Ocean Sciences

OS51A MCC: Hall D Friday 0830h

Prediction of Underwater Landslide Hazards Posters *(joint with H, T)*

Presiding: **D R Tappin,** British Geological Survey**; P Watts,** Applied Fluids Engineering, Inc.

OS51A-0138 0830h INVITED POSTER

Advances in the Numerical Modeling of Sediment Failure During the Development of a Continental Margin

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The SedFlux model is modified to more realistically simulate the distributions of seafloor geotechnical parameters during the growth of a seismically active continental margin. Alternative methods are provided for the prediction of the coefficient of consolidation, remolded shear strength, internal friction angle, sediment cohesion, dynamic viscosity and excess pore pressure. The new methods improve simulations of the architecture of basin deposits through the dynamics within the slope stability and debris flow modules. SedFlux is then used to examine the role of global sea level fluctuations on the location and dimensions of sediment failure, and the subsequent transport of sediment to the deep ocean. More sediment failures are predicted to occur during periods of falling or low sea level conditions, and be confined to the upper continental slope (500 m plus or minus 250 m water depth). The shallower failures are more characteristic of the period represented by the last two episodes of low sea level (i.e. during the Late Pleistocene), affected by the magnitude of the sea level fluctuation. Most of the predicted failures have thickness greater than 10m. Larger failures occur during periods of rising or high sea level stand.

URL: http://instaar.colorado.edu/deltaforce/

OS51A-0139 0830h POSTER

Seismic response of submarine slopes

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The geological profile of submarine slopes on the continental shelf typically consists of normally to lightly overconsolidated clays with depths ranging from a few meters to hundreds of meters. The seismic stability of these slopes is often investigated with pseudostatic methods by reducing the dynamic loading to an inertial force applied as a static load. The simplifications introduced in these analyses hardly provide a satisfactory answer to the questions of instantaneous and permanent displacement, accelerations, excess pore pressures and especially triggering mechanism.

In order to provide a realistic assessment of the behavior of the slope to seismic loading, it is necessary to describe the stress-strain-strength response under irregular cyclic loading. The SIMPLE DSS model is an effective stress model that is able to account for strength anisotropy, accumulation of plastic strains and generation of excess pore pressures during successive loading cycles. This paper will investigate the effects of different soil profile characteristics on the response of submerged slopes and determine which parameters are most important when evaluating their seismic stability. The effect of layering, and in particular thin very soft layers, will also be examined.

OS51A-0140 0830h INVITED POSTER

Submarine Landslides, Seafloor Roughness, and Tsunami Hazard on Convergent Margins

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Analysis of multibeam bathymetry and 3D seismic data from seismically active convergent margins suggests that frequent and low volume erosive events preclude the formation of large, geomorphically expressed landslides. Regions smooth in appearance may not have significant landslide-derived tsunami hazard, although the seismic tsunami hazard may very well remain high. We examined bathymetry data from five convergent margins, and found that regions with frequent seismic activity were significantly smoother that those with longer recurrence intervals. The seafloor on margins that have much less frequent seismicity or the potential for producing tsunami earthquakes (where the size a post-seismic tsunami is disproportionately large compared to the corresponding earthquake) tend to be a significantly rougher. We quantify roughness by measuring aspect and gradient variance on slopes with a high surface to planimetric area ratio. Large landslides (<2 sq. km) tend to leave scars on the slope that can be identified using multibeam or seismic techniques. These scars will have scarps that are steeper than the surrounding unfailed slope, and sidewalls and debris that have elements that face in different directions. Of the regions studied, the Nankai (Japan) and Makran (Pakistan) margins have the smoothest slopes, and Nicaragua, Papua New Guinea, and Oregon have the roughest slopes. There has been some debate over the nature of tsunamis generated in Nicaragua (1992), PNG (1998), and Oregon (1700), and these data suggest that coseismic landsliding could be partially responsible for increasing the tsunami amplitude. Another option could be a slow source mechanism that limits shaking and large coseismic slope failures, preserving landslides caused at an earlier time.

OS51A-0141 0830h INVITED POSTER

Mechanics of Landslide Initiation with Application to Submarine Landslides

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A three-dimensional mechanical model of shear fracture in an elastic half-space provides insight into the landslide initiation process. An elastic model is justified physically if regions of non-elastic deformation associated with sliding are small relative to the size of the shear fracture. A subsurface elliptical shear fracture parallel to the surface simulates sliding at depth along a bedding plane or some other pre-existing weakness. As the shear fracture spreads, tensile stress concentrations promote its propagation up towards, and normal to, the surface. For a circular slip patch, surficial fracturing should start in the head and from there unzip down along the slide flanks. In contrast, if the slip patch length downslope is more than three times its width across slope, then fracturing at the surface should initiate at the flanks. Depending on the ambient stress state and the shear strength loss at the slide base, a shear fracture might need to attain across-slope and downslope dimensions several or more times greater than its depth to develop a sufficiently intense stress concentration to propagate out of plane to the surface. This accounts for the large length-to-thickness ratios of many natural slides. Sliding not only involves downslope displacement of the material above the slide plane, but also upslope displacement of material below the slide plane. As the slip patch grows, however, the displacements across the slide plane become increasingly dominated by downslope displacement above the slide plane: the material below the slide plane acts as though it were increasingly rigid. The model also accounts for the following generic landslide characteristics: a steep, arcuate, concave-downhill head scarp; an echelon pattern of opening-mode fractures along the flanks and subparallel to the head scarp; normal faulting near the head of a slide, and thrust faulting and across-slope buckles near the slide toe. The model also predicts that as slopes steepen, landslide slumps should tend to become smaller relative to their thickness. This is consistent with recent data on submarine landslides, but marked scatter in the data at low slopes suggests that variations in other factors (e.g., sediment age and type) also exert a strong influence on the geometry of a slide mass, especially on shallow slopes.

OS51A-0142 0830h POSTER

Ages of Large Submarine Landslides in Puget Sound

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Holocene sediments in Puget Sound contain episodically deposited turbidites that may have been triggered by large earthquakes. High-resolution geophysical surveys and sediment sampling in Puget Sound were conducted to better define seismic risk associated with seismic shaking, faulting, and submarine landslides. Massive Holocene submarine landslides occur around the South Whidbey Island fault zone at Possession Point, Mukilteo, and Edgewater; in proximity to the Seattle fault off Alki Point; and around the Tacoma fault at Three Tree Point, Maury Island, and Fox Island. More than ninety piston cores were taken near the toes of large slides to help constrain their ages. Preliminary findings from analysis and dating of the cores suggest that four turbidite events occurred at about 1050, 790, 550, and 300 14C yr BP. These events are widespread throughout the Sound. The 1050-year event is seen in Poverty Bay and off Fox Island. The 790-year event is seen at Fox Island, Port Gardner, and possibly Poverty Bay. The 550-year event is seen at Poverty Bay, Three Tree Point, and Quartermaster Harbor. At Three Tree Point, this event is represented by a major erosional event and a large mudflow. A rapid depositional event at Port Gardner is younger than 350 years and a 300-year event is seen at Poverty Bay and Fox Island. These ages correlate to the dates of submarine landslides in Lake Washington and to the ages of paleoseismic events observed elsewhere in the Sound.

OS51A-0143 0830h POSTER

Transformation of Debris Flows Into Turbidity Currents: a key Process for Hazard Prediction

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Although landslides start as a dense mass of sediment, flow transformation into more dilute flows can alter flow properties and thus associated hazards. A good understanding of the transformation process is therefore critical for accurately predicting hazard potential.

To improve understanding of flow transformations in gravity currents, three series of lock exchange laboratory experiments were undertaken, for cohesive flows, non-cohesive flows and mixed flows containing both cohesive and non-cohesive material. These experiments had a flow volume of 120 litres and initial volumetric concentrations ranging from 4 % to 40 %. Flows travelled along a 5.5 m long, 0.2 m wide channel, within a larger (6 m by 0.5 m by 1.5 m) glass-walled flume. Velocity was measured using a vertical array of ten 2 MHz Ultrasonic Velocity Probes and concentration was measured using an Ultrasonic High Concentration Meter in conjunction with siphon sampling. Video cameras were used at several positions along the flume to track flow behaviour.

A full suite of flows was observed, from flows that underwent rapid transformation to flows that underwent almost no dilution and transformation. These experiments enable the effects of sediment type (e.g., cohesive, non-cohesive), velocity and concentration on flow transformation to be quantified for the first time.

OS51A-0144 0830h POSTER

Landslide Tsunami Generation Models: Validation and Case Studies

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There has been a proliferation of landslide tsunami generation and propagation models in recent time, spurred largely by the 1998 Papua New Guinea event. However, few of these models or techniques have been carefully validated. Moreover, few of these models have proven capable of integrating the best available geological data and interpretations into convincing case studies. The Tsunami Open and Progressive Initial Conditions System (TOPICS) rapidly provides approximate landslide tsunami sources for tsunami propagation models. We present 3D laboratory experiments and 3D Boundary Element Method simulations that validate the tsunami sources given by TOPICS. Geowave is a combination of TOPICS with the fully nonlinear and dispersive Boussinesq model FUNWAVE, which has been the subject of extensive testing and validation over the course of the last decade. Geowave is currently a tsunami community model made available to all tsunami researchers on the web site www.tsunamicommunity.org. We validate Geowave with case studies of the 1946 Unimak, Alaska, the 1994 Skagway, Alaska, and the 1998 Papua New Guinea events. The benefits of Boussinesq wave propagation over traditional shallow water wave models is very apparent for these relatively steep and nonlinear waves. For the first time, a tsunami community model appear sufficiently powerful to reproduce all observations and records with the first numerical simulation. This can only be accomplished by first assembling geological data and interpretations into a reasonable tsunami source.

URL: http://www.tsunamicommunity.org

OS51A-0145 0830h INVITED POSTER

Gas Hydrates And Submarine Landslides: The Storegga Slide Case Study

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The sensitivity of ocean gas hydrates and submarine slope stability to sea level changes and warm water perturbation is a critical issue for the assessment of potential slope failure areas. On the Mid-Norwegian Margin relatively rapid warm water inflows after the Last Glacial Maximum (LGM) occurred during the Younger Dryas (YD) at approx. 11.5 cal ka BP and stable warm water inflow conditions in the period after 9.8 to 8 cal ka BP. This inflow caused major reductions in the thickness of the Gas Hydrate Stability Zone (GHSZ) as shown by modelling results, first in the deeper and then in shallow water continental slope sediments. Such a pattern of gas hydrate melting implies the Storegga slope were first vulnerable to slope failure in the deeper water and afterwards in the shallower sites of the continental slope. Here, we argue that the major phase of hydrate melting that occurred in depth shallower than 500 m coincides with the Storegga slide event at 8.2 cal ka BP. This conclusion is based on observations and modelling using existing bottom water temperature and sub-seabed temperature profiles. The slide event starting at the upper slope could have impacted major parts of the total GH area, which were vulnerable to slope failure after the YD in an area of approx. 12000 km2. A future warming of the bottom water of lets say 1-3°C in the most vulnerable regions within the present day GH area, we argue, is showing no direct evidence that gas hydrate could generate a new slope failure within the next 100 yrs.

OS51A-0146 0830h POSTER

A seismic dislocation model for tne 1946 Aleutian tsunami in the far-field

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The 1946 Aleutian tsunami was catastrophic both in the near field, where it eradicated the Scoth Cap lighthouse and in the far field, where it caused severe damage in Hawaii, the Marquesas, Polynesia and Easter. While in the near field, both the absolute level of run-up (42 m at Scotch Cap) and its concentrated distribution along the coastline rule out generation by a seismic dislocation, we examine here the properties of the tsunami in the far field. A large dataset of far-field run-up values published in Hawaii and collected by Okal et al. (2002) from the interview of elderly witnesses in Polynesia, Easter and Juan Fernandez, upholds a strong pattern of far-field directivity, the energy of the tsunami being concentrated in the azimuth 150 +/- 15 deg. Inside this lobe, overland run-up values are consistently 6 to 16 m in the far field. We show theoretically that such a pronounced directivity pattern is well modeled by a dislocation source within the constraints of recent seismological studies. As it requires hypersonic rupture, it cannot be generated by physically acceptable landslide models. Estimates of the spectral amplitude of the tsunami waves, based on normal mode asymptotics, also predict, for all landslide sources, a fast decay of the far field at the low frequencies (1 mHz) reported in witness accounts. Our results are upheld by Pacific-wide hydrodynamic simulations carried out both for a dislocation source compatible with seismological studies, which correctly predicts run-up in Hawaii and other islands, and for dipolar landslide sources, the latter failing to develop directivity and to match the observed amplitudes. We conclude that the far field tsunami was generated by the dislocation resolvable from seismological data.

OS51A-0147 0830h POSTER

The 1946 Aleutian Tsunami in the Far Field: Inadequacy of an Earthquake Source, Confirmation of a Landslide, and Implications for Warning

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In the far field, the Aleutian tsunami of 1 April 1946 exhibited very large waves along a narrow beam. The directivity poses an insuperable problem for an earthquake source. To match the observation that waves in the Marquesas (average 8 m, max. 20 m) were larger than in Hawai'i (average 6 m, max. 16 m) demands rupture along 400 km of trench—far larger than the 100 km width of the aftershock zone. Back-projecting from arrival times at tide gauges, we find the tsunami source width was indeed no more than 100 km and may have been narrower.

The large waves are equally problematic. A large tsunami from a less-than-giant earthquake (M_S = 7.1, $M_W \simeq$ 8.1) implies large shallow slip, which in turn implies rupture through low-rigidity sediments. The larger the slip, however, the larger the updip elevation of the sea surface. The resulting tsunami should have a strong leading elevation wave in the far field. But the tsunami of 1946 was very different: the leading disturbance *was* an elevation, but it was less than one third the amplitude of subsequent waves and was followed by an anomalously deep trough. Most survivors became aware of the tsunami from the dramatic drawdown rather than from the modest initial wave. By contrast, in tsunamis of clear earthquake origin (e.g., 1960, 1964), the leading wave is at least half the amplitude of those following.

Does a landslide-generated tsunami fit the observations? Ugamak Slide at the edge of the Aleutian Shelf is a 25-km-wide collapse scar extending downslope at least 60 km. Assuming a length at failure of 30 km, our modeled tsunami from Ugamak Slide satisfies all near-field runups and the travel time to nearby Scotch Cap. At its maximum the sea surface drawdown over the tail of the slide is seven times the amplitude of the broad uplift ahead of the nose. In the far field, the tsunami from such a source would first appear as a modest rise followed by a severe fall, exactly what was seen in 1946. The landslide explains the large waves too: viscoelastic models show that for much of the motion the bulk of the slide travels at more than 80% of celerity. The small difference between slide and tsunami speeds means efficient energy exchange, so the tsunami grows. The result is large waves in the direction of slide motion, with amplitude decaying rapidly to either side. Unlike an earthquake, then, a landslide satisfies all the far-field observations of the 1946 tsunami, at least qualitatively.

Top speed of the Ugamak Slide was almost 200 m/s. This seems high, but it is less than the theoretical terminal velocity (250 m/s) and is supported by the observation of 20 m/s for the early stages of one of the short, thin-skinned failures of the Grand Banks in 1929. Speed scales as the square root of slide length, so the Grands Banks event predicts more than 100 m/s for the early motion of a 30-km-long slide.

1946 is a warning that any long slope draped with glacial debris, especially one shaken by earthquakes, may fire a destructive tsunami entirely across an ocean basin. This is not the type of source anticipated by the tsunami warning system.

OS51A-0148 0830h POSTER

Megatsunami Deposits on the Island of Hawaii: Implications for the Origin of Similar Deposits in Hawaii and Confirmation of the Giant Wave Hypothesis

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Deposits from giant waves in the Hawaiian Islands have been linked to giant submarine landslides (GSLs) offshore, for which there is abundant geophysical evidence. The setting of the deposits is ambiguous, however, so variations in sea level, local tectonics, stream deposition, or anthropogenic modification, have each been posed as alternatives to deposition from a landslide-generated tsunami. During a reconnaissance in May 2002, we found sedimentary sequences of marine and non-marine origin on the northwest flank of Kohala Volcano, Island of Hawaii. Our preliminary fieldwork at these locations, previous isotopic age dating of Kohala rock sequences, and the known local tectonism of the island, together provide compelling evidence that the marine sequences were deposited by at least one, if not two, megatsunamis during the past 300,000 years. That inference has been largely supported by sedimentary facies analysis based on petrography and paleontology. Based upon the present maximum known exposure elevations and the known subsidence history of Kohala, we show that two distinct calcareous basalt boulder conglomerates, of probable ages of 110 +/- 10 ka and 255 +/- 10 ka, were deposited at paleo-elevations of greater than 330 m and 750 m above MSL. These ages correspond to the eustatic sea level rises at stages 5e and 7, but the large elevations discount sea level high stands as the cause of deposition. The run-ups from tsunamis resulting from GSLs offshore are modeled in hundreds of meters, in broad agreement with the elevations of the calcareous basalt conglomerates we have found. Preliminary interpretations suggest that the conglomerates are of similar age to the known GSLs offshore: Alika phase 2 for the younger deposit (ca. 130 ka BP) and Alika phase 1 or South Kona for the older deposit (ca. 240 ka BP). Some of the Kohala marine conglomerates are very fossiliferous and some are barren; they unconformably overlie paleosols. For age control, we presently rely upon a U-series age of an in situ coral fragment determined by alpha spectrometry (Stearns, 1973) and on stratigraphic relations with mugearite lavas that were previously dated by K-Ar techniques. Our results have important implications for hydrodynamic models of megatsunamis. Using a rough 1/3 rule, the inferred wave heights of greater than 100 m (stage 5e) and 250 m (stage 7) are 2 to 4 times in excess of recent modeling for this area. Our results also imply that similar deposits previously described on the islands of Lanai, Molokai, Maui and Oahu may indeed originate from megatsunamis. We strongly suspect that when more precise ages for these deposits are forthcoming, they will support the hypothesis of a changing climate trigger within the transgressions of the last two interglacial periods, which also suggests why these deposits are sometimes confused with sea level high stands.

OS51A-0149 0830h POSTER

The 1998 PNG tsunami: multidisciplinary evidence on its architecture and run-up effects - pathways to prediction?

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To address the threat of tsunami prediction from local slumps is problematic. To generate realistic models of tsunami generation and runup, an essential requirement is for the models to be validated by direct evidence provided from offshore surveying. Case studies are therefore required and a seminal example is the Papua New Guinea tsunami of 1998.

After considerable controversy over the origin of the 1998 PNG tsunami, there is now a body of evidence that supports a cause by sediment slumping offshore of the devastated area. In association with onshore run-up measurements, five surveys carried out between 1999 and 2000 offshore of the most affected area have resulted in a composite suite of data that locates and images the slump and also allows appraisal of its geotechnical properties. An original dataset of multibeam bathymetry, high resolution 3.5kHz data, multichannel seismic, and piston cores in association with ROV and submersible images and direct seabed observation has now been improved with the acquisition in 2001 of a closely spaced grid of single channel seismic data. Better definition of the slump is now possible for use in modelling.

The slump geometry in the context of the regional tectonic setting, suggests a novel type of stability analysis performed with a 1D-consolidation code. The simulation results help constrain slump motion following failure. The geologic, bathymetric and soil mechanic data are now all used in new simulations of fully 3D tsunami generation by the slump as newly defined. The result is a more definite assessment of the susceptibility to slumping of the area offshore of northern PNG. The interpretations and analyses employed in this work may contribute to the identification of other regions susceptible to comparable offshore slumping and tsunami generation.

OS51B MCC: Hall D Friday 0830h

EOS Data Access and Manipulation: Tools and Techniques Posters

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

OS51B-0150 0830h POSTER

EOSDIS Science Data Information and Analysis Systems

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NASA's Earth Science Data Information Systems (ESDIS) Project is committed to operating and maintaining a quality Earth Observing System (EOS) Data and Information System (EOSDIS) which enables research by Earth scientists and fosters data accessibility and application by the broader user community. With the recent launch of Aqua, a few hundred new datasets will be added to the current 1560 datasets available through EOSDIS.

One of the core functions at ESDIS is to enable the processing of all science data collected from the various EOS missions including Terra and Aqua, upcoming ICESat and Aura and other missions. There are many EOS Science data producers, data users, planners and managers of available data systems and tools for managing EOS data. There are also many services available through EOSDIS including those that will help scientists process, archive and access data and information for research, applications, planning and management.

This paper will describe system services, functionality, access requirements and procedures and the intended user community that work principally with EOSDIS data. It will address analysis tools, data population tools, specific EOSDIS data sets and metadata types, tools for metadata creation and management, tools for distribution, EOSDIS data formats and distribution techniques. New techniques are critical to the success of EOS data manipulation including data mining, intelligent data archiving, data fusion, agent technologies, visualization, and other advanced information system concepts. Data management is key to EOSDIS and our strategic focus areas look to EOSDIS evolution, external integration, data system development and relationship building with our user community.

OS51B-0151 0830h POSTER

Earth Observing System (EOS) Data and Service Records Growing Through NASA's Global Change Master Directory

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The Earth Observing System (EOS), the cornerstone of NASA's Earth Science Enterprise (ESE) mission, is highlighted by the successful launches and instrument deployments of the Terra (launch: December, 1999) and Aqua (launch: May, 2002) spacecraft. Data collected by EOS instruments have significantly contributed to our understanding of Earth's processes with the first global pollution measurements, new global vegetation mapping, detection of large iceberg breakups in Antarctica, improved weather system models, and global wildfire monitoring.

How will the student, researcher, educator, planner, or interested public know where to find EOS data? NASA's Global Change Master Directory (GCMD) staff (http://globalchange.nasa.gov) works closely with EOS data centers to provide information about EOS data sets that can be searched through the directory. The GCMD holds data set descriptions that inform the user about the spatial and temporal coverage and resolution, where data can be ordered or downloaded, associated investigators, and links to the actual data, along with other information vital to assist the user in determining if the data are what is needed. The GCMD database contains more than 11,700 Earth science data set descriptions, of which more than 3000 refer to data from NASA ESE missions.

The GCMD database can be searched for EOS data sets using an extensive set of Earth science topic keywords (more than 1200 keywords are controlled through a 3 level hierarchy) or by free-text. Data sets can also be discovered by searching by platform (or spacecraft), instrument, data center, geographic location, or project. For example, a user may conduct a search for all data sets from Terra or data sets collected by the MODIS instrument.

Users can focus their searches using GCMD's portal technology to search only those data set descriptions available from the Federation of Earth Science Information Partners (ESIP) through the ESIP portal (http://gcmd.nasa.gov/Data/portals/esip/). The ESIP consists of EOS data providers, along with other researchers and organizations using EOS data for research and applications. In addition to locating EOS data sets, users can discover other Earth science data sets from outside the EOS community relevant to global change research from over 1500 data providers from around the world.

Earth science related services (http://gcmd.nasa.gov/services/) are also searchable. Examples range from specialized tools for browsing, manipulating, and visualizing EOS data products to Earth science educational products and environmental hazard advisory services. Users can search the services database using controlled keywords or free-text to discover data set specific tools like the misr-view visualization software for MISR and AirMISR data or the Graphical Interface for Subsetting, Mapping, and Ordering (GISMO) tool for snow and ice data.

URL: http://globalchange.nasa.gov

OS51B-0152 0830h POSTER

Earth Observing System (EOS) Clearinghouse: A Framework for Sharing Community Data, Services and Tools

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The Earth Observing System ClearingHOuse (ECHO) is an enabling framework that allows different data systems and services to work together therefore allowing communities to share tools, services and data. An open system, ECHO's application program interfaces (APIs) are published for use by the user community. The idea is to extend available Earth science resources from the science community, to the science community. ECHO accomplishes this through a metadata clearinghouse and service broker application program interfaces (APIs) based on XML and web service technologies. ECHO is being developed and released in increments to allow for insight and feedback during the development process. As a metadata clearinghouse, it supports iterative query data access and a newer data access paradigm called navigation/discovery, that serves to eliminate zero-hit and mega-hit results sets. As a service broker, ECHO decentralizes tools for manipulating data and supports interoperability of distributed functions. A well documented, message based interface is provided instead of an integrated web server. This approach allows various providers to build their own user interfaces so they are not limited by any single integrated data search and order system. This new approach is consistent with the trend toward a federated community.

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EOS-WEBSTER - Providing Satellite Imagery for Everyone

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The University of New Hampshire's WEB-based System for Terrestrial Ecosystem Research (EOS-WEBSTER) distributes a special collection of data and imagery products for the Earth Science community. This collection includes satellite imagery from several sensors including the MODIS instrument aboard TERRA. Our services have been designed so that different types of users can access and use only the data that they want. Users can search EOS-WEBSTER's collections, create spatial and temporal subsets, and order data in ASCII or binary formats. We have developed a suite of MODIS products covering Amazonia. These products serve the Large Scale Biosphere-Atmosphere Project in Amazonia (LBA), a joint project of the Brazilian government and NASA. Products include 8-day reflectances (MOD09A1), daily fire potential (MOD14A1), and 16-day NDVIs (MOD13Q1), starting in January 2001. EOS-WEBSTER takes care of obtaining the 14 MODIS tiles that cover Amazonia and stitching them together into a seamless regional coverage. Users can cookie-cut the regional data into smaller areas of interest, such as a field site, a political boundary, or a watershed, then choose an output format such as GrADS and retrieve their order by ftp or on CD-ROM. EOS-WEBSTER delivers MODIS to users whether or not they can manipulate the HDF-EOS format. These regional data sets were developed in cooperation with Eros Data Center to facilitate use of MODIS products by the LBA community. Other products and regions can be developed for other user communities if there is enough interest. Please contact us at support@eos-webster.sr.unh.edu for more information. MODIS is only one of a variety of imagery products available from EOS-WEBSTER. Other platforms include Landsat, SPOT-VEGETATION and IKONOS. We provide Landsat imagery data access to educators by supporting the Forest Watch program, an educational project that includes K-12 teachers and students in UNH research activities that assess the state-of-health of local forest stands. EOS-WEBSTER is a member of the Federation of Earth Science Information Partners (http://esipfed.org) and can be viewed at http://eos-webster.sr.unh.edu.

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The NASA Earth Observing System Data Gateway

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