OS42Q-11 1620h

Comparison of Turbulent Dissipation Rates in Different Flow Environments in Chesapeake Bay, USA

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Recent breakthroughs in the accessability of affordable, accurate velocity sensors with high temporal and small spatial resolution have made measurements from which turbulent properties of a flow can be calculated much more available. Even more recent has been the commercial availability of affordable temperature micro-structure profilers (MSP). From these instruments the dissipation rate of turbulent kinetic energy,ϵ ,can be estimated. ϵ is a property of particular importance, since it equals the amount of energy input at larger scales and also reveals important information about small scale properties such as shear and the Kolmogorov length scale. From 1998 to 2001 field studies were carried out in Chesapeake Bay deploying a 5 megahertz Acoustic Doppler Velocimeter (ADV) at three sites in three different flow environments: 1) a wave dominated surface boundary layer, 2) a shallow site where the measurement location was affected by both surface waves and the mean flow impinging on the bottom, and 3) a mean flow dominated site within the bottom boundary layer that was not affected by surface wind waves. In addition a temperature MSP and a 10 megahertz ADV on a profiling rig were used over a tidal cycle, concurrent with the deployed ADV measurements for site (3). Statistical differences in the nature of ϵ were observed in the three environments, due to the stochastic nature of wind waves versus the periodic nature of the predominately semi-diurnal tidal flows. ϵ values from the temperature MSP are compared to those calculated from the ADV data. Because the ADV data represent much longer temporal averages than those from the MSP these comparisons help reveal the intermittency of ϵ.

OS42Q-12 1635h

Mixing Levels and Mechanisms in the Main Basin of Puget Sound

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The dynamics of fjords are often simplified by assuming all of the mixing takes place over the sills and that the reaches, or basins, are relatively quiescent and simply advect water that obtains its properties at the sills. Microstructure measurements and current velocity data collected in the Main Basin of Puget Sound, Washington, however, show that it does not fit the "advecting reach" simplification of fjord dynamics. Although mixing levels in the Main Basin are two to three decades lower than observed and inferred levels over the Narrows and Admiralty Inlet sills, our measurements of diapycnal diffusivity, K_ρ, in the Main Basin are one to two decades greater than typical values found at the open-ocean thermocline. Additionally, the subthermocline stratification of the Main Basin is similar to the canonical stratification, N_o (3 cycles/hour), of the open-ocean thermocline. This implies that significant diapycnal mixing of temperature and salinity gradients, and potentially oxygen and nutrient concentrations, is occurring in the Main Basin. We observed mixing events largely dominated by mid-depth density intrusions and low-mode internal tides. These observations suggest that there are at least several possible mechanisms for energy to propagate away from the dynamically active sills and result in higher than expected mixing levels in the fjord basins.

OS42Q-13 1650h

A Relationship Between Finestructure and Turbulent Flux on the Continental Shelf

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The possibility of a relationship between turbulent buoyancy flux and density gradient within a fluid of nonuniform density gradient has been hypothesized and investigated in the literature over the past three decades. Any such relationship would serve to either intensify, eliminate, or have no effect on the density gradient structure. We have field evidence from a continental shelf environment that a relationship which would intensify density finestructure can occur, at least under the conditions during our study.

Conductivity microstructure, water velocity, and stratification were measured during a tow-yo transect near the New England shelf/slope front in early August 1997. Estimates of χ, the rate of dissipation of temperature variance, were computed from the conductivity data with vertical resolution of 0.3 m. Relationships between χ and shear, temperature gradient, buoyancy frequency (N) and gradient Richardson number (Ri) were explored in waters exhibiting variable density gradient, N ranging from 5 to 40 cph. An average χ value was computed for data grouped into five classes of local mean temperature gradient ($d\bar{T}/dz$), and was proportional to $d\bar{T}/dz$ to the 0.7 power, which is consistent with diapycnal thermal eddy diffusivity K being proportional to $(d\bar{T}/dz)^{-1.3}$ if one invokes the Osborn-Cox model. No correlation between K and Ri (computed at 4-meter vertical scale) was observed, so that systematic inhomogeneous large scale forcing was not responsible for a spurious correlation of K and $d\bar{T}/dz$. Water mass salinity characteristics in the area make this K to $d\bar{T}/dz$ relationship equivalent to the steep inverse relation $K = 10^{-10}N^{-3.3}$, with N in radians/s and diffusivity in m^2/s. A different fit, $K = 2 \times 10^{-9}N^{-2.5}$, results if one questionable data ensemble is eliminated. These relationships are not expected to hold beyond the investigated range of N. These are not intended to be universal formulae, but are meant to describe the conditions we encountered. Possible causes and consequences of these relationships will be discussed, with one consequence being an interesting restriction of flux. An interpretation of the cause is that the lower-N layers in this shelf area are more prone to instability of large-scale shear than the intervening interfaces, with the subsequent greater energy dissipation in the layers leading to higher buoyancy flux KN^2 in the layers than in the interfaces.

OS42R HC: 316 C Thursday 1330h

Transport and Transformation of Biogeochemically Important Materials in Coastal Waters V

Presiding: **J L Largier,** Scripps Institution of Oceanography**; J A Barth,** College of Oceanic and Atmospheric Science

OS42R-01 1330h

Field Study of Possible Cross-Shelf Transport Mechanisms for a Treated Wastewater Plume Discharged on the Continental Shelf off Huntington Beach, CA

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Preliminary results from an extensive field study that took place during May - Oct. 2001 on the San Pedro shelf off Huntington Beach in southern California will be presented. The Orange County Sanitation District brought together a multi-agency consortium in an effort to clarify the role played, if any, by their outfall in the 1999 - 2001 summer beach closures due to bacterial contamination. The sampling strategy was designed to address a hypothesis that the normally subsurface sewage plume, which is discharged 8 km offshore, is transported shoreward by internal waves during the stratified summer season, and then is introduced into the surfzone through an interaction with the ocean discharge from a nearby power plant. The study is also meant to address other surface, subsurface, and benthic mechanisms that could conceivably transport the treated wastewater to shore.

This talk will concentrate on the physical, chemical and microbiological data collected from moorings, bottom tripods, vertical profiling stations, tow-yos and beach samples. Five 48-h and one 24-h multi-ship surveys were conducted, measuring velocity, temperature, salinity, fluorescence, light transmission, nitrate, ammonium and bacteria from the surfzone to the shelf break. At 13 locations in depths from 10-200 m, surface and subsurface moorings and bottom tripods were deployed for a 4-month period starting in mid-June to collect temperature, salinity, velocity, light transmission, optical backscatter and sediment trap data. Additional moored velocity and temperature measurements were made over a shorter period of time in the very nearshore zone. Surf-zone temperature and bacteria were sampled once per day throughout the study period, and at hourly intervals during the cruise times. Additional time series data collected include meteorological variables, surface waves, and tidal heights.

OS42R-02 1345h

Long and Short Term Variability in Ocean Water Quality at Huntington Beach, California

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Ocean water quality at Huntington Beach varies over time scales that span at least seven orders of magnitude, from minutes to decades. Natural and anthropogenic factors apparently responsible for this variability include nearshore mixing phenomena, sunlight intensity, the phase of the moon, seasonal variations in rainfall, El Niño events, and changes in wastewater treatment and disposal practices. Ocean water quality at Huntington Beach has not significantly worsened since 1958, even as the surrounding area has undergone significant urbanization. The variability documented in this presentation calls into question national protocols for the monitoring and reporting of ocean water quality.

OS42R-03 1400h

Transport of Organochlorines Among Various Environmental Compartments in the Coastal Ocean off Southern California

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Dichlorodiphenyltrichloroethane and its metabolites (DDTs) and polychlorinated biphenyls (PCBs) were discharged into the coastal waters off southern California mainly via sewage outfalls. Notably, sediments on the Palos Verdes Shelf adjacent to the outfall system of the Joint Water Pollution Control Plant (JWPCP; operated by the County Sanitation District of Los Angeles County) are known to contain highly elevated levels of DDTs (relatively low level of PCBs also noticed). Since the discharge of DDTs and PCBs via sewage outfalls was banned in early and late 1970s, respectively, concentrations of DDTs and PCBs in wastewater effluents have continuously declined and become virtually non-detectable presently. However, DDTs and PCBs (especially DDTs) remain widely distributed in the Southern California Bight (SCB), even in areas far away from any known points of historical discharge. One hypothesis attributes the widespread distribution of DDTs and PCBs to resuspension and dispersal of these compounds from previously contaminated sediments to remote areas.

One way to determine whether DDTs and PCBs are transported away from contaminated areas is to examine the thermodynamics that dictates the redistribution of DDTs and PCBs. To accomplish this, we measured DDTs and PCBs in various interacting environmental compartments in three nearshore locations of the SCB with different levels of contamination. We found that DDTs and PCBs were widely distributed in the overlying water, sediment, polychaetes, and hornyhead turbot liver and muscle tissues. The Students t tests indicated that the measured partitioning coefficients between overlying water and other phases at a heavily contaminated location were significantly greater than what were predicted by the equilibrium partitioning

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theory (EPT). Measured partitioning coefficients for a few DDT components at two other stations (moderately and little contaminated) also were generally greater than the EPT predictions. These findings suggest that DDTs and PCBs have the tendency to partition towards overlying water from other interacting compartments. Therefore, they are likely to be dispersed via the water column to areas away from points of historical discharge.

OS42R-04 1415h

Remotely Driven Upwelling Near San Diego, CA: Strong Stratification, Weak Local Forcing and Coastal Trapped Waves.

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Alongshore winds in Baja California are found to strongly influence the temperatures off Pt. Loma, San Diego, California, hundreds of kilometers to the north. The time lag between wind and temperature is consistent with first mode coastal trapped waves predictions. Strong stratification allows the coastal trapped waves to extend into the nearshore (10-30m) and drive cross-shelf transport there. The observed nearshore wave-driven overturning circulation is not entirely consistent with low mode coastal trapped wave structure, and may indicate local topographic scattering into higher wave modes. Nonetheless, it is argued that the link between nearshore temperature and remote forcing does not depend critically on the particular bathymetry near Pt. Loma, and is likely to exist elsewhere in the Southern California bight and in other strongly-stratified coastal oceans with weak local forcing.

Stronger upwelling favorable winds 300km to the south of Pt. Loma lead to onshore transport of cold water at depth and, much of the year, to weaker stratification. Thus stronger remote upwelling winds lead to onshore transport of nutrients at depth and offshore transport of surface trapped pollutants. Relaxation of the remote winds is observed to lead to stronger stratification, and thus perhaps to enhanced nearshore internal wave activity and reduced vertical mixing.

OS42R-05 1430h

Resuspension, Redistribution of Sediments in San Diego Bay, California

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San Diego Bay is a landlocked bay surrounded by metropolitan San Diego and industrial and Navy facilities. Water within the Bay is affected by strong semidiurnal tides. Once labeled "one of the most contaminated bays in the United States", San Diego Bay has historical contamination of heavy metals, petroleum derivatives, and other organic pollutants in sediment, and intensive tidal waves may have a potential effect on the resuspension of sediment thus redistribution and dispersal of these contaminants. In a project targeting the resuspension, redistribution, and dispersal of polychlorinated biphenyls, we used radioisotope tracers 234Th, 210Pb, 210Po, 137Cs, 226Ra in water column and sediment to study the sedimentation rate, tidal flushing, particle scavenging, sediment resuspension and pollutant redistribution. Our findings include: 1. The sedimentation rates within the Bay vary widely from 0.25cm/y to 2cm/y. Tidal flushing, sediment input, dredging activities are main factors contributing to the diverse sedimentation rates across the Bay. 2. 234Th, 210Pb, 210Po, 137Cs, 226Ra profiles in sediment column and water content profile within sediment column show that San Diego Bay sediment is heterogeneous vertically, and bioturbation is extensive in many places; 3. Sediment resuspension, focusing, and particle scavenging cast great influences on the distribution of radioisotopes 210Po, 210Pb and 234Th, all are particle-reactive and used in our study to simulate the particle adsorption of PCBs. Patterns of these radioisotopes in dissolved, particle forms clearly show that particle scavenging of Pb, Po and Th isotopes is dominant in the inner Bay while near the mouth of the Bay, sediment resuspension becomes dominant; 4. Storms are rare but significant events affecting the sedimentation process within the San Diego Bay. Sediment trap data shows that during stormy days the suspended solids can be 10-20 times higher than average.

PCB levels are very low in both sediment and water columns. PCBs in water columns exist mainly in dissolved form (<0.4um), with particulate form detected only at middle of the Bay (i.e. known contamination sources). Total PCBs are generally in a range of 0.05 to 0.25ng/L, and the patterns suggest a possible dilution effect by tidal flushing.

The above observations lend great credibility to our hypothesis that sediment resuspension is an important process resulting from the intensive tidal flow, and that sediment resuspension may have played an important role in diluting, redistribution and dispersal of PCBs in the Bay and transported a significant amount of PCBs out of the Bay, resulting in the unexpected low levels of PCBs. Using a box model for PCB inventories since early 1980s and a model for the evolution of PCB profile within sediment column we found that aside from dredging and covering of contaminated sediment, tidal flushing and sediment resuspension play an important role in the decrease of PCB levels of San Diego Bay.

URL: http://earth.usc.edu/~jianpeng

OS42R-06 1445h

River plumes in the Santa Barbara Channel, California - observations of river discharge and plume forcing

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The Santa Barbara Channel (SBC) contains the northernmost basin of the Southern California Bight, which preserves sediment input in annual varves. As shown by others, approximately 85% of the SBC basin sediment mass and almost all of its continental shelf sediment can be attributed to discharge from local river sources. Using river sampling, shipboard observations and remote sensing analyses, we have studied river supply and dispersal of sediment in the SBC to better describe sediment discharge pathways. River data suggest that over half of the long-term sediment load to the SBC has discharged during dense, hyperpycnal conditions (river suspended sediment concentration >40 g L^{-1}). Regardless of the density of river discharge, however, shipboard and remotely sensed observations reveal that very little (<1%) of recently-discharged river sediment is present in the easily-observed surface plume. This suggests that flocculation, settling and hyperpycnal plumes rapidly partition the vertical distribution of sediment to bottom shelf waters. Horizontal dispersal scaling relationships of the plume observations suggest that large river plumes are forced primarily by inertial forces within approx. 10 km of the river mouth, after which they are more subject to the complex wind and current forcing of the SBC. Plume observations within this inertial scale suggest that these energetic surface plumes still loose sediment rapidly. Thus, sediment transported into the SBC deposits rapidly on the inner continental shelf, and advection into the SBC basin occurs primarily in bottom layer processes. This results in the relatively constant sediment deposition rates observed by many in the SBC basin, even though the river input is ephemeral.

OS42R-07 1520h

Wintertime Shoreward Currents South of Cape Hatteras

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Cross-isobath flow on continental shelves is of interest for a variety of reasons. Near Cape Hatteras, North Carolina, the transport of larval organisms, pollutants, and oceanic carbon budget constituents to and from the adjacent Albemarle and Pamlico Sounds may depend critically on cross-isobath currents. Shoreward currents in the near surface waters south of Cape Hatteras are documented here, on the basis of continuous two-year time series. Energetic shoreward currents exist ~30% of the time in records from mid-fall through late spring in three consecutive winter seasons sampled. These currents are evident over the 20 and 35 m isobaths along a mooring line situated ~40 km southwestward from Cape Hatteras. Shoreward velocities average ~12 cm/s, and events persist from 0.5-4 days, occurring every 2.5-5 days, except in summer. These events often coincide with southwestward winds, but occur under both upwelling and downwelling-favorable conditions. In winter, the mooring line south of Cape Hatteras is frequently traversed by a strong temperature and salinity front, with light, relatively fresh, cold, stratified water on one side, and denser, more saline, warmer, unstratified water on the other. Hydrography and satellite sea surface temperature imagery help identify this front as the boundary between South Atlantic Bight and Mid-Atlantic Bight coastal shelf waters, the "Hatteras Front". Flow along the Hatteras Front where it crosses the shelf appears to account for the observed shoreward currents. The alongshelf advection of the Hatteras Front may depend on both winds and Gulf Stream distance offshore.

OS42R-08 1535h

Direct Observations of Along-Isopycnal Upwelling at the Shelfbreak Front

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In June of 1999, we deployed an isopycnal subsurface float, the COastal Ocean Lagrangian (COOL) float, near the foot of the shelfbreak front south of Georges Bank. While tracking the float acoustically from the ship, high-resolution 10 km × 20 km CTD surveys using the towed undulating vehicle SeaSoar were conducted around the COOL float. At the same time, horizontal velocities were obtained using a shipboard ADCP. These surveys were repeated for the 2-1/4 day mission of the COOL float.

We will describe the quasi-Lagrangian evolution of the hydrographic conditions at the shelfbreak front for two deployments of the COOL float. During the first deployment, the COOL float moved 15 km seaward as it rose from 80 to 40 m depth along the sloping frontal isopycnals over two days. The directly measured vertical velocity, 20 m/day, is in general agreement with model predictions of the secondary circulation near a shelfbreak front. For the second deployment of the COOL float, the float experienced a net downwelling of 10 m/day near the shelfbreak front. We attribute this to the strong mesoscale meandering of the shelfbreak front occurring at this time.

OS42R-09 1550h

Secondary circulation at the Shelfbreak Front

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We use a (non-hydrostatic) numerical model to explore the secondary circulation at the shelfbreak front. In particular we explore the mechanisms that give rise to vertical motion that may be responsible for enhanced biological productivity at the shelfbreak. When the front is dynamically unstable, growing meanders are associated with localized cells of vertical motion and three-dimensional Lagrangian pathways through the frontal system. When the front is stable, finite-amplitude external perturbations such as those associated with Gulf Stream rings and filaments in the Mid-Atlantic Bight can produce similar effects. Vertical motion can be a significant transport mechanism for nutrients. The largest vertical motions seem to arise under transient conditions. We evaluate the mean vertical velocity field for a stable jet subject to persistent transient forcing.

We also evaluate the differences in vertical velocity fields and meander evolution between hydrostatic and non-hydrostatic simulations. As one would anticipate from aspect ratio arguments, these are generally small in a slowly evolving system but for some types of motion, a significant difference is seen.

OS42R-10 1605h

Influence of Boundary Currents on Cross-shelf Transport in the Mid-Atlantic Bight: Radiochemical and Hydrographic Studies

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From 1999-2001 several cross-shelf sections spanning the continental shelf and slope were sampled in the Mid-Atlantic Bight. The sections contained strong shelfbreak jets with maximum along-front velocities of up to 70 cm/s. In addition, the majority of the sections contained features related to the proximity of Gulf Stream warm-core rings or streamers. Naturally occuring short-lived radium isotopes with coastal sources were used to trace water masses orginating in the inner shelf. These tracers, Ra-223 and Ra-224, indicated very little transport across the shelfbreak within the timescales of the isotopes (20-30 days). However, unusually high levels of Ra-224 (half-life 3.7 days) were detected on several occasions beyond the shelfbreak in water with salinities of 35 to over 36 ppt. The high salinity and absence of Ra-223 point to a source other than the adjacent shelf. Water subsequently collected at the west wall of the Gulf Stream on the Cape Hatteras shelf shows a similar isotope ratio and contains extremely high levels of Ra-224. Using published Gulf Stream drifter and larval transport rates, it is apparent that this region could be the source for high offshore Ra-224 levels as far north as Nantucket Shoals. Thus, it is possible that transport by the Gulf Stream, from remote shelf locations, may be a source of geochemical signals on the MAB slope that is of equal or greater importance than local, direct transport across the shelfbreak front.

OS42R-11 1620h

Constraining the Sources and Fluxes of Organic Carbon to Continental Shelf and Slope Waters Using Natural ^{14}C and ^{13}C

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Dissolved and particulate organic carbon (DOC and POC, respectively) in ocean margins may have a variety of both old and young marine and terrestrial sources, and the qualitative and quantitative evaluation of these sources is a considerable challenge to marine geochemists. While natural isotopic signatures of DOC and POC lack the specificity of organic biomarkers for source identification, they may offer more integrated estimates of potential sources, provided the isotopic signatures of the various sources can be adequately constrained. Historically, stable isotopes have been used more frequently for assessing coastal organic matter sources, but recently natural ^{14}C has also been used effectively, and offers certain advantages over stable isotopes as a result of its much greater dynamic range.

We present here an extensive dataset on the natural $\Delta^{14}C$ and $\delta^{13}C$ composition of DOC and POC in continental shelf and slope waters of the western North Atlantic collected over two years. The ranges in both $\Delta^{14}C$ and $\delta^{13}C$ of DOC and POC are among the greatest ever observed for a marine system. The DOC of shelf and shallow slope waters is deduced to be comprised of 3 main end-members: young terrestrial C, young marine C from contemporary primary production, and old oceanic DOC. The DOC in deeper slope waters is comprised of old C (>∼4,000 yrs in age) ranging from -23.7 to -21.3$^{o}/_{oo}$ in $\delta^{13}C$. The POC from shelf and surface slope waters is deduced to be comprised of a mixture of modern aged marine and terrestrial C. However, POC from slope waters shows a striking positive correlation between $\Delta^{14}C$ and $\delta^{13}C$, and indicates that the oldest (to ∼5,000 yrs in age) material has the most terrestrial (i.e., ^{13}C-depleted, to ∼-31$^{o}/_{oo}$) character. The DOC and POC of slope waters is universally older and more depleted in ^{13}C than open ocean DOC of the N. Atlantic. We also show results of a dual isotopic multiple source model that constrains the contributions to shelf and slope DOC and POC of old and young marine (including sedimentary) and terrestrial/riverine material to these pools.

OS42R-12 1635h

Inferring Physical Processes Using Phytoplankton Structure and Bulk Optical Properties in Coastal Waters.

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The nearshore waters off the central New Jersey coast are characterized by a two-layered system separated by a strong offshore pycnocline. The onshore expression of this density gradient fluctuates in response to the episodic upwelling and downwelling events, with a spreading of the isopycnals in intermediate conditions. Phytoplankton responses to this physical structure are varied, with the chlorophyll maximum located either on or within the pycnocline layer, suggesting differential mixing. During the summer of 2001, multiple transects of physical, optical and biological data were collected at the Long-term Ecological Observatory (LEO-15) to examine the biological response to pycnocline dynamics. While biological material is distributed cross-shore along the pycnocline, generally increasing inshore (>15ug/L), it is not known whether the origin of the material offshore is the same as that along the coast. A time series of satellite ocean color data suggests that the origin of biological material along the pycnocline may be dependent on the episodic events. Bulk optical properties along with discrete measurements of phytoplankton taxonomic structure will be used as tracers to examine and differentiate the physical processes in the study area.

OS42S HC: 319 A Thursday 1330h

Chemical Oceanography: Metals

Presiding: **J Resing,** Pacific AMrine Environmental Lab**; R T Powell,** Louisiana Universities Marine Consortium

OS42S-01 1330h

Distribution of Dissolved Aluminium in Surface Coastal Waters of the Northeast Pacific

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Dissolved Al concentrations were determined across a series of horizontal surface transects along the Northeast Pacific, off the coast of Big Sur, California to Vancouver Island, British Columbia. This region of coastline allows the relative importance of different modes of input of Al to be assessed. The work reported here forms part of larger study of the California Current system carried out in June/July 1997. Dissolved Mn and Ga distributions from the study were compared with the Al data.

Average concentrations of Al ranged from 0.4-0.7nM. These values are consistent with observations of Al, ranging from 0.3-1nmol/kg in California Current waters off Santa Cruz. Higher concentrations of Al (1.1nM) were observed in the lowest salinity waters (21) sampled at WCCST09. These waters initially form a shallow lens overlying the California Current and are then transported and mixed both vertically and horizontally. The lens extends offshore, moves south and west and retains its low salinity, high silicate signal as far south as WCSST07, more than 200km south of the head of the river. In contrast to both Ga and Mn which remain elevated above background as far south as WCSST07; Al signals decrease rapidly to background values beyond WCSST09. Trace metal versus salinity plots indicate the rate of removal for Mn and Ga to be considerably slower than that observed for Al. This agrees well with previous estimates of surface ocean residence times for these elements.

Summer upwelling off the coasts of Oregon, Washington and California did not appear to provide dissolved Al to overlying surface waters. This is in direct contrast to dissolved Mn and Ga, which both show elevation in upwelled waters, and we suggest that the lack of an elevated signal for Al reflects its rapid removal from the water column.

OS42S-02 1345h

The Distribution of Particulate, Colloidal and Dissolved Mercury and Monomethyl Mercury in the San Francisco Bay Estuary

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Surface water samples were collected from the San Francisco Bay estuary in September October 2000 and March 2001, and total mercury (THg) and monomethyl mercury (MeHg) concentrations were measured in unfiltered, filtered (< 0.45 μm), colloidal (1 kDa 0.45 μm), and dissolved (< 1 kDa) fractions. The particulate (> 0.45 μm) THg concentration ranged between 5.3 and 163 pM. Suspended particulate matter (SPM) and particulate organic carbon (POC) played important roles in the particulate THg distribution in the northern reach and South Bay, respectively. The filter-passing THg constituted only 12 $\pm$ 7 % (n = 29) of the unfiltered THg concentration. Colloidal THg accounted for 38 $\pm$ 18 % (n = 9) of the filter-passing THg in fall and 57 $\pm$ 10 % (n = 12) in spring. Distribution coefficient assessment revealed that THg had a greater affinity for particulate material in September October, but similar affinity for both colloidal and particulate material in March. A steady-state, non-conservative, estuarine mixing model suggests internal sources of particulate, colloidal and dissolved THg within the estuary in September October, but net sinks of colloidal and dissolved THg in March. The particulate MeHg concentration ranged between 0.09 and 0.40 pM during the low flow condition and between 0.10 and 0.95 pM during the high flow condition. The correlation between particulate MeHg concentrations and SPM or POC was stronger during the spring than in the fall, indicating that interaction between particulate MeHg and SPM varied with season. The filter-passing MeHg consisted of 57 $\pm$ 17 % of the unfiltered pool in the fall and 37 $\pm$ 12 % in the spring. However, the percent colloidal MeHg in the filter-passing fraction was higher in the spring (56 $\pm$ 13 %) than in the fall (32 $\pm$ 9 %). Higher partitioning coefficients between colloidal and dissolved MeHg (log Kc = 5.6 $\pm$ 0.3) than those between particulate and dissolved MeHg (log Kp = 4.9 $\pm$ 0.5) suggest that MeHg is preferentially associated with colloidal material that is mostly composed of organic matter. In general, MeHg concentrations were very well correlated with organic carbon content in filter-passing, colloidal and dissolved fractions, confirming the importance of organic matter in MeHg transport. A non-conservative estuarine mixing model suggests that significant amounts of particulate, colloidal and dissolved MeHg are removed in the estuary in both seasons.

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Iron Speciation in the Gulf of Mexico

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In an attempt to more fully understand the chemical processes that control Fe concentrations in surface waters, the Surface Water Iron Speciation Study (SWISS) began in 2000. We are attempting to characterize as many aspects of the Fe cycle as possible in an area that has predictable periods of high and low atmospheric deposition. Collaborators are measuring aspects such as aerosol solubility, particulate Fe, total

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