suboxic sediments is well documented, DOC pore water gradients have most often been interpreted uniquely as indicative of a flux of DOC out of the sediments to the overlying bottom waters [2-5]. This interpretation stems from our inability to resolve a subsurface DOC sink from the vertical distribution of sedimentary particulate organic carbon (POC). This DOC sink, if it exists, would considerably alter our views of the mechanisms that regulate DOC fluxes across the sediment-water interface as well as their quantification. Sorption onto authigenic metal oxides may also lead to a molecular and isotopic fractionation of DOC. Furthermore, if DOC sorption to metal oxides is a reversible process, it may buffer pore water DOC concentrations and release to the overlying waters. Oxic surface sediments recovered from the St. Lawrence Estuary and the Saguenay Fjord were incubated under anaerobic conditions and extracted with a mild reducing agent to determine the amount and composition (molecular and isotopic) of the DOC associated with the authigenic iron and manganese oxides. Preliminary results from the study will be presented. References: [1] Deflandre et al. (2002) Geochim. Cosmochim. Acta, 66; 14, 2547-2558. [2] Alperin et. al., (1999) Geochim. Cosmochim. Acta, 63; 3-4, 427-448. [3] Burdige et al., (1999) Geochim. Cosmochim. Acta, 63; 10, 507-1515. [4] Holcombe et al., (2001) Limnol. Oceanogr., 46; 2, 298-308. [5] Papadimitriou et. al. (2002) Mar. Chem., 79, 37-47.

### OS43A-07 1330h POSTER

## Contributions of Wind Forcing and Surface Heating to Interannual Sea Surface Height Variability in the Atlantic Ocean.

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Inteannual sea surface height variations in the Atlantic Ocean are examined from 10 years of high-precision altimeter data in light of simple mechanisms that describe the ocean response to atmospheric forcing: (1) local steric changes due to surface buoyancy forcing and a local response to wind stress via ekman pumping, and (2) baroclinic and barotropic oceanic adjustment via propagating Rossby waves and quasi-steady Sverdrup balance respectively. It is shown that most of the interannual sea level variability is related to local response to heat fluxes changes (more than 50% in the eastern North Atlanic). Except in a few places, a local response to wind stress forcing is less successful in explaining sea surface height observations. In this case, it is necessary to consider large scale oceanic adjustments: first baroclinic mode forced by wind stress explain more than 30% of interannual sea level variations in the eastern North Atlantic or in the South Atlantic (between 30 and 40 $^{\circ}$ S) and in the range of 70 % in the latitude band 17-20 $^{\circ}$N. A quasi-steady sverdrup response is also observed between 40 and 45 $^{\circ}$N.

### OS43A-08 1330h POSTER

## Multi-Platform Seabed Classification of Georgia Strait, British Columbia (Canada)

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This paper presents the results of a multi-platform seabed classification in Georgia Strait. This study is part of an NSERC CRD project to establish a methodology to efficiently develop a comprehensive understanding of the seabed, based on the integration of the classification of acoustic data from multiple sonar platforms with suitable auxiliary groundtruth data. Two different data sets are classified and integrated in this paper. Classification of the backscatter of Simrad EM1002 multibeam data generated a high spatial resolution map related to the seafloor geology. Classification of high-resolution Huntec seismic lines in the same area produced a map of the subbottom seabed geology that can be compared to the multibeam seafloor classification map. The main challenge addressed in this paper is that EM1002 often operates in 3 discrete modes to optimize the quality of the bathymetric data. Generally these modes are depth related, with a longer acoustic pulse used in areas where the seafloor is deeper. For classification purposes, this means that each mode has to be treated separately, because the pulse length strongly influences the backscatter statistics. From here, a general multibeam classification was developed from the 3 separate classification results and integrated with the seismic classification results.

### OS43A-09 1330h POSTER

## Testing the Reliability and Sensitivity of Foraminiferal Transfer Functions Based on the Modern Analog Technique (MAT)

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Quantitative estimates of past sea-surface temperatures (SST's) based on surface sediment calibration data sets of planktic foraminifers and modern SST's have been widely used in the interpretation and modeling of past climates. One widely used approach, The Modern Analog Techniques (MAT) relies on comparing a downcore sample to the Brown University modern Global Data Base of 1265 seabed samples and choosing either the10 or 5 most similar modern samples using the squared-chord distance similarity metric. The SST's above the best modern analogs are then averaged to produce the downcore SST estimate. We have chosen a set of 8 modern sea-bed samples from the Global Data Base with a wide range of foraminiferal compositions; 3 from the Pacific, 3 from the Atlantic, and 2 from the Indian Ocean and have generated duplicate foraminiferal census counts from sets of 5-6 random splits from each of our 8 samples so that we can: 1. compare the degree of similarity between duplicate samples so that we can evaluate the differences in dissimilarity values that can be attributed to counting error and begin to better understand the sensitivity of the chosen dissimilarity measures to ecologically produced differences in foraminiferal composition, 2. evaluate differences in how the duplicate samples choose analogs from the Global Data Base, and 3. test the sensitivity of the MAT's ability to accurately and precisely predict SST's using analogs from the Global Data Base for each set of duplicate samples. Comparison of the dissimilarity coefficients within each set of duplicate samples produces maximum dissimilarity values that range from 0.03 to 0.14. Both mean and maximum dissimilarities are greatest in sample sets from the low latitudes. The 5 best analogs chosen from the Global Data Base for samples within each set of duplicates generate average dissimilarities that range from 0.01 to 0.04. However, between a total of 8 and 12 different modern analogs were needed to find the 5 best analogs for all the samples within a particular set of duplicates, with no regional pattern in this number observed. The warm and cold SST estimates generated using the SST's above each of the 5 chosen analogs exhibit a wide range of variation, particularly for the three sample sets from the high latitudes. The three subpolar sample sets exhibit a 3.4, 1.1, and 1.0 degree C range in their cold SST estimates. There is no clear relationship between differences in SST estimates and differences in the average dissimilarities within duplicate sample sets. Using 10 instead of 5 modern analogs to estimate SST's produces somewhat better results for 4 of the 8 sample sets and similar results for the remaining 4. Our results suggest that foraminiferal samples with dissimilarity values of up to 0.15 are not detectably different from duplicate foraminiferal census counts and should be considered excellent modern faunal analogs for any fossil sample. In addition high latitude samples seem to be produce somewhat less reliable SST estimates than low latitude samples. Finally, our results suggest that, when estimating past SST's choosing to average the SST's above the 10 best analogs produces more accurate (and precise) results, particularly in situations where the Global Data Base contains adequate modern analogs.

## OS44A CC: 520 A Thursday 1530h

### Rachel Carlson Lecture *(joint with U)*

***Presiding:*** **J A Carton,** University of Maryland

### OS44A-01 1535h

## Beyond Correlations: the Search for Mechanisms Underlying Coupled Climate/Ecosystem Variability in the Oceans

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Correlations between variables describing some part of the earth's climate system and others associated with some part of oceanic ecosystems are widely used to suggest the existence of causal linkages. I will consider the dangers inherent in using such correlations for predictive purposes, and argue that real predictive skill demands identification of the underlying connective mechanisms. As an example, I will describe a possible mechanistic explanation for observed correlations between the winter state of the atmosphere over the North Pacific Ocean and the success of various North Pacific salmon fisheries. This same context will be used to demonstrate that the crucial final step, that of testing candidate mechanisms, is presently severely limited by lack of long-term data sets that include biological variables other than fish catches. Identification and understanding of the mechanisms connecting variability in climate and large marine ocean ecosystems is both economically essential, and increasingly urgent as the earth's climate system moves into states outside the experience of observational earth sciences in the modern age.

## OS51A CC: 524 C Friday 0830h

### General Ocean Sciences II

***Presiding:*** **H Sun,** Rider University**; J E Friddell,** ERDC-Cold Regions Research and Engineering Laboratory

### OS51A-01 0830h

## Decadal Changes in the North Atlantic Subpolar Circulation

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Observations of sea surface height reveal that dramatic changes have occurred over the past decade in the mid-to-high-latitude North Atlantic Ocean. Altimeter data from TOPEX/Poseidon mission show that subpolar sea surface height increased during the 1990s and the geostrophic velocity derived from altimeter data shows a decline in the subpolar gyre circulation. Combining the data from earlier satellites, Seasat (1978) and Geosat (1985-1988), we find that at the late 1990s the subpolar circulation may actually be considerably weaker than in the (late 1970s and) 1980s. Direct current-meter observations in the boundary current of the Labrador Sea support the circulation trend of the 1990s and, together with hydrographic data, show that the mid-to-late 1990s decline extends deep in the water column. Based on analysis of the local surface forcing we find that buoyancy forcing over the northern North Atlantic has a dynamic effect consistent with the altimeter data and hydrographic observations: a weak thermohaline forcing and the subsequent decay of the domed structure of the subpolar isopycnals would support the observed decline of the gyre circulation. Only continued remote and in situ observations will show whether this 1990s change is temporary or part of much longer term variability.