OS11F HC: Hall III Monday 0830h

Ocean Sciences: Societal Impacts and Services

Presiding: **L A Drake,** Old Dominion University, Department of Ocean, Earth and Atmospheric Sciences**; A J Mariano,** Rosenstiel School of Marine and Atmospheric Science/MPO, U. of Miami

OS11F-74 0830h POSTER

Geology, Oil Potential, Environmental Issues and Geopolitics of the Caspian Sea

Mehdi Yusifov (979 8452400; rabinowitz@geo.tamu.edu); Farkhad Sadikhov; Ercin Ozgul; Kenan Aliyev; Khayyam Farzullayev; Jessica Arnoldi; Eyal Hakim; Philip D. Rabinowitz[1] (979 8452400; rabinowitz@geo.tamu.edu)

[1]Dep't of Geology & Geophysics, Texas A & M University, College Station, Tx 77843

The stratigraphy and tectonics of the geological basins within the Caspian Sea and adjacent land areas are discussed. Emphasis will be given to two major basins, the North Caspian (or Precaspian) Basin and the South Caspian Basin. The South Caspian Basin, a remnant of Tethys, was formed during Early-Middle Jurassic to Early Paleogene as a result of the opening of back-arc basins behind volcanic arcs. From Early Paleogene to present, the sedimentation rate was extremely high (∼1000 m/Ma). During this time period ∼ 30 kms of sediment, consisting primarily of shale, silt and sand were deposited. The South Caspian Basin is also host to a substantial portion of the worlds mud volcanoes, the regional distribution of which coincides with that of gas hydrates. The North Caspian basin occupies the northern part of the Caspian Sea and extends onshore onto Kazakhstan and Russia for more than 400km. This basin is characterized by thick sediment accumulations (∼20 km) which commenced during the Middle Devonian. The sedimentary section consists of a Permian salt formation that separates pre-salt carbonates from post-salt terrigenous deposits with numerous salt domes. Other basins include the Mangyshlak and North Usturt basins in the northeast Caspian bordering Kazakhstan.

The Caspian Sea contains vast oil and gas potential that some investigators equate to those of the Persian Gulf. The numerous concerns associated with these oil and gas fields will be discussed. For one, the huge number of mud volcanoes observed in the South Caspian Basin, as well as the gas hydrates, are a hazard for the installation of oil platforms and other facilities. Also, the most efficient methods (both economical and political) of transporting fossil fuels from the Caspian Sea have yet to be resolved. The Caspian Sea surrounded by Azerbaijan, Iran, Turkmenistan, Kazakhstan and Russia is a region of very complicated geopolitics, especially when it comes to solving important environmental problems and locations of oil and gas pipelines.

OS11F-75 0830h POSTER

The National Tsunami Hazard Mitigation Program

Eddie N. Bernard (1-206-526-6800; bernard@pmel.noaa.gov)

NOAA/Pacific Marine Environmental Laboratory, 7600 Sand Point Way N.E., Seattle, WA 98115, United States

The National Tsunami Hazard Mitigation Program is a state/Federal partnership that was created to reduce the impacts of tsunamis to U.S. Coastal areas. It is a coordinated effort between the states of Alaska, California, Hawaii, Oregon, and Washington and three Federal agencies: the National Oceanic and Atmospheric Administration (NOAA), the Federal Emergency Management Agency, and U.S. Geological Survey. Because of NOAA's responsibility to provide tsunami warning services to the nation, NOAA has led the effort to forge a solid partnership between the states and the Federal government. The partnership has established a mitigation program in each state that is preparing coastal communities for the next tsunami. Inundation maps are now available for many of the coastal communities of Alaska, California, Hawaii, Oregon and Washington. These maps are used to develop evacuation plans and, in the case of Oregon, for land use management. The partnership has successfully upgraded the warning capability in NOAA so that earthquakes can be detected within 5 minutes and tsunamis can be detected in the open ocean in real time, paving the way for improved tsunami forecasts. An overview of the program will be given along with the results of a review of the program's accomplishments.

URL: http://www.pmel.noaa.gov/tsunami-hazard

OS11F-76 0830h POSTER

Multi-Scale Ocean Forecasting System (MSOFS)

Dmitry Chalikov (301 7863 8133 x.7239; Dmitry.Chalikov@noaa.gov)

National Center for environmental prediction, 5200 Auth Rd Room 209, Camp Springs, MD 20746, United States

Report provides a brief description of an ocean forecasting system that has been developed by the Ocean Modeling Branch, National Centers for Environmental Prediction (NCEP). The ocean forecast system is developed for forecasting the ocean state on short to medium range time scales (1 day to several days). The system is designed specifically to take full advantage of parallel distributed memory Class VIII SMP computer systems. It demonstrates a fundamentally new approach in ocean modeling which probably will be unchanged as long as parallel distributed memory architecture remains as a basic idea in the development of supercomputers. The system consists of a global ocean model approximated on an arbitrary orthogonal spherical grid and a set of embedded regional models with different horizontal and vertical resolutions. Each of the regional models is represented as a set of submodels for relatively small 3-D blocks where equations are integrated over a single time step by explicit scheme with exchange of information across the boundaries at each time step. Matching of the global and nested regional models is assumed to be done at each time step of the global model by Newtonian adjustment through a transition strip in which the solution is given by a linear superposition of regional and global solutions with weights diminishing from a value of one at the inner boundary to zero at the outer boundary.

All models are based on primitive dynamic equations for momentum, temperature, salinity and sea level. The model is written in a z-coordinate system. The physical formulation of the model and numerical scheme include new features which were not used previously in other ocean models. A scheme for the vertical mixing in the upper ocean and interaction with the atmosphere represents a new approach based on empirical data and similarity theory. The numerical scheme is based on the splitting method which combines explicit, semi-implicit and implicit steps. The effective resolution of the global model is 80 km in the horizontal and 37 levels in the vertical. At present, one regional model is embedded in the global domain encompassing the entire coastal area of the contiguous United States. This regional model has an effective resolution of 8 km and the same vertical resolution as the global model. It is expected that more regional models will be created (starting probably with a model for the Alaska region), as well as local models nested in regional models. The set of model parameters, in both the global and the regional ocean models, is chosen specifically for the simulation of short to medium range variability of the ocean. Atmospheric forcing is provided by the surface fluxes from NCEP's operational Medium Range (Atmospheric) Forecast (MRF) model. The model also takes into account tidal forcing by including several of the important tidal harmonics. Preliminary results on the global and the regional ocean model simulations are given. Forthcoming and future development of the global ocean forecasting system are discussed.

OS11F-77 0830h POSTER

Fisheries Resource Management and Safety at Sea: New England Groundfish and Scallop Fleets

Donald Lucas (972-783-0237; djlucas1@yahoo.com)

University of Texas at Austin, 2305 Leon Street, Austin, TX 78705, United States

Commercial fishing is by far the most dangerous occupation in the United States, and there is a great deal of interest in finding ways to increase fishing vessel safety. The Magnuson-Stevens Fishery Conservation and Management Act, which provides the legal framework for fishery management at the federal level, has established a national standard requiring all fishery management plans to promote the safety of human life at sea. However, some analysts and industry groups believe that the recent implementation of certain conservation and management measures may have exacerbated risk-taking behavior, thereby increasing the hazards of commercial fishing. Our study analyzes this problem for the northeast fisheries off the coast of New England. We consider weather patterns and commercial fishing vessel activity for the northeast region's sea scallop and groundfish fisheries from 1987-2000. To do this, we develop a daily heavy weather "exposure index" that combines the number of fishing vessels in identifiable regions with the maximum wind speed recorded by the closest oceanographic data buoy. It has been hypothesized that sharp reductions in the numbers of days that fishing vessels are permitted to be at sea may lead fishermen to continue to fish in heavy weather, thereby increasing the risk of accidents, so that they do not lose a portion of their days-at-sea allotment by returning to port. We examine the behavior of the index prior and subsequent to the implementation of the days-at-sea regulations in 1994. Contrary to initial expectations, we found that the exposure index declined slightly after 1994. From a policy perspective, this result implies that a limit on days-at-sea has not led to a reduction in fishing vessel safety in the northeast fisheries. One possible explanation for our result is that the days-at-sea limitation encourages fishermen to work around heavy weather events.

OS11F-78 0830h POSTER

Bio-Pollution: Ballast Water as a Vector for Global Transport of Microorganisms and the Associated Risk of Microbial Invasion

Lisa A Drake[1] (1-757-683-5060; ldrake@odu.edu)

Leslie G Ball[1] (1-757-683-4742; lball@odu.edu)

Katharina R Moreira[1] (1-757-683-4742; kmoreira@odu.edu)

Keun-Hyung Choi[1] (1-757-683-5984; kchoi@odu.edu)

Fred C Dobbs[1] (1-757-683-5329; fdobbs@odu.edu)

[1]Old Dominion University, Department of Ocean, Earth and Atmospheric Sciences, 4600 Elkhorn Avenue, Norfolk, VA 23529, United States

Ships require ballast to control their stability and balance, and until the 1890s, rocks, dirt, and other forms of dry ballast were used. Today, ships use water for ballast; a single ship can load tens of thousands of tonnes of water in coastal ports and discharge it at successive ports of call. Ballast water may contain everything found in coastal water–viruses, bacteria, phytoplankton, zooplankton, and fish–and some of the transported organisms can colonize new areas where the ballast water is discharged. Such bio-pollution can have drastic effects; the proliferation of zebra mussels in the Great Lakes is an example of a ballast-water invader that subsequently grew unchecked in a new location. Large areas of the Great Lakes are literally carpeted with foreign mussels, and they have caused great economic damage, as well as profound ecological change.

Microorganisms are orders of magnitude more abundant than macroorganisms in coastal waters and are thus transported around the globe via ballast water in enormous numbers. We evaluated microbial metrics in the ballast water of ships arriving to Chesapeake Bay as well as throughout a trans-oceanic voyage. At the endpoints of trans-oceanic voyages, total bacteria and virus numbers are about 3-fold less than values found in coastal waters. Our measurements taken throughout a voyage showed a decrease in all microbial metrics over time. Of great interest is the risk associated with discharging microorganisms into new environments. By examining the difference in temperature and salinity between the ballast water and the water into which it is discharged, we will begin to estimate the risk of microbial invasion.

OS11F-79 0830h POSTER

A Web-based Ocean Current Reference Site

Arthur J. Mariano[1] (305-361-4193; amariano@rsmas.miami.edu)

Edward H. Ryan[1] (305-361-4109; eryan@rsmas.miami.edu)

Joanna Gyory[1] (305-361-4193; jgyory@rsmas.miami.edu)

[1]Rosenstiel School of Marine and Atmospheric Science/MPO, U. of Miami, 4600 Rickenbacker Causeway, Miami, FL 33149, United States

A web-based ocean current reference site is being constructed at the Rosenstiel School of Marine and Atmospheric Science, U. of Miami. The Atlantic Ocean Surface Current page will be put on-line for the Ocean Science meeting. Each major ocean current has a listing of important links, text and data plots. The text provides a detailed summary of observed velocities, transport, temperature, and variability for each current. Data plots include average and seasonal surface current fields derived from ship-drift, sea surface temperature maps, near-surface drifter trajectories, and output from numerical simulations by the HYCOM Consortium for Data-Assimilative Ocean Modeling.

OS11F-80 0830h POSTER

NOAA Ocean Exploration Program: First Year Results

Stephen R Hammond[1] (541-867-0183; Stephen.R.Hammond@noaa.gov)

Craig McLean[1]

Michael Kelly[1]

Margo Bohan[1]

Katie Croff[1]

[1]NOAA Ocean Exploration, 1315 East-West Highway SSMC3, 11th Floor, Silver Spring, MD 20910, United States

Last year, NOAA received $4M for the purpose of creating a new program which would initiate major new efforts in ocean exploration. The strategy of the resulting NOAA Ocean Exploration (OE) program thus envisions an interdisciplinary, collaborative global-ocean research effort that, emphasizes seagoing expeditions to unknown, or not well known, regions of the ocean; sponsorship of development, or unique applications, of state-of-the-art ocean exploration technology; and exploration of the Nation's maritime cultural heritage. The program strongly emphasizes complementary public education and outreach. OE is part of a hoped-for vigorous multi-agency ocean exploration effort described in a Presidential Panel report, Discovering Earth's Final Frontier: A U.S. Strategy For Ocean Exploration.

The poster, NOAA Ocean Exploration Program's First Year Results, includes results from expeditions in the northeast Pacific, the eastern Atlantic, and in Lake Huron. Also presented are results of successful ocean technology efforts to expand real-time acoustic ocean monitoring as well as utilization of very-high-resolution sonar mapping systems to both geologically and biologically explore the seafloor. Included as well are important maritime historical results obtained from the exploration of shipwrecks in Lake Huron and from studies of the USS Monitor.

In the federal FY 2002, OE anticipates to being able to provide approximately $14M in research support for an even more diverse ocean exploration agenda comprised of projects solicited from the national ocean research community.

OS11F-81 0830h POSTER

Oceans Product Specific Metadata Applications

Krishna Tewari[1] (301-614-5750; ktewari@gsfcsrvr4.gsfcmo.ecs.nasa.gov)

A. K. Sharma[1] (301-614-5378; sharma@daac.gsfc.nasa.gov)

S. Fox

M. Fuerst[1]

G. Roth[1]

[1]NASA Goddard Space Flight Center, GES DAAC, Code 902.2, Greenbelt, MD 20771, United States

The Earth Observing System (EOS), the centerpiece of NASA's Earth Science Enterprise program, consists of launching a series of satellites, and a distributed network for processing, storing and distributing data to the Earth Science communities. As part of EOS mission, the Terra satellite (formerly known as AM-1) launched in December 1999, contains the Moderate Resolution Imaging Spectroradiometer (MODIS) as one of the five instruments. The MODIS views the entire Earth surface every 1-2 days taking observations in 36 spectral bands ranging from 0.4-14.4 microns with spatial resolution from 0.25 - 1 km. Ocean geophysical parameters such as ocean color is derived using bands 8 and 9 (405-448 nm), phytoplankton abundance is derived using band 14 (673-683 nm), and sea surface temperature is derived using bands 21-23 (3.9-4.0 microns).

The MODIS ocean data products are processed by the MODIS Adaptive Processing System (MODAPS) and ingested and distributed by the Goddard Earth Sciences Distributed Active Archive Center (GES DAAC). These data products are archived and distributed in the Hierarchical Data Format - Earth Observing System (HDF-EOS) format. HDF-EOS format was chosen so that metadata can be placed with the data in the same file. Metadata is defined as "data about data", or "information about the data". Metadata includes the information about geophysical parameters, spatial and temporal coverage, quality assessments, and version number of the science software. Ocean Data products archived at the GES DAAC are voluminous and need a quick search mechanism. Metadata helps to find the data in an efficient manner.

This presentation will describe the EOS Data Model and associated metadata attributes such as core metadata, product specific metadata attributes (PSA) etc. and how they relate to various ocean data products at the GES DAAC. Thus users who are familiar with the ocean PSA metadata will find it easier to search and acquire the data they need.

URL: http://daac.gsfc.nasa.gov

OS11F-82 0830h POSTER

MODIS Ocean Products at the GES DAAC

James Koziana[1] (301-614-6136; jkoziana@daac.gsfc.nasa.gov)

Wayne Esaias[1]

Gregory Leptoukh[1]

Andrey Savtchenko[1]

George Serafino[1]

[1]NASA/Goddard Space Flight Center, Code 902 Building 32, Greenbelt, MD 20771

The Goddard Earth Science (GES) Distributed Active Archive Center (DAAC), the official source of MODIS Ocean data products for the science and general user communities, has been receiving, processing, archiving and distributing Moderate Resolution Imaging Spectroradiometer (MODIS) data since February 2000. The GES DAAC archives approximately 500 Gigabytes (GB) of Terra/MODIS data per day of which approximately 230 GB are Ocean data products.

The MODIS Ocean products (ocean color, SST and primary productivity) will allow researchers to investigate linkages between physical forcing and biological responses from local to global scales. The Level 2 products (local scenes) are 5-minute 1 km swaths of 40 Ocean measurements (36 Ocean color and four SST). The daily Level 3 (global composites) products include global daily composites of the local granules for all 40 MODIS Ocean measurements. The daily Level 3 products are averaged into weekly, monthly and yearly Level 3 products, which have 4.63 km, 36 km and 1 degree spatial resolutions. The Level 4 primary productivity parameters are averaged into weekly and yearly products with a spatial resolution of 4.63 km, 36 km and 1 degree. The current suite of Ocean products will be generated for both Terra and Aqua. In addition, joint Terra/Aqua Ocean products will be derived.

The MODIS Data Support Team (MDST) at the GES DAAC has been established to provide expert assistance to users in accessing Ocean data products, information on visualization tools, documentation for data products and formats and information on the scientific content of products and metadata. For more information, visit MDST web site at http://daac.gsfc.nasa.gov/CAMPAIGN_DOCS/MODIS/index.shtml

OS11F-83 0830h POSTER

Comparisons of AVHRR-based, ATSR and MODIS Satellite SST Data

Edward M Armstrong[1] (818 393-6710; ed@seanet.jpl.nasa.gov)

Jorge Vazquez-Cuervo[1] (818 354-6980; jv@pacific.jpl.nasa.gov)

[1]Jet Propulsion Laboratory , 4800 Oak Grove Dr. MS 300-320, Pasadena, CA 91109, United States

A comparison study was undertaken to ascertain the relative properties of four remotely sensed sea surface temperature (SST) datasets including NOAA/NASA Pathfinder AVHRR SST, U.S. Navy AVHRR MCSST, European Space Agency ATSR-2 SST and NASA MODIS SST. These datasets all derive SST through some combination of infrared channels from their respective radiometers, however, the MODIS SST and ATSR algorithms incorporate a semi analytical approach to SST derivation while AVHRR-based SST relies on an empirical regression method to in situ SST observations from buoys.

The MODIS SST data are the provisional Level 3 science quality (version 3) data that were rebinned from a 4 km global resolution to 9 km so that they could be directly compared to the 9 km AVHRR products. Time scales for the comparisons varied from daily, to weekly, to monthly with data separated into daytime and nighttime periods. Some of the properties investigated were mean bias differences among the SST datasets, cloud contamination signatures in the data, diurnal variability, and regional artifacts such as aerosol and water vapor contamination. Preliminary comparisons between the ATSR-2 SSTs and the Pathfinder SSTs indicate mean differences on the order of 0.3 degrees. Comparisons with aerosol and cloud data from the TOMS instrument indicate a significant proportion of these mean differences may be explained by aerosol and/or cloud contamination.

OS11F-84 0830h POSTER

Impacts on Water Quality and Microbial Community Structure by Artificial Substrates in a Zero-exchange *Litopenaeus vannamei* Culture System

Lytha D. Conquest[1] (1-808-259-7951; lconquest@oceanicinstitute.org)

Olivier Decamp[1]

David A. Ziemann[1]

Albert G.J. Tacon[2]

[1]Oceanic Institute, 41-202 Kalanianaole Hwy., Waimanalo, HI 96795, United States

[2]Aquatic Farms, 49-139 Kamehameha Hwy, Kaneohe, HI 96744, United States

The impact on water quality and the microbial community by artificial substrates (AS) was examined in experimental *L. vannamei* culture systems. Benefits of AS in culture systems include: additional surface area for the microbial community (including typically benthic organisms), the ability to function as an *in situ* biofilter to mitigate the buildup of metabolic wastes, and structure or habitat for shrimp individuals (possibly reducing stress). Two trials were carried out in triplicate 1500 liter tanks with artificial flexible fronds adding one meter^2 additional surface area; control tanks were without the AS. Changes in dissolved inorganic nutrients, water column and substrate-associated chlorophyll *a*, total suspended particulates, community size structure and composition, BOD, and shrimp performance were tracked for ten weeks. The AS presence resulted in changes in the microbial community structure and processes. Treatments with AS had decreased particulate load in the water column with a smaller community size structure and a higher total chlorophyll *a* biomass due to substrate-associated chlorophyll *a*. Shrimp survival with AS was significantly higher (2x) in one trial. Similar concentrations of nitrogenous metabolic products in treatments which had different shrimp biomass loads suggest that the nitrogen transformations by the AS community were proceeding at a higher rates compared to the community without AS. Diatoms and protozoans dominated the particulate floc in the control tanks while smaller eustigmatophytes were found in AS treatments.

OS11F-85 0830h POSTER

Bluegill Metazoan Parasite Community Structure in 2 Non-Point Source Polluted Streams in San Antonio, Texas

Mary Bhuthimethee[1] ((979) 845-5777; mary-b@tamu.edu)

Norman O. Dronen[1] ((979) 845-5777; n-dronen@tamu.edu)

William H. Neill[1] ((979) 845-5777; w-neill@tamu.edu)

[1]Department of Wildlife and Fisheries Sciences, Texas A&M University, 2258 TAMU, College Station, TX 77843-2258, United States

Non-point source (NPS) pollution from agricultural and urban runoff adversely affects aquatic ecosystems. These effects are evident in changes of species diversity and composition of biota in streams as the system adapts to disturbance. Because fish parasites are sensitive to changes in water quality, they have been used as cost-effective bio-indicators of watershed degradation. Our study examined the fish metazoan parasite community (Copepoda, Monogenea, Nematoda, Trematoda) of 2 NPS polluted streams in San Antonio, Texas, using the bluegill (Lepomis macrochirus), a sunfish, as a model host at upper and lower watershed sites. Bluegill were obtained from a local aquaculturist and placed in submerged, stationary wire-mesh cages in the streams for approximately 20 days in August 1999 and again in August 2000. This treatment exposed fish to stream conditions and allowed parasite communities to become established. During the 1999 field season, values of Shannons diversity index indicated a greater diversity of bluegill parasites at the upper watershed sites for both Leon and Salado creeks (1.142, 1.144), compared with the lower sites (0.48, 0.75). Equitability followed the same pattern, with the upper Leon and Salado watershed sites having higher values (0.64, 0.64) than the lower sites (0.27, 0.42). The August 2000 data reflected similar patterns, with the upper Leon diversity index being 0.630 and that for the lower Leon site being 0.514. The Salado Creek indices in 2000 did not follow the trend, but this may have been due to a high-flow event that killed 58% of the bluegill caged at the lower site. Dissolved nitrate values ranged from 0.28 to 9.1 mg/L in 1999, and from 0.19 to 4.8 mg/L in 2000. Both parasite diversity and equitability decreased with increasing nitrate level. With the statistical effects of nitrate level and year-to-year differences

removed, there were no apparent differences in parasite species diversity or equitability between streams or between sites within streams. High nitrate levels in aquatic systems are indicative of eutrophication and may be harmful to wildlife and humans. Our study adds to the developing knowledge of bio-indicators of environmental quality in stream habitats.

OS11F-86 0830h POSTER

Heavy Metal Uptake of Biotic Versus Abiotic Sediment Sources in the Filter Feeding Blue Mussel Mytilus Trossolus.

Joline R King[1] (604-299-3176; jolinek@sfu.ca)

Leah I Bendell-Young (604-291-5985; bendell@sfu.ca)

[1]Simon Fraser University, 8888 University Drive, Burnaby, BC V5A 1S6, Canada

Within freshwater and marine ecosystems, bivalves occupy an important intermediary position linking lower trophic to higher trophic level organisms. Bivalve invertebrates are excellent candidates for metal uptake studies due to their feeding behavior, their widespread abundance in North American marine ecosystems, and the fact that they are major food sources for higher order vertebrates. In order to quantify the amount of metal being transferred from the environment into biota, basic variations in ecosystems and organism behavior need to be considered. Given their ecological and economic importance, research investigating the various geochemical and physiological conditions that maximize metal accumulation in these species is needed. As a consequence, my research focuses on the uptake of biotic and abiotic sediment components by the blue mussel, Mytilus trossolus. My primary hypothesis is that the blue mussel uptakes an equivalent or greater concentration of heavy metals via its diet due to the ingestion of organic particles contaminated with metals versus just inorganic metal particles.

M. trossolus is an intertidal filter feeding bivalve that is able to adapt its ingestion rate of suspended particles based on carbon content and particle size. Keeping this unique behavior in mind, feeding various sediment matrices that fall within the preferred particle range of M. trossolus (under 100um) is key in ensuring a maximal uptake rate. In addition, both high and low carbon sources have been combined with particle size in producing synthetic feeding matrices. In-lab feeding experiments using various synthesized biotic (bacteria) and abiotic (Cd, Mn, Pb oxides) food sources have given us valuable information on the uptake and potential toxicity of heavy metals. Upon the completion of these experiments, an Atomic Absorption Spectrophotometer was used to analyze over 500 mussel tissue samples for the presence of the above metals. Using these results, I have been able to determine that both abiotic and biotic sources of metal uptake need to be considered when monitoring heavy metal transfer within ecosystems.

OS11F-87 0830h POSTER

The Effect of Elevated CO2 Detritus on the Foraging Decisions of Crayfish (Orconectes virilis)

Julie A Adams[1,2] ((419)372-0570; jaadams@bgnet.bgsu.edu)

Nancy C Tuchman[2,3] (ntuchma@luc.edu)

Paul A Moore[1,2] ((419)372-8556; pmoore@bgnet.bgsu.edu)

[1]Laboratory for Sensory Ecology Bowling Green State University, Dept. of Biological Sciences Bowling Green State University, Bowling Green, OH 43403, United States

[2]University of Michigan Biological Station, 9008 Biological Road, Pellston, MI 49769, United States

[3]Department of Biology Loyola University Chicago, 6525 N. Sheridan Rd., Chicago, IL 60626, United States

With the atmospheric concentration of CO_2 expected to double in the next 50 years, research elucidating impacts to the biosphere are important. Many tree species show a decreased nutritional quality of leaves when reared under elevated CO_2 conditions. In riparian lotic systems where leaf litter comprises up to 99% of the carbon foundation of the food web, changes in leaf chemistry as a result of increased CO_2 may affect the behavior of organisms that feed on those leaves. Crayfish are macroinvertebrates in these lotic systems that locate food by chemoreception. A y-maze was used to determine crayfish preference for detritus reared under the current CO_2 concentration of 360 ppm (ambient, AMB) or twice the current concentration, 720 ppm (elevated, ELEV). Stimuli consisted of: 1) fresh detritus, 2) detritus leached for 24 hours, and 3) leachate from detritus. Within these preparations were three treatments with pair-wise combinations of stimuli: AMB x CONTROL, ELEV x CONTROL, and AMB x ELEV. Behavioral parameters measured from videotapes were initial arm choice, time spent in each arm, and time spent at each source. Initial arm choices were tested with a Chi Square and times were tested with paired t-tests within each treatment. Crayfish preferred AMB stimulus over ELEV or CON when offered fresh detritus or leachate. There were no differences in the ELEV x CON treatment. When offered leached detritus, crayfish showed no preference for any stimuli. These results demonstrate that crayfish can discriminate chemically between AMB and ELEV detritus, that AMB detritus is preferred, and that crayfish are attracted by chemicals diffusing from the leaves. Since, as omnivores, crayfish can function as keystone species in detritus-based systems, these changes in crayfish foraging decisions can affect the whole community.

OS11G HC: Hall III Monday 0830h

Coastal Sedimentation I

Presiding: **M A Allison,** Tulane University**; C A Nittrouer,** University of Washington

OS11G-88 0830h POSTER

Wave propagation simulations in muddy environments along the Louisiana coast

Alexandru Sheremet[1] (225-578-2951; ashere1@lsu.edu)

Gregory W. Stone[1] (225-578-6188; gagreg@lsu.edu)

James M. Kaihatu[2] (228-688-5710; kaihatu@nrlssc.navy.mil)

[1]Coastal Studies Institute, Louisiana State University, Howe-Russell Geoscience Complex, Baton Rouge, LA 70803

[2]Ocean Dynamics and Prediction Branch, Oceanography Division, Naval Research Laboratory, Stennis Space Center, MS 39529

Much of the insight into nearshore hydrodynamic processes (waves, currents, sediment transport) gained recently is due to a series of massive field experiments (eg. Duck '97) conducted on nearly plane beaches of medium grained, quartz sand. Worldwide, though, approximately 80% of non-rocky coastal regions are mixed sand, silt, and mud, often dominated by cohesive sediments. The applicability of existing numerical models to these environments is doubtful.

In this work, the effects of different sedimentary environments on wave propagation along the Louisiana coast are compared using three months of WAVCIS wave and wind observations and SWAN-based numerial simulations. We focus on two locations: at station CSI-3, south of Atchafalaya Bay system, in a cohesive sedimentary environment;and CSI-5, located south of the Terrbonne Bay, in a sandy environment. Despite virtually identical local wind mesurements, observed wavefields differ significantly, with across the spectrum wave attenuation observed in the muddy environment. Comprehensive numerical simulations were conducted using SWAN with nowcast wind stresses from the Navy COAMPS model at 0.2 degree resolution. As expected, simulation results compare well with observations for the CSI-5 site, while at CSI-3 wave energy levels are significantly over-predicted.

The results illustrate the weak performance of current wave models in cohesive sedimentary environments, and demonstrates the magnitude of their wave attenuation effects in comparison with other mechanisms.

URL: http://wavcis.csi.lsu.edu

OS11G-89 0830h POSTER

Fluid mud Sedimentation on the Innermost Western Louisiana Continental Shelf

Kristina A. Rotondo[1] ((225)757-9089; kroton1@lsu.edu)

Samuel J. Bentley[1] ((225)578-2954; sjb@lsu.edu)

[1]Coastal Studies Institute, Louisiana State University, Baton Rouge, LA 70803

The Atchafalaya River is a major distributary of the Mississippi River and discharge is leading to the formation of a new delta lobe. Sediment deposited by the Atchafalaya is transported westward by storm currents parallel to the coast. The Atchafalaya experienced a period of high discharge in March 2001, associated with spring runoff. Sediment cores were taken in May 2001 from the inner Louisiana Shelf 100 km west of Atchafalaya Bay and landward of the 10 m isobath. Box cores displayed an apparently continuous gradient from muddy water to watery mud, rather than an obvious sediment-water interface. Cores were analyzed for grain size, porosity, radioisotopic activity and x-radiography. Preliminary analyses reveal a high porosity (<95%) mud layer 15-23 cm thick that contains vertically uniform ^{7}Be activities. X-radiographic inspection reveals the lack of biologic activity so isotopic profiles probably reflect primary physical deposition associated with Atchafalaya discharge and storm driven along-shelf transport.

OS11G-90 0830h POSTER

Seasonal trends in sediment dynamics on the Po River continental shelf

Annika M V Fain[1] (206-543-6454; afain@ocean.washington.edu); Andrea S Ogston[1] (ogston@ocean.washington.edu); Stefano Miserocchi[2] (stefano@igm.bo.cnr.it); Chuck Nittrouer[1] (nittroue@ocean.washington.edu); Cindy Palinkas[1] (cpalinkas@ocean.washington.edu); Richard Sternberg[1] (rws@ocean.washington.edu)

[1]University of Washington, School of Oceanography Box 357940, Seattle, WA 98195, United States

[2]Istituto Geologia Marina-CNR Istituto Geologia Marina-CNR, Via P. Gobetti, 101, Bologna 40129, Italy

With the objective of learning how sedimentary processes create strata in a shallow, deltaic setting, we have initiated investigation of sediment dynamics on the Adriatic continental shelf at the mouth of the Po River. This work uses a combination of water-column profiling and bottom-boundary-layer time-series measurements for the period from December 2000 to October 2001.

In October 2000, a 100-year flood event on the Po River deposited a sediment layer up to 15 cm thick on the continental shelf. When discharge was still elevated soon after the flood (December 2000), water-column profiling following the flood showed the surface plume to be patchy, with lowest salinity and highest suspended-sediment concentrations close to the main distributaries of the Po. The surface plume over the shelf was generally 1.5 m thick and contained suspended-sediment concentrations of up to 50 mg/L. During the spring survey, the surface plume thinned to less than 0.5 m, and had low concentrations (< 25 mg/L). Intermediate nepheloid layers were seen at shallow depths (12-17 m water depth) throughout the year, but primarily during June 2001 along transects in the vicinity of the main distributaries. These layers appear to correspond with a weak density contrast. A bottom nepheloid layer was observed during all cruises, but primarily during December 2000 and January 2001, when conditions in the Adriatic Sea were energetic and recently-deposited sediment may not have been highly consolidated.

Sediment was actively resuspended during storms, as seen in the correlation between wave orbital velocities and suspended-sediment concentrations measured at the tripod location. At the time-series location (12-m water depth) the sediment flux was primarily to the south-east during the winter and spring, in events consistent with forcing by the strong, cold, Bora winds. Although sediment concentrations are low throughout the water column during profiling, < 50 mg/L, we do see significant concentrations, up to 2 g/L (12-cm above the bed) in the time-series measurements of sediment concentrations during large wave events. Rapid sediment deposition from the surface plume appears to occur in response to river discharge events on the Po continental shelf. Subsequent storm events can cause transport in intermediate and bottom nepheloid layers, which move sediment away from the zone of rapid deposition during the flood.

OS11G-91 0830h POSTER

The use of In-line Laser Holography in the Analysis of Sediment Erosion

Rupert Gordon Perkins[1] (01334 46 3445; rgp@st-andrews.ac.uk)

Hongyue Sun[2] (01224 272 816; h.sun@eng.abdn.ac.uk)

David M Paterson[1] (01334 46 3467; dp1@st-andrews.ac.uk)

John Watson[2] (01224 272 804; j.watson@eng.abdn.ac.uk)

Giselher Gust[3] (ggust@t-online.de)

[1]SERG, Gatty marine Labs, University of St. Andrews, Fife, Scotland, St Andrews, Fife, Sc KY16 8LB, United Kingdom

[2]Dept. of Engineering, Dept. of Engineering, University of Aberdeen, Aberdeenshire, Scotland, Aberdeen, United Kingdom