North Pacific, we conducted the plankton tow in the upper 200 m for seven depth intervals (0-20 m, 20-40 m, 40-60 m, 60-80m, 80-120 m, 120-160 m, 160-200 m) at three sites (Site A (36N, 142E), Site B (41.5N, 142E) and Site b (41N, 143E)). We also measured hydrographic conditions and primary production with CTD and FRRF at the same time.

The plankton tow yielded 20 foraminiferal species (> 125 um) at Site A and 8 species at both sites B and b. Globigerina bulloides (av. 19.7 %), Globigerinoides ruber (av. 18.9 %), Neogloboquadrina pachyderma (including Neogloboquadrina incompta) (av. 18.9 %), Neogloboquadrina dutertrei (av. 14.9 %), and Globigerinoides sacculifer (av. 6.7 %) were predominant at the southern site (Site A), and N. pachyderma (av. 49.2 and 37.5 %), Globigerina quinqueloba (av. 39.7 and 56.7 %), and G. bulloides (av. 6.4 and 4.7%) were abundant at northern sites (Sites B and b).

The average standing stock of living foraminifera (0-200 m) were 24, 18, and 30 shells m-3 at Site A, Site B and Site b, respectively. The standing stocks at all three sites were closely correlated with the chlorophyll a concentrations except for the upper most surface layer at Site A, perhaps because major species in this study are mostly herbivores. The profiles of vertical temperature at northern sites (Site B and b) were very similar. However, the standing stock profiles at both sites showed different patterns depending on chlorophyll concentration. It suggests that foraminiferal population is more related by chlorophyll concentrations than by temperature in this study.

On the other hand, standing stocks of surface layer (0-40 m) at the southern site (Site A) were poorly correlated to chlorophyll concentrations and temperature, and well correlated to light intensity. It can be attributed to predominance of endosymbiont-bearing species which may obtain nutrition from their symbiont photosynthesis. The hosting symbiont species, G. ruber and G. sacculifer and facultative symbiont species, N. dutertrei, Globigerinita glutinata, Pulleniatina obliquiloculata and Globorotalia menardii have high standing stocks of 45 shells m-3 at surface layer (0-20 m), mean value of 19 shells m-3 (0-80 m). These species were abundant only in surface layer and diminised rapidly with depth. Predominance of endosymbiont-bearing species is the reason behind high standing stock of surface layer. Vertical distribution of foraminiferal abundance depended more on light intensity and photosynthetic activity of symbiont than on chlorophyll concentration and temperature because of predominance of endosymbiont-bearing species.

PP21C-0343 0830h POSTER

Upwelling off Namibia: Approaches to Solving the Walvis Opal Paradox

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Upwelling off Namibia was enhanced during glacial time in the coastal ocean off southwestern Africa, as documented in a number of productivity proxies. However, the deposition of diatoms and other siliceous plankton remains was diminished. This discrepancy is known as the Walvis Opal Paradox. Understanding this paradox is fundamental to the understanding of glacial-interglacial productivity fluctuations. Several conceptual approaches to solving this paradox have been offered. We consider two of these: (1) The suggestion that the thermocline was impoverished in silicate during glacial time, and (2) the suggestion that the change in topography that results from a drop in sea level has important implications for the rate of deposition of diatoms on the upper slope. The first approach focuses on changes in circulation and changes in overall nutrient supply. The second emphasizes regional factors affecting the position of upwelling centers and the role of recycling and redeposition of siliceous materials. Simple models incorporating the relevant processes are presented, models that can suggest observations allowing a choice between these alternatives.

PP21D MCC: 270 Tuesday 0830h

The Paleogene and Cretaceous Pacific: Results From ODP Drilling I

(joint with GP, OS, GC)

Presiding: **D K Rea,** University of Michigan**; A K Tripati,** University of Cambridge

PP21D-01 0830h INVITED

New Evidence for Abrupt Climate Change in the Cretaceous and Paleogene: Ocean Drilling Program Leg 198 to Shatsky Rise, Northwest Pacific

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Sediments recovered during Ocean Drilling Program Leg 198 to Shatsky Rise in the northwest Pacific contain a record of climate and oceanography of the past 145 million years. Eight sites were drilled along a depth transect to reconstruct water column structure through the warm climate interval of the Cretaceous and Early Paleogene. The sediments recovered from this transect hold clues to a number of abrupt climate and environmental events that took place during this time interval. These transient events are recognized by major upheaval in marine communities and profoundly altered biogeochemical cycling. Shatsky Rise cores contain organic carbon-rich strata deposited during a brief interval of open ocean dysoxia or anoxia in the Early Aptian (120 Ma). Exceptional preservation of organic compounds suggests that bacterial activity helped sequester organic carbon in these strata. Graphic evidence exists in Shatsky cores for the mid-Maastrichtian (69 Ma) global extinction of the inoceramids, a long-ranging, widespread group of bottom-dwelling clams. Stratigraphically expanded records of the Cretaceous/Tertiary (K/T) boundary extinction event (65 Ma) were recovered at four different sites. The cores show evidence of the response of biogeochemical cycling and the subsequent recovery of oceanic plankton in the wake of this catastrophe. A new biotic event of major evolutionary significance was found in the early Late Paleocene (58.4 Ma) possibly associated with a change in deep water circulation. The Paleocene-Eocene Thermal Maximum (PETM; 55 Ma), an abrupt warming event associated with major reorganization of benthic and planktonic communities and carbon cycling, was recovered in cores from five sites along a depth transect. PETM warming may have been induced by methane derived from dissociation of methane hydrates. The Shatsky Rise depth transect shows evidence of the expected response of such methane input: pronounced, short-term shoaling of the lysocline and calcite compensation depth (CCD). Shatsky Rise sediments also show the response of the tropical Pacific to an abrupt cooling event near the Eocene/Oligocene boundary (33.5 Ma) marking the transition from the last major greenhouse into the icehouse conditions of the remainder of the Cenozoic. This event is reflected by a marked increase in carbonate content of the sediment preserved on Shatsky Rise that signifies a profound drop in the lysocline and CCD and altered deep sea circulation patterns.

PP21D-02 0845h

Molecular Proxies for Cyanobacterial Production during OAE 1a and for Cooler Waters during the Late Valanginian at Shatsky Rise

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The occurrences, distributions, abundances and isotopic compositions of preserved suites of biomarkers in organic-rich marine sediments provide proxy records that can be interpreted in terms of environmental, climatic and evolutionary change.

Assemblages of biomarkers in Lower Aptian sediments from Shatsky Rise provide evidence of variations in phytoplankton production during OAE 1a. In particular, stratigraphic variations in the prevalence of 2-methylhopanoid hydrocarbons and ketones through the event attest to significant, yet fluctuating, contributions from cyanobacteria. A prominent role for cyanobacteria among the plankton is consistent with the possibility that nutrient limiting conditions favored organisms able to fix nitrogen.

The occurrence of sterol ethers in Quaternary and Neogene sediments appears to be restricted to upwelling systems, which has prompted the suggestion, still unproven, that they derive from diatoms. Sterol ethers have also been found to occur in late Eocene through Oligocene sediments from high latitudes, suggesting an affinity with cooler water regimes. Recognition of a suite of sterol ethers in a late Valanginian organic-rich interval from Shatsky Rise therefore prompts speculation that these compounds may reflect the presence of cooler waters during this interval of the early Cretaceous.

PP21D-03 0900h

The P-E Boundary Carbon Isotope Excursion in ODP Leg 198 Sites from Shatsky Rise: An Initial Test of the Methane Hydrate Dissociation Model

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The Paleocene-Eocene Thermal Maximum (PETM) was characterized by rapid (<40 kyr) global warming (5-10^{o}C), and by shifts in precipitation patters and intensity. These changes were relatively short-lived lasting for less than <200 kyr. Several lines of empirical and theoretical evidence suggest that this perturbation resulted from an equally rapid(<10^4-10^5y) release of a greenhouse gas(es) into the ocean/ atmosphere system. The most significant clue is a large (>3.0 $^{o}/_{oo}$) negative carbon isotope excursion as recorded in both marine and terrestrial environments. The rate and magnitude of the excursion indicate an injection of a massive quantity of isotopically depleted carbon. One plausible source is the bacterially produced methane stored in marine hydrates. Numerical modeling shows that release and oxidation of 2000 Gt of methane (δ^{13}C = -60$^{o}/_{oo}$) could create the observed δ^{13}C anomaly. Such a perturbation would also create several other notable effects including an abrupt shoaling of the lysocline/CCD followed by a gradual recovery.

Ocean Drilling Program (ODP) Leg 198 recovered a series of pelagic sediment cores from Shatsky Rise in the western Pacific that enable testing of this hypothesis, in particular the predicted response of the lysocline/CCD. The PETM was recovered in 4 sites, 1208, 1209, 1210, and 1211, spanning a paleodepth range from 2.2 to 3.6 km. Each PETM horizon is marked by a distinct "dissolution" layer with lower carbonate content. Carbon isotope records constructed for each hole provide tight constraints on the timing of this carbonate dissolution layer. In essence, these records show the base of the dissolution layer to be coincident with the initial negative δ^{13}C excursion at all sites. The timing of recovery, however, varies as function of depth with resumption of carbonate deposition at the deeper site,1211, delayed by 50 kyr relative to the shallowest site, 1209. Both the magnitude and rate of change in the lysocline are, within certain limits, consistent with those predicted by numerical simulations of the methane-related carbon cycle perturbation discussed above.

URL: http://www-odp.tamu.edu/publications/198_IR/198ir.htm

PP21D-04 0915h

Climate of the Early Paleogene Tropics: The "forecast" from a coupled climate model

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In order to provide a framework for the integration and comparison of data collected from Legs 198 and 199, fully coupled ocean-atmosphere climate model simulations were performed for early Paleogene conditions, including 560 and 1120 ppm pCO2. Predictions of tropical Pacific climate properties and processes, including temperature, upwelling rates, current velocities, thermocline tilt, and salinity, produced by the model are independent of climate proxies and therefore useful in comparing the climate interpreted from the geological record against expectations from physical principles. The model indicates that east-west temperature gradients are comparable to modern, although somewhat (2°C) stronger, with vigorous upwelling in the eastern equatorial Pacific and the Intertropical Convergence Zone was similar to modern. The simulated surface temperature distribution is found to partially reconcile apparently substantial differences in tropical paleotemperatures inferred from "standard" planktonic foraminiferal oxygen isotopic records as well as more recent and controversial "hot" values. The potential role of El Nino phenomena in the early Paleogene as predicted by the model and indicated by proxy data is discussed. Warm and salty North Atlantic-derived water traveling through the open Panamanian Isthmus at intermediate-to-deep levels in the equatorial Pacific provides a signal of "young" water at depth into the central Pacific. Estimates of seawater and calcium carbonate oxygen isotopic compositions are also made.

URL: http://www.dcess.ku.dk/~rop

PP21D-05 0950h INVITED

The Eocene and Oligocene Pacific Equatorial Region from ODP Leg 199 Drilling

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ODP Leg 199 drilled a latitudinal transect of sites across the position of the early Eocene equator, designed to study the evolution of the equatorial Pacific current and wind system as the Earth went from maximum Cenozoic warmth to initial Antarctic glaciations. The cruise recovered a biogenic sedimentary record of equatorial processes from the early Miocene to the late Paleocene, roughly from 18 to 56 Ma. Above the biogenic sediments are 10 m or more of nonfossiliferous clay, representing most of the Neogene interval.

We found that equatorial deposition patterns were stable for the Eocene but very different from those of the Neogene. The Eocene is marked by a very shallow carbonate compensation depth (CCD) and radiolarian ooze sediments. In contrast, Pleistocene equatorial sediments are carbonate and diatom rich. The Eocene equatorial sedimentation regime was also much wider than modern, expanding in the middle Eocene to about 10 degrees north of the paleoequator. We interpret the Eocene sedimentary environment to indicate significantly more diffuse upwelling than is found in the modern ocean and a deeper-than-modern eastern Pacific thermocline. Eocene deep waters appear to have been well-oxygenated despite being much warmer than modern deep waters.

There is an abrupt sedimentological transition from the Eocene equatorial state to proto-modern conditions coincident with the first major glaciation of Antarctica in the early Oligocene. Over a time period of about 120 kyr the CCD dropped by more than 1.3 km and sedimentation focused into a narrow equatorial band similar to equatorial sedimentation in the Holocene equatorial Pacific. We interpret the change to mark the first Cenozoic appearance of the modern Pacific equatorial upwelling system.

We also recovered examples of the Paleocene-Eocene boundary at 3 different drillsites from about 1 degree south of the 55 Ma paleoequator to 11 degrees north of it. The P-E boundary event, one of the largest carbon-isotope excursions of the Cenozoic, is represented by a carbonate-poor multi-colored sediment interval. Consistent banding between two sites more than 200 km apart suggest significant changes in deep ocean chemistry during this time interval.

PP21D-06 1005h

The CCD of the Paleogene Tropical Pacific - Results of ODP Leg 199

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Sites dilled by Leg 199 form a transect from 4.5°S to 18.5°N across the Paleogene equator. Drillsites were located atop anomaly 25, 56 m.y old, ensuring recovery of early Eocene carbonates. Many earlier DSDP and ODP Paleogene paleoceanographic efforts were confounded by the common Eocene cherts. The drilling strategy adopted by Leg 199 obviated some of these problems, with the result that we have increased amount of information regarding the Paleogene low-latitude CCD several fold. To reconstruct the CCD we have assumed simple sea-floor subsidence and that the depth of the Paleogene East Pacific Rise axis was 2750 m. Sediment loading depresses the sea floor so any complete determination of age-depth histories requires an unloading step. Results for the Leg 199 sites are comparable among the sites to 50 m; absolute values of the paleodepths depend on the EPR axial depth assumption.

Results show a shallow early Eocene CCD of 3200 m at the equator, deepening to 3600 m at 10°N. Now the CCD always deepens towards the equator, so something quite different occurred in the early Eocene. The CCD remained at these shallow levels until the end of the Eocene, with the exception of a sudden sharp downward excursion (drop/rise) of about 700 meters at 41 Ma. The large drop of the CCD at the end of the Eocene has been known since the earliest CCD studies, but completely recovered sections across this boundary are quite rare. Leg 199 recovered several complete records of this event. At the time of the Eocene/Oligocene boundary the CCD in the low-latitude Pacific fell by over 1000 meters to 4350m, the largest change in ocean paleochemistry in the entire Cenozoic. This drop occurred in two steps likely separated by one eccentricity cycle, each step occurring as rapidly as in thousands of years. A preliminary oxygen isotopic record of these materials at Site 1218 shows the CCD drop is in phase with the long recognized O-18 shift at the E/O boundary. The Neogene CCD in sub-tropical North Pacific lies at about 4600 m, about 500 meters deeper than the CCD of the sub-tropical South Pacific.

PP21D-07 1020h

The Paleogene Intertropical Convergence Zone

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Latitudinal transects of eolian deposition can help define patterns of equatorial zonal winds during Paleogene warm periods and their movement in response to global climatic transitions of the Cenozoic. We examined geochemical and mineralogical data from a number of piston cores and ODP drill sites in the tropical and subtropical Pacific Ocean. In the modern Pacific, dust deposited beneath the northeast trade winds reflects Asian provenance and is likely transported back west through the trade wind system via input from the mid-latitude westerly winds. The amount of dust supplied from American source regions is an order of magnitude lower and has limited influence on the dust record in the offshore pelagic realm of the Pacific. The intertropical convergence zone (ITCZ) forms an effective barrier to inter-hemispheric dust transport and marks the southern boundary of the Asian dust component. Just south of the ITCZ, dust is transported by southern trade winds predominantly from andesitic source regions of Central and South America.

During warm periods of the early Paleogene, andesitic sources appear to dominate eolian deposition throughout the central and equatorial Pacific. Two hypotheses are offered to explain this observation. First, increased andesitic input is associated with trade wind transport from a North American provenance because Asian dust flux, which overwhelms this component in the modern Pacific, was significantly reduced at this time. Mineralogical data collected by light-absorption spectroscopy techniques on bulk sediments recovered during ODP Leg 199 supports this scenario showing increased illite/smectite ratios during the late Cenozoic near the time when Asian dust flux increased. Alternatively, the increased andesitic component during the Paleogene may reflect eolian deposition beneath the southern trade winds with the position of the ITCZ at a latitude as far north as perhaps 25°N. Data from clay mineralogy (from XRD), elemental geochemistry and Nd isotopic ratios from piston cores EW9709-01 and LL44-GPC3 support this hypothesis and show a transition to Asian-like dust provenance occurring by the early Miocene.

PP21D-08 1035h INVITED

Early Cenozoic Stratigraphy of the Equatorial Pacific and the Eocene Revealed

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The broad mound of sediments found in the equatorial Pacific contains a detailed and complex record of the history of equatorial divergence, trade wind strength, biogeochemical fluxes, and biologic evolution. To extract this history from the biogenic sediments of this region the recovery of undisturbed and complete sections is required. Also required is the development of a detailed chronostratigraphy with which we can determine both the times and rates of paleoceanographic and paleoclimatic change. As this mound of sediment has ridden northward on the Pacific crust the most biogenic parts of the lower Cenozoic sediments have gradually moved from under the region of high flux rates at the divergence center. Now they lie within the reach of APC coring on the JOIDES Resolution. The sections recovered on Leg 199 form a paleolatitude transect from about 4.5°S to 18.5°N. Study of these sections has given us a well documented magnetic stratigraphy back into the Eocene, good calcareous nannofossil stratigraphy for the lower Miocene, Oligocene, and early Eocene, and excellent radiolarian stratigraphy from the lower Miocene through the middle Eocene. In addition we recovered good the Miocene/Oligocene and Eocene/Oligocene boundaries in an equatorial setting and LPTM sections near basement at three different sites. These results have allowed a more certain assignment of ages of biostratigraphic events and an opportunity to develop orbitally tuned time scales in sections from the lower Miocene down through the Oligocene. The initial estimates of sediment accumulation rates in the radiolarian oozes indicate variation by a factor of three from upper to middle Eocene times. Mapped patterns of sediment accumulation in the Eocene using both ODP Leg 199 and older DSDP data indicate at least two latitudinal zones of maxima in accumulation rates. Determination of the exact latitudes of these zones awaits further study.

PP21D-09 1050h INVITED

Miocene-Oligocene magnetostratigraphy from Equatorial Pacific sediments (ODP Site 1218, Leg 199)

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ODP Site 1218 was cored in the equatorial Pacific Ocean during Leg199. The 270 m of sediments from the site yielded an excellent record of the geomagnetic polarity reversals for the entire Miocene and most of the Oligocene. Nannofossils and radiolarians indicate that the section is biostratigraphically complete with no apparent hiatuses. The top 165 m of Site 1218 was cored using the Advanced Piston Corer and sediment cores could be azimuthally oriented preserving the declination information. The high-resolution magnetostratigraphic record has been obtained by measurements made on u-channel samples, augmented by about 300 discrete samples. U-channel samples were measured at 1cm interval and stepwise demagnetized in alternating field up to a maximum peak field of 80 mT. The Characteristic Remanent Magnetization directions were determined each 1 cm by principal component analysis for demagnetization steps in the 20 mT to 50mT peak field range. A similar treatment was carried out on the discrete samples, that gave results compatible with u-channel measurements. . Magnetostratigraphy from u-channel samples are compared with shipboard data that was based on blanket demagnetization at peak AF fields of 20 mT. U-channel measurements add more detail to the magnetostratigraphic record and allow identification of short polarity zones especially in the upper part of the section were the sedimentation rates are very low (2m/Ma) The component magnetization directions determined from u-channel measurements also gave more reliable and precise estimates of inclination (paleolatitude). Although the calculation of the paleomagnetic pole is hindered by the low precision of the cores azimuth orientation, the excellent data from both u-channel and discrete samples allow determining of the paleolatitude of the Site for different ages with relatively high precision. Paleomagnetic data indicate that the paleolatitude of Site 1218 is increasing with time form nearly equatorial in the Oligocene to its present latitude. Within the precision given by the paleomagnetic method, this is in agreement with current predictions of plate motion.

PP21D-10 1105h

Paleomagnetism of ODP Leg 199 Sediments: Implications for Paleogene and Neogene Magnetic Stratigraphy and Paleolatitudes

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ODP Leg 199 was designated to collect sediments along a latitudinal transect in the Pacific Ocean to better understand Paleogene sedimentation patterns and the system of equatorial currents. At ODP Sites 1218 through 1220, the magnetic record of the Paleogene Equatorial sediments extends back to Polarity Chron C20r (Middle Eocene), providing an unprecedented record of Paleogene magnetostratigraphy in Equatorial Pacific sediments. Paleomagnetic data were acquired on the JOIDES-Resolution pass-through cryogenic magnetometer from archive halves of core sections. Ongoing analysis on u-channels corroborates the polarity pattern obtained on the shipboard magnetometer. Natural Remanent Magnetization was measured at 5-cm intervals for each core section, and was followed by four to five steps of alternating field demagnetization up to a maximum of 15 or 20 mT. In addition, shipboard and shore-based measurements of discrete samples were also carried out, including alternating field and thermal demagnetization. All measured lithologies, including an upper red clay, radiolarian ooze and nannofossil ooze/chalk yield reproducible results and have a moderate magnetization intensity, well above the noise level of the cryogenic magnetometer. Stepwise demagnetization of discrete samples indicates that the Characteristic Remanent Magnetization (ChRM) is stable and well defined for the most part of the sedimentary record. The obtained high-resolution magnetic stratigraphy allows to cross-calibrate magnetic reversal stratigraphy with biostratigraphy, including the placement of the Eocene-Oligocene and Oligocene-Miocene boundaries. Overall, results from Leg 199 provide the first complete magnetobiostratigraphic record for the Middle Eocene through the Pliocene in the Equatorial Pacific Ocean. A particularly important aspect of Leg 199 was to establish the latitudinal plate motion of the Equatorial Pacific, based on paleomagnetic data. ChRM directions for the demagnetized discrete samples are used to construct the paleolatitudinal evolution of Leg 199 sites. A progressive northward displacement of the Pacific Plate in the Paleogene, which places the equatorial mound of biogenic sediment in northern latitudes and moves sediments out of the high sediment flux area, is established from the analysis of paleomagnetic inclinations.

PP21D-11 1120h

Correlation and Astronomical Calibration of Pacific Sediments From ODP Leg 199

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One of the great successes of Leg 199 was the recovery of a high-resolution ($\sim 1 - 2cm/ky$) biogenic sediment record from the late Paleocene to the early Miocene. These sediments were found to contain an uninterrupted set of geomagnetic chrons, as well as a detailed record of calcareous and siliceous biostratigraphic datum points. In addition, lithological measurements revealed clearly recognisable cycles that can be attributed to climatic change, driven by Milankovitch style orbital variations of the Earth. Discovering drill sites with a well-defined magneto- and biostratigraphic record that also show clear lithological cycles is rare and valuable, and opens the opportunity to develop a detailed stratigraphic inter-site correlation, as well as providing the data to refine and extend the astronomical time calibration for parts of the Cenozoic.

The basis for stratigraphic correlation and time scale calibration is a complete and representative sedimentary record with a high signal-to-noise ratio in the lithological data. Shipboard work allowed the generation of a continuous spliced record, formed by correlation of at least two holes drilled at the same site. However, differential stretching and squeezing of sedimentary features, due to both coring and geological processes, result in events that are not aligned in the depth domain. We present the results of extensive postcruise work that resulted in the generation of a revised composite depth stack that puts data from all holes of sites 1218 and 1219 into a common depth framework. It was possible to extrapolate magneto- and biostratigraphic datum points between these two sites (separated by $\sim$ 750 km). This procedure allowed the generation of a site composite record, which provides smaller uncertainty intervals for bio- and magnetostratigraphic zones, as well as giving refined and more detailed preliminary age models for either site.

We then use the aligned and stacked lithological data from sites 1218 and 1219 to develop a preliminary astronomical time scale calibration that also spans the Eocene-Oligocene (E/O) boundary. First results indicate that (1) all main orbital frequencies (long & short eccentricity, obliquity and climatic precession) are present in the record, but (2) the dominant cyclicity changes across the (E/O) as well as within the Oligocene, possibly related to the evolution of the CCD. (3) A plateau in a step-like transition observed across the E/O from Site 1218 can be constrained to approximately one eccentricity cycle, and (4) distinct eccentricity cycles ($\sim$ 400 ky and 100 ky) in the Oligocene can be matched to amplitude modulation cycles of climatic precession observed from Atlantic ODP cruise Leg 154, which was astronomically calibrated by Shackleton et al. (1999).

PP21D-12 1135h

The Os isotope record of the Eocene-Oligocene transition

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Osmium (Os) isotope analyses of bulk sediments from the South Atlantic (DSDP 522), Equatorial Pacific (DSDP 574C), and the Italian Apennines yield a coherent pattern of $^{187}Os/^{188}Os$ variation across the Eocene-Oligocene transition. This record has potentially important implications for our understanding of (1) the causative factors responsible for the first major glaciation of the Oligocene, and (2) the interplay between glaciation, chemical weathering and global climate. The two most prominent features of the Os isotope record are a pronounced minimum in $^{187}Os/^{188}Os$ (0.22 to 0.27) in the late Eocene, between 34 and 34.5 Ma, and a subsequent rapid increase in $^{187}Os/^{188}Os$, to approximately 0.6, that coincides with the growth and decay of the first major Antarctic ice sheet. The timing of the local minimum in the Os record is significant in that it immediately precedes the growth of the first major Antarctic ice sheet. Two alternative hypotheses for the late Eocene $^{187}Os/^{188}Os$ minimum are presented: (1) an ultramafic erosional event, or (2) an episode of increased influx of extraterrestrial particles to the Earth. Either event has the potential to influence on the evolution of Earths climate system.

Comparison of the $^{187}Os/^{188}Os$ to benthic foram oxygen isotope records indicates that enhanced release of radiogenic Os followed the termination of the first major Antarctic glaciation. This association suggests that exposure of freshly eroded material during deglaciation enhanced chemical weathering rates, and may have contributed to ice sheet stabilization by drawing down atmospheric carbon dioxide. This observation supports analogous interpretations of the Eocene-Oligocene portion of the marine Sr record (Zachos et al. Chem. Geol. 1999) The improved temporal resolution and age control of the refined Eocene-Oligocene Os isotope record also makes it possible to illustrate the use of late Eocene Os isotope excursion as a tool for global correlation of marine sediments.

PP22A MCC: Hall D Tuesday 1330h

The Paleogene and Cretaceous Pacific: Results From ODP Drilling II Posters *(joint with GP, OS, GC)*

Presiding: **M Lyle,** Boise State University**; J Zachos,** University of California, Santa Cruz

PP22A-0344 1330h POSTER

Paleomagnetic Paleolatitude of Early Cretaceous Ontong Java Plateau Basalts: Implications for Pacific Apparent and True Polar Wander

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We present paleomagnetic data from basaltic pillow and lava flows drilled at four Ocean Drilling Program (ODP) Leg 192 sites through the Early Cretaceous ($\sim$120 Ma) Ontong Java Plateau (OJP). Altogether 270 samples (out of 331) yielded well-defined characteristic remanent magnetization components all of which have negative inclinations, i.e. normal polarity, consistent with an OJP formation shortly after the onset of the Cretaceous normal polarity superchron. Dividing data into inclination groups we obtain 5, 7, 14 and 15 independent inclination estimates for the four sites. Statistical analysis suggests that paleosecular variation have been sufficiently sampled and site-mean inclinations therefore represent time-averaged fields. Of particular importance is the finding that all four site-mean inclinations are statistically indistinguishable, strongly supporting indirect seismic observation from the flat-lying sediments blanketing the OJP, that the studied basalts have suffered little or no tectonic disturbance since their emplacement. Moreover, the corresponding paleomagnetic paleolatitudes agree excellently with paleomagnetic data from a previous ODP site (Site 807) drilled into the northern portion of the OJP. Two important conclusions can be made based on presented dataset: (i) the Leg 192 combined mean inclination (Inc= -41.4°, N= 41, k= 66.0, a95= 2.6°) is inconsistent with the Early Cretaceous part of the Pacific apparent polar wander path indicating that previous paleomagnetic poles derived mainly from seamount magnetic anomaly modelling must be used with care. (ii) The Leg 192 paleomagnetic paleolatitude for the central OJP is 20° north of the paleogeographic location calculated from Pacific hot spot tracks assuming the hot spots have remained fixed. The difference between