Appendix VI

Post-Doctoral Scholars and Investigators Funded by CICOR

The CICOR Postdoctoral Scholarship program has supported high-caliber post-doctoral scholars working with CICOR PIs on research related to CICOR themes. Since its inception CICOR has funded 7 postdoctoral scholars:

Nancy Grumet Prouty,
Nicholas Scott,
Ruoying He,
Fiamma Straneo,
Liviu Giosan,
Jim Lerczak and
Amy Baco-Taylor

Postdoctoral Investigators funded under CICOR research accounts include:
Dr. Bomin Sun,
Dr. Sudharshan Sathiyamoorthy
Dr. Kier Colbo
Dr. Xingwen Li

During the 4th year of CICOR's five year Cooperative Agreement (July 1, 2004 through June 30, 2005), two Post-Docs were funded. Ruoying He accepted a position with the AOP&E department as an Assistant Scientist. Nicholas Scott completed his CICOR Post-Doctoral scholarship in April of 2005. Nancy Grumet Prouty arrived in Fall 2004.

Brief Summaries of CICOR Post-Doctoral Scholars Follow:

Nancy Grumet Prouty completed her Ph.D. at Stanford University in June of 2004. In September 2004 she began her postdoctoral `scholarship working with Dr. Konrad Hughen in the Department of Marine Chemistry and Geochemistry. Her research at WHOI specifically aims to understand and reconstruct environmental conditions in the subtropical and tropical oceans through the development of coral chemical records. High resolution proxy records available from coral reefs demonstrate that chemical tracers within coral aragonite can accurately record seasonal and annual changes in environmental parameters, such as precipitation, river input, salinity, and sea surface temperature, as well as changes in ocean circulation. The extreme sensitivity of corals to changes in precipitation and thermal conditions as well as the geochemical properties coral aragonite has greatly enhanced our understanding of climate variability on time scales relevant to human activity, such as the El Niño/Southern Oscillation (ENSO). The combination of coral radiocarbon, stable isotope, and trace element measurements provides an invaluable tool to reconstruct ocean temperature and circulation, and to further refine ocean circulation models.

Nicholas Scott

CICOR Post-Doc 2003 - 2004

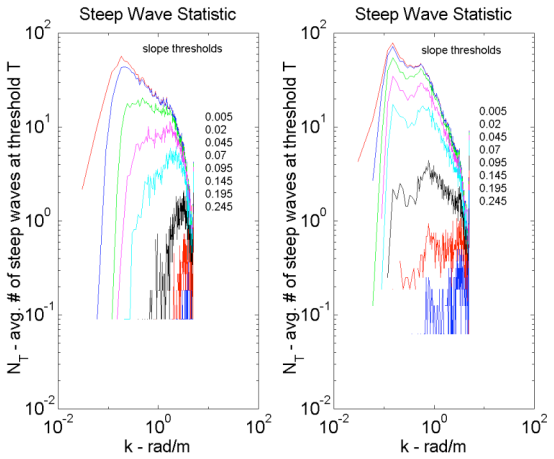
Scott received his PhD in May 2003 from the University of Rhode Island. He is worked with John Trowbridge and Jim Edson, both scientists in the Applied Ocean Physics and Engineering Department (AOP&E). The title of his PhD Thesis is "Observations of the Wind-Wave Spectrum and Statistics of Deep Waves in Open-Ocean Waters." He arrived in October 2003 funded by the J. Seward Johnson Fund. In January 2004, CICOR began to provide the funding for his Postdoctoral Scholar award.

Comprehension of the statistical distribution of steep and breaking surface waves is crucial to the understanding of such issues as the air-sea momentum flux and the air-sea gas exchange. My work, begun in January 2004 and funded by CICOR, is aimed at understanding the distribution of steep surface waves that are part of steep wave groups on the ocean surface. This is accomplished through the use of a new signal processing algorithm based on wavelet analysis. This methodology is applied to open ocean wave height data acquired from wave gauges during the Flux, Etat de la mer et Teledection en Condition de fetch variable (FETCH) experiment (1998) and the Adverse Weather Experiment (1998). Both experiments were air-sea interaction studies which employed the use of the Air-Sea Interaction Spar (ASIS) buoy, a spar-buoy designed specifically for the measurement of directional wave spectra and meteorological parameters.

Wavelet analysis of ocean surface wave data yields a quantity dubbed the steep wave statistic. The steep wave statistic, $N_T(k,\theta)$, is simply the number of steep wave crests at wave slope threshold T, wavenumber k, and angle θ It is calculated via a two part process. First the wavelet transform is used to not only detect local steep wave events which pass over a wave gauge array but also to find their scale. These events are tallied up according to wavenumber, angle, and wave slope threshold to yield the statistic.

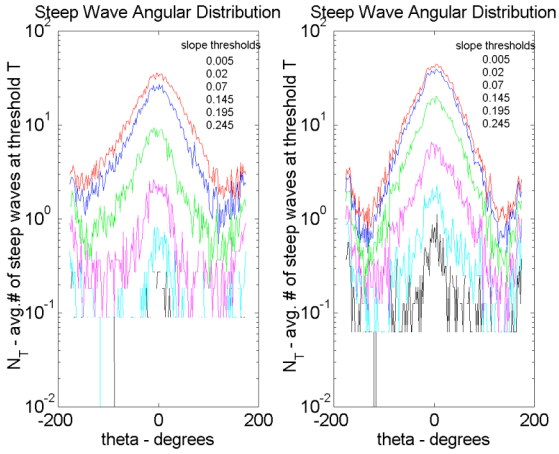
Results from the analysis of wave gauge measurements of the surface wave field from the Adverse Weather experiment and the FETCH experiment are shown in Figure 1. The figure shows N_T, the average number of steep wave events at wave slope threshold T versus wavenumber k. The wave slope thresholds are listed in black with increasing wave slope threshold from top to bottom corresponding to each of the curves of decreasing mean value for N_T. The figure shows that high wave slope crests appear over a wide range of wavenumbers for both the low wind case and the high wind case. Figures 1a and 1b show that at low wave slope thresholds, a larger amount of steep waves at low wavenumbers exists than at high wavenumbers. As the wave slope threshold is increased, the trend changes with the number of steep waves increasing with wavenumber, over a large portion of the wavenumber range. These curves point to the importance of the small-scale steep waves in characterizing the wave field.

Comparison of Figure 1a to Figure 1b shows that the trend at high wave slope thresholds is modulated in the case of high wind with the slope of the curves being gentler than in the previous case. This may be due to the presence of very steep and breaking waves in the wave field which occur at high wind speeds.



a) b)

Figure 1: Steep wave statistic, N_T vs. k at different wave slope thresholds T. Increasing values of the wave slope thresholds from top to bottom correspond to each of the curves of decreasing mean values of N_T . a) Adverse Weather Experiment case. Mean wind speed at 6 meters above ocean surface, U_6 = 6m/s. b) FETCH experiment case. U_6 = 15 m/s.



a) b)

Figure 2: Steep wave statistic, N_T vs. θ at different wave slope thresholds T. Increasing values of the wave slope thresholds from top to bottom correspond to each of the curves of decreasing mean values of N_T . Mean wind direction at θ =0. a) Adverse Weather Experiment case. Mean wind speed at 6 meters above ocean surface, U_6 = 6m/s. b) FETCH experiment case. U_6 = 15 m/s.

Directionality analysis of the waves was also performed. Figure 2 depicts the steep wave angular distribution, N_T for two different experiments as a function of angle, θ where the direction of the wind is at zero degrees. The plots show that irrespective of wave slope threshold, most of the steep waves move in the mean wind direction. This is qualitatively consistent with other observations.

The complete form of this work is in preparation for publication in Elsevier Scientific's Applied Ocean Research.

Ruoying He

CICOR Post-Doc 2003 - 2004

Ruoying He received his PhD from the University of South Florida in May 2002. He worked working with Bob Beardsley, a senior scientist in the Physical Oceanography Department and Dennis McGillicuddy, an associate scientist in the Applied Ocean Physics & Engineering Department. His research interests include Shelf and Estuarine Circulation, physical/biogeochemical interactions, air/sea interactions and inverse methods of oceanography.

He arrived at WHOI in September 2003 as CICOR 5th postdoctoral scholar. He worked on two main research projects. The first project is on the Gulf of Maine coastal circulation and harmful algal transport. This work is a part of the MERHAB (Monitoring and Event Response for Harmful Algal Blooms) project led by Dennis McGillicuddy (WHOI AOPE), Don Anderson and Bruce Keafer (WHOI BO). Ruoying participated in the MERHAB 2003 field survey in the Gulf of Maine where they collected a wonderful set of *in-situ* measurements of physical and biogeochemical variables. He then implemented and tested an adjoint data assimilative ocean model that assimilates coastal sea levels and currents to hindcast the circulation and material transports. Exciting research findings on the utility of data assimilative ocean model and on mechanisms controlling water exchange and transport processes were presented in several scientific meetings and seminars. A paper documenting detailed scientific results is to be submitted for the refereed journal publication. MERHAB 2004 field survey was just completed this summer. With two years *in-situ* measurements, Ruoying is working on another paper focusing on the inter-annual variability of the Gulf of Maine circulation and transport and will submit it for publication shortly. The second research project Ruoying is involved in is the southeast Atlantic coastal ocean observing system. This is a collaborative study with other investigators from University of Miami (UM), Skidaway Institute of Oceanography (SKIO), University of South Carolina (USC), and University of North Carolina (UNC). Ruoying has played an important role in data analyses of surface wind fields and satellite observations, and real time numerical model nowcast and forecast of coastal circulation. Several journal publications have been produced out of this work. Ruoying will start on September 1st as an assistant scientist in WHOI APOE department. Listed below is a short list of Ruoying's research activities so far in 2004.

Journal Publication

He, R., D. J. McGillicuddy, K. W. Smith, D. R. Lynch, C. A. Stock, and J. P. Manning, 2004, Adjoint data assimilation model hindcast of the Gulf of Maine coastal circulation and material transport. *To be submitted*

He, R., Y. Liu and R. H. Weisberg (2004), Coastal ocean wind fields gauged against the performance of an ocean circulation model. *Geophysical Research Letters,* Vol. 31, 14, 14303, doi:10.1029/2003GL019261

Weisberg, R. H., **R. He**, G. Kirkpatrick, F. Muller-Karger, J. J. Walsh (2004), Coastal Ocean Circulation influences on remotely sensed optical properties. *Oceanography*, 17, 68-75

Book Chapter

Weisberg, R. H., **R. He**, Y. Liu, and J. Virmani (2004), West Florida shelf circulation on synoptic, seasonal and inter-annual time scales, *Physical Oceanography in the Gulf of Mexico*, *in review*

Seminar and Presentation

He, R., Shelf and deep ocean interactions, Case studies on the West Florida Shelf. WHOI. December 9, 2003

He, R., Shelf and deep ocean interactions, Case studies on the West Florida Shelf. Marine Science Department, University of Connecticut, February 26, 2004

He, R., Observation and Data Assimilative Model Hindcast of the Coastal Circulation in the Gulf of Maine. Regional Associate for Research on the Gulf of Maine, July 15, 2004

He, R., Understanding and quantifying the deep ocean influence on the coastal ocean, WHOI, July 27, 2004

Research Proposal

Coastal Water Connectivity and Material Transport; PI: **R. He**, submitted to *NSF OCE* 2004 August Panel Review

Amy Baco-Taylor

CICOR Post-Doc 2002-2003

Summary of Accomplishments (Written in Summer 2003)

I arrived at WHOI in June of 2002. Since then I have submitted two papers from my dissertation, one is published and the other is currently in press. In the lab, I am focusing on one research project, examining the population genetics and dispersal of deep-sea precious corals from the Hawaiian Archipelago. These corals are the focus of a profitable fishery, yet little is known about their dispersal capabilities or general ecology. I am using microsatellite methods to address these issues. The findings of this research will help improve the management of these species as well as improve our general understanding of dispersal in the deep-sea. Most of my time has been spent learning new microsatellite methods and developing useable microsatellite markers for my study. So far I have obtained 7 microsatellite loci for one of these species. I am preparing a manuscript from this research and have presented the results at three international conferences.

I have also submitted several proposals related to the ecology and evolution of seamount fauna. Two of these proposals have been funded, both through NOAA's Office of Ocean Exploration. I will have a cruise in Sept- Nov. 2003 to the Northwest Hawaiian Islands to document the distribution of deep-sea corals on 3 previously unexplored seamounts. I will also collect deep-sea corals from 4-5 additional sites in the Northwestern Hawaiian Islands to add to my current study of dispersal and population genetics of Hawaiian deep-sea precious corals.

A third proposal is currently pending with NOAA NURP Alaska. I participated in an Ocean Exploration cruise to the Gulf of Alaska Seamounts where I collected deep-sea corals and other seamount invertebrates. Based on observations from this cruise I submitted a proposal (to NOAA-NURP Alaska) to return to the same seamount chain to further examine their fauna and to use molecular methods to determine levels of dispersal in some of the dominant taxa.

Submitted Publications:

Baco, A.R. and C.R. Smith. In Press. High biodiversity levels on a deep-sea whale skeleton. Marine Ecology Progress Series.

Baco, A.R. and T.M. Shank. Population Genetic Structure of the Hawaiian Precious Coral Corallium lauuense Using Microsatellites. In prep for special volume Hydrobiologia.

Smith C.R. and A.R. Baco. 2003. Ecology of whale falls at the deep-sea floor. Oceanography and Marine Biology Annual Review 41: 311-354.

Liviu Giosan

CICOR Post-Doc 2001 - 2003

In September 2001, Liviu Giosan arrived on a CICOR Postdoctoral Scholarship at WHOI from State University of New York at Stony Brook where he completed his Ph.D. Since then, Liviu has continued his work on sediments from the Blake Ridge sediment drift drilled during ODP Leg 172 for recovering climatic information over the Pliocene-Pleistocene. Four scientific papers resulting on this subject will be published in Marine Geology in 2002 (see references below). Reflectance spectra collected during Leg 172 were used in concert with solid phase iron chemistry, carbonate content, and organic carbon content measurements by Giosan et al. (2002a) to evaluate the agents responsible for setting the color in sediments. Factor analysis has proved a valuable and rapid technique to detect the local and regional primary factors that influence sediment color. On the western North Atlantic drifts, sediment color is the result of primary mineralogy as well as diagenetic changes. Sediment lightness is controlled by the carbonate content while the hue is primarily due to the presence of hematite and Fe^{2+}/Fe^{3+} changes in clay minerals. Hematite, most likely derived from the Permo-Carboniferous red beds of the Canadian Maritimes, is differentially preserved at various sites due to differences in reductive diagenesis and dilution by other sedimentary components. Various intensities for diagenesis result from changes in organic carbon content, sedimentation rates, and H_2S production via anaerobic methane oxidation. Iron monosulfides occur extensively at all high sedimentation sites especially in glacial periods suggesting increased high terrigenous flux and/or increased reactive iron flux in glacials. Further, carbonate content estimated by Giosan et al. (2001) from reflectance spectra at the Leg 172 sites were used by Grützner, Giosan et al. (2002) to develop age models covering the past 0.8-0.9 Ma, by tuning variations of estimated carbonate content to the orbital parameters precession and obliquity. Using these age models, color variations at the Leg 172 sites were interpreted in paleoceanographic terms by Giosan et al. (2002) for the late Pliocene - Pleistocene. In the last 800 kyr sedimentation pattern changes on the Blake-Bahama Outer Ridge were determined by the sediment delivery to the deep basin as well as circulation changes. Sediment delivery increased during glacials (especially during the last 500 kyr and particularly since Stage 6). A fundamental change in the thermohaline circulation occurred at about ~500 ka corresponding to the end of the Mid-Pleistocene Transition period at the onset of the predominant 100-kyr climate cyclicity. Sedimentation related to WBUC had intensified at that time and had become more focused at depths below 3000 m. Abundance of Upper Carboniferous spores indicates that the hematite is probably derived from the Permo-Carboniferous red beds of the Canadian Maritimes. Changes in hematite content and sedimentation rate show a pulse of sediment via the St. Lawrence outlet at the Pliocene-Pleistocene boundary suggesting that a likely change in the hydrography and/or physiography of the Laurentide Ice Sheet could have been involved in the climatic and ocean circulation changes at that time.

The migration history of an abyssal mud wave on the Blake-Bahama Outer Ridge (ODP Site 1062) has been studied by Flood and Giosan (2002) through the analysis of multiple ODP holes spaced across the mud wave. Additional information about wave migration patterns comes from 3.5 kHz records and seismic profiles. These data suggest that mud wave migration has varied during the last approximately 10 Ma. Seismic profiles suggest wave migration was initiated about 8 to 10 Ma, and wave migration was pronounced from about 5 Ma to about 1 Ma (with an episode of strong flow about 4.5 Ma). Analysis of sediment cores suggests that

migration rates have been somewhat lower and have varied during the last 1 Ma. Intervals of no wave migration are observed for several time intervals and appear to characterize deglaciations, especially during the last 500 kyrs. Comparisons between seismic profiles and the core record show that most of the seismic horizons correlate closely with time horizons, and thus that the seismic profiles give a reasonable representation of mud wave migration. Models suggest that wave migration is more pronounced during periods of higher bottom current flow and less pronounced during periods of lower current flow. Thus the migration record is consistent with generally higher bottom flow speeds at this site prior to 1 Ma and lower bottom flow speeds after 1 Ma. The transition from a dominant climatic period at 40 kyrs to a dominant climatic period at 100 kyrs occurs at about this time, suggesting an overall reduction in bottom flow speed at this site coincident with changing climate patterns. These changes in flow speed could be related to changes in the depth of the flow as well as to changes in the speed of thermohaline circulation.

In April-May 2002, Liviu Giosan participated in the ODP Leg 202 drilling in southeast Pacific. During the cruise, he employed analysis of reflectance spectra and other physical properties to detect climatic changes recorded by the drilled sediments. One interesting result of this preliminary research, has been the detection of a link between the uplift of the Andes and eolian activity and ocean circulation in the southeast Pacific.

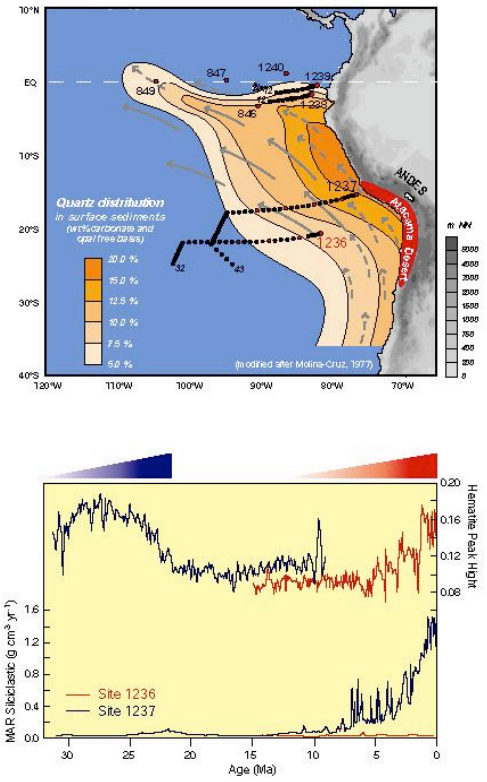


Figure. Wind directions and the extension of the SE Pacific dust plume originating in Peru-Chile deserts (after Molina-Cruz, 1977). The present positions and tectonic backtracks for sites drilled by Leg 202 that are potential recipients of a South American dust plume are shown together with a preliminary reconstruction of the aridity/wind activity based on estimated hematite contents and mass accumulation rates of siliciclastic sediments at sites 1326 and 1237. (*Figure to be printed in Leg 202 Initial Reports*)

Today, the Andean barrier leads to enhanced precipitation from the trade winds on the eastern side of the mountain chain. Heavy rainfalls form a major source for the Amazon River, which drains its sediment load into the Atlantic. The western side suffers from a rain shadow rainshadow effect and drier climate conditions, in the Atacama desert. The long-term history of eolian deposition in the subtropical southeastern Pacific is probably best recorded at Sites 1236 and 1237 drilled during Leg 202 (see figure above). Today, both sites underlie the path of eolian transport from the Atacama Desert in Chile. The southeast trade winds are the major dust carrier carriers as indicated by the pattern of quartz distribution in southeast Pacific surface sediments (Molina-Cruz, 1977). The presence of terrigenous hematite and goethite goethite, as well as other mainly clay-sized siliciclastics at Sites 1236 and 1237 (see figure), is indicative of a far-field eolian component. The combined records of these tracers suggest that eolian dust has accumulated in the subtropical southeast Pacific since at least the late Oligocene. The hematite record, reconstructed from reflectance data, suggest an increased aridity on South America during Oligocene, prior to the uplift of the Andes. Aridity in this region could have been the result of loss of humidity by the southeast trade winds along their continental path across South America and the presence of the adjacent cool Peru-Chile Current. Since the late Miocene and Pliocene, eolian iron oxides, complemented by a significant eolian siliciclastic fraction, indicate steplike increases in eolian deposition, that are paralleled by an increase in coastal upwelling and productivity. A change in atmospheric circulation could explain both features. Intensified trade winds would enhance equatorial upwelling/productivity and the northward advection of nutrient-rich waters transported by the Peru-Chile Current. Modern upwelling along the Peruvian continental margin occurs over a broader region than just a very narrow coastal strip, due to topographic steering by the newly uplifted Andes. Liviu will test these hypotheses by evaluating the validity of using iron oxides as eolian proxies and by reconstructing the wind history. Liviu will also work in cooperation with Konrad Hughen at WHOI on a detailed sedimentary sequence recovered during Leg 202 on the Chilean slope. The objective is to reconstruct links between the South American climate and ocean circulation in the southeast Pacific using ultra-high resolution records of continental vegetation, riverine efflux, and sea surface temperature. Funding for these preliminary studies will be provided to Giosan from USSSP/NSF.

Liviu continued his collaborative studies on wave-influenced deltas and presented his work at the 2001 GSA's annual meeting in Boston and at a USGS-sponsored talk at WHOI in the fall of the same year. A paper on this subject is in revision for *Sedimentology* and another paper is in preparation for submission to *Geomorphology*. He is preparing proposals for initiating field work in the Danube and Indus deltas. In cooperation with Janok Bhattacharya, Liviu has organized a session on deltas that he will co-chair at the GSA Annual Meeting in Denver in October 2002. Given the high quality of the works to be presented at the session, a special volume of the Society for Sedimentary Geology (SEPM) is now edited by Giosan and Bhattacharya. A paper titled "Large scale coastal behavior in delta: A Danube delta overview" with Liviu Giosan as the first author is in preparation for that volume. Liviu together with Jeff Donnelly have been awarded a Coastal Institute grant for studying the Danube delta: field work will begin in Fall 2003. Also Peter Clift and Liviu Giosan have been recently funded by NSF to study the Indus delta.

Liviu's previous work in the Black Sea area has resulted in a collaborative proposal submitted to NSF together with Bill Ryan from Lamont-Doherty Earth Observatory to test that in glacial and deglacial times these seas acted as Eurasian analogues to the giant amplifier lakes of the USA's Great Basin. Strontium, oxygen and carbon isotopes on both mollusc shells and precipitated calcite in association with indicators of ancient shoreline positions, depositional environments and sediment provenance will be used to explore the possibility that the Black and Marmara Seas, like the landlocked Caspian, expanded during cold periods and shrank during

warm periods when global sea level lay below their inlets. Modern humans migrated into Anatolia and Eurasia during these climate shifts. Key cultural milestones, such as the origin of farming and the rapid maritime colonization of the western Mediterranean coincide with abrupt changes in temperature and precipitation, but surprisingly such events occurred during cold periods and are inadequately explained. The insight gained from this proposed study into the last 25 ky BP should also help pave the way to future IODP drilling by strengthening the palaeoceanography-palaeoclimate component. Related to this latest subject, Liviu together with Roger Flood (SUNY Stony Brook) have been awarded funding for organizing a mini-workshop on drilling in the Black Sea. The workshop will take place in Stony Brook in October, 2003. In the meantime, a paper with Liviu as a co-author on "Testing the physical oceanographic implications of the suggested sudden Black Sea in-fill 8400 years ago" is in press in the journal Paleoceanography.

Closer to WHOI, Liviu Giosan and one of his mentors at WHOI, Lloyd Keigwin, have been awarded a 2002 Ocean and Climate Change Institute (OCCI) Research Award. A major physical oceanography initiative at WHOI aims to collect a new dataset on the deep western boundary current (DWBC) interannual circulation in the North Atlantic via moored and hydrographic-velocity-tracer observations on a transect that will extend from the New England shelf to Bermuda. The DWBC is a major branch of the thermohaline circulation and an important component of the global heat balance. A cruise that will service Station W in the fall of 2002 will be added one additional day using the OCCI award for acoustically surveying (3.5 kHz) and coring on two transects off Martha's Vineyard and Nantucket. The main goal of this work is to identify subsurface sedimentary features indicative of good paleoclimatic records that could be recovered by coring. If suitable sedimentary records can be recovered on the New England slope, the higher understanding of the DWBC regime that will come from the modern study performed by the physical oceanography team can be used to enhance understanding of the paleocirculation at a key, easily accessible location on the path of WHOI ships' cruises. Keigwin and Giosan will apply a similar approach for the Colombian margin of the Panama Basin for which they have been recently funded by the Earth System History program at NSF.

Liviu Giosan has been also involved in more synergistic activities. He participated at a workshop on the transport, transformation, and fate of carbon in river-dominated ocean margins (RIOMAR) and another workshop dedicated to the future participation of US scientific community at the new Integrated Ocean Drilling program. Liviu also has founded and led a new Internet-based journal dedicated to the young Romanian scientists (see www.ad-astra.ro).

Dr. Giosan is currently an Assistant Scientist in the Geology and Geophysics Department at WHOI.

References

Giosan, L., Flood, R.D., Grützner, J., Franz, S.-O., Poli, M.-S., Hagen, S., 2001. High-resolution carbonate content estimated from diffuse spectral reflectance for Leg 172 sites. In: Keigwin, L.D., Rio, D., Acton, G.D., Arnold, E. (Eds.), Proc. ODP Sci. Results 172.

Giosan, L., Flood, R.D., Aller, R., 2002a. Paleoceanographic significance of sediment color on western North Atlantic drifts: I. Origin of color. Mar. Geol.

Giosan, L., Flood, R.D., Aller, R., 2002b. Paleoceanographic significance of sediment color on western North Atlantic drifts: II. Late Pliocene-Pleistocene sedimentation. Mar. Geol.

Grützner et al., 2002. Grützner, J., Giosan, L., Franz, S.-O., Tiedemann, R., Cortijo, E., Chaisson, W.P., Flood, R.D., Hagen, S., Keigwin, L.D., Poli, M.-S., Rio, D., Williams, T., 2002. Astronomical age models for Pleistocene drift sediments from the western North Atlantic (ODP sites 1055 to 1063). Mar. Geol.

Flood, R.D., Giosan, L., 2002. Migration History of an Abyssal Mud Wave on the Bahama Outer Ridge. Mar. Geol.

Bhattacharya J. and Giosan, L., in revision. Geomorphology of wave influenced deltas: Implications for facies interpretation, Sedimentology,

Giosan, L., Vespremeanu, E., Buonaiuto, F., in preparation. Wave-influenced asymmetrical deltas: The typical example of Danube's St. George Lobe

Fiamma Straneo

CICOR Post-Doc 2000 - 2001

Fiamma Straneo focused on the interannual variability in the formation and export of dense water from convective sites, with a special emphasis on the Labrador Sea. In particular she addressed how a convective site is affected by interannual and longer timescale atmospheric fluctuations and what kind of signal one may expect to detect downstream from the formation region. She approached this problem by coupling an advective-diffusive model for the spreading of Labrador Sea Water based on Lagrangian observations (Straneo et al., 2001b) with an idealized thermodynamic model of convection based on historical hydrographic data collected in the Labrador Sea. This coupled model has allowed her to explore how oceanic non-linear processes may lead to a modification of the signal imprinted by the atmosphere over the convective region (Straneo and Pickart, 2001c and 2001d) leading to the more general question of the ocean's response to an interannually or decadally varying atmosphere. Work in this more interdisciplinary field of climate, has been greatly facilitated by her participation in a number of climate related meetings, and especially the Colloquium on Interannual and Decadal Climate Variability (UCAR, Boulder, July 2000) during which I was able to interact with scientists in related disciplines. Participation to several of these meetings was made possible thanks the support she have received from CICOR.

Referred and Non-referred Publications

Straneo, F., M. Kawase and R.S. Pickart, 2001a: 'Effects of wind on convection in a weakly and strongly baroclinic flow: with an application to the Labrador Sea'.JPO - submitted.

Straneo, F., R.S. Pickart and K. Lavender, 2001b: 'Spreading of Labrador Sea Water: an Advective-Diffusive Study Based on Lagrangian Data.' DSR - submitted.

Straneo, F. and R.S. Pickart, 2001c: Modification of the NAO signal imprinted during deep convection in the Labrador Sea. Chapman Conference on the North Atlantic Oscillation (AGU) Galicia, Spain. Abstract Volume.

Straneo, F. and R.S. Pickart, 2001d: 'Interannual Variability in Labrador Sea Water Formation and Export: Response to a Variable Atmosphere Extended Abstract, US CLIVAR Meeting on the North Atlantic, Boulder, June 2001.' (submitted).

Proposals: 'Interannual Variability at Deep Convective Sites' - with R.S. Pickart. February - 2001 NSF.

Cruises: Red Sea Outflow Experiment - Feb-Mar 2001, Gulf of Aden - with A. Bower and D. Fratantoni (WHOI) and W. Johns and H. Peters (RSMAS). CTD operations and data analysis.

Background

Post-doctoral scholar Straneo arrived in November 1999 from the University of Washington where she completed her PhD with a thesis titled 'Dynamics of Rotating Convection Including the Effects of a Horizontal Stratification and Wind'. Under the supervision of Bob Pickart, she

has started to investigate the observed interannual variability in the formation and export of Labrador Sea Water. Through deep convection, the Labrador Sea is one of the few oceanic regions where there exists a direct pathway for the remote communication of surface anomalies to low latitudes via the ocean's interior. It is through these pathways that, scientists believe, the ocean may be playing a role in modulating climate on decadal, or longer, timescales. This research falls under the Cicor theme "Ocean Participation in Climate and Climate Variability". Some fraction of the observed deep convection variability, has been attributed to the forcing, the North Atlantic (or Arctic) Oscillation being the dominant mode in this region on decadal and longer timescales. The remaining, however, is presumably driven by the interplay of the interior circulation and the fresh water and salt exchange with the boundary currents. Additional variability, in the characteristics of Labrador Sea Water observed downstream, may also result from the still uncertain export mechanisms. Since she has been at WHOI, Fiamma has taken advantage of a variety of data collected during recent extensive surveys of the Labrador Sea region which include the first high resolution mapping of the circulation in the Labrador Sea, obtained from mid-depth floats (R. Davis, Scripps and B. Owens, WHOI) as well as wintertime (during active convection) observations collected by Bob Pickart. With these data, she has been able to put together a model which highlights the interior pathways for the spreading of the dense water and their timescales. The next step will see her analyzing a collection of hydrographic sections across both the inflow and outflow boundary currents to piece together a description of the variability in the inflow and outflow. During her two year appointment her goal is to investigate how, and if, all of these different factors may result in an oceanic modulation of climate signals.

Dr. Straneo currently holds a position as Assistant Scientist in the Physical Oceanography Department at WHOI.

Jim Lerczak

CICOR Post-Doc 2000-2001

Summary of Accomplishments (written in 2001)

Since arriving at WHOI in December of 2000, I have submitted three papers from my doctoral dissertation for publication (see reference list below). One of the papers has been accepted and the other two are being reviewed. I have been involved in two research projects. The first is a study of zooplankton patch dynamics in Cape Cod Bay and is in collaboration with Cabell Davis, Carin Ashjian, Bob Beardsley, and Scott Gallager. Here I am analyzing current, hydrographic and drifter data from an intensive set of field studies in NE Cape Cod Bay to detect tidally-dependent surface convergences. We are also analyzing video plankton recorder (VPR) data to study copepod behavior and determine whether the copepods respond to convergences to facilitate aggregation. Second, I have been working with Rocky Geyer, Bob Chant (Rutgers), and Bob Houghton (Lamont-Doherty) on a study of secondary flows in the Hudson River estuary. For this project, I participated in two cruises. In April 2001, we conducted cross- and along-estuary ADCP, hydrography, and sediment load surveys in the lower Hudson River. In May 2001, we injected fluorescein dye into the Hudson River estuary and conducted fluorometer, ADCP, and hydrographic surveys to track the dye's subsequent advection and dispersion over several tidal cycles. I have been analyzing the currents and hydrography obtained from these cruises to determine the strength and dynamics of the secondary (lateral) flows. In addition I have begun to run simulations using ROMS to study the dynamics of secondary flows in idealized stratified estuaries.

Papers submitted for publication:

Lerczak, J. A., M. C. Hendershott, and C. D. Winant. 2001. Observations and modeling of coastal internal waves driven by a diurnal seabreeze. J. Geophys. Res., accepted.

Lerczak, J. A., M. C. Hendershott, and C. D. Winant. 2001. Coherence between the semidiurnal barotropic tide and internal tidal currents on the southern California shelf. J. Phys. Oceanogr., submitted.

Lerczak, J. A., C. D. Winant, and M. C. Hendershott. 2001. Observations of the semidiurnal internal tide on the southern California slope and shelf. J. Geophys. Res., submitted.

Background Information

Postdoctoral scholar Jim Lerczak arrived at WHOI in December, 2000. He received his PhD from Scripps Institution of Oceanography where he studied the dynamics of wind-driven, tidal and high-frequency internal waves observed off the coast of southern California. He is beginning to identify the research he will engage himself in while at WHOI. Possible directions include a study of the dynamics of the shelfbreak front under the supervision of Dave Chapman; a study of the role of currents in the aggregation of phytoplankton in Cape Cod Bay with Carin Ashjian and Cabell Davis; and a numerical study of the secondary circulation in the Hudson River estuary and its role in enhancing mixing across the salinity front with Rocky Geyer.

Dr. Lerczak is currently an Assistant Scientist in the Physical Oceanography Department at WHOI.