orientation. If alongshore transport is related to hot spot behavior, shoreline curvature will correlate with shoreline change. Preliminary analyses of field measurements indicate a surprisingly high correlation between shoreline curvature and the local rate of shoreline change.

Simplified numerical simulations reveal information about what combinations of shoreline orientation, wave climate, and shoreline perturbations will produce migrating zones of erosion and accretion over the monthly to annual time scales of medium-term hot spots. For long-term (decadal) hot spots, we have performed numerical simulations based on the measured northern Outer Banks shoreline and wave climates. The goal is not to quantitatively predict rates of shoreline change, but to compare model predictions of general regions of long-term erosion and accretion to the observations. Initial tests of these predictions are encouraging.

The dominantly low-angle wave climate of the northern Outer Banks should result in long-term coastline smoothing. This shoreline contains subtle undulations occurring over many scales, verifying that controls or processes other than gradients in alongshore sediment flux affect coastline shape. However, we have preliminarily identified links between erosional hot spots and alongshore sediment transport.

OS52F-10 1615h

Hindcasting Storm-Induced Erosional Hazards for the Outer Banks, NC.

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The spatial variability of dune response along a section of the NC Outer Banks has been examined for the 1999 Hurricane Dennis. Dennis generated some of the largest wave heights recorded in the past 20 years along the Outer Banks of North Carolina, reaching 6.3 meters (measured at the U.S. Army Corps of Engineers Field Research Facility at Duck, North Carolina). Pre and post-storm topography was measured as part of a joint USGS-NASA program using lidar technology. These data were used to calculate changes in the elevation and location of the dune crest and dune base (Dhi and Dlo). Roughly 66% of the region from Cape Hatteras to Ocracoke Inlet experienced some dune erosion. The spatial variability in dune response is compared to hindcast erosion hazard predictions. Observations of maximum wave conditions are used as input to SWAN, a 3rd generation and shoaling wave model, output from which is used to drive empirical relationships for wave runup. Estimates of hazard potential are derived from Sallengers recently proposed storm impact scale. The hindcast hazard potentials are then compared to direct observations.

OS52F-11 1630h

Wind-Driven Flow and the Maintenance of a Rippled Scour Depression: Wrightsville Beach, North Carolina, USA.

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Current observations across the inner-shelf of North Carolina are used to assess sediment transport potential and the physical mechanisms responsible for the maintenance of large subtle bedforms identified in high-resolution seafloor mapping studies of the geological framework at this setting. Analysis of the recorded data shows that tidal flows account for a small percentage (less than 15 percent) of the current variability such that wind driven flows dominate current patterns. Observations at the inshore site located in 10 m of water within 0.8 km of the coastline illustrate that currents closer to shore are more often aligned in the alongshore direction compared to the measurements acquired farther offshore. Near-bed measurements 2.5 km offshore in 13 meters of water show that the flows are more often directed in the alongshore direction to the southwest, yet flows causing the highest shear velocities are directed mostly in the cross-shore direction. These instances of increased shear velocities exclusively coincide with wind events driving coastal upwelling. The majority of elevated horizontal wave orbital velocities also occur mainly during upwelling episodes. Comparison of 33-hour low pass filtered observations from the two current meters over a 45-day period show that the inshore station varies with the wind while the current at the offshore measurement location takes between 22-31 hours to reflect the wind forcing. Although there is an overall alongshore-current alignment, wind-driven upwelling contributes significantly to the sediment transport events indicated by the offshore current sensor. These findings contradict earlier hypotheses that suggested that these features could be the result of storm-induced set-up and associated down-welling. This illustrates the importance of wind driven flows in controlling the maintenance of the large bedforms noted offshore of Wrighsville Beach on the inner-shelf of Onslow Bay, NC.

OS52F-12 1645h

Physical Processes and Sediment Transport in Onslow Bay, NC

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As part of the Coastal Ocean Research and Monitoring Program (CORMP) at the University of North Carolina at Wilmington, a quadrapod frame with a downward looking Pulse-Coherent Acoustic Doppler Profiler (PC-ADP), two optical backscatter sensors (OBS), and an upward looking Acoustic Doppler Current Profiler (ADCP) has been maintained on the continental shelf at approximately 30 m depth since May of 2000. The instruments are moored 27 nautical miles off the coast of Wilmington, NC in Onslow Bay (33° 59'N, 77° 21'W) adjacent to a productive marine hardbottom. Simultaneous measurements of flow velocities from the surface to the seabed, along with turbidity measurements at 30 and 80 cm above the seabed, have been obtained over the past two years. Measurements of seabed elevation, temperature, conductivity, and pressure were also collected at the site. Critical bed shear stresses were calculated using the Grant-Madsen model (1994) and compared with bed stresses from measured waves and currents to evaluate sediment transport. The objective of this study is to identify and quantify the magnitude, frequency, and duration of physical forcing mechanisms resulting in significant sediment mobility on the continental shelf from May to December, 2000. During the study period, 3 small noreaster storms were observed. Sediment mobilization was initialized during these small storm events when wave orbital velocities of 25-30 cm s-1 and mean currents of 15-20 cm s-1 were reached. Usually, these events resulted in net erosion at the site on the order of 2-3 cm. Significant sediment transport also occurred during fair weather when southwesterly winds of 15-25 knots were sustained for 3 or more days. Two of these type events were identified during the study period where currents exceeded 20 cm s-1 and interacted with longer period waves from the south resulting in sediment transport and net accretion of up to 3 cm at the site. Extensive sheets of fine-grained sands exist to the southwest of the study site and it is likely that these materials are being mobilized by southwesterly flows to result in the accretion patterns observed during this study.

OS61A MCC: Hall D Saturday 0830h

Nearshore Processes II Posters *(joint with T)*

Presiding: **N Plant,** Naval Research Laboratory**; A Reniers,** Naval Postgraduate School

OS61A-0181 0830h POSTER

Site Survey of the Martha's Vineyard Coastal Observatory: Backscatter, Grain Size and Temporal Evolution of Rippled Scour Depressions

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The Office of Naval Researchs Mine Burial Prediction program has chosen the Marthas Vineyard Coastal Observatory (MVCO) as a natural laboratory for experimental observations of object burial by nearshore processes (e.g., bedform migration, scour). In support of this program, the MVCO has been subject to an intensive site survey program, involving, since early 2001: (1) three swath backscatter and/or bathymetry surveys; (2) three high resolution seismic surveys; (3) ultra-high resolution sector-scanning sonar on pole mounts; (4) in situ geotechnical (velocity and resistivity) measurements, (5) grab sampling, and (6) vibracoring. These efforts are concentrated in water depths between ∼8 and 18 m, centered on the site of the MVCO permanent node at ∼12 m water depth

Rippled scour depressions (RSDs) are pervasive within the MVCO. RSDs are ∼shore-perpendicular bands of coarse sands separated by overlying fine sands. The term itself implies that the coarse sands are heavily rippled (∼0.5-1 m wavelength, ∼0.1 m amplitude) and slightly depressed relative to the fine sands which, in the MVCO, are generally just a few 10s of cm thick. The RSDs are clearly evident on sidescan data as bands of high backscatter. For the most part, grain size measurements confirm a strong positive correspondence between mean grain size and backscatter intensity. However, a critical exception is seen in deeper water where, well within the area of fine sands, backscatter increases noticeably as mean grain size decreases from ∼150μ to ∼130μ. Topographic expression related to the RSDs is confined primarily to evident scour depressions at the edges. The RSDs are highly asymmetric: backscatter is higher, the coarse/fine transition is more sharply defined, and the scour depression is deeper on one side than the other. This pattern changes within the survey: the higher backscatter edge is always to the west in the western part of the survey, and vice versa to the east. The strike of the RSDs also changes, from being slightly east of north in the western part of the survey to slightly west of north to the east.

The MVCO site survey work establishes a baseline set of observations against which physical changes in the seafloor with time can be measured. Early evidence of significant change has been provided by comparison of the first two sidescan surveys, which indicates a shift in the RSD boundaries by as much as 50 m between February and September of 2001. Continued seafloor evolution is evidenced by the August 2002 grab sampling and sector scanning sonar. This dynamic setting will continue to be monitored by additional swath mapping and sampling in conjunction with the planned winter 2003/2004 mine burial experiment.

URL: http://www.mbp.unh.edu/

OS61A-0182 0830h POSTER

In Situ Measurement of Sediment Properties and Relationship to Backscatter: An Example From the ONR Mine Burial Program, Martha's Vineyard Coastal Observatory

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In support of the Office of Naval Researchs Mine Burial Program (MBP), in situ acoustic and resistivity measurements were obtained using ISSAP (In situ

Sound Speed and Attenuation Probe), a device developed and built by the Center for Coastal and Ocean Mapping. One of the field areas selected for the MBP experiments is the WHOI coastal observatory based off Martha's Vineyard. This area is an active natural laboratory that will provide an ideal environment for testing and observing mine migration and burial patterns due to temporal seabed processes.

Seawater and surficial sediment measurements of compressional wave sound speed, attenuation, and resistivity were obtained at 87 station locations. ISSAP used four transducer probes that were arranged in a square pattern giving approximate acoustic path lengths of 30 cm and 20 cm and a maximum insertion depth of 15 cm. The transducers operated at a frequency of 65 kHz. Five acoustic paths were used; two long paths and three short paths. A 15.4 s pulse was generated at a repetition rate of 30 Hz. The received signal was combined with the transmitter gate pulse to generate a composite signal that was sampled at a frequency of 5 MHz with a National Instruments PCI-6110E data acquisition board. Two resistivity probes were mounted on the ISSAP platform and positioned in locations selected to limit interference with the acoustic signals. Also mounted on the platform were a color video camera and light, and a Jasco Research UWINSTRU, which measured platform pitch and roll angles, heading, depth, and temperature.

At each of the 87 stations, the ISSAP probe was lowered into seawater to a location 6m above the seafloor. A measurement cycle was completed by transmitting 10 pulses on each of the five paths and repeating three times for a total of 150 measurements. Resistivity measurements were obtained from both probes following completion of the acoustic measurements. The ISSAP platform was then lowered into the seafloor where two acoustic and resistivity measurement cycles were completed in the sediment. Probe insertion was aided by the video signal which provided imagery of the seafloor. The instrument was removed from the sediment and a second seawater measurement cycle completed. Typically, a sequence of measurements (300 acoustic and 40 resistivity measurements in seawater and similarly in sediment) was completed in 4 minutes.

Recorded waveforms were processed for sound speed using two methods, cross-correlation and envelope detection. Sediment attenuation was estimated using the filter-correlation method of Courtney and Mayer. In conjunction with the MBP experiments, several surveys (sidescan, interferometric bathymetry, and multibeam) have been completed. The ability to predict quantitative acoustical and physical properties of sediments from remotely measured backscatter data will be examined.

OS61A-0183 0830h POSTER

Resolving the Ripples (and a Mine): High-Resolution Multibeam Survey of Martha's Vineyard ONR Mine Burial Program Field Area

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In an effort to better understand the coastal processes responsible for the burial and exposure of small objects on the seafloor, the Office of Naval Research is sponsoring the Mine Burial Program. Among the field areas chosen for this program is the site of the Martha's Vineyard Coastal Observatory (MVCO), a permanent instrumented node in 12 m of water about 500 m off the southern shore of Martha?s Vineyard. In support of the ONR program, several site surveys of the MVCO area have been conducted (see Goff et al); here we report the result of the most recent of these surveys, a very high-resolution multibeam survey aimed at establishing a detailed base map for the region and providing a baseline from which subsequent surveys can measure seafloor change

In late July we conducted a five day survey of an approximately 3 x 5 km area surrounding the MVCO node using a Reson 8125 focused multibeam sonar aboard the SAIC survey vessel Ocean Explorer. The 8125 is a newly developed multibeam sonar that operates at 455 kHz and uses dynamic focusing to compensate for the curvature of the wavefront in the near-field. By using a relatively long array, the system can achieve very high spatial resolution (0.5 degree beam width) and with the dynamic focusing, can operate in the near field. The real constraint on resolution using this system is the ability to position the soundings and thus three kinematic DGPS base stations were established on Martha?s Vineyard and three kinematic receivers were used on the survey vessel. The kinematic GPS positioning is also critical to the ability to do repeat surveys with an accuracy high enough to resolve small (less than 10 cm) seafloor changes. Also to aid in our ability to accurately position repeat surveys, divers jetted sonar reflectors into the seafloor to act as fiducials.

A super high-resolution (4 m overlap) survey was conducted in a small area surrounding the MVCO node and mine burial sites, a slightly lower resolution survey (12 to 25 m overlap) in a box approximately 1 x 1 km surrounding the ?target box? and a lower resolution survey (25 to 40 m line overlap) in a 3 x 5 km region surrounding the 1 x 1 km box. The Reson 8125 produced approximately 1 gigabyte of data per hour. The bathymetric resolution we were able to achieve was beyond our expectations. The node site and all diver-emplaced reflectors were clearly identified Most amazingly, we are able to resolve fields of individual ripples that are less than 2 cm height. Of particular relevance to the mine burial program was our ability to resolve an instrumented mine that had been deployed earlier by NRL. This mine is buried in a scour depression and is only a few centimeters proud above the base of the depression.

OS61A-0184 0830h POSTER

Observations of Bedforms and Mine Burial Processes at the Martha's Vineyard Coastal Observatory

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As part of the ONR Mine Burial Prediction program a series of experiments were conducted in the winter of 2001/2002 at The Martha?s Vineyard Coastal Observatory (MVCO) on the south coast of the island of Martha?s Vineyard, Massachusetts. The sedimentary environment at MVCO consists of a series of Rippled Scour Depressions (RSDs). These features consist of approximately shore normal bands of coarse and medium to fine sand with width and separations of order 100 m. Mine burial experiments were conducted in the med to fine sand between the RSDs, and involved deploying an instrumented mine with orientation and optical transmission sensors within the field of view of a high resolution rotary sidescan sonar. The sonar was able to show development of a scour pit around the mine and the orientation sensors combined with the optical sensors document the process whereby the mine sinks into the scour pit that has developed around it. Two deployments were conducted. In the first deployment the mine buried in 38 days in response to a series of storms with 3 m significant wave height. In the second deployment the waves were smaller (maximum approximately 2 m) and the mine did not bury completely. One of the interesting observations from the sonar, and confirmed by scuba divers, was that the scour pit filled with mud despite the local surface sediments generally consisting of medium to fine sand. To complete the burial process the medium sand covered the mud filled scour pit within hours of the deposition of the mud. The rotary sonar measured bed elevation changes of 10 to 15 cm during the first deployment and 5 to 8 cm during the second deployment. The spatial scale of theses elevation changes was larger than field of view of the sonar (8 m), or the slopes associated with these features were too low to be resolved by the sonar. However, a high resolution bathymetric survey performed at the end of the second deployment revealed 4 to 8 m horizontal scale, 10 to 15 cm height bedforms in the medium sand that may have been responsible for the observed elevation changes. A second rotary sonar was deployed in the coarse sand to observe the geometric evolution and migration of the orbital scale ripples (0.5 to 1.5 m wavelength, 7 to 20 cm height) that are found in the RSDs. As observed previously at LEO-15, these bedforms become increasingly two dimensional as wave energy increases up to a bottom orbital r.m.s. velocity of 40 cm/s. At MVCO during wave events with near bed r.m.s wave velocities between 40 and 60 cm/s the orbital bedforms transform into complex irregular three dimensional bedforms which occasionally showed characteristics of large cross ripples and lunate forms. Future deployments of instrumented mines are planned in the coarse sands, which will allow us to understand how these scale bedforms influence mine burial processes.

OS61A-0185 0830h POSTER

Predicting Mine Burial at the Marthas Vineyard Coastal Observatory

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Mine burial by scour and fill was characterized in real-time on a fine sand substrate at the Martha's Vineyard Coastal Observatory using an optically instrumented mine, Acoustic Doppler Velocimeter (ADV), bottom-mounted pressure sensors, and a sector-scan sonar (see poster by Traykovski and Richardson, for details). In two separate experiments, episodic scour and fill in response to surface gravity wave stress was responsible for mine burial. In the first experiment compete burial was achieved by changes in seafloor morphology. The mine did not completely bury in the second experiment. The effect of tidal currents on mine burial was minimal for both experiments. A time-scaling scour burial model based on amplification of sediment transport around the mine and modified by infilling was found to accurately predict mine burial. The wave orbital velocity measured at the sea floor using the ADV was similar to orbital motion predicted from wave height and period, which were derived from a NOAA regional wave model (WaveWatch III). These experiments and model comparisons suggest burial by scour can be accurately predicted from sediment type (mean grain size), bathymetry, mine characteristics, and measured or modeled wave statistics and bottom currents.

OS61A-0186 0830h POSTER

Geometry and Sedimentary Characteristics of a Submerged Proglacial Spring-Sapping Valley, Offshore Martha's Vineyard, Massachusetts

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A dense grid of high-resolution chirp seismic profiles with more than 200 km of coverage, and 35 vibracores have been collected around the Martha's Vineyard Coastal Observatory. These data, which were gathered as part of ONR's large multi-disciplinary Mine Burial Prediction Program, provide shallow sub-bottom stratigraphic information that characterizes the local sediment distribution and can be used to understand the most recent episodes of postglacial reworking.

The offshore extension of a Late Pleistocene spring-sapping valley complex presently occupied by the Edgartown Great Pond can be traced for at least 4.5 km from the shoreline. The main paleo-valley is 200-500 m wide and 1.5-3.0 m deep, becoming shallower in a seaward direction. It is narrower than the present-day Edgartown Great Pond (2.5 km) and its dimensions and geometry closely resemble the shallow, elongated spring-sapping valleys of Cape Cod and the Islands.

Seismic profiles reveal sharp valley outlines and conformable to complex asymmetric valley fills that contrast with the surrounding outwash deposits. Several tributaries join the main valley at wide angles and are 100-200 m wide and ∼1.0 m deep. In places, a transgressive unconformity separates the valley-fill and the outwash from the overlying shoreface sands.

The vibracores contained 0.5-1.5 m of coarse sands with fine-grained, silty sands at the top and very coarse, gravelly sands with shoreface macrofauna at base. At a number of locations, penetration of ∼2 m resulted in near complete sampling of the paleo- valley fill. Six cores from within the main valley bottomed in black, stiff mud containing shells of mollusks found today in shallow, protected embayments. One vibracore, taken along the margin of the valley, sampled saltmarsh peat 0.4-0.6 m below seafloor (∼13 m below mean sea level), indicating a former, more seaward, position of the South Beach barrier in the mid-Holocene. We present preliminary sedimentological and paleoecological analyses from within the paleo-valley complex and discuss their implications for regional coastal evolution.

OS61A-0187 0830h POSTER

High-Resolution Multibeam Survey of ONR Mine Burial and Scour Study Area near Clearwater, Florida

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During April 17-21, 2002, a Kongsberg Simrad EM 3000 (300 kHz) shallow water multibeam bathymetry and backscatter system was used on the R/V Suncoaster to map a series of NW-SE trending sedimentary bedforms which overlie the Florida carbonate platform. The total area covered is approximately nine square nautical miles or 31 square km. The depth ranges from about 10 to 17 meters. Bathymetry and backscatter data characterize a complicated (and unexpected) three-dimensional pattern of sediments and karst-like bathymetry, including vertical (1-3 m) limestone ledges (corroborated by SCUBA dive observations). The mosaic displays two large sedimentary ridges and two very broad troughs that have very little sediment cover composed primarily of shell hash or exposed limestone. Circular-shaped depressions in the trough areas, however, appear to act as traps for finer sediments with the same backscatter characteristics of the large sedimentary ridges. The trough areas also have irregular geomorphology, including several lineaments (kms in length) of unknown origin. The length of the northernmost ridge is at least 4 km. The width of the ridge is sharply defined in the bathymetry data (3-5 m steep relief) and is narrow (about 1 km). A narrow band of low backscatter also suggests a similar width of the ridge, but extends out further N, NW, and W into deeper areas surrounding the ridge. In contrast, the southernmost ridge, is a broader and less sharply defined ridge (1-3 m gradual relief) with a length and width of about 3 and 1.5 km. Furthermore, the backscatter data define the ridge area more sharply than the bathymetry data. This southernmost ridge has been selected for the mine burial and scour experiment in January-March 2003, due to its sediment thickness and geomorphology. Enlarged views of post-processed bathymetry and backscatter will be presented as a poster and interactively using the Fledermaus fly-through software. We will also present preliminary results from automated seafloor bottom classification schemes using the Konsgberg Simrad Triton multibeam software and Quester Tangent single-beam classification (QTC).

URL: http://www.marine.usf.edu/geology/onrmine.html

OS61A-0188 0830h POSTER

Sedimentary Framework of an Inner Continental Shelf Sand-Ridge System, West-Central Florida

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The west-central Florida inner continental shelf is a dynamic environment subject to current flows on a variety of temporal and spatial scales. A site survey program, undertaken in support of the Office of Naval Researchs Mine Burial prediction program, is focused on the sedimentary framework and sediment accumulation patterns in 10-18 meters water depth. Our specific goals are to image the shallow subsurface and to monitor changes in bedform distribution patterns that coincide with physical processes studies ongoing in the area. Methods of study include side-scan sonar imaging, boomer and chirp subbottom profiling, and sedimentary facies analysis using surface sediment sampling and vibracoring.

A well-defined sand-ridge system was imaged, trending oblique to the west-Florida coastline. The side-scan clearly shows that there is extensive three-dimensional structure within these large-scale NW-SE trending sedimentary bedforms. The sand ridges commonly are approximately 1 km wide and 4-8 km in length. The characteristics of these ridges are distinctly different than the sand ridges in < 8 m water that we have previously studied. Ridges in the offshore area tend to be thicker, have a flatter morphology, and exhibit fewer smaller-scale sand waves. Sand-ridge thickness ranges 2-3 meters, and typically consists of fining upward medium to fine quartz sand facies with occasional centimeter-scale coarser-grained carbonate-rich intervals.

Time series investigations tracking the shift in position of the sand ridge margins have found undetectable net annual movement. However significant resuspension and bedform development accompanies high-energy events such as winter cold front passage. Thus the large-scale bedforms (sand ridges) are in a state of dynamic equilibrium with the average annual hydrodynamic regime. Repeated field surveys will focus on monitoring small-scale sedimentological and stratal framework changes that will be integrated with the quantitative process studies.

OS61A-0189 0830h POSTER

Climatology of a Bottom Boundary Layer and Acoustic Proxies for Sediment Suspension

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A multi-year effort was recently initiated to study the time history of the seabed (and objects placed on it) on the inner continental shelf off the west coast of Florida (Gulf of Mexico). One goal of this program is to estimate the bed shear stress due to combined effects of surface waves and currents and the resulting mobility of the seabed.

Measurements of the bottom boundary layer are made using a downward looking acoustic Doppler profiler operating in pulse-coherent mode. The useful profile distance is approximately 1.0 m with bins of 5 cm. The near bed flows are tied to the remainder of the water column using a standard bottom-mounted ADP. The total water depth at the measurement site is approximately 14 m. These instruments give excellent vertical resolution of the near bed mean flow for estimation of bed shear velocity and bed roughness using standard log-layer approach. Inclusion of wave effects follows the work of Grant and Madsen as modified through the years. These sensors also measure acoustic backscatter strength, a function, at least in part, of the suspended sediments in the water column. Additional suspended sediment information is gained from OBS and LISST-100 measurements. We will report on 14 months of data, concentrating first on the time history of boundary layer characteristics, then correlating temporal variability in those characteristics with fluctuations in the suspended sediment concentration proxies. Contrasts between storm and non-storm periods will be made to highlight the importance of surface waves at this site.

The Office of Naval Research supports this work.

OS61A-0190 0830h POSTER

Geologic structure and hydrodynamics of Egmont Channel: an anomalous inlet at the mouth of Tampa Bay, Florida

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High-resolution bathymetry surveys of Egmont Channel were conducted in 1999 and 2001 using a Kongsberg Simrad EM 3000 multibeam bathymetric system. These data were supplemented with other bathymetry data, seismic profiles, underwater scuba observations, and current velocity data, in order to investigate the geologic and hydrodynamic characteristics of Egmont Channel, which is the main shipping channel for Tampa Bay.

The cross sectional area (17,964 m2) and the tidal prism (6x108 m3) for Egmont Channel derived in this study are larger than theoretically predicted. The tidal prism is two orders of magnitude greater than previously calculated. This result indicates the current velocities near the deepest part of the channel, referred to herein as Egmont Deep (30 m), are faster than the rest of the Tampa Bay and the large cross sectional area is most likely due to the large tidal prisms associated with storm events. Currents measured at Egmont Deep and the Sunshine Skyway Bridge (11 km away) with Acoustic Doppler Current Profilers, have a high correlation (97%) indicating the current velocities at Sunshine Skyway Bridge can be used as a proxy for current velocities at Egmont Deep. Seismic profile data indicate that both the mouth of Tampa Bay and the bay proper contain many stratigraphic depressions. Egmont Deep is located at one of these depressions. Bathymetry and seismic data indicate that the main ebb jet for Tampa Bay is deflected northward by a local stratigraphic high underlying Egmont Key. This deflection appears to cause the asymmetry of Egmont Channel.

The repeated high-resolution multibeam bathymetric surveys document sediment bedform migration. Large subaqueous dunes in the north and western portions of Egmont Channel have moved at least 13 m in a WNW direction over 24 months. Medium-sized dunes are superimposed on the large dunes. Smaller sandwaves appear intermittently in Egmont Deep, which is bounded to the north by a linear steep scarp (38^{o}) and by a more gradual slope ($> 10^{o}$) to the south. The area of the deep fluctuates in size due to the erosion and deposition of gravelwaves. Analysis of seismic data and SCUBA observations suggest that the most likely origin for Egmont Deep is a combination of dissolution of lower strata limestone during a lower sea level, causing partial collapse, followed by tidal current scour that maintains the deep. A three-dimensional seismic survey and drilling is needed to further test this proposed origin.

OS61A-0191 0830h POSTER

Holocene and Pleistocene Marine and Non-marine Sediment from Tampa Bay, Florida

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Two sediment cores were collected in Tampa Bay, Florida with the French R/V Marion Dufresne. One core (MD02-2579), is 11.3 m long and recovered sediments that contain a record of late Quaternary sea-level, climate and, environmental history. Tampa Bay averages less than 4 m water depth except in a natural karst-like depression in the central part of the basin where the core was taken in 9 m water depth. Karst topography is almost ubiquitous in Tampa Bay and the surrounding area. Sediment thickness to the deepest recorded reflection in the depression is about 16-18 m, therefore at least 5 m of sediment lies beneath the bottom of the core.

The core contains three distinct units. The uppermost 2.9 m is composed of gray-green shelly marine mud (mid- to late Holocene) containing bay foraminiferal and ostracode assemblages. It overlies 4.5 m of light to dark tan lacustrine sandy marl deposited during the low sea-level of the last glacial. The lacustrine unit is rich in fresh-water ostracods and molluscs and contains thin layers of tan to black organic-rich muds. The light tan color of the fossiliferous section

suggests that the lake sediment was deposited under dry climatic conditions, but it has not yet been determined whether the source of the water is riverine or from an underlying aquifer. The lowest unit is composed of 3.9 m of light to medium gray shelly sandy deposited during a previous interglacial highstand (most likely marine isotope stage 5 or 11). Pore water salinity measurements become increasingly fresh down section, indicating a hydrologic communication with the underlying Floridan Aquifer system. The second core repeated the upper section and terminated in the lacustrine sediment.

OS61A-0192 0830h POSTER

Fly River Sediment Input to the Northern Great Barrier Reef, Australia

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The Fly River, Gulf of Papua, is located in close proximity to the northern end of the Great Barrier Reef. The river annually discharges about 120 million tonnes of sediment, equal to that of all Australia's rivers combined, and is considered to be the major control on the northern extent of the Great Barrier Reef. Using 240 kHz swath mapping sonar, we discovered a series of channels extending for more than 80 km from eastern Torres Strait across the northern end of the Great Barrier Reef. Some channels in the north are relict fluvial channels, containing lateral accretion surfaces in shallow sub-bottom profiles and incised channels that truncate underlying strata. Significantly, several over-deepened channels up to 220 m deep occur in the south. The channels, the deepest yet discovered on the Australian shelf, exhibit closed bathymetric contours and are floored with well-sorted carbonate gravelly sand. Tidal current modelling confirms that maximum bed stress occurred in the channels when sea level was approximately 40 m below its present position. The over-deepened channels appear, therefore, to be relict, having formed by tidal current scour during Pleistocene sea level low stands. Oceanographic data indicate that the channels are also conduits for the upwelling of nutrients from the Coral Sea onto the shelf. Tidal current scour, dispersal of Fly River terrigenous mud, and the existence of over-deepened channels have enabled reef growth to extend to its present northern limit at around latitude 9 degrees south.

OS61A-0193 0830h POSTER

Wave-Modified Sediment Gravity Currents: A Laboratory Study

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Several recent studies have illustrated the importance of wave-modified, sediment-laden gravity currents transporting sediment across the continental margin in modern environments and ancient analogs. A fundamental problem in applying basic models to these flows is that these flows are influenced by numerous external oceanic processes (i.e., waves, upwelling/downwelling, etc.). These interactions are also governed by both stratified and multi-phase fluid mechanics, making standard modes of inquiry (e.g., theoretical and numerical analysis) inadequate to describe a wide range of realistic flow conditions. Physical (laboratory) models are required to constrain these theoretical models and help understand the physical processes observed in field measurements. We have constructed a laboratory facility that will be able to identify the underlying physical relationships between a wave environment and the gravitational flux of material in sediment-laden gravity currents as well as the depositional characteristics that these flows create. The facility consists of a sealed, recirculating channel that can tilt up to 15°. At the upstream end, a motor drives a piston to produce waves. The result is a flume that can produce wave-modulated gravity currents, when either brine or sediment is added to the main channel. The piston was designed such that the experimental range of the waves is close to natural conditions (i.e., periods on the order seconds, with wave orbital velocities on the order tens of centimeters per second). The facility also has a false floor, which can be replaced by a sediment bed in order to analyze erosion and deposition of the seabed. The workings of the facility are shown, along with preliminary data and future experiments.

URL: http://oceanweb.ocean.washington.edu/people/grads/mike/fluidmud.htm

OS61A-0194 0830h POSTER

Particle Transport in the Coastal Bottom Boundary Layer Using Combined PIV and SVM

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Our submersible PIV system, developed in recent years, enables us to examine the sediment resuspension process in situ, while measuring the flow structure. The PIV images show the distribution of particles within an illuminated plane, but they are not able to measure the particle size and shape. Therefore we added a submersible video microscope (SVM), consisting of a video camera equipped with a microscope objective lens, located at the same elevation as the PIV system. This camera records silhouette images, i.e. the camera is facing a strobe light, and the particles appear as dark shadows. The size of a sample area is 0.5 mm x 0.4 mm within estimated depth of field of 2.2 mm. The smallest measurable particles have a diameter of 6.25um. An automated data analysis procedure determines the statistics of particle size distribution and aspect ratio at different heights. The SVM provides a sample of the particles at a resolution that enables us to determine their size and shape. While the PIV images (0.4 m x 0.4 m) are used for determining the distribution of particles over a larger area.

The most recent series of experiments took place in September 2001 near LEO-15. Two sets of data obtained were: i) 3 hours of data recorded sporadically during a one-week period, series-1, and ii) a continuous 3 hours series measured during one night, series-2. The mean diameters were 16.8 um and 19.1 um for series-1 and 2 respectively. The density of particles increases with increasing height above bottom for both series. The concentration of particles is 7 particles/ml at 0.5 m vs. 14 particles/ml at 6.5 m for series-1, and 3 particles/ml at 0.5 m vs. 5 particles/ml at 6.5 m for series-2. In series-1 the particles have a mean aspect ratio of 2.4 ranging from 1.8 to 3.4, whereas in series-2 the aspect ratio is 3.2, and more uniform throughout water column. PIV measurements of the turbulent velocity show the turbulence is weaker during series-2.

A preliminary study of particle shapes shows large variety. Some particles with clearly distinguished boundaries have been tentatively identified as copepod or euphasiid fecal pellets, and diatom chains. Calculating the particle concentration and vertical particle flux from PIV images is currently in progress.

OS61A-0195 0830h POSTER

Detailed Morphology and Sediment Transport Processes in the Nearshore of the Fraser River Delta, British Columbia

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Permanent river training structures have stabilized the mouth of the Fraser River and largely isolated the Roberts Bank sector of the Fraser River delta from sandy sediment supply. In a study to determine the susceptibility to erosion of the delta nearshore and associated infrastucture, the entire delta front has been mapped using multibeam sonar. High-resolution morphological maps of the nearshore reveal a range of bedforms, dominated by the strong tidal currents that sweep the delta front. Certain sectors of the nearshore are, however, dominated by erosional features including outcropping beds. Numerical modeling, using the SEDTRANS96 program, indicates that wave motions influence sediment transport in water depths less than 15 m during the moderate fetch-limited winter storms typical of the region. Wave, current profile, suspended sediment and seabed imagery data were collected at a site in 10 m water depth as a calibration for further sediment transport modeling. Preliminary results indicate bedload and suspended sediment transport occurred in response to both tidal currents and combined wave- and current conditions.

OS61A-0196 0830h POSTER

A Technique For Remote Sensing Of Suspended Sediments And Shallow Coastal Waters Using MODIS Visible and Near-IR Channels

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ABSTRACT

We have developed an algorithm to detect suspended sediments and shallow coastal waters using imaging data acquired with the Moderate Resolution Imaging SpectroRadiometer (MODIS). The MODIS instruments on board the NASA Terra and Aqua Spacecrafts are equipped with one set of narrow channels located in a wide 0.4 2.5 micron spectral range. These channels were designed primarily for remote sensing of the land surface and atmosphere. We have found that the set of land and cloud channels are also quite useful for remote sensing of the bright coastal waters. We have developed an empirical algorithm, which uses the narrow MODIS channels in this wide spectral range, for identifying areas with suspended sediments in turbid waters and shallow waters with bottom reflections. In our algorithm, we take advantage of the strong water absorption at wavelengths longer than 1 m that does not allow illumination of sediments in the water or a shallow ocean floor. MODIS data acquired over the east coast of China, west coast of Africa, Arabian Sea, Mississippi Delta, and west coast of Florida are used in this study.

OS61A-0197 0830h POSTER

Lake Tahoe Bottom Characteristics Extracted from SHOALS Lidar Waveform Data and Compared to Backscatter Data From a Multibeam Echo Sounder

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The waveforms recorded by airborne lidar bathymetry (ALB) systems are currently processed only for depth information. In addition to bathymetry, multibeam echo sounder (MBES) systems provide backscatter data in which regions of different acoustic properties are distinguishable. These regions can often be correlated to different bottom types. Initial attempts to extract equivalent data from the ALB waveforms have confirmed the expectation that such information is encoded in those waveforms.

Water clarity, bathymetry, and bottom type control the detailed shapes of ALB waveforms in different ways. Specific features of a bottom-reflected signal can be identified, for example its rise-time and amplitude, and used for clustering and classifying the individual data points.

Two data sets from Lake Tahoe are available for comparison: ALB data from the SHOALS (scanning hydrographic operational airborne lidar survey) system of the US Army Corps of Engineers, and Simrad EM1000 MBES data from the USGS. Feature extraction, clustering, and classification of the SHOALS data reveals changes in the optical bottom reflectance characteristics that are echoed in the acoustic bottom backscatter properties.

URL: http://www.ccom.unh.edu/

OS61A-0198 0830h POSTER

Wave-Current Ripple Geometry and Mobile Layer Depths on Sable Island Bank.

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Observations of the temporal evolution of seafloor ripples are analyzed in terms of geometric properties, migration rate, and hydrodynamic forcing. Observations were collected during five experiments on Sable Island Bank using rotary acoustic sonars, acoustic backscatter sensors and current meters. The bed consisted of medium to coarse sand in water depths of 18 to 40 m. Mobile layer depths, estimated from changes in bed elevation and bedform height, increased linearly with peak significant wave height. Wave and wave-current ripples formed in response to swell, storms and semi-diurnal tides. Ripple height and wavelength compared favorably to previous field observations, and except in one case, ripple direction was approximately parallel to wave direction. Ripple types were classified according to current and wave Shields parameter in a similar manner to Amos et al.(1988).

OS61A-0199 0830h POSTER

Multi-year and Hurricane-induced Sediment Activity on the Scotian Shelf

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Detailed multi-instrument surveys by both Defence Research & Development Canada Atlantic (National Defence) and the Geological Survey of Canada (Atlantic) have been performed over the past several years at a site in 70 m water depth on the Scotian Shelf near Sable Island. The resulting data set is comprehensive, including high-resolution seismic, sidescan and multibeam bathymetric sonar surveys, as well as acoustic propagation, reverberation and bottom loss measurements. These are supported by sediment samples, bottom photographs, and oceanographic data. This area is of interest to both research groups for several reasons, for example as a control site for acoustic propagation studies and for the assessment of engineering hazards affecting offshore petroleum development.

The repeat sidescan sonar surveys reveal a diverse range of bedform types in the area (sand ridges, ribbons, megaripples, wave-formed ripples) that show long-term trends in morphology, and also of particular interest, changes associated with Hurricane Michael in October 2000. The seismic surveys and sediment samples provide context and ground truth for the sidescan and bathymetry data. After applying a novel motion-cleaning technique to the high-resolution bathymetry data, vertical scales of features down to decimeter-size have also been determined. The combined picture confirms a dynamic sediment environment and the serial nature of the data set gives insight into the thresholds for sediment activity events.

OS61A-0200 0830h POSTER

Chenier Plain Coast, Louisiana: Seasonal to Decadal-Scale Shoreline Evolution and Response to Episodic Storm Events

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Multiple aerial photographic surveys conducted above the chenier plain coast, Louisiana, between 1987 and 2001 reveal rapid morphologic evolution along this mud-dominated shoreline west of the Atchafalaya River. Mudflat progradation is apparent on subseasonal time scales, as sediment derived from the Atchafalaya River plume and shallow inner shelf accretes on to the coast. Much of this accreted sediment is subsequently transported to the west by prevailing longshore currents. On a decadal scale, erosion dominates the central and eastern chenier plain, with the exception of a 13-km strip of shoreline where pronounced accretion has formed an increasingly stable mudflat, the result of both natural processes and reworking of dredged sediment. Aerial still photography, aerial video surveys, synoptic weather-type classifications, and the historical hurricane record have been employed to generate an overview of the chenier plains response to episodic storm events.

Chenier plain accretion is shown to correlate with storm activity during winter cold fronts, associated with southerly winds that force resuspension and onshore transport of sediment. It is estimated that annual onshore mud deposition on the eastern chenier plain is equivalent to approximately 8 to 16% of the mass of sediment leaving Atchafalaya Bay each year. This study provides additional insight into the recently recognized phenomenon of fine-grained sediment deposition under highly energetic conditions. Abundant suspended sediment near shore leads to rapid attenuation of wave energy, encouraging deposition, in stark contrast to erosion of sandy beaches under similar conditions. These results attest to the ability of cold front storms, hurricanes, and tropical storms to cause aggradation, progradation, and increased lateral continuity of mudflats in the presence of abundant fine-grained sediment. Such powerful storms have not previously been appropriately recognized as such potentially important agents of coastal accretion.

OS61A-0201 0830h POSTER

Tsunami Hazard Maps of Alaska Communities

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The Geophysical Institute of the University of Alaska Fairbanks and the Alaska Division of Geological and Geophysical Surveys participate in the National Tsunami Hazard Mitigation Program by evaluating and mapping potential inundation of selected coastal communities in Alaska. The communities are selected in coordination with the Alaska Division of Emergency Services on the basis of location, infrastructure, availability of bathymetric and topographic data, and willingness for a community to use the results for hazard mitigation. We work in cooperation with the NOAA/PMEL Center for Tsunami Inundation Mapping Efforts, which assists in developing bathymetric and topographic data grids for the area of interest. Three communities in the vicinity of Kodiak were the first for which we produced inundation maps. The work is under way for Homer, Seldovia, and possibly other communities along Kachemak Bay.

We use numerical modeling as a primary research tool to study tsunami waves generated by earthquake sources. We consider several hypothetical tsunami scenarios with a potential to generate tsunami waves that can affect the coastal communities. The nonlinear shallow-water wave equations are solved with a finite-difference method. We use embedded grids that increase in resolution from the source area to the target community. State and local emergency planners will use results of the numerical modeling combined with historical observations to develop evacuation plans and to educate the public for reducing risk from future tsunamis.

OS61A-0202 0830h POSTER

Using radium isotopes to estimate cross-shelf mixing rates: Spatial and temporal variability of radium isotopes in the surf zone and coastal ocean

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Evaluating the impact and fate of surface water runoff and associated contaminants requires knowledge of the rates of mixing and transport in the coastal zone. The distribution of naturally-occurring radium isotopes is being explored as a tracer to evaluate these rates. Two types of sampling have been utilized to study these processes: shore-based sampling in the surf zone and offshore sampling on transects from 0.5 to 15 km from the coast.

Shoreline samples were collected every other hour for 10-12 hours at several locations between Huntington Beach and Santa Monica, California, during a range of seasons and tidal amplitudes. The ^{223}Ra and ^{224}Ra concentrations are related to the tides, with higher concentrations during low tide and lower concentrations at high tide. However, the ^{223}Ra/^{223}Ra ratio remains relatively constant. This indicates that the two isotopes co-vary and probably have a coherent source. As the tidal range while sampling increased, the average isotope concentration decreased, apparently reflecting increased offshore mixing rates.

Six offshore transects have been obtained in the Huntington Beach area. Vertical profiles indicate that in most cases, the short-lived radium isotopes are primarily confined to the mixed layer. Results show that on the time scale of a few days, the system appears to be in steady state. During spring, higher concentrations in offshore surface waters were observed. This difference appears to result from confinement of the radium input to a shallower mixed layer, because integrated isotope inventories are remarkably consistent and suggest that the input does not vary greatly with time. Fits to a one-dimensional exponential function indicate that the two short-lived isotopes have quite similar horizontal scale distances. This is unexpected because a 1-D diffusion-reaction formulation predicts that scale distances should differ by a factor of 1.6. In contrast to the Huntington Beach region, three transects at Hermosa Beach indicate considerable temporal variability. Analyses of ^{228}Ra are underway to provide further constraints on mixing.

OS61A-0203 0830h POSTER

Turbulence Closures for Estuarine Mixing: Implementation and Applications of a Generic Length Scale Method in the 3D Oceanographic Model ROMS

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Numerical oceanographic models require parameterization of subgrid scale turbulence mixing - referred to as turbulence closures. Recently, Umlauf and Burchard (submitted 2002) introduced a Generic Length Scale (GLS) method that provides a canonical form to represent several popular two-equation closures such as Mellor and Yamada Level 2.5 (KKL), k-epsilon (KE), k-omega (KW88), and a new generic closure (GC) proposed by Umlauf and Burchard (2002). This GLS method and stability functions of Galperin, Kantha and Clayson, and Canuto have been implemented in the Regional Ocean Modeling System, a full-featured community three-dimensional primitive equation oceanographic model (ROMS v2.0, http://marine.rutgers.edu/po/index.php). ROMS also contains turbulence closures based on the original Mellor Yamada Level 2.5 method (MY25), the KPP scheme, or a user-defined analytical expression. Oceanographic modelers now have the flexibility to test and compare

several types of turbulence closures in one 3D numerical model.

We performed numerical experiments with the original MY25 method and the GLS method implemented as KKL, KE, KW88, and the new proposed closure GC. Three idealized cases were simulated: steady uniform open channel flow, surface-stress induced mixed-layer deepening, and estuarine circulation. Results highlight differences and similarities among the closure methods. Significant differences arise because of the pragmatic requirement to place minimum and/or maximum bounds on turbulent length scales and turbulent kinetic energy. For the first test case the KE, KW88, and GC methods produce similar results, with the KW88 closure agreeing most closely with the analytical solution. The KKL (and MY25) results agree least with the analytical solution, largely because they require an additional parameterization of a wall proximity function. Larger differences were found in the mixed-layer deepening and the estuary test cases because of the limitation imposed on the turbulent length scale and the selection of the buoyancy parameter. For the GLS method the length scale limitation is imposed on all aspects of the solution for turbulent kinetic energy and for the prognostic variable of the second equation. However, for the MY25 method, the length scale is only limited in the stability function and eddy viscosity calculations, not in the wall proximity or dissipation. Thus, results from GLS set to KKL will differ from results using the original formulation of the MY25 closure. Comparison of results from the MY25 method to results from GLS as KKL demonstrate enhanced entrainment rates (up to 30 %) for the mixed-layer deepening case and an estuarine turbidity maximum displaced by up to 20 km. Additional differences will be presented from results with the KE, KW88, and GC closures.

URL: http://woodshole.er.usgs.gov/project-pages/sediment-transport/

OS61A-0204 0830h POSTER

Modern Estuarine Sedimentation in Suisun Bay, California

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Suisun Bay is the northeasternmost part of San Francisco Bay (California), the largest estuary on the Pacific Coast of the United States. Suisun Bays geographic and morphologic position are unique in that it occupies the head of the estuary and is subject to the maximum freshwater inflow and sediment input of the Sacramento-San Joaquin Rivers, whose drainage basin covers 40% of the land area of California. Suisun Bay consists of two smaller subembayments, Grizzly and Honker Bays. Gravity cores obtained in 1990-1991 and 1999 were analyzed to delineate depositional environments and sedimentation patterns in Suisun Bay. Major depositional environments include: tidal channel (subtidal), tidal channel banks (subtidal), tidal flat (intertidal to subtidal), and bay mouth (subtidal).

The tidal channel environment includes both large and small channels in Suisun Bay as well as the tidal sloughs Suisun and Montezuma Sloughs. The coarsest sediment, usually sand or muddy sand, characterize this environment and water depths range from 2 to 11 m. Thin (1-2 mm) and discontinuous silt and clay laminae are common. Suisun and Montezuma Sloughs are the exception to this pattern in that they consist of massive, intensely bioturbated muds. Tidal channel banks (both "cut" and "accretionary" channel margins), particularly accretionary banks, are characterized by low-to-moderate bioturbation and sandy mud to muddy sand lithology. Typically alternating sand and mud beds (1-6 cm thick) are present; both types of beds consist of 1mm to 1cm thick subhorizontal to inclined laminae. Laminae composed of organic detritus are also present. Where this environment is transitional with the tidal flat environment water depths range from 2-8 m. Tidal flat environments include the "sand" shoals present on bathymetry charts, and are typically a bioturbated muddy sand to sandy mud. Sand and mud beds, 1-3 cm thick, are often characterized by very fine 1-2 mm thick silt and mud laminae. Water depths range from 2 to 4.5 m where these laminated tidal flat sediments occur. Bay mouth environments occur only in the distal portions of Grizzly and Honker Bays, subembayments of Suisun Bay proper. This environment is transitional with both tidal channel bank and tidal flat environments and shares characteristics with each. Massive to interbedded mud is the most common lithology, although sandy mud to muddy sand also occurs. Centimeters thick sand and mud beds typically alternate vertically. Bioturbation is low to moderate. Water depths over this environment range from 2 to 3 m.

Depositional environments present in Suisun Bay are the result of a full range of tidal and fluvial processes as shown by the lithologies and alternating sediment stratigraphic patterns observed in cores. Very thin beds and intense bioturbation evidence intervals of very slow to negligible sedimentation. Rapid deposition and/or resuspension are evidenced by thick sediment intervals and by laminae that are continuous and apparently unbioturbated. Very fine scale sedimentation that may represent individual ebb and flood events as well as longer term seasonal sedimentation patterns are also present. An additional observation is that almost a quarter of the gravity cores reveal that modern estuarine deposits overlie an erosional surface that separate them from an organic-rich mud. This organic-rich mud, in one core to date, has been radiocarbon dated at roughly 4500 yrs. B.P. (J.Chin and K. Orzech, 2002, unpublished data). The organic-rich mud is interpreted as a tidal marsh deposit that pre-dates the present tidal marshes occurring in Suisun Bay.

OS61A-0205 0830h POSTER

The effects of wind-driven resuspension events on the flux of metals across the sediment-water interface in a shallow estuarine environment, Lake Pontchartrain, LA

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Lake Pontchartrain is a shallow estuary ($\sim$ 3.7 m average depth), which undergoes frequent storm and wind events. These events provide the energy necessary to resuspend the near-surface sediment, allowing metals in the dissolved and particulate phases to enter the water column.

In this study a suite of redox sensitive elements (Fe, Mn, Mo, U, V, Cr) were measured in porewaters, on a monthly basis, to determine the effects of mixing on the porewater chemistry of the surface sediment (down to 20 cm depth). Porewater concentrations of Mn, Mo, U, V, and Cr were affected by resuspension events, however Fe did not show any major changes in its concentration over time. This is most likely due to Lake Pontchartrain being a Mn-dominated system where Fe reduction does not occur at the depths affected by resuspension. Porewater Mn concentrations were greatest in May and June possibly due to a short period of quiescence prior to sampling allowing a build-up of reduced Mn in the porewaters. Soluble U concentrations were also greatest in May reflecting an association with Mn oxides. Mo showed a similar trend. Porewater Cr and V concentrations were highest in June and August suggesting that processes other than Mn cycling contribute to the control of V and Cr geochemistry.

Previous studies have suggested that the seasonality of wind and storm events promote a similar seasonality in the resuspension and mixing of sediment at depth. The frequency and intensity of storm events increases in the fall and winter months. However, the porewater metals data did not suggest that there were any seasonal trends in the flux of dissolved metals across the sediment-water interface. The data suggested that there is sufficient energy in the smaller events to alter the surface-sediment chemistry that large winter storms are not needed.

A fully instrumented weather station was constructed at our field site in the western portion of Lake Pontchartrain (30 18.800 N, 90 16.831 W). Using the measurements from the platform combined with short-lived radioisotope data, a resuspension model was created that describes the influences of wind speed and direction on depth of resuspension. This model also suggests that the resuspension events affecting the porewater chemistry are less seasonal and more stochastic.

OS61A-0206 0830h POSTER

Characterization of Sediment Properties in the Northeastern Gulf of Mexico Using the Acoustic Sediment Classifier System (ASCS)

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The processing of normal incident acoustic data was carried out to determine sediment properties (acoustic impedance, sound velocity, attenuation, bulk density, porosity, shear strength, and grain size) in the northeastern Gulf of Mexico in 2000. The acoustic data was acquired using a 15 kHz normal incident echo sounder for approximately 2000 km of track line. The calibration factor for echo strength was determined by the comparison of acoustic data and data from five core samples (ground truth data). This echo strength calibration was used for the entire data set. Comparison of ground truth and echo strength to data from 20 additional core locations shows close agreement. Discrepancies are probably due to navigation errors or weak returns in deeper water. Using sediment prediction, four sediment provinces of the study area are defined as the following facies: sandy clay (impedance, 1.6-2.0 10^6 kg/m^2 sec), sand-silt-clay and/or clayey sand (impedance, 2.01-2.40 10^6 kg/m^2 sec), fine sand (impedance, 2.41-2.90 10^6 kg/m^{2}sec), medium/coarse sand (impedance, 2.91-4.0 10^6 kg/m^2 sec). The areal distributions of the four facies coincide with the previous reports based on sediment sampling. Therefore, the acoustic technique can effectively be used to define and classify sediments and map sediment provinces.

OS61A-0207 0830h POSTER

Partitioning of Metals Throughout a Winter Storm-Generated Fluid Mud Event, Atchafalaya Shelf, Louisiana

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Particulate and dissolved phases of a suite of metals and radionuclides were analyzed in fluid mud samples collected during a time series. This time series was taken during the passage of a winter storm on the Atchafalaya Shelf off the coast of Louisiana. The shelf receives an estimated 30% of the flow of the Mississippi River from its distributary, the Atchafalaya River. This input contributes a high sediment load to the shelf. Frequent winter storms provide shear stress to resuspend sediments and form fluid mud. Samples of fluid mud and overlying water were collected every two hours for 56 hours. Meteorological data as well as turbidity measurements by OBS were collected throughout the study. Bottom sediments were also collected before and after the time series. Partitioning effects were investigated on Be7, Th234, and Pb210 by gamma spectroscopy. These effects were also studied on several redox-sensitive metals, including Fe, Mn, Mo, Te, Re, U, Al, Ti, and V by ICP-MS analysis. Preliminary results indicate a rapid establishment of reducing conditions in fluid mud immediately overlying the seabed. These conditions persist until the suspended sediments in the fluid mud settle, and the fluid mud dissipates. The recurrence of storm front passages and their subsequent fluid mud formation cause repeated cycling from oxic to suboxic conditions in these coastal bottom waters. This redox cycling could potentially alter the fates of redox-sensitive metals, especially those associated with metal oxide carrier phases.

OS61A-0208 0830h POSTER

The Utility of High-Resolution Digital Elevation Models in Geomorphic Analyses of Periglacial Coasts

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Modern surveying technologies, such as LIDAR, bathymetric LIDAR and multi-beam SONAR, when combined together provide an unprecedented opportunity to study the nearshore geomorphology of periglacial coastlines. At Possession Point, Puget Sound, the three technologies can be combined along a 5-km stretch of coastline such that the entire landscape has been captured in high resolution detail—from the forested bluffs 100-m or more above the beach, across the narrow and steep tidal bench and out into Possession Sound at more than 200-m deep. Details visible in the combined terrain model range from individual lag stones (boulders) to large landslides. The mixed-gravel tidal bench displays bars and troughs, berms, and cusps, while the deeper-water bathymetry shows

an interesting set of depositional fans and distributary channels marked with dune and ripple fields. In some cases there is a clear connection between the on-shore erosional and the off-shore depositional morphology, in other cases the connection is not clear, suggesting either relict topography or an unidentified transport process. The important point is that this combined bathymetric and topographic view of the coastal zone greatly enhances our ability to examine and speculate about nearshore processes in periglacial environments.

OS61A-0209 0830h POSTER

Filling of a Salt-withdrawal Minibasin on the Continental Slope by Turbidity Currents: Futher Research and Results

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We illustrate further research results on the transport and deposition of sediment by turbidity currents in an experimental basin, designed to model salt-withdrawal minibasins found along the northern continental slope of the Gulf of Mexico. The experiment was performed in 2001 in the subsiding EXperimental EarthScape facility (XES) at St. Anthony Falls Laboratory, University of Minnesota. The run consisted of two stages that each contained the same sequence of events, which were of three different variations (1.85-minute pulses of 1.5 liters/s discharges, 3.8-minute pulses of 4.5 liters/s discharges, or 36 minute events of 1.5 liters/s discharges). The sediment comprised three grades of silica with nominal diameters of 20 microns (45%), 45 microns (40%) and 110 microns (15%) and all flows had a volume concentration of sediment of 5%. The only difference between stage I and II was that no subsidence occurred during stage II, and that the 110 micron sand was removed from the flows late in stage II to study the effects of a smaller mean flow-grainsize.

Research since the run has focused on the correction of high-frequency sonar data taken during the run, digital photography taken of dried deposit stratigraphy and grainsize data also taken at various locations in the dried deposit. The sonar data is utilized in the creation of post-event topographies and isopach maps to illustrate what the controls on erosion, deposition, flow path, deposit thickness and even the channelization of early flow events are. Comparisons of the stratigraphy and the grainsize data with the conclusions from the sonar data are made, as sonar is also constructed in a manner that exhibits synthetic or predicted stratigraphy (before compaction). Finally the stratigraphy is structurally described in the proximal, medial, and distal segments of the deposit and comparisons to the field are made.

OS61A-0210 0830h POSTER

Evolution of Sandy Beach Profiles Under Waves

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A quantitative theory is described for the evolution of a sandy seabed under surface water waves. By assuming the slopes of the waves and seabed are comparably gentle, an approximate evolution equation is found for the seabed elevation. The effects of bed load, suspended load and mean beach slope are considered. The wave field and boundary layer structure are calculated. In addition to the effects of bed load previously studied, contributions by suspended load are now taken into account. It is found that the suspended load adds a new forcing mechanism, which includes various correlations between the oscillatory flow and suspended sediment concentration. When the seabed is composed of fine sediment grains, suspended load has a significant effect on sand bar shape, height and crest position. When wave reflection is significant, bars and waves interact through the Bragg scattering mechanism. The dependence of bar morphology on sediment grain size and other parameters will be examined. Comparison with laboratory experiments will be discussed. When reflection is negligible, sand bars do not form and our theory predicts the long-scale evolution of the seabed profile.

OS61B MCC: Hall D Saturday 0830h

Scientific Advances From Stable Offshore Platforms Posters

Presiding: **K Hardy,** Scripps Institution of Oceanography**; R Pinkel,** Scripps Institution of Oceanography**; F Spiess,** Scripps Institution of Oceanography**; F Fisher,** Scripps Institution of Oceanography

OS61B-0211 0830h INVITED POSTER

Spar Buoy Laboratories - Origins and Early Realizations

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At least as early as the 1950's there was a realization in the ocean research community of a need for stable platforms that could remain on station in the deep ocean for protracted periods. The 1959 report (Oceanography 1960-1970) of the NAS/NRC Committee on Oceanography includes the recommendation that a manned spar buoy laboratory should be among the new types of research platforms that should be built. By the late 1960s there were at least four craft of this type in operation: Cousteau's Bouee-Laboratoire, US Naval Ordnance Laboratory's SPAR, General Motors Defense Laboratory's POP, and the Marine Physical Laboratory's FLIP. All of these achieved their stability by using relatively deep draft spar buoy configurations. They differed, however, in their design philosophies and thus in their overall dimensions, general configurations, ultimate uses and longevity. Flip has had the longest life of any of the four, for a variety of reasons, but primarily due to its versatility, as attested to in other papers in this session. This paper will discuss the origins, design considerations and careers of these and other similar craft.

OS61B-0212 0830h INVITED POSTER

Challenges in Measuring Air-Sea Interaction: Platforms and Sensors

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Air-sea fluxes of heat, mass (gas and aerosols), momentum and energy are important in constraining the role of the oceans in weather, climate and the major biogeochemical cycles. However, the direct measurement of these fluxes is very difficult, especially in the energetic environment of the air-sea interface during high wind and wave events. The fact that the important fluxes typically scale as some significant power of the wind speed means that very short periods of high winds can contribute as much to the fluxes as very long periods of low winds. While remote sensing of air-sea fluxes has developed significantly over the last two decades, it is still the case that remote sensing algorithms are only reliable in the parameter ranges for which there is good "ground truth". It is especially in the high wind-speed regimes that the algorithms need to be carefully tested against in situ measurements.

The development of platforms and instruments that can withstand the rigors of operating successfully in this environment is an important component of air-sea interaction research. No one platform is universally useful in providing a base for the measurements, and the judicious use of a variety of techniques is required to address the issues of both spatial and temporal coverage in a range of environments. While the development of small autonomous platforms has been very successful, they are not yet at the stage where their computational capabilities and communication bandwidths are sufficient to fully exploit the data that can be collected. In many cases, manned platforms are required, especially during the early stages of the development of new techniques when data acquisition and analysis are exploratory rather than operational. This is particularly the case for modern imaging techniques that generate large amounts of data.

In this paper I will discuss these issues, presenting past efforts and potential future work in the use of platforms and sensors for the measurement of air-sea fluxes.

OS61B-0213 0830h INVITED POSTER

Air-Sea Interaction Measurements from R/P FLIP

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Soon after its inception, R/P FLIP was used to study the interaction of the atmosphere and ocean due to its unique stability and low flow distortion. A number of campaigns have been conducted to measure the surface fluxes of heat, water vapor and horizontal momentum of the wind with instrumentation as used over land, supported by the Office of Naval Research and the National Science Foundation. The size of FLIP allows for simultaneous ocean wave and mixed-layer measurements as well. Air-sea interaction was a prime component of BOMEX in 1968, where FLIP transited the Panama Canal. The methods used were similar to the over-land Kansas experiment of AFCRL in 1968. BOMEX was followed by many experiments in the north Pacific off San Diego, northern California, and Hawaii. Diverse results from FLIP include identification of the mechanism that causes erroneous fluctuating temperature measurements in the salt-aerosol-laden marine atmosphere, the role of humidity on optical refractive index fluctuations, and identification of Miles' critical layer in the air flow over waves.

OS61B-0214 0830h POSTER

Air-Sea Interaction and Remote Sensing Experiments Using R/P FLIP

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Although the Research Platform FLIP was originally designed for sonar studies, its unique characteristics have made it an ideal platform for experiments using remote sensing techniques to study air-sea interaction. The combination of stability and access to the air-sea interface provides the capability to make a variety of remote sensing measurements simultaneously with direct measurements of the relevant atmospheric and oceanic parameters. When FLIP is freely drifting, the hull rotates so that it is in the same orientation relative to the wind. Judicious use of the variety of booms available for instrument mounting makes it possible to view the sea surface without platform interference. This ability to make continuous measurements regardless of changes in wind direction is a major advantage of FLIP over fixed platforms. A survey of remote sensing measurements made from FLIP will be presented, including a variety of active microwave sensors (radars and scatterometers), passive microwave sensors (radiometers), infrared sensors (radiometers and imagers), and visible sensors (video cameras).

OS61B-0215 0830h POSTER

Observations of Langmuir Circulation From FLIP

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Langmuir circulation has significance across the marine disciplines. Enhanced deepening and inhibited re-stratification can alter the surface temperature and hence net air-sea exchanges. Organization of bubbles into windrows introduces dramatic sound speed variability and also affects air/sea gas fluxes. Organization of seaweed and plankton affects marine life, including pelagic fisheries. Finally, dispersal by Langmuir circulation is a major component in models for oil-spill tracking and for search-and-rescue operations. To get an adequate picture of the forcing and response of Langmuir circulation (and the wind-mixed layer in general), the observations needed include windstress, directional waves, wave breaking, heat and moisture fluxes, stratification (temperature and salinity profiles), velocity profiles across the mixed layer and thermocline, spacing and orientation of windrows, and a measure of the strength of the circulation (e.g., surface rms velocities). These measurements span both the air/sea interface and the thermocline, and must be maintained continuously for many days to span storms and daily, tidal, and inertial cycles. In addition, the total power requirements exceed that comfortably supplied by batteries or local generation by wind or solar energy. It appears that FLIP is uniquely qualified as a platform from which the required range of measurements may all be made. Findings concerning the evolution and dynamics of Langmuir circulation that were facilitated by FLIP are reviewed and summarized, with emphasis on observations from 1990, 1995, and 2002.