Variations in nitrogen isotopic composition (δ^{15}N) and total chlorin accumulation rate (AR) are employed as proxies to reconstruct oceanic nitrate inventory, the balance between denitrification and N fixation, and paleoproductivity in a sediment drift deposit recovered from the northern South China Sea (SCS) during ODP Leg 184 (Site 1144). Sub-surface and deep waters of the N. SCS are sourced from the shallow Kuroshio Current and Pacific Intermediate Water respectively. Their relative importance in determining sedimentary δ^{15}N and paleoproductivity on glacial/inter-glacial timescales has been altered by changes in equatorial circulation, summer- and winter-monsoon intensity and relative sea-level. The location and unusual configuration of this marginal basin renders it especially sensitive to such changes.

Assuming complete annual nitrate utilization based upon modern water column measurements, low δ^{15}N values during glacial stages are interpreted as a reflection of reduced remote denitrification in the Eastern Tropical North Pacific (ETNP) source waters, while much of the warmer marine isotope stage (MIS)3 and last inter-glacial were characterized by high denitrification. However, intermittent intervals of anomalously low δ^{15}N values are interpreted as reflecting the regional contribution from N fixation in W. Pacific surface waters, transmitted to the site by the shallow Kuroshio Current. Millennial-scale variations during MIS3 suggest N-fixing organisms flourished at a time of enhanced dustiness recorded during cold stadials in the Greenland ice-core records. Indeed, higher frequency variations in both ETNP denitrification and local N fixation appear to be coherent with a hemispheric response to Dansgaard-Oeschger events recorded at high latitudes.

For much of the last glacial cycle, paleoproductivity was decoupled from δ^{15}N, and instead seems to reflect the extent of the global nitrate inventory stimulated by elevated dust fertilization, and regional mixed-layer deepening associated with the relative intensity of the winter monsoon. Since chlorin AR exhibits strong glacial/inter-glacial variability, transfer of a detailed δ^{18}O-based chronostratigraphy for the last ~1 Myr facilitates calculation of a long-term sedimentary decay constant for this proxy. Applying this decay correction, an extended record of chlorin AR shows very strong coherence with winter monsoon intensity over the mid- and late Pleistocene and likely represents a novel tracer for paleomonsoon intensity in this Pacific Marginal Sea.

OS22N-09 1555h

The Structure and Eastward Extension of the Changjiang River Plume in the East China Sea

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The hydrographic structure and offshore extension of freshwater plume discharged from the Changjiang (also known as the Yangtze) River in the northern East China Sea were investigated by analyzing conductivity-temperature-depth (CTD) data and drifter trajectories collected during the summers of 1997 and 1998. From June to early September when southerly winds prevail, the plume tends to move northeast in the Chinese coastal area, and then separates from the coastal zone to travel eastward over 400 km offshore across the western shelf of the northern East China Sea. During other seasons when northerly winds prevail, the plume is confined to the Chinese coast. In the summer, the plume in the mid-shelf, confined to a thin surface layer 10 to 15 m thick, extends eastward in the form of patches of low-salinity water rather than spreading as a tongue-shaped pattern from the Changjiang mouth. The eastward movement of patches in the western shelf is primarily due to upwelling favorable southerly winds that prevail in the summer monsoon. Upon reaching the vicinity of Cheju-do, an island in the middle of northern East China Sea, the patches are advected to the Korea/Tsushima Straits by either the Cheju Warm Current or a northward-flowing mean current of the Kuroshio Branch Current, and then finally flow into the East/Japan Sea.

OS22N-10 1610h

Summary of Observations and Modeling of Optical Properties in the Yellow Sea

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This paper reports on the work that was performed on the Korean coast of the Yellow Sea in collaboration with the West Fishery Center of the National Fishery Research and Development Institute of Korea from 1996 to 1999. It includes data and analysis from four seasons: June and October 1996, April 1998, and February 1999. A description of the seasonal changes of individual Inherent and Apparent Optical properties is discussed. Although, the location of the thermocline appeared to have influenced the vertical distribution of the optical properties during June and October, the major contributor to the spatio-temporal variability of the Yellow sea is the tidal current at all depths in all the seasons. Other factors influencing the distribution appear to be the type of bottom and particle size. The largest magnitudes of the optical properties were found in areas of fine sediment and strong tidal current. Coastal stations reported the highest values of backscattering and attenuation coefficients at all seasons. The lowest values were found in offshore areas and at the surface. In general, the costal optical environment of the Yellow Sea was found to be dominated by backscattering from particles during the time of this study. There were some isolated areas in which the absorption processes dominated the scattering processes. These occurred where blooms of the blue-green algae Synechococcus spp. were found. The findings from our seasonal optical studies in Korea, enabled the construction of an environmental optical model to extract spectral attenuation coefficient and backscattering coefficient with respect to depth using environmental parameters, exclusively

OS22N-11 1625h

Evaluation of Satellite Ocean Color Algorithms in East Asian Marginal Seas

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Current standard ocean color algorithms perform best in open ocean (Morel Case-1) waters where optical properties are dominated by phytoplankton and pure water. In turbid coastal waters (Case-2) optical properties diverge significantly from Case-1 waters and current algorithms are not generally valid.

Ocean spectral reflectance (Rrs) data and supporting in situ measurements (chlorophyll-a, suspended solids, particulate and dissolved absorption, particulate organic carbon) were collected in the western Pacific and East Asian marginal seas including the Sea of Japan (East Sea), East China Sea and South China Sea (near Hong Kong and the Pearl River estuary). Comparison with Case-1 Rrs chlorophyll-a relationships shows that in Case 2 waters Rrs is highly variable and can be either higher or lower than corresponding Rrs of Case-1 waters at similar chlorophyll-a concentration. Normalizing the Rrs spectrum to a Rrs value at a longer wavelength reduces the effects of particle scattering and enhances the effects of absorption. Rrs ratios in the turbid coastal waters show distinct clusters that diverge significantly from Case-1 relationships and cause significant overestimation of chlorophyll-a when using standard Case-1 algorithms. The divergence from Case-1 waters of Rrs - chl-a relationships for the Asian waters studied are caused by the non-correlation of chl-a with inorganic and organic detrital particles, and dissolved material. Using ship-based data with simultaneous observations from SeaWiFS, we observed significant errors in retrieval of both chl-a and normalized water leaving radiances for certain conditions. Atmospheric correction errors caused by turbid atmospheres as well as the complexity of Case-2 waters both contribute to these errors.

OS22O HC: 316 A Tuesday 1330h

Maintaining Deep Ocean Stratification I

Presiding: **R Pinkel,** Scripps Institution of Oceanography**; J Ledwell,** Woods Hole Oceanographic Institution

OS22O-01 1335h

Initial Results of the Salt Finger Tracer Release Experiment

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Microstructure surveys and a tracer release experiment were performed in the thermohaline staircase region in the western tropical North Atlantic. The Salt Finger Tracer Release Experiment involved staircase sampling and tracer injection in January-February 2001 and a tracer survey with further microstructure profiles in November 2001. The goal was to quantify the vertical dispersion of tracer due to the action of salt fingers within the staircase, and relate this to the observed dissipation levels. Typical profiles displayed 6-12 mixed layers in the main thermocline between 200 and 600 m depth. The tracer was injected at a depth of about 400m in a mixed layer with a temperature near 10 C. Elevated thermal dissipation was observed at the high gradient interfaces between mixed layers. This signal displays a close variation with the theoretical salt finger growth rate, consistent with the "frozen growth" similarity solutions for salt fingers. Interfaces varied from 0.5m to over 10m in thickness, possibly due to high mode internal waves. There was also a tendency for the thinnest interfaces to be found when the vertical shear was weakest. This is suggestive of an interplay between salt finger convection and shear instability in controlling the interface thickness. Preliminary results of the November tracer survey will be reported.

URL: http://www.whoi.edu/science/PO/dept/

OS22O-02 1405h

The temperature-salinity relationship in NATRE

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Measurements of temperature (T) and salinity (S) from the North Atlantic Tracer Release Experiment (NATRE), in the eastern North Atlantic, are used to study the interplay of processes that stir tracers along density surfaces with processes that mix tracers across density surfaces. The data consist of a grid of 100 vertical profiles regularly spaced over an area of 400x400 km. We show that the Central Waters of the main thermocline are characterized by an extremely tight T-S relationship and small thermohaline fluctuations. Below, at the level of the Mediterranean Outflow (900-1400 m), thermohaline fluctuations are much larger and characterized by strong density compensation. That is, there are large T-S intrusions along density surfaces.

Double-diffusive processes are often invoked as an explanation for the formation of T-S intrusions. Here we take the alternative view that T-S fluctuations are created by mesoscale eddies that stir the large scale thermohaline gradients. The argument stems from theoretical work by Hua and collaborators on quasi-geostrophic dynamics and goes as follows. The outflow of Mediterranean waters creates a large scale salinity gradient along isopycnals. Mesoscale motions, being almost parallel to isopycnals, are effective at increasing temperature and salinity fluctuations along isopycnals, but they are ineffective at creating small scale density variability. The consequence is that, at small scales, T-S fluctuations tend to be larger than density ones and there is density compensation. Further up in the water column, where the T-S relationship is tight, this process cannot work, because there is no large scale thermohaline gradient along isopycnals to stir.

Numerical simulations of a fully-turbulent quasi-geostrophic stratified flow confirm that mesoscale dynamics can account for the different levels of thermohaline variability observed throughout the water column.

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Furthermore they suggest that the enhanced dissipation rates measured by Polzin and collaborators at the Mediterranean Outflow level reflect the compensated variability generated by mesoscale stirring and not diapycnal processes.

OS22O-03 1420h

Mixing in the Deep Brazil Basin - An Update

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Tracer was released in the eastern Brazil Basin early in 1996 on an isopycnal surface at 4000 m depth above one of the zonal valleys emanating from the Mid-Atlantic Ridge (MAR). A diapycnal diffusivity of 3 cm2/s was estimated for the depth of the release from surveys of the tracer in 1997, 1998, and 2000, and the tracer diffusivity appears to increase strongly with depth. The evolution of the tracer distribution indicated an eastward flow of about 1 cm/s towards the MAR below the level of the release, whereas at 4000 m the tracer moved to the southwest at a mean speed of approximately 0.3 cm/s over the four years. Tracer was clearly passing through the MAR into the Angola Basin in 2000 along the Rio de Janeiro fracture zone.

Mean dissipation rate estimates for turbulent kinetic energy and temperature variance measured in 1996 and 1997 about the release location, when corrected for temporal and spatial sampling biases, agreed with the estimates of diffusivity from the tracer. Microstructure sampling on a broader scale within the Brazil Basin implied a diapycnal diffusivity of order 0.1 cm2/s throughout the water column in the west where the bottom is smooth, while diffusivities over the abyssal hills characteristic of the entire eastern half of the basin were elevated at all depths below about 1000 m, with values increasing to more than 10 cm2/s near the bottom.

A current meter mooring, deployed for two years with instruments at and below 2940 m, documented a mean flow of approximately 1.5 cm/s to the east below 4600 m, towards the head of the valley above which the tracer was released. The near-bottom mean velocity estimates are strongly influenced by two episodes of eastward flow having speeds near 5 cm/s that lasted some 100 and 60 days respectively. The sub-inertial flows at and above 4000 m, the approximate depth of the local bathymetric crests, were not coherent with those deeper. Spectra of vector components of shear from current meters deployed on the mooring in pairs separated by 25 m show prominent peaks at tidal and inertial frequencies above 4000 m depth. At these peaks, the shear variance is due chiefly to the turning of the velocity vector with depth. No inertial peak is found within the valley. The spectral energy density of shear magnitude is nearly independent of frequency between the inertial and buoyancy periods and a suggestive but not statistically significant peak is found at the fortnightly period.

The abyssal hills that characterize the eastern half of the Brazil Basin were sampled in detail with a multibeam sounding system. These hills provide an enhanced finescale internal wave field through both generation and scattering processes. The mixing we observed appears to result from breaking of these finescale internal waves. The strong increase of diffusivity with depth implies a divergence of buoyancy and, in steady state, a downward diapycnal velocity. This downwelling is balanced by an eastward flow of bottom water to lighter density classes, especially in the zonal valleys. Representation of such topographic and mixing phenomena in quantitative ocean models is a significant challenge.

OS22O-04 1435h

Spatial Distribution of Diapycnal Mixing in a Rift-Valley Segment of the Mid-Atlantic Ridge: The Role of Cross-Sill Flows

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The hydrography in some submarine valleys (including fracture zones, rift valleys, and ridge-flank canyons) is characterized by monotonic horizontal gradients, which are maintained by along-valley mean flows and diapycnal diffusion of heat and salt. In some cases it has been conjectured that the mechanical mixing may be primarily associated with breaking internal waves with the tides being a dominant energy source. The along-axial bathymetry of many submarine valleys is characterized by deep basins separated by shallower regions ("sills") and from microstructure observations in a major fracture zone it is known that much of the mixing there is associated with hydraulically controlled cross-sill flows.

We analyzed hydrographic and current-meter data from a rift-valley segment of the Mid-Atlantic Ridge where the situation appears similar to the one found in a ridge-flank canyon with bulk diffusivities of order $5 \times 10^{-3} \mathrm{m}^2 \mathrm{s}^{-1}$ and significant mean along-valley flow into a region of closed bathymetry. While the current-meter spectra contain signatures of energetic internal waves the spatial distribution of statically unstable overturns indicates that the largest diapycnal diffusivities occur immediately downstream of topographic highs in the path of the mean flow, coinciding with regions of hydrographic evidence for hydraulic control. This suggests vertical shear associated with cross-sill flows as the dominant contributor to the mechanical mixing in the rift valley. The small horizontal scales of the overflows imply that the regions of largest mixing can easily be missed.

OS22O-05 1450h

Internal Swell: Global Patterns and Observations

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The energy flux from the wind to inertial mixed-layer motions is computed for all oceans from 50^oS to 50^oN for the years 1996-1999, using 6-hour, 2.5^o-resolution NCEP/NCAR global reanalysis surface winds and a slab mixed-layer model. The validity of the reanalysis winds and the slab model is demonstrated by direct comparison with wind and ADCP velocity records from NDBC buoys. (At latitudes $> 50^o$, the inertial response is too fast to be resolved by the reanalysis winds' 6-hour output interval.) Midlatitude storms produce the greatest fluxes, resulting in broad maxima near 40^o latitude during each hemisphere's winter. The total power input is 0.29 TW, the same order of magnitude as recent estimates of the global power input to baroclinic M_2 tidal motions, suggesting that wind-generated near-inertial waves may play an important role in the global energy balance. Preliminary calculations of horizontal energy flux from moored records indicates that this energy subsequently propagates equatorward, as required by internal-wave dynamics.

OS22O-06 1505h

High and Low Latitude Observations of Fine Scale Oceanic Shear

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It is likely that turbulent mixing contributes significantly to the net vertical diffusivity of the ocean interior and that fine-scale oceanic shear is the immediate energy source for the turbulence. An empirical relationship between shear, stability, and vertical diffusivity, $K_v = 5 * 10^{-6} S^2/N^2$, developed by Gregg (1989), has proven remarkably robust. Young et al,(1984), noted that, once vertical diffusivity has been established, near-inertial shears will further enhance lateral mixing processes. The diffusivity increase is of order $\Delta K_H = 0.25 K_v S^2/f^2$. If the primary source of Gregg's shear is also low frequency internal waves, the two expressions taken together suggest that lateral diffusivities in the ocean interior might vary as the sixth power of wavefield shear.

Unfortunately, the relative contribution of inertial shear or even internal wave shear to the overall fine-scale shear field is poorly known. Here we report recent observations of extremely low variance (Arctic) and high variance (Hawaiian) shear fields obtained with Doppler sonars.

The Arctic measurements, from the western Beaufort Sea and the Chukchi Cap were obtained from the SHEBA ice camp during 1997-8. These demonstrate rms shears 2 to 10 times less than typical oceanic records. The shear wavenumber-frequency spectra show an increasing wavenumber (frequency) bandwidth with increasing frequency (wavenumber). This behavior, while not consistent with the canonical GM model of internal waves, is well modeled by a monochromatic shear spectrum that is peaked at the inertial frequency and is simply Doppler shifted by mild horizontal currents.

The Hawaiian observations were made 450 km SW of Oahu, along a tidal energy pathway which stretches from the Kauai Channel to the SW. A high-power, lowered Doppler sonar was deployed from the RP FLIP during October-November,2001. It provided velocity and shear data from 100-800m, with 3.5m vertical resolution. The vertical advection of slowly varying shear layers is clearly apparent, increasing with increasing depth. Fluctuations in the depth distribution, scale and energy of the shear with the fortnightly tidal cycle are presently being investigated.

OS22O-07 1540h

Abyssal mixing and upwelling in the northwestern Indian Ocean

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Recent invers modelling of Indian Ocean hydrographic data suggests strong meridional overturning. Such a circulation requires large deep water upwelling and consequently strong diapycnal mixing. During the WOCE Special Survey of the Somali and Arabian Basins (ISS2) we have collected velocity and hydrographic profiles during the summer monsoon season as well as moored current observations covering both monsoon seasons. These data are used to study the internal wave field and to infer diapycnal mixing and mass transfer rates.

The internal wave field in the western Arabian Sea does not WKB-scale but is bottom intensified. Dissipation estimates derived from finescale internal wave shear and strain levels are nearly uniform with depth. Application of the Osborn relation for eddy diffusivity then yields eddy diffusivities increasing with depths as $< K_\rho > \sim N^{-2}$. Comparatively high values of $< K_\rho >$, in the range of $0.5 - 4 \times 10^{-4}$ m^2 s^{-1} were derived for depths larger than 2000m. A possible internal wave energy source is interaction of intraseasonal fluctuations with topography.

OS22O-08 1555h

The Influence of Internal Tide Driven Mixing on the Oceanic General Circulation

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Astronomical data reveals that approximately 3.5 terawatts (TW) of tidal energy is dissipated in the ocean. Altimetry suggests that 1 TW of this energy is converted from the barotropic to internal tides in the deep ocean, ultimately contributing to turbulent mixing. This conversion is concentrated around regions of rough topography such as mid-ocean ridges. Here, we use a global tidal model with a parameterization of internal wave drag to compute turbulent energy levels associated with dissipating internal tides. This scheme partitions the baroclinic tidal energy into a component which contributes to locally enhanced mixing, and a radiated component that contributes to background levels of mixing in the ocean interior.

The diapycnal mixing supported by this tidal energy flux is computed using the Osborn (1980) relation. This mixing scheme has been incorporated into a coarse-resolution numerical model of the global ocean driven by climatological winds and relaxation to observed surface temperature and salinity. Unique features of this implementation are that the model explicitly accounts for the tidal energy source for mixing, and that mixing evolves both spatially and temporally with the model state. The model is run out to equilibrium (> 8000 years). Basin averaged diapycnal mixing rates have a vertical profile ranging from $0.1 cm^2 s^{-1}$ at thermocline depths to $3.0\ cm^2 s^{-1}$ in the abyss, with a globally averaged value of $1.1\ cm^2 s^{-1}$, in qualitative agreement with observations. It is found that abyssal water mass properties are strongly influenced by the enhanced levels of mixing in the deep ocean. The thermal structure of the ocean is substantially improved, relative to a control run using spatially uniform diapycnal

mixing rates. These simulations suggest that strongly bottom intensified mixing captured by the new scheme is an essential component of the balances required for the maintenance of the deep stratification. New insight has been provided into the contribution of baroclinic tides to the dynamics of the deep ocean.

OS22O-09 1610h

The eddy-driven thermocline

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The nonlinear equilibration of a rapidly rotating fluid differentially heated from above is examined. In a periodic geometry, a zonally symmetric steady state exists which is weakly stratified in the small Rossby number limit. Such steady state is linearly unstable to transverse time-dependent baroclinic waves very similar to non-geostrophic Eady modes. The finite amplitude equilibration of these baroclinic disturbances mantains a well-defined deep stratification which depends very weakly on the explicit vertical diffusion.

OS22O-10 1625h

The Effects of Mesoscale Eddies on the Thermal Structure of an Ocean With a Circumpolar Channel

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We investigate the affect of mesoscale eddies on the stratification of the oceanic thermocline and abyss. Motivated by the potentially large dynamical importance of the Southern Ocean on the ocean as a whole, we integrate a primitive-equations ocean model with an idealized domain containing a box bordered by a circumpolar channel to the south, forced both mechanically and thermally.

Because of the surface forcing, certain isopycnals outcrop in the channel. We ask: a) Under what circumstances do these isopycnals enter the box region, and b) when they do enter, what determines their depth? When mesoscale eddies are absent from the simulation, the lack of a zonal pressure gradient in the channel prohibits meridional transport, the outcropping isopycnals are trapped in the latitudes of the channel, and the abyss has a very small vertical temperature gradient. When a mountain barrier that partially blocks the channel is included, meridional transport is supported and abyssal thermal gradients are produced, even in cases with small vertical diffusivity.

Mesoscale eddies appear to have a significant affect on this picture. Much of the non-eddying channel has temperature fronts which are baroclinically unstable. As the eddies form they act to decrease the available potential energy of the system, relax the fronts, and transport the water from the channel into the abyss. We are able to run the eddy resolving model for approximately 850 years, which is sufficient to achieve near-equilibration in the abyss, and investigate the processes determining the stratification of the polar channel. When we increase the vertical diffusion, we find that the isopycnals are deeper, consistent with a net storage of more available potential energy in the system. Typically, the eddying simulations are much less sensitive to topographic effects in producing stratification than are non-eddying runs. In all eddying cases the main stratification remains in the upper ocean. We conclude that mesoscale eddies are playing an important role in determining the stratification of the (model) Southern Ocean, but that they alone cannot produce deep stratification.

OS22O-11 1640h

Role of Cross-Isopycnal Mixing in the Thermohaline Circulation

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This study seeks to improve understanding of the role of cross-isopycnal mixing in the dynamics of the NADW circulation. Most of the previous studies considered only vertical mixing at the low latitudes in the Atlantic. This study includes all cross-isopycnal eddy transports, horizontal as well as vertical, and considers a role of the mixing in both the Atlantic and the Southern Ocean. A set of numerical experiments in a coarse-resolution OGCM and an output of an eddy-permitting simulation are combined with an analytical model of the main dynamical processes that set the deep density structure in the Atlantic. The analytical model does not assume a local balance between the vertical diffusion and upwelling, which has been shown to be invalid in several of studies, but rather represents 3D buoyancy balances in the deep ocean. Coarse-resolution numerical experiments explore dependence of the circulation on the distribution and magnitude of mixing. The output from an eddy-permitting OGCM is used to verify the main balances in the heat and salt equations.

It is demonstrated that the NADW circulation is highly sensitive to the amount and type of the cross-isopycnal mixing in the Southern Ocean. In particular, noticeable differences between a simulation with the Gent-McWilliams mixing scheme and the one with the horizontal diffusion are almost entirely explained by the differences in the mixing in the Southern Ocean. Low-latitude horizontal eddy transports change deep horizontal density gradients but have a limited effect on the strength of NADW flow. The attempt is also made to separate a role of the air-sea fluxes in the Southern Ocean from direct effects of the internal mixing.

OS22P HC: 315 Tuesday 1330h

Oceanic Time-Series Measurements: Assessment of the Past and Planning for the Future III

Presiding: **J E Corredor,** UPR-Dept. of Marine Sciences**; G A Cutter,** Old Dominion University

OS22P-01 1330h

Interannual to decadal variability in the carbon cycle of the subtropical gyres: A comparative study between Station 'S'/BATS and HOT

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We examine interannual to decadal variability in the ocean carbon cycle in the subtropical gyres on the basis of three long-term upper ocean time-series records. The longest record exists from Station 'S' near Bermuda (32°10'N, 64°30'W), where the Carbon Dioxide Research Group (CDRG) at Scripps Institution of Oceanography started sampling in late 1983. In 1988, as the Bermuda Atlantic Time-series Station (BATS) (31°50'N, 64°10'W) and the Hawaii Ocean Time-series (HOT) program (22°45'N, 158°W) were established, CDRG extended its sampling to both these sites. At the same time, independent sampling and analysis of inorganic carbon properties started at Bermuda and Hawaii (e.g. *Bates*, 2001; *Winn et al.*, 1994; *Dore et al.*, 2001). As differences between the laboratories and between the two Bermuda sites are small, these records can be combined into the two longest existing records of inorganic carbon variability in the ocean. Both sites exhibit substantial interannual variability in all measured and computed carbon properties (dissolved inorganic carbon (DIC), total alkalinity (Alk), computed ocean surface partial pressure of CO_2 (pCO_2), and the $^{13}C/^{12}C$ ratio of DIC). We also find at both sites strong anti-correlation between sea-surface temperature (SST) anomalies and DIC anomalies, which lead to a suppression of the correlation of either of these properties with pCO_2. We employ a simple diagnostic box model, a modification of (*Gruber et al.*, 1998) to quantify the contribution of the processes controlling this variability. Near Bermuda, the variability in the carbon dynamics is largely driven by variations in winter mixed layer depths, which impact both the amount of DIC that gets entrained into the mixed layer and the magnitude of net community production. The variability of air-sea CO_2 fluxes tends to be controlled by sea-surface temperature (SST) anomalies with larger CO uptake from the atmosphere during years of deeper than normal mixed layers. We find significant correlation of the magnitude of net community production and air-sea CO_2 fluxes with the North Atlantic Oscillation (NAO), attributed to a strong influence of the NAO on convection and SST during winter. Preliminary analyses of the HOT data indicate a much weaker role of mixed layer depth variability, and a much stronger role of SST and windspeed anomalies driving air-sea CO_2 flux variations, and hence driving DIC variability. Interannual variations in net community production and air-sea CO fluxes tend to be correlated, as was the case near Bermuda. Results of a more refined analysis and comparison between the two sites will be presented and discussed.

OS22P-02 1345h

The Atlantic Meridional Transect Programme

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The biota of the surface ocean has a profound influence on the global budgets of climatically-active trace constituents in the atmosphere (CO2, DMS, N2O, CH4 and aerosols) and hence climate. For this reason attempts to predict the future global environment depend on an improved knowledge of how biogeochemical cycling in the oceans affects the climate system, and of how changes in climate influence the structure and functional properties of oceanic ecosystems.

The Atlantic Meridional Transect (AMT) Programme (1995-2006) [http://www.pml.ac.uk/amt/index.html] aims to quantify the nature and causes of ecological and biogeochemical variability in the planktonic ecosystems of the tropical and temperate Atlantic Ocean, and the effects of this variability on biological C cycling and on air-sea exchange of radiatively active gases and aerosols. Marine and atmospheric data are collected from more than 14 biogeochemical provinces during the bi-annual passage of RRS James Clark Ross between the UK (50oN) and the Falkland Islands (52oS) including the undersampled subtropical gyres and the NW African upwelling.

These data represent the most coherent set of repeated biogeochemical observations over ocean basin scales and have led to several important discoveries concerning the validation of ocean colour algorithms, distributions of picoplankton, and variability in rates of primary production and respiration.

This presentation will summarise the data collected thus far and describe the additional hypotheses to be tested in the future.

URL: http://www.pml.ac.uk/amt/index.html

OS22P-03 1400h

Mesoscale Variability of pCO2 at the Sea Surface in the North East Atlantic Ocean as Measured by Ship and CARIOCA Drifters

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An important French oceanographic program POMME was conducted in the North East Atlantic in 2001. A major objective of the project was to investigate the coupling of mesoscale dynamical and

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