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Features of large-scale atmospheric/oceanic circulation at hemispheric and regional scale affect the many moisture-sensitive, well-replicated millennial length tree-ring records in the Western US that span all the last millennium. This tree-ring variability may be associated with the Pacific Decadal Oscillation (PDO), the Southern Oscillation Index (SOI) and the Southwest Trough Index, all of which directly influence climate variations in the American Southwest. 1000-year atmospheric/oceanic time series based in these associations were then linked with the observed and previously reconstructed summer Palmer Drought Severity Index (PDSI) in western US, providing a decadal to multi-century perspective on climate/circulation variability. Hemispheric and regional climate association tend to be stronger during sudden reversals from dry to wet which were not uncommon throughout the millennium, such as the 1970s PDO reversal which followed the 1950s drought, the 1610s wet interval that followed the 16th century mega drought, and the late 11th, early 12th centuries. Proxy and instrumental data suggest that significant regional anomalous dry (wet) periods over the last millennium (for example in the 1580s and 1950s) coincided with infrequent (frequent) short-wave trough activity. This probably teleconnected with cold sea surface temperature (SST) and high sea level pressure (SLP) over the eastern North Pacific that was enhanced by a greater number of in-phase cold-ENSO and PDO events.

PP52A-0963 1330h POSTER

Global and Regional Modes of the Northern Hemisphere Atmospheric Circulation

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We investigate the relation between the North Atlantic Oscillation (NAO) and the Arctic Oscillation (AO) from the perspective of non-stationarity of Atlantic-Pacific atmospheric teleconnections. We detect decadal variations in the correlation of NAO and El Niño-Southern Oscillation (ENSO) indices in observational data, proxy data and coupled ocean-atmosphere model simulations. During periods when the NAO and Niño3 indices are significantly negative correlated the dominant mode of Northern Hemisphere atmospheric circulation has an annular structure similar to AO (global mode). For these periods NAO can be viewed as a regional manifestation of AO. During periods when NAO and Niño3 indices are not significantly correlated the dominant mode of the Northern Hemisphere atmospheric circulation is concentrated in the Atlantic-European region and has a spatial structure similar to NAO (regional mode). During the last century, the global (regional) mode dominates the Northern Hemisphere circulation during the 1930s to 1960s (after the 1970s). The combined analysis of a snow accumulation time series from an ice core from Mount Logan (northwestern Canada) and a coral oxygen isotope time series from Ras Umm Sidd (northern Red Sea) reveals that the global mode dominates the Northern Hemisphere atmospheric circulation also during the 1750s to 1850s. The correlation between NAO and ENSO indices in a millennial-scale climate simulation of the coupled ocean-atmosphere model ECHO-G indicates decadal variations as detected in observed and proxy data. The model shows more frequent occurencies of global-mode regimes relative to regional-mode regimes, showing that a large part of millennial scale variability is related to AO.

PP52A-0964 1330h POSTER

Variability in Coupled Ocean-Atmosphere Models of the Pre-Industrial and Modern Climate

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Proxies from the geological record are an invaluable source of climate information, and have led to profound insights about the variability of the climate system. On long (orbital) timescales, the time-averaging of proxies arguably removes most of the higher frequency (centennial and shorter) unforced signal. However, as paleoclimatologists construct paleoclimate records (e.g., isotopic concentrations of foraminiferal calcite from drill cores) with limited spatial coverage but increasing time-resolution (annual to decadal), the interpretation of the proxy record becomes more complicated. It is difficult to separate the forced portion of the high-resolution signal from that arising through natural (intrinsic) variability of the ocean-atmosphere system. A high-resolution isotopic record of foraminiferal calcite from the Santa Barbara Basin is currently being constructed by P. Gomez. As a first step toward deconstructing the forced and natural variability in this record, two long (2000 year) simulations have been completed of the pre-industrial and modern climate using a coupled ocean-atmosphere model (the Fast Ocean-Atmosphere Model). These simulations will be analyzed using common statistical methods to identify spatiotemporal patterns of sea-surface temperature at annual, decadal, and centennial time scales. Pre-industrial patterns of variability will be compared with existing Late Holocene paleoclimate records to determine whether their signals rise above that of naturally occurring variability. Finally, pre-industrial and modern simulations will be compared to determine how anthropogenic influences have modified internal modes of variability.

PP52A-0965 1330h POSTER

Application of Sr/Ca Ratios in Sclerosponges as Temperature Proxy

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We investigated Sr/Ca ratios of sclerosponge skeletons collected from the Caribbean and the Pacific Ocean. Sclerosponges build massive calcareous skeletons in isotopic and chemical equilibrium with seawater. Because of their slow growth rate of 0.1-0.4 mm/y, they cover time intervals of decades and centuries. Sclerosponges do not depend on photosynthesis and live as deep as several hundreds of meters below sea level. Thus data derived from sclerosponges can greatly extend proxy records from reef corals. Three species of sclerosponges have been investigated: *Ceratoporella nicholsoni* from the Caribbean and *Vaceletia* sp. and *V. crypta* from the southwestern Pacific ocean (Coral Sea, Fiji). The specimens were sampled from different water depth between 10 and 350 m with temperatures ranging from 16 to 28°C. The modern temperature differences were used to calibrate the Sr/Ca thermometer. In all species we find a negative correlation of Sr/Ca with temperature. The different species show different Sr/Ca ratios at similar water temperatures, however they point to similar temperature sensitivity of Sr/Ca in all skeletons of about -0.1 mmol/mol/°C. We apply the Sr/Ca temperature proxy to establish a temperature reconstruction for Jamaica at 20 m below sea level with a roughly monthly temporal resolution in a 50 year time frame in the mid 17th century. This high resolution Sr/Ca record reflects annual temperature variations of up to 1.5°C. Comparison of the mean Sr/Ca ratio of this interval with the mean of the second half of the 20th century yield a temperature increase of about 2°C.

PP52B MCC: 3004 Friday 1340h

Paleoproductivity, Proxies, and Preservation: Records of Neogene Evolution of the Oceans II *(joint with B, OS)*

Presiding: **L Diester-Haass,** Universitaet des Saarlandes, Zentrum fuer Umweltforschung**; K Billups,** College of Marine Studies, University of Delaware

PP52B-01 1345h

Applicability of Modern Benthic Foraminiferal Based Paleoproductivity Estimates to the Neogene Record: A Case Study from the South China Sea

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We investigate the applicability of modern benthic foraminiferal based paleoproductivity proxies to fossil assemblages in the South China Sea. This western Pacific marginal basin has a 30 Myr continuous pelagic sediment record and minimal carbonate dissolution, and thus provides ideal boundary conditions for such a test. We relate the composition of modern and Pleistocene to Oligocene benthic foraminiferal assemblages to satellite derived primary productivity estimates, geochemical productivity proxies and multispecies infaunal and epifaunal carbon isotope values in surface samples and piston cores from several RV Sonne cruises and from ODP Leg 184. In our core top samples, we observe a strong correlation of living and dead benthic foraminiferal density, diversity indices, and assemblage composition with carbon flux at the seafloor. These carbon-flux related faunal trends are also apparent in the fossil record, however, their general applicability to fossil assemblages are restricted by major evolutionary changes such as the middle Miocene evolution of the modern oligotrophic deep sea benthic foraminiferal fauna and the mid-Pleistocene extinction of deep water benthic foraminifers (the "Stilostomella extinction" at approx. 0.8 Ma). Our investigation shows that the use of benthic foraminiferal test accumulation rates, diversity patterns, and abundances of index species provides relatively robust tools for estimating relative carbon flux rates, even for Oligocene and Miocene assemblages. However, a straightforward application of carbon-flux transfer functions based on multivariate analyses of assemblage composition appears restricted to benthic foraminiferal assemblages that post-date the Mid-Pleistocene Revolution. Improved understanding of the paleoecology of extinct infaunal high carbon flux indicators may offer the possibility to extend this type of approach to the entire Neogene.

PP52B-02 1400h INVITED

Paleoproductivity Reconstructions Using Radiolarians

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This talk reviews the use of radiolarian assemblages in paleoproductivity reconstruction. Molina-Cruz and CLIMAP co-workers first identified a distinct radiolarian assemblage whose modern geographic distribution closely matched that of an upwelling region (eastern Pacific Peru-Chile). Nigrini and Caulet subsequently identified additional species largely endemic to various upwelling environments. They applied this in the form of an Upwelling Radiolarian Index (URI) in downcore studies of upwelling history. Recently, Jacot des Combes and Weinheimer have used published distributions of living radiolarians in the water-column to assign fossil taxa to surface vs subsurface groups. They used ratios of thermocline to surface taxa (e.g., the

Thermocline to Surface Radiolarian Index, or TSRI), which measures relative enhancement of thermocline to surface radiolarian production in regions of upwelling, to reconstruct past ocean productivity. Both methods appear to perform well, although neither is always reliable. Both the URI and TSRI methods are based on a small number of taxa (ca. 10 each), although biogeographic and water depth information are now available for ca. 100 living species. The use of additional taxa should make reconstructions more robust by reducing the effects of single species ecology, and making index values less sensitive to evolutionary changes in taxa over Neogene time intervals. Taxonomic assemblage reconstructions of productivity have some inherent advantages over bulk flux proxies, being less sensitive to preservation problems or the age model employed. Radiolarian assemblages are particularly useful in upwelling regions where carbonate fossils are poorly preserved. All are however limited by our sparse knowledge of the ecology of the various species used. Among the major microfossil groups, radiolarian ecology and biology are in particular relatively poorly known; even the descriptive taxonomy of living species is not yet complete. Despite these limitations, radiolarian assemblages provide a useful tool for paleoproductivity research. Their power will continue to improve in the future as radiolarian biology becomes better known.

PP52B-03 1415h

Reconciling elemental Ba and barite as proxies of export production: Multiple Ba reservoirs in biogenic sediment

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The use of barite has long been recognized as a promising proxy for export production due to the relationship between its formation and settling biogenic matter. Accordingly, excess Ba (total Ba minus Ba associated with terrigenous material) calculations have been applied as a proxy of barite to assess export production, although this approach may be problematic. For example, because there are additional carrying phases of Ba in sediment other than terrigenous Ba and barite (e.g., oxides, organic matter), excess Ba may not be related in a predictable manner to export production. Indeed, previous workers have also identified the importance of non-barite reservoirs of Ba in sediment traps (e.g., Dymond et al., 1992; Francois et al., 1995) and sediment (e.g., Schroeder et al., 1997; Eagle et al., 2003). Despite these multiple reservoirs, the use of elemental Ba in biogenic sediment as a proxy of export production has a proven and resilient track record. To further understand the partitioning of Ba in biogenic sediment, we sequentially extracted seven, operationally-defined fractions (loosely-bound, exchangeable, carbonate, oxide, organic, opal, and residual) of sediment from surface and downcore samples from a cross-equatorial meridional transect in the equatorial Pacific. We find that Ba is evenly distributed between the sedimentary components with approximately 25-40 percent of the total extracted Ba in each of the exchangeable, carbonate, and oxide fractions for both surface and downcore sediment samples. In the surface sediment transect across the equator, there is no Ba in the residual fraction, and between 10 and 50 percent of the total extracted Ba is in the organic fraction. Also, downcore samples that were extracted from sediments with low relative bulk Ba/Ti tend to have Ba in both the residual and organic fractions as opposed to samples with high relative bulk Ba/Ti where there is a lack of Ba in both the residual and organic fractions. These observations indicate that alternate carriers of Ba, including the exchangeable, carbonate, and oxide fractions of sediment, may exert a larger influence on total Ba than previously suspected. Our new results, when interpreted in the context of recent experimental (Ganeshram et al., 2003) and observational (Eagle et al., 2003) studies of barite formation and the relationship between barite and Ba, further explain why elemental Ba is a valid proxy of export production, as is the distribution of barite (e.g., Paytan et al., 1996). Our results show that while there is a reorganization of elemental Ba between sedimentary phases (which can be considered a continuation of the water column processes described by Ganeshram et al., 2003), the reorganization only affects the distribution of the Ba and does not destroy the primary relationship between export flux and the accumulation of Ba preserved in the sedimentary record.

PP52B-04 1430h INVITED

The Intrinsic Mass Balance Problem With Using Biogenic Barite Accumulation to Record Past Productivity

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The construction of "paleoproductivity" records, especially over brief (<200,000 yr) times of major carbon cycle perturbation, has become a growing research theme in paleoceanography. These records are necessarily generated using proxies. The accumulation of euhedral barite in pelagic sediment correlates to the flux of sinking marine organic matter in many locations at present-day. Thus, records of biogenic barite have been used extensively to infer changes in past productivity. In several recent studies, euhedral barite records have been constructed at a limited number of locations, and then used to argue for regionally to globally enhanced productivity across brief events. Here we discuss straightforward results from numerical models of the marine Ba cycle to elucidate potential causes for these widespread pulses in euhedral barite accumulation. Our primary conclusion is that, irrespective of how Ba cycles within the ocean, a significant global increase in biogenic barite outputs (>10%) over appreciable time (>1000 yr) necessitates elevated Ba inputs to the ocean because Ba has a very short residence time at present-day (<10,000 yrs). High sulfate concentrations and the low Ksp for barite presumably maintain a similar residence time for much of the younger geological record. If truly global, intervals of significantly greater euhedral barite accumulation must therefore be viewed as times of increased Ba input to the ocean rather than times of elevated primary productivity. Over brief events, however, established sources of Ba to the ocean, hydrothermal waters and rivers, cannot furnish large amounts of Ba. There appear to be three general explanations for short intervals characterized by enhanced barite deposition at multiple locations: (1) decreased Ba accumulation at other locations counterbalanced the excess accumulation in examined records, (2) sulfate concentrations were much lower during these intervals, or (3) a major flux of Ba to the ocean lies outside of current models. We cannot exclude the first two possibilities with available data but suggest that methane-laden fluids escaping from the seafloor provide a very large and highly variable source of barium to deep ocean water. Changes in this source could account for certain observations.

PP52B-05 1445h

The use of alkenone $\delta^{13}C$ as a paleo-growth rate proxy

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The carbon isotopic fractionation that occurs during marine photosynthetic carbon fixation (ϵ_p) is primarily a function of the concentration of CO_{2aq}, cellular growth rate, and cell geometry. Field data from natural haptophyte populations provide evidence for a robust relationship between the ϵ_p values derived from diunsaturated alkenones ($\epsilon_{p37:2}$) and the concentration of reactive soluble phosphate. Given our understanding of the factors controlling $\epsilon_{p}37:2$, it is likely that differences in algal growth rates are responsible for this relationship. Records of ϵ_p reconstructed from the stable carbon isotopic of diunsaturated alkenones and coeval planktonic foraminifera have been used to reconstruct the long-term evolution of atmospheric carbon dioxide during the Neogene by restricting analysis to relatively stable oceanographic environments and thus minimizing the effects of variable nutrient availability and cellular growth rates. However, $\epsilon_{p}37:2$ trends from different ocean sites do not only reflect global pCO2 levels, because there are significant differences in isotopic trends between basins. These differences likely reflect regional differences in haptophyte growth rates. For example, records of $\epsilon_{p}37:2$ from site 516 in the southwest Atlantic records a large, and permanent decrease in $\epsilon_{p}37:2$ between 20.3 to 19.5 Ma, coincident with a 4 degree decline in surface water temperature inferred from the $\delta^{18}O$ of planktonic foraminifera. This decrease in $\epsilon_{p}37:2$ is interpreted as reflecting both higher growth rates and nutrient concentrations in the upper-water column, caused by a reduction in upper water column stratification. Disappearance of measurable alkenones by 17 Ma occurs prior to a reduction in surface-to-thermocline $\Delta\delta^{18}O$ and $\Delta\delta^{13}C$ gradients, and is attributed to low nutrient concentrations and reduced influence of proto-Antarctic Intermediate Water. We continue to investigate a potential nutrient control on the character of $\epsilon_{p}37:2$ at site 516 by evaluating the Cd/Ca and Ba/Ca character of depth stratified foraminifera coeval with the decrease in $\epsilon_{p}37:2$ between 20.3 to 19.5 Ma. Initial results suggest that the nutrient character of the upper water column experienced substantial change coincident with the $\epsilon_{p}37:2$ shift.

PP52B-06 1500h INVITED

Coccolith Chemistry as a Paleoceanographic Indicator in Paleogene and Neogene Sediments

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Coccoliths are the dominant form of carbonate in many Neogene and Paleogene marine sediments. Recent culture and sediment core top studies suggest that coccolith Sr/Ca ratios increase with nutrient-stimulated growth rates, potentially offering a new indicator of the productivity of the coccolithophorid algae. Unlike many other common productivity indicators, the coccolith Sr/Ca indicator does not depend on knowledge of the sediment accumulation rate which can be difficult to determine with precision in pre-Quaternary sediments. Separation of near-monospecific coccolith fractions from sediments can yield species-specific Sr/Ca records. This method was applied to sediments from the Weddell Sea (ODP site 690) to test whether marine productivity increased during the Paleocene-Eocene Thermal Maximum. In the dominant coccolithophorid genus Toweius, a large (40%) Sr/Ca increase immediately after the carbon isotope excursion suggests an important increase in nutrient availability and coccolithophorid productivity. Productivity levels remain high for 60,000 years but decrease to pre-event levels within 120,000 years. Elevated productivity corresponds with locally and globally increased silicate weathering intensity indicated by published clay mineral assemblages and Os isotope records; increased weathering intensity may have accelerated nutrient fluxes to near-continent regions. If this type of productivity response occurred globally, it would also be consistent with the timing of C drawdown that may have returned temperatures to near pre-event levels. Unfortunately, at other PETM sites like Blake-Bahama Plateau (ODP 1051) and Shatsky Rise (ODP 1209), application of the coccolith Sr/Ca technique is limited by abundant non-coccolith carbonate in the coccolith size fraction. Analysis of stable isotopes in near-monospecific coccolith fractions from Paleocene sediments illustrates a small range of vital effects among different species and reaffirms the fidelity of coccolith-dominated bulk carbonate records for this event.

PP52B-07 1515h INVITED

De-coupled upwelling, productivity, surface water pCO2 of the Benguela Current System During the Intensification of Northern Hemisphere Glaciation.

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The Intensification of the Northern Hemisphere Glaciation (3.2 to 2.5 Ma) is a key climatic transition in Earth History. Deep-sea sediments recovered from ODP Leg 175 Site 1083 cover this important time period and provide a means of monitoring the Benguela Current Upwelling system and the adjacent African continent. With a resolution of approximately 1 ka, we have reconstructed the following climatic parameters: Global ice volume (benthic foraminifera oxygen isotopes), wind strength and land aridity (HIRM, MS, Al/Ti ratios), upwelling intensity (UK37'-SSTs), surface water productivity (TOC, Chaetoceros resting

spores, alkenone abundance, pigments, Ba), surface water nutrient availability (organic nitrogen isotopes), nutrient source (diatom species abundance), land vegetation type (n-alkane abundance and carbon isotopes) and surface water pCO2 (alkenone and calcite carbon isotopes). Three conclusions have been drawn from this unique data set: 1. Surface water productivity is not associated directly with increased glacial upwelling. Peaks in productivity occur during early glaciation, and full glacial productivity is lower than the interglacial levels. It is suggested that this is caused by the antagonistic effects of upwelling intensity and nutrient supply from the Southern Ocean. 2. Surface water pCO2 is relatively insensitive to changes in upwelling and productivity, suggesting the Benguela current is continuous sink of atmospheric carbon dioxide throughout a glacial-interglacial cycle. 3. South West Africa vegetation co-varies with precession and is independent of glacial-interglacial cycles. We suggest that this is due to the strong influence of precession on the southward penetration of the ITCZ and thus moisture availability.

PP52C MCC: 3004 Friday 1600h

Effects of Sediment Dynamics on Marine Paleorecords II *(joint with B, OS)*

Presiding: **A Pearson,** Harvard University**; T I Eglinton,** Woods Hole Oceanographic Institution**; T Wagner,** Woods Hole Oceanographic Institution**; L Giosan,** Woods Hole Oceanographic Insitution

PP52C-01 1600h INVITED

Temporal and spatial changes in sedimentation along the margins of the North Atlantic

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The seafloor along both the eastern and western margins of the North Atlantic is dominated by features produced during times of lowered sealevel and modified during the Holocene. The most striking features are glacial outwash fans, giant landslides and canyoned margins with associated filled basins. The landslides occur in areas of high accumulation and can relocate hundreds to thousands of cubic kilometres of sediment in single erosive events. Off NW Africa up to 20% of sediment may be remobilized by landslides, with each event leaving a hiatus. Each of these hiatuses extends over an average area of 4800 km2 and represents removal of sediment layers several tens of meters thick and of several hundred thousand years duration. Evidence will be presented to show that the rate of redeposition is related to climate/sealevel change in some basins.

PP52C-02 1615h INVITED

Radiocarbon ages of marine biomarkers and co-occurring foraminifera: evidence for differential particle transport on continental margins

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Continental margins, with their typically high accumulation rates, are prime locations for high temporal resolution studies of past climate. One key assumption is that the sediments in these locations reflect past conditions in overlying ocean waters, and that co-occurring sediment constituents are coeval. We will present evidence based on radiocarbon dating of various sediment constituents from several continental margin sites that these assumptions are often not valid due to current-induced sorting of fine-grained and coarse-grained sediments. Marine organic biomarkers, which are often also used as proxies for past ocean conditions, can be up to several thousand years older than co-occurring foraminifera, which in turn provide age control in most paleoceanographic studies. The age offsets between the organic compounds and the coarse-grained foraminifera appear to be site-dependent and, at the same time, relatively constant over time at a given site. The offsets seem to be caused by a combination of resuspension, often caused by bottom currents, and preferential preservation of protected and refractory compounds. This observation has important implications for our understanding of sedimentary records, the paleoclimatic signals preserved in them, and organic carbon burial.

PP52C-03 1630h INVITED

Paleoclimate Variability Inferred From Size Distributions of Deep-Sea Sediments: A Comparison of Different Methods

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One of the outstanding problems of paleoclimate reconstruction from physico-chemical properties of terrigenous deep-sea sediments stems from the fact that most basin fills are mixtures of sediment populations derived from different sources and transported to the site of deposition by different mechanisms. Conventional approaches to paleoclimate reconstruction from deep-sea sediments do not distinguish between provenance and dispersal-related variations, and therefore often fail to recognize the true significance of variations in sediment properties.

Many attempts to extract paleo-environmental information from deep-sea sediments have focused on grain size, more specifically on the use of variations in univariate summary statistics of grain-size distributions (GSDs). This approach to characterization is unlikely to be successful because most deep-sea sediments are mixtures of different sediment types, as a consequence of time-averaging effect related to bioturbation and low accumulation rates. We present a conceptual model of spatio-temporal grain-size variation in terms of dynamic populations (DPs). Each DP results from a characteristic combination of production and transport mechanisms that corresponds to a distinct subpopulation in the data analyzed. The mathematical-statistical equivalent of the conceptual model may be solved by means of the end-member-modeling algorithm EMMA. The modeling results of a high- and low-latitude ocean basin are shown to illustrate the common degree of complexity of deep-sea grain-size records. The distinction between DPs related to selective dispersal of detritus from a single source, and DPs related to mixing of detritus from different sources is shown to be essential for successful paleoclimate interpretation. The case study of the North Atlantic is discussed in more detail to illustrate the latter.

Variability in iceberg discharge and deep-ocean circulation in the North Atlantic during the last glacial period is inferred from the GSD and trace elemental composition of terrigenous sediments on Reykjanes Ridge. End-member modeling of the GSDs is used to unmix the signals of varying bottom-current speed and iceberg discharge. The GSD within the silt fraction appears to be influenced by both factors. We show that reconstructions of variations in bottom-current speed based on the raw grain-size data are opposite to inferences from the unmixed record. The discrepancy between the interpretations obtained by the conventional approach and EMMA highlights the danger of interpreting grain-size variation in terms of a single controlling factor without knowledge of the sources and dispersal mechanisms of the sediments.

PP52C-04 1645h

Comparisons of Radiocarbon Ages of Alkenones With Planktonic Foraminifera and Total Organic Carbon in Oceanic Surface Sediments

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To further evaluate the fidelity of alkenones as molecular stratigraphic markers, we have measured radiocarbon ages of alkenones as well as coexisting planktonic foraminifera and total organic carbon (TOC) in the surface sediments collected from a range of depositional settings (Gulf of Mexico, Arabian Sea, Indian Ocean, NE Pacific margin, NW Atlantic margin, Bermuda Rise, south Atlantic, etc.). Radiocarbon ages of alkenones are equivalent with those of planktonic foraminifera in sediments from the Arabian Sea, and Indian Ocean. However, at the other sites investigated alkenones are significantly older than those of the corresponding planktonic foraminifera. We ascribe these age differences to sedimentary processes influencing coarse-grained foraminifera and alkenones associated with fine-grained particles. The latter are more susceptible to resuspension, advection and redeposition by oceanic currents. Alkenone ages are, on average, younger than TOC ages at the study locations. The age difference appears to be greatest in coastal sediments, which could be explained by the contribution of old terrigenous organic matter.

PP52C-05 1700h

On the potential sedimentological origin of downcore variations of bulk sedimentary δ^{15}N

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ODP site 1144 is located less than ten kilometers from core site SONNE 17940 on the continental slope of the northern South China Sea (SCS). Despite their proximity, the sedimentary nitrogen isotope records are distinctly different at both sites, with glacial-interglacial variations of ca. 1 permil at site 17940, and up to 4 permil at site ODP1144. Here we explore the potential origin of these differences in the δ^{15}N records, focussing on three aspects of the variable sedimentology at both sites on glacial-interglacial timescales. 1) Based on major element contents (Si/Al and Zr/Al ratios), glacial sediments at site ODP1144 are significantly finer-grained than at site 17940. As evident from a suite of samples from the SCS, finer-grained sediments are associated with higher δ^{15}N values, thus contributing to the offset in the δ^{15}N records between both sites. 2) Sediments at site ODP1144 contain lower amounts of potassium, and, by inference, ammonium, which substitutes for potassium in K-bearing minerals. Given the low δ^{15}N of ammonium fixed in clay minerals this difference in mineralogy further contributes to lower glacial δ^{15}N values at site 17940 compared to ODP1144. 3) We will also be presenting radiocarbon dates of total organic carbon (TOC), in an attempt to elucidate the different origin and sedimentological history of TOC at both sites. Sediments found at both ODP1144 and 17940 originate from an area affected by eustatic sediment redistribution, gravity- and fluvially-driven sediment mobilization from the broad northern SCS continental shelf. Rare earth element analyses (Shao et al., 2001) indicate that a significant part of the detrital material at ODP1144 originates from Taiwan, transported through the Penghu channel to the coring site in the northern SCS, and is not representative of the vertical particle flux to the sea floor. Sediment redistribution therefore potentially affects downcore variations in bulk sedimentary δ^{15}N, and cautions the interpretation of a single downcore record with respect to local/regional δ^{15}N variations in the past, and indeed with respect to other sedimentary proxies.

PP52C-06 1715h

A Sub-Decadal Continental Margin Record of Little Ice Age-to-Modern Climate-Induced Changes in Sediment Delivery and Transport in the Gulf of Alaska

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