concentrations predicted from least squares regression analysis of the mixing curve are similar to flow weighted mean concentrations of the major runoff sources to the upper bay. Total Mn appears to behave conservatively in February but has a significant internal source in May and September consistent with benthic remobilization. Eighty to ninety percent of the Cu added to the bay appears to be deposited based on comparison of measured input concentration with those projected from the salinity curves. Regression of total Pb against salinity overestimates the measured input concentration, consistent with a significant additional source, presumably atmospheric. Estimates of Cu removal based on the transects is consistent with estimates based on annual sediment accumulation and total annual input from the major input sources.

Effect of Temperature and Nutrient Enrichment on Nitrification in a Costal Marine Ecosystem

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An annual cycle of water column measurements of nitrate, nitrite and ammonia has been used to calculate the rate of net nitrification and its response to eutrophication in large (13 m^3) microcosms at the Marine Ecosystem Research Laboratory (MERL). Calculations with corresponding benthic flux data allowed partitioning of these rates into pelagic and benthic components. Data from direct measurements of denitrification in the microcosms allowed calculations of the loss of nitrite and nitrate through this pathway. Results show that net production rates of combined nitrite and nitrate ($NO_2^{-1} + NO_3^{-1}$) generally vary inversely with water temperature. Nutrient enrichment generally resulted in an increase of net production of $NO_2^{-1} + NO_3^{-1}$ as eutrophication levels increased. Rates for the unenriched microcosm showed little variation remaining around 0.2 moles per l per day, while at the highest enrichment level (which is comparable to the enrichment of New York Bay) rates varied from 0.4 moles per l per day at 22 °C to 4.0 moles per l per day at 0.5 °C. Essentially, all of the net nitrification was pelagic in the unenriched microcosm throughout the year. In the more eutrophied microcosms, benthic production accounted for 15–35% of the total in the winter and was negligible in the summer. A variety of explanations for these trends may be proposed and it is thought that future N^{15} tracer work will better define the responsible factors.

THE ESTUARY AS A FILTER: CHEMICAL/GEOCHEMICAL PROCESSES

Convenor: A. Lerman

Invited Session

Behavior of Heavy Metals in a Highly Polluted Estuary (The Scheldt)

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The behavior of heavy metals in the estuarine zone is strongly dependent on the chemical characteristics imposed more particularly by the physical and biological processes occurring in this region. Many estuaries are now characterized by a drastic increase of their organic carbon load. In long residence time estuaries, this organic load can induce a permanent or seasonal anaerobic zone due to the bacterial heterotrophic activity. It is the case of the Scheldt estuary which is also characterized by the presence of high concentrations of heavy metals. In order to investigate the processes involved in the transformation of trace metals between particulate and solution during estuarine mixing, Cu, Cd, Zn, Ni and Mn were measured in solution and suspension in the estuary of the river Scheldt. Samples were obtained at six fixed positions at 1-hour intervals during complete tidal cycles in selected overlapping salinity regimes. The resultant plots of the concentrations in solution vs. salinity suggest conservative mixing of nickel. However, manganese, cadmium and zinc plots have pronounced maxima, which occur at different locations and salinities. Dissolved manganese is produced in the low pH, low dissolved oxygen area (around 10‰ S). Cadmium and zinc maxima occur at higher salinities (21 and 17‰ S respectively). Possible explanations include the effect of pH, redox potential, formation of soluble complexes during mixing of fresh water and seawater, biological uptake or release.

Chemistry of the Chesapeake Bay: Summary 1983

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Strong interest in the environmental health of the Chesapeake Bay has spurred a considerable increase in monitoring and research studies of the bay. Trace metals, "nutrients," trace organic compound and radioisotopes have been analyzed in more detail and on a