Addendum to Poster Abstract List

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Sediment Transport in and Near the Mississippi Canyon

Submarine canyons accumulate and transfer sediments and carbon from continents to the deep ocean. Transport dynamics in canyons depend on each canyon's topography, sediment source and hydrodynamic setting. We present some results from three studies where we evaluated sediment distribution and dynamics in and around the Mississippi Canyon and their effects on dispersal from the Mississippi River system. Transects across the shelf during the LATEX program showed high surface and benthic nepheloid layers (BNL) in the spring, but during late summer through the winter, only BNLs were present. Transects down the axis of the canyon show higher concentrations in May than October, with particle maxima between 50-200 m. Sediment is often transported from the Mississippi River across the canyon with much higher concentrations in May than October. Time-series measurements in the canyon axis show considerable temporal variability in particle concentration over a 24-hour period. There is a persistent mid-water maximum between 50-200 m in the canyon that is not coincident with the fluorescence peak near the surface down to 50 m, indicating that the particle maxima are mostly inorganic material as opposed to biogenic. Across the slope outside the canyon, particle concentrations are less than in the canyon and advective layers are rare.

Currents in the canyon axis are driven by the semi-diurnal tidal flow with stronger currents at 3.5 mab than at 50 mab at a canyon depth of 300 m. Bottom shear stress is usually greater during down-canyon flow, but exceeds critical erosion values in both directions, yet particle concentrations seldom show separate peaks for both up- and down-canyon flow. Up-canyon flows bring in water that is 1-2 °C cooler, which must come from 50 m deeper in the canyon. These tidal oscillations act as a pump in carrying sediment down the canyon.

In summary, fine-grained material settles out near the Mississippi delta and is then advected in BNLs toward the canyon. Some of it is advected from the canyon as intermediate nepheloid layers distinct from the primary production layers. Large aggregates become much more abundant within the canyon head, which probably enhances sedimentation and later "pumping" down canyon by tidal currents.

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Effects of Physical Forces on Diurnal C, N, P, and Fe Dynamics and Submarine Groundwater Discharge within a Permeable Coastal Margin

Nutrient and iron dynamics were examined in a coastal backreef environment on south Maui where chronic eutrophication via terrestrial sedimentation and non-point nutrient inputs via submarine groundwater discharge occurs. Because of the high permeability of the sediments, physical forces can greatly affect porewater-water column exchange and, hence, porewater concentrations. We examined the diurnal changes in inorganic carbon, phosphorus, nitrogen, and iron inventories in the sediment porewater and the water column along a coastal margin in the island of Maui, Hawaii, and explored the covariance between nutrient concentrations and physical forces acting on the system (wind, waves, and currents). Preliminary results suggest that both submarine groundwater discharge and sediment biogeochemical processes, coupled with physical forcing, can largely account for inventory changes observed in sediments and the water-column. Our study emphasizes the challenges facing the determination of nutrient and carbon fluxes to the ocean, and the importance of submarine groundwater discharge to nutrient subsidies in these systems.

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Carbon Analysis in Estuarine Ecosystems: A New In Situ Non-destructive Approach

The poster describes a new instrument for non-destructive analyses of *in situ* estuary sediments that overcomes many of the current limitations. The instrument is based on inelastic neutron scattering (INS)-induced gamma ray spectroscopy. It provides a multi-elemental analysis, e.g., H, C, N, O, P, Cl, Na, K…, with high elemental specificity, regardless of the chemical state of the element. The INS system's large footprint, of about 2 m^2, and large sampling mass of a few hundreds of kilograms to a depth of about 30 cm, combined with its ability to continuously scan arbitrarily large areas, the INS revolutionizes the wisdom of the conventional sampling paradigm with an extensive reduction in labor, time, and costs. Its non-destructive nature enables true multilevel temporal measurements and design of novel dynamics and transport experiments. It functioned well in 100% saturated soils and above small puddles of water in a forest. In principle the INS system can be redesigned as a submersible unit to operate independently at an arbitrary depth. The INS system was demonstrated for carbon analysis of terrestrial soils (publication pending in SSSAJ) in static -and scanning-modes of operation.

I consider that the INS might prove very useful in significantly enhancing the assessment of the coastal and continental shelves C stocks and their dynamics needed to quantify the role of the land-water sector in the global carbon cycle. INS warrants a critical deliberation in the forthcoming OCB Workshop on the role of the coastal line on the carbon cycle and sequestration.