OS72A-0350 1330h POSTER

Effects of Fine-Scale Wind Direction Information on Retrieval of Surface Layer Wind Speed From SAR Ocean Surface Imagery

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Wind speed retrievals from C-band SAR sea surface imagery using algorithms such as CMOD4 or CMOD_IFR2 depend significantly on the assumed local surface wind direction. To evaluate this dependence, we present retrievals of surface wind speed from RADARSAT SAR images acquired during the Shoaling Waves Experiment (SHOWEX) off the coast of North Carolina in November and December 1999, and retrievals from ScanSAR scenes acquired over the Tropical Atmosphere Ocean Project (TAO) 95 W buoys during April and May 2000. These cases include moderate and low wind regimes and stable and unstable boundary layer stratification. A few images contain the signature of boundary layer roll vortices.

SAR backscatter images can provide wind speed retrievals of ∼300m resolution or better, as compared with a typical 25-km scatterometer footprint. SAR wind retrievals typically rely on wind-direction input from relatively coarse numerical models or from a buoy point source. When present, the signature of roll vortices in an image is often used to assign wind direction. Even so, the SAR wind speed images often show wind variability over regions much smaller than typical scatterometer footprints. The question remains: How much of this apparent variability is due to spatial changes in wind direction rather than wind speed?

For the SHOWEX cases we coordinated 50km LongEZ flight legs at ∼20m above the sea surface with the SAR overpasses. These surface layer flights provide km-scale wind-direction input for the CMOD4 algorithm. The fine-scale wind-speed and flux measurements also provide 10m wind-speed estimates to compare with the retrieved wind speeds. We present our evaluation of SAR wind retrievals obtained from applying the various wind-direction inputs. We also show the sensitivity of winds retrieved over the TAO array when nearly coincident QuikSCAT scatterometer wind directions are applied instead of point-source winds from TAO buoys.

OS72A-0351 1330h POSTER

Near Real-Time High Resolution Ocean Wind Vectors from QuikSCAT

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The NESDIS of NOAA processes and distributes near real-time global ocean surface wind fields with a 25km resolution, from QuikSCAT scatterometer measurements, since July 1999. The standard wind product is derived from scatterometer backscatter measurements that are actually higher in resolution. This led to the development of a high resolution QuikSCAT wind product. The high resolution product provides wind estimates in 12.5 km by 12.5 km wind vector cells (WVC). Processed with the standard QuikSCAT algorithms the resultant ocean wind field appears noisier than the standard product.

To improve resultant high resolution wind field we defined 'solution probability threshold' (SPT) parameter, which is a function of solution likelihood estimator, mean wind speed, number of solution and across swath position of a given WVC. The average values for this parameter were obtained using four months of collocated high resolution QuikSCAT wind vectors and NCEP global data assimilation systems wind field. This parameter is then used in a baseline processing to allow all solutions acceding predefined threshold to influence initialization of ambiguity removal procedure. This filtering of noisy data based on retrieval error estimates before median filtering significantly improved wind direction accuracy.

Due to measurement sampling geometry high resolution product has a tendency of producing wind vectors that are less influenced by rain. To account for this feature we modified rain flagging algorithm by combining multidimensional histogram rain flag and solution probability threshold. This significantly reduced number of WVC that were faultily flagged as rainy.

OS72A-0352 1330h POSTER

A High-Resolution Surface Vector Wind Product for Coastal Oceans: Blending Satellite Scatterometer Measurements with Regional Mesoscale Atmospheric Model Simulations

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A 2-dimensional variational method is used to blend the satellite scatterometer measured (QuikSCAT) and regional mesoscale atmospheric model simulated (COAMPS) surface vector winds for coastal central California. The approach is distinct from existing methods in that it considers errors from both measurements and models. When compared with independent in situ observations, the blended wind product shows consistently higher correlation and smaller RMS errors than QuikSCAT or COAMPS winds. The proposed blending algorithm can be implemented over any part of the world ocean. It should be a valuable tool for describing small-scale atmospheric processes in the coastal zones and for forcing high-resolution coastal ocean models.

OS72A-0353 1330h POSTER

A Global Comparison of Ekman Pumping From Satellite Scatterometers and Ocean Data Assimilation Estimates

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Ekman pumping, a form of wind-driven upwelling, plays important roles in upper-ocean dynamics, thermodynamics, and biology as well as in boundary-layer meteorology. Inverse models, such as those of ECCO (Estimation of the Circulation and Climate of the Ocean, http://www.ecco-group.org/), estimate wind forcing through ocean data assimilation. Scatterometer data provide a stringent test of the skill of the assimilation in estimating wind. Ekman pumping obtained from various scatterometers are compared with those derived from ECCO models which assimilate TOPEX-derived sea level anomalies using the adjoint and Kalman filter/smoother methods. Differences in Ekman pumping between scatterometer and assimilation estimates are quantified in terms of the mean, standard deviation, and correlation. Changes in the Ekman pumping due to the assimilation are analyzed to identify the spectral (frequency-wavelength) space over which the assimilation has a significant impact. The comparison also highlights aspects where the ECCO model and assimilation schemes need improvement.

OS72A-0354 1330h POSTER

Drift of Floating Debris in the South Pacific Ocean: Application to the Seaweeds Drift in French Polynesia.

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The objective of this study is to determine trajectories of floating debris in the South Pacific Ocean and in particular to study seaweed drift in French Polynesia.

Surface currents are considered to be the sum of the geostrophic and the Ekman components determined from altimetric data of Topex-Poseidon and from wind provided by ERS scatterometer. Data are available on a one degree grid every five days from January 1993 to January 2001. As expected, large variabilities of currents are due to the El Nio event of 1997-1998. Trajectories of floating debris in the South Pacific Ocean are determined by solving the lagrangian equations that give the position of the floating debris every 5 days. First calculations are carried out at the scale of the South Pacific Ocean from 1993 to 2001. Results show that debris follow the main surface currents such as the South Pacific Current, the Perou Current or the South Equatorial Current and the East Australian Current. Whatever the starting point of the debris, the debris after a long period of drift accumulate in the center of the Subtropical gyre at about 110 W and 27 S.

One application of our drifting model is the determination of trajectories of seaweeds that are detached from the reefs. The objective is to understand how two brown seaweed, Turbinaria ornata, came to populate the Tuamotu archipelago during the last two decades. This seaweed is found on high volcanic islands (Gambier, Society, Austral and Marquesas islands) while it is absent from the low carbonate islands (Tuamotu atolls). Several simulations have been performed over periods of 3 months supposed to be the seaweed life period in open ocean. The 3 month periods are chosen according to the seasonal variation (dry and wet season) and according to the El Nio and La Nia events. Our results show that at any season seaweeds departing from Marquesas islands can reach the Tuamotu atolls. Seaweeds reach the southernmost part of the Tuamotu atolls if they depart from Gambier islands during El Nio and La Nia.

OS72B MCC: Hall D Sunday 1330h

Scientific Results From Coastal Ocean Observing Systems II Posters *(joint with B)*

Presiding: **C N Mooers,** University of Miami**; M Kosro,** College of Oceanic and Atmospheric Sciences

OS72B-0355 1330h POSTER

Analysis of Acoustic Signals from Shipping Traffic at Pioneer Seamount

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In September of 2001 a cabled vertical linear array (VLA) of hydrophones was deployed on Pioneer Seamount, 90 km off the California coast near Half Moon Bay, by the NOAA-PMEL and University of Washington-APL. The array of 4 hydrophones is at a depth of 950 m, and the four signals are digitized at the shore end of the cable at 1000 Hz. The data are archived by PMEL, and are available to the public over the internet. Spectrograms of all of the data are accessible on the SFSU web site.

A prominent feature of the spectrograms is the acoustic signal of a passing ship. Some striking interference effects are seen in these spectrograms which provide a means of estimating the distance to the sound source. Even signals from single hydrophones show the effect of interference between direct sound waves and those reflected from the bottom.

The analysis of these interference effects will be discussed, and measurements of ship speed and course will be presented.

URL: http://www.physics.sfsu.edu/~seamount

OS72B-0356 1330h POSTER

Blue-Whale Calls Detected at the Pioneer Seamount Underwater Observatory

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Mellinger, David K., and Christopher W. Clark [2000], "Recognizing transient low-frequency whale sounds by spectrogram correlation," J. Acoust. Soc. Am. 107 (3518). Stafford, Kathleen M., Christopher G. Fox, and Davis S. Clark [1998], "Long-range acoustic detection and localization of blue whale calls in the northeast Pacific Ocean," J. Acoust. Soc. Am. 104 (3616).

URL: http://www.physics.sfsu.edu/~seamount

OS72B-0357 1330h POSTER

Iron in the MBARI Monterey Bay Time Series

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MBARI has maintained a time series at three stations in the Monterey Bay region of the California Current System since 1988. The stations are visited by ship at approximately three-week intervals and moorings are maintained at two of the stations. A broad suite of biogeochemical measurements are made. Dissolved and dissolvable iron have been measured in this coastal observing system over nearly four annual cycles (44 months; ~21 day resolution) at these stations. A large pulse of dissolvable iron consistently occurs during the first spring upwelling event of each year that is derived from resuspended sediment. Iron concentrations then drop rapidly at all three stations. The most offshore station (45 km offshore) appears to be iron limited for most of the summer and fall. The station at the mouth of the bay (20 km), however, receives episodical inputs of iron and nitrate during the summer months from the advection of upwelled water originating along the broad shelf north of the bay. South of Monterey Bay, where the shelf is much narrower, these upwelling events bring only nitrate to the surface. The most inshore station (5 km) maintains relatively high iron concentrations due to sources from runoff and the resuspension of shallow sediments, in addition to coastal upwelling. Here iron remains in excess of nitrate even during the summer months. The result is high productivity at the nearshore station and at the station at the mouth of the bay and much lower productivity offshore and to the south of the bay. In all but the nearshore station, the degree of productivity appears to be controlled by the supply (or lack) of iron.

In addition, there is often a significant pulse of iron observed during winter. However, the biogeochemical response during these events is weak. This suggests that the system may be limited by physical parameters such as light limitation due to strong vertical mixing and short day length during these times.

On average, dissolved iron (0.45 μm) accounts for only 5-10% of the dissolvable (pH3, 1 minute) iron at the two most inshore, productive stations. Offshore, however, dissolved iron is 50-100% of the dissolvable iron. This supports the notion of a sedimentary source that is rapidly removed from the system, preventing high concentrations of iron offshore.

OS72B-0358 1330h POSTER

Coastal Ocean Research and Monitoring Program at the University of North Carolina at Wilmington

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The Coastal Ocean Research and Monitoring Program (CORMP) is a research program and observing system in the coastal ocean off the Carolinas. The program is funded by NOAA to provide an interdisciplinary science-based framework that supports sound public policy, wise coastal use, sustainable fisheries and improved coastal ocean ecosystem health. Core variables of CORMP's monitoring efforts include: physical processes (meteorological and oceanographic), ocean color, water quality (e.g., nutrients, turbidity), irradiation, sediment types, benthic ecology and larval fish distribution. The program's observing system consists of monthly coordinated (multi-disciplinary) surface-based and underwater sampling transects, and a series of long-term moorings in Onslow Bay and Long Bay off North and South Carolina.

URL: http://www.uncwil.edu/cmsr/comp

OS72B-0359 1330h POSTER

A Loop Current Intrusion Case Study on the West Florida Shelf

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The Gulf of Mexico Loop Current intruded upon the West Florida Continental Shelf in June 2000. In-situ currents and hydrography along with satellite temperature and altimetry measurements are used to describe this event and its effects on the shelf. A strong southward current is observed to flow along the shelf slope seaward of the intruded water boundary. This current transported cold, nutrient rich water from the north, thereby producing anomalous hydrographic features near the shelf-break (80m isobath). An array of moored velocity profilers reveals that the currents landward of the intruded water are independent of the Loop Current and primarily driven by local winds. A series of idealized numerical model simulations inclusive of forcing by both the Loop Current and local winds confirms these observational findings that the shelf-break currents are largely Loop Current controlled while the shelf currents are largely controlled by the local winds.

OS72B-0360 1330h POSTER

Observations of the Central California Diurnal-Band Velocity and Temperature Field.

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The vertical structure of the diurnal-band temperature and velocity fields is described using data from the extensive Santa Barbara Channel-Santa Maria Basin (SBCSMB) data set. The SBCSMB data consists of 10 years of high resolution temperature, velocity and pressure data taken from moorings in the Santa Barbara Channel and on the continental shelf, north of Point Conception. Despite the sub-inertial geographical location, the energetics of the diurnal band fluctuations observed in the area are commensurate with the semi-diurnal fluctuations.

We interpret the observed diurnal band fluctuations as locally generated and non-propagating internal structures. Eigenfunction decomposition of the diurnal band temperature fluctuations indicates that three or fewer vertical modes account for greater than 90% of the variance at all mooring locations. These modes strongly resemble the theoretical internal wave modes at the diurnal frequency. Annual cycles in the amplitude of the internal modes correlate strongly with the annual stratification/ destratification cycle of the water column. The diurnal velocity variations correlate with the local diurnal-band tidal elevation. Depth variations in this coherence indicate a baroclinic structure to the diurnal velocity field.

OS72B-0361 1330h POSTER

The Santa Barbara Channel - Santa Maria Basin Study: Wind Measurements and Modeling Resolving Coastal Mesoscale Meteorology

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The importance of winds in driving the coastal ocean has long been recognized. Pre-World War II literature links wind stress and wind stress curl to coastal ocean responses. Nevertheless, direct measurements plausibly representative of a coastal area are few. Multiple observations on the scale of the simplest mesoscale atmospheric structure, such as the cross-coast variation along a linear coast, are even less frequent. The only wind measurements that we are aware of in a complicated coastal area backed by higher topography are in the MMS sponsored, Santa Barbara Channel/Santa Marina basin study. Taking place from 1994 to present, this study had an unheard of dense surface automated meteorological station array of up to 5 meteorological buoys, 4 oil platforms, 2 island stations, and 11 coastal stations within 1 km of the beach. Most of the land stations are maintained by other projects. Only a large, a well funded project with backed by an agency with the long-view could dedicate the resources and effort into filling the mesoscale "holes" and maintaining long-term, remotely located stations.

The result of the MMS funded project is a sufficiently dense surface station array to resolve the along-coast and cross-coast atmospheric mesoscale wind structure. Great temporal and spatial variation is found in the wind, wind stress and the wind stress curl, during the extended summer season. The MM5 atmospheric mesoscale model with appropriate boundary layer physics and high-resolution horizontal and vertical grid structure successfully simulates the measured wind field from large scale down to the lower end of the mesoscale. Atmospheric models without appropriate resolution and boundary layer physics fail to capture significant mesoscale wind features. Satellite microwave wind measurements generally capture the offshore synoptic scale temporal and spatial scale in twice-a-day snap shots but fail in the crucial, innermost coastal waters and the diurnal scale.

OS72B-0362 1330h POSTER

Kinematic mapping of circulation and water properties off Pt. Conception, California

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One of the most important challenges of coastal ocean observing systems is how to meld together data from different observing platforms. Coastal ocean observing systems typically include data from a number of measuring platforms and platform types. Some are deployed as part of the observing system, while others exist independently. Instrument platforms may be

moved added, or permanently removed from the system. At any given time at least some sensors are inoperable. Moreover, different parts of the database are usually gathered with different sampling schemes.

The Minerals Management Service funded Santa Barbara Channel - Santa Maria Basin circulation study provides a prime example of these challenges. The study has taken place over the last decade. Platforms used in it include moorings, drifters, survey data, and meteorological stations. Over the course of the study, the observing system changed in response to differing scientific objectives, but some elements remained constant.

We have adopted a 2 part approach in mapping and analyzing the data. First, we identified large-scale synoptic states which are clearly expressed in the unchanging elements of the observations. Second, we used the large scale states to inform objective maps of the data. The large-scale states provide reasonable interpolations of often sparse data while the objective maps provide consistent kinematic interpolations of the data and error estimates. We map the data in an along-shelf and cross-shelf coordinate system with realistic, anisotropic correlation scales. The mapping region extends approximately 250 km along the shelf and 50 km across it.

This approach has been used to map surface and subsurface circulation time series, meteorological time series, and survey observations on comparable scales. Circulation and wind fields have been mapped from November 1992 to November 1999. The circulation results have an important practical benefit in that they have some ability to predict parcel trajectories. Comparisons of the mapped circulation, wind, and survey fields are made possible by the objective mapping procedure. These comparisons highlight the relative importance of different dynamical processes in the region. The mapped fields are also ideal for assimilation into numerical models and have been provided to numerical modelers for these purposes.

OS72B-0363 1330h POSTER

Pressure Response in the Santa Barbara Channel and Santa Maria Basin

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An eight-year time series of physical observations in the Santa Barbara Channel (SBC) and Santa Maria Basin (SMB) is used to explore the role of pressure gradients in the coastal circulation. Previous work has characterized the regional wind stress field and demonstrated that both wind stress and pressure gradients are important to regional circulation patterns. The relationship between the wind stress and pressure gradients and their roles in driving the coastal ciruculation in the SBC is investigated by quantifying correlations and lags between the two forcing mechanisms. Along the north coast of the SBC wind forcing is weak, and alongshore pressure gradients have been significantly correlated to alongshore flow in accordance with a model of simplified pressure-gradient driven flow. In contrast, the southern shelf of the SBC is exposed to stronger, more consistent winds which correlate with a model of simplified wind-driven flow. This work demonstrates the need for an operational Coastal Ocean Observing System to include observations from which pressure gradients can be estimated.

OS72B-0364 1330h POSTER

Numerical Simulation of Near-Surface Wind over Santa Barbara Channel and Southern California Bight

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Accurate wind field in coastal-ocean modeling is important, because there exists a delicate balance between direct wind-forced and wind- and wind-curl-induced pressure forces in coastal regions, particularly where significant wind shears exist, downwind of a Cape, for example. To simulate coastal ocean circulation in San Barbara Channel and Southern California Bight accurately, the spatial and temporal distributions of near-surface wind are required to have a high fidelity due to their complexity in this region. The use of wind fields obtained from sparsely distributed buoys and land surface stations, or from large-scale models of coarse-resolutions to force coastal circulation models is convenient, but inadequate. Mesoscale atmosphere models with data assimilation can provide high-resolution wind fields in the lower atmosphere. Such fields can be used to force coastal ocean models after they are verified with available observations.

We have conducted numerical simulations with the Coupled Ocean/Atmosphere Mesoscale Prediction System (COAMPS) of NRL Monterey with both two-nest and three-nest configurations: 81/27 km and 81/27/9 km, respectively for the period March to May 1999. Sensitivity of the simulated winds to grid resolution, as well as extensive comparison of the modeled wind and wind curl to observations will be discussed.

OS72B-0365 1330h POSTER

THE PROSPECTS FOR USING LITTLE DIOMEDE ISLAND AS A BASE FOR MONITORING BERING STRAIT

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Diomede, Alaska is arguably the most isolated community in the United States, located on a small island in the center of Bering Strait, one mile from the international dateline, where nutrient-rich waters from the Bering Sea enter the Arctic Ocean. Postal service is once weekly via helicopter, weather permitting and the 140 Native Inupiat residents (2000 census) are highly dependent upon a subsistence lifestyle utilizing local seabirds, marine mammals, and shellfish. Since the summer of 2000, we have worked with the local community to improve analytical capabilities to analyze waters flowing through the Bering Strait. Other goals of the Bering Strait Environmental Observatory include evaluating the biological health and contaminant burdens of marine mammals used for subsistence by island residents. We have also been annually using the Canadian Coast Guard Service Sir Wilfrid Laurier to assess the biological productivity of benthic organisms that are important as food sources in the Bering Strait region for apex predators such as bearded seal, walrus, diving ducks and gray whale. Future infrastructure that is needed includes a subsea water intake system that would be less vulnerable to wave and ice damage than the interim systems we have employed to date.

Using a jet well pump in August, 2001, we pumped water onshore through a thermosalinograph, automated nutrient monitoring devices, a fluorometer, and we also collected discrete samples for silica and oxygen-18/oxygen-16 ratios in a small laboratory constructed under the village school. Results indicate that there is a strong relationship between the surface wind regime and the fertility of waters flowing through the center of Bering Strait. Following sustained northerly wind events, and an approximate 72 hour lag period, waters passing Little Diomede Island were predominantly of Alaska Coastal Water origin, with low nutrients and salinity, and comparatively high temperatures. Southerly winds were by contrast significantly correlated with higher nutrients, lower temperatures, and higher salinities following a similar 72-hour period. These observations are consistent with expected Coriolis forcing and suggest that the flux of high nutrient water flowing through Bering Strait may be particularly sensitive to short and long-term variability in surface wind patterns in this localized region.

URL: http://arctic.bio.utk.edu

OS72B-0366 1330h POSTER

Transports on the Shelf of the Southeastern Bering Sea

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The eastern half of the Bering Sea basin is composed of a wide (>500 kilometer) continental shelf (<200 meter depths). The supply of nutrient rich shelf slope water and high solar radiation values combine to make this shelf one of the most productive regions of the worlds oceans, supporting a large food chain of marine mammals, birds, fish and shellfish. An important component of the water that flows onto the eastern Bering shelf is transported through Unimak Pass. Unimak Pass (relatively shallow, <80m, and narrow, ∼30km) is the only significant connection between the Gulf of Alaska and eastern Bering Sea shelves. Satellite drifter trajectories and water mass analysis suggest that this water has its source in the Alaskan Coastal Current originating up to 1000 kilometers away in the Gulf of Alaska. After passing through Unimak Pass, the current splits, with part forming a weak, but persistent current to the northeast along the Alaskan peninsula and the 50-meter isobath, and part flowing northward along the 100-meter isobath toward the Pribilof Islands. It is conjectured that these flows eventually rejoin at the Bering Straits, accounting for a third of the transport there.

To track the fate of water entering the southeastern Bering Sea through Unimak Pass, we will present simulated drifter trajectories from a regional circulation model of the northeastern Pacific and Bering Sea. These simulated trajectories will be compared with the large data set of real drifters that have been released in the Bering Sea. We will also compare transport results to hydrographic data collected along transects off Unimak Island, Port Moller, Cape Newenham and Nunivak Island.

OS72B-0367 1330h POSTER

Gulf of Mexico 900 Meter Circulation From PALACE floats

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Seventeen PALACE floats drifted in the Gulf of Mexico, at about 900 meter depth, over the period April 1998 - March 2002. This original data set leads to more than 1700 deep drift records and allows for the first time the Lagrangian exploration of the 900 meter depth circulation in the Gulf of Mexico. Statistics calculated in $0.5^o \times 0.5^o$ bins,and trajectories are presented.

The data suggest two different cells of circulation in the deep Gulf of Mexico, with a meridional separation at about 90^oW. Floats launched on one side tends to remain in the same part during the full experiment. Similar results are found in a numerical model simulation of float drift at the same depth. One of these cells, in the eastern part is strongly influenced by the anticyclonic Loop Current. The other one coincides with a cyclonic basin wide flow pattern along the northern and southwestern Gulf of Mexico, associated with strong deep western boundary currents.

Several regions appear to trap floats over intervals of many months and are associated with 150 km diameter cyclonic eddy-like structures, some of them also being reproduced as stationary features in recent numerical outputs. Floats also get trapped in transient mesoscale activity, some of which being strongly linked to surface flow features, as inferred from altimeter data charts.

OS72B-0368 1330h POSTER

New Opportunities for Cabled Ocean Observatories

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With the decommissioning of transoceanic telecommunications cables as they become obsolete or uneconomical, there is an opportunity to use these systems for ocean observatories. Two coaxial cables, TPC-1 and HAW-2 are currently in use for observatories, and another, ANZCAN, is scheduled to be used beginning in 2004 to provide a cabled observatory at Station ALOHA, north of Oahu. The ALOHA observatory will provide several Mb/s data rates and about 1 kW of power to experiments installed at Station ALOHA.

Sensors can be installed either by wet mateable connection to a junction box on the ocean floor using an ROV, or by acoustic data link to the system. In either case real-time data will be provided to users over the Internet. A Small Experiment Module, to be first installed at the Hawaii-2 Observatory, and later at Station ALOHA, will provide relatively cheap and uncomplicated access to the observatories for relatively simple sensors.

Within the next few years, the first electro-optical cables installed in the 1980s will be decommissioned and could be available for scientific use. These cables could provide long extension cords (thousands of km) with very high bandwidth and reasonable power to several observatories in remote locations in the ocean. While they could be used in-place, a more exciting scenario is to use cable ships to pick up sections of cable and move them to locations of higher scientific interest. While such moves would not be cheap, the costs would rival the cost of installation and maintenance of a buoyed observatory, with far more bandwidth and power available for science use.

URL: http://kela.soest.hawaii.edu/ALOHA/

OS72B-0369 1330h POSTER

Development of a Power System for Cabled Ocean Observatories

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Cabled Ocean Observatories offer the potential to delivery unprecedented amounts of power to remote instruments and sensors. The availability of sufficient power will enable new instrumentation and methods. Here we describe the present NEPTUNE power system design which will be capable of delivering an average of approximately 4 kW or a maximum of 10 kW to over 40 seafloor node locations spread over approximately 100,000 sq nm of seafloor. The system will have a backbone of 3500 km of standard seafloor telecommunications cable connecting the nodes in a mesh topology. The network will have 10 kVdc parallel feed, distributed stochastic load, and constant voltage output. A network of secondary extension cables will be developed that will allow the network to be extended up to 100 km from the backbone. The backbone cable has a single power conductor so a seawater ground return will be used. High availability and reliability over the 30 year life of the system is an important consideration in design and construction of the system. It is anticipated that faults will occur in the node electronics, cables, etc., so a protection system is being incorporated to allow faulted sections to be isolated and then to utilize the mesh topology to minimize impact on the rest of the system. [Work supported by the National Science Foundation.]

URL: http://neptunepower.apl.washington.edu

OS72B-0370 1330h POSTER

Temperature inversions in the Gulf of Mexico

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Seventeen PALACE floats drifted in the Gulf of Mexico, at about 900 meter depth, over the period April 1998 - March 2002, acquiring temperature profiles during their ascent. This original data set leads to more than 1700 profiles distributed all over the Gulf.

Half of the profiles when examined present temperature inversions of a magnitude of at least 0.008^{o} C. This reduce to 25% when the criterium applied is raised to 0.020^{o} C.

Inversions can be found everywhere in the Gulf and are usually located in the first 200 meters with a higher concentration between the surface and 40 m.

Temperature inversions must be associated with salinity minima since they appear to be statically stable. Thus, rivers discharge in the Gulf are suspected to be the origin of those temperatures inversions. The Mississippi river which accounts for 55% of the total fresh water output in the Gulf is obviously an important source, but mapping shows that it is not the only one.

Temperature inversions are usually found under the form of filaments or low salinity lenses, as confirmed by infrared satellite pictures and numerical model simulations.

OS72B-0371 1330h POSTER

Preliminary results from pressure tank test and field acceleration test of New-Profiling float of Japan (NINJA)

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As one of contributions of Japan to the international Argo community, one of Japanese ocean instrument manufacturers, Tsurumi Seiki Co. (TSK), has started the development of original profiling float in 2000. We purchased the four TSK floats in 2001, and performed the pressure tank test and the acceleration field test in the north Pacific. Among four floats, two are carrying SBE41 CTD sensor, and two are carrying TSK-original CTD sensor. In the pressure tank test, by controlling a tank pressure as float controller expects, we created the ideal ocean in a tank for the float. The TSK float successfully worked as was scheduled, and measured profile data when the float was coming up to the surface (i.e. pressure in tank was decreasing). We also performed the ballasting test of weight of the TSK float to drift at 2000dbars (Swift and Riser, 1994). After these tests, we launched two floats with TSK sensor in the north Pacific in June. One of the floats has finished the 20th profile on 26 August 2002 and is still working. The technical message from the float indicates the stable parking near 2000dbars, the stable profiling speed, and no missing profile data. The temperature and salinity data also indicate the stable T-S relations in deeper layer below 1500dbars among profiles. In this presentation, we will also show the results of field test of the floats with SBE sensor, which will be launched in October 2002.

OS72C MCC: 274 Sunday 1330h

Nearshore Processes V *(joint with T)*

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

OS72C-01 1330h

Swash Zone Sediment Dynamics on Steep and Shallow Beaches

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In the swash zone, high sediment concentrations and large flow velocities mean that the potential for sediment transport and beach profile change is considerable. However, our understanding of the contribution of different suspension mechanisms (e.g. velocity, acceleration, turbulence, in/exfiltration) on beaches of different slopes is limited. Furthermore, the cross-shore structure of sediment transport in the swash zone is poorly understood. Field measurements of swash hydrodynamics, sediment dynamics and profile change have therefore been made at a dissipative, fine grained beach in North Cornwall, UK (Perranporth), and at a steeper, coarser grained beach in West Cornwall (Sennen).

Velocities were measured at high frequency close to the bed using a vertical array of two electromagnetic current meters and 2-D and 3-D acoustic döppler velocimeters. Suspended sediment concentrations were measured using a vertical array of miniature optical backscatter sensors. Further to this, run-up data were collected using video, pressure sensors were used to measure wave heights and pressure gradients in the bed, and surveys were taken at each low tide to establish profile change.

On both beaches, large suspended sediment concentrations ($200 kg/m^3$) were measured in the initial (turbulent) part of the uprush. On the dissipative beach, secondary waves behind the initial uprush suspended an order of magnitude less sediment than the initial front. On the steep beach, the high uprush concentrations in the inner swash were well correlated with downward pressure gradients in the bed, suggesting a dominance of boundary layer thinning over sediment stabilisation. During the backwash, a second peak in concentration occurred, although backwash velocities were not as efficient at suspending sediment than uprush velocities.

The net cross-shore transport from uprush and backwash was examined in relation to cross-shore position in the swash. Data from high-energy conditions showed that on both beaches, onshore transport dominated in the inner swash zone on both flood and ebb tides. A zero crossing in the cross-shore transport occurred at the mid swash zone on the flood tide on both beaches. Offshore transport occurred seaward of this point. The transport divergence point shifted landward in both cases during the ebb tide, possibly due to differences in the water table.

Further detailed analysis of data is being carried out in order to examine the role of the various mechanisms of suspension, and their contribution at different cross-shore positions in the swash.

URL: http://www.ims.plym.ac.uk/swash

OS72C-02 1345h

Field Evidence for Plug Flow

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Under significant pressure gradients an O(cm) layer of still sediment can accelerate and move as a uniform plug (Sleath,1999). This thick, mobile layer is capable of transporting significant quantities of sediment. Although typical sediment tranpsort models assume the tranpsort is a function of the shear stress, plug flow is driven by the normal stress applied to the bed. Plug flow is a function of the non-dimensional parameter, S, which is the ratio between the oscillatory pressure gradien and gravitational forces acting on the sediment grains and can exist when S exceeds a value of 0.29. In this work, we will present the first field evidence for the existence of plug flow. Observations of flow, concentration, and mobile layer thickness will be compared with plug flow theory (Sleath, 1999).

As part of the cooperative 1994 Duck94 field experiment, a vertical array of 4 hot film anemometers and a stacked array of fiber-optic backscatter probes piercing the bed were used to measure the incident and turbulent structure of the wave bottom boundary layer (Foster et al., 2000). The observations showed a highly unsteady turbulent kinetic energy structure which was correlated to the large wave crests and also bed shear stresses and phase shifts which were smaller than theoretical models that assume rigid no-slip condition at the bed. Over the course of a 30 minute sampling period, the hot films became buried. During the acceleration phase of large wave crests, the buried sensors recorded significant onshore velocities as high as 100 cm/s which are consistent with the plug flow theory. The plug flow parameter, S, for these observations is as large as 0.25. Given the uncertainty of the parameter estimates these observations may be within the allowable limits for plug flow, indicating that these observations may be the first quantitative evidence for the existence of plug flow in the coastal ocean.