science applications and interdisciplinary research efforts. As such, ECHO is expected to attract a wide audience. In this poster, we highlight the contributions of current ECHO data partners and provide information for prospective data partners on how the project supports the incorporation of new collections and effective long-term asset management that is directly under the control of the organizations who contribute resources to ECHO.

U41B-0028 0830h POSTER

Earth Science Data and Service Management System (EDSMS)

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The Earth Science Data and Service Management System (EDSMS) is a software system for Earth science data and process management and data processing support. It serves as a catalog system that enables users to register and discover metadata of data and process. It also serves as a supporting system that enables data service providers to register data service processes into the system and their users to utilize the services to act upon the data represented in the system. The objective is to build a computing environment for data system/centers to provide the services involving online data processing, such as content-based search, service-oriented retrieval, and online data analysis.

U41B-0029 0830h POSTER

Pragmatic Metrics for Monitoring Science Data Centers

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Science data metrics and their analysis are critical components to the end-to-end data and service flow for science data centers. The Earth Science Data and Information System Project has collected records of EOS science data archive, processing and distribution metrics from NASA's Distributed Active Archive Centers since 1996. The ESDIS Science Operations Office and the DAAC data centers have cooperated to develop a DAAC metrics reporting capability called the EOSDIS Data Gathering and Reporting Systems (EDGRS). This poster illustrates EDGRS processes and metrics data applications. EDGRS currently accesses detailed archive and distribution metrics from nine DAAC sites and transfers results to a centralized collection system on a routine basis. After automated quality checks the records are immediately made available through a web-based Graphic User Interface. Users can obtain standard graphs and prepare custom queries to generate specific reports for monitoring science data processing progress. Applications are illustrated that explore methods for performing data availability studies and performance analyses. Improvements are planned to support granule-level science data accounting and characterization of product distribution.