to be presented at the spring meeting of the American Geophysical Union, May 29-June 2, 1995, Baltimore, MD.

Coupled Geochemical Records of Early Diagenesis: Radionuclide Trends and Pathways of Sulfidation and Organic Remineralization

T W Lyons (Department of Geological Sciences, University of Missouri, Columbia, MO 65211; 314-882-6328; e-mail: geoltl@showme.missouri.edu)
M Kashgarian (Center for Accelerator Mass Spectrometry, Lawrence Livermore National Laboratory, PO Box 808, L-397, Livermore, CA 94551; e-mail: kashgarian@llnl.gov)

Data have been generated for a wide range of solid-phase and pore-water constituents in an integrated study of sediments from anoxic sites of the outer-shelf/upper-slope of the Black Sea. In general, these muds show strong geochemical evidence for rapid accumulation, as indicated by profiles for ^{210}Pb and ^{137}Cs and a down-core persistence of elevated levels of acid-volatile iron monosulfide. Most importantly, however, the sulfur geochemical characteristics of sediments collected in the Bay of Sinop region, including trends for total dissolved sulfide and extents of Fe sulfidation, display clear evidence for non-steady-state behavior. This conclusion is consistent with the observed patterns for the ^{14}C ages of bulk organic and inorganic carbon.

Despite a deep distribution of anthropogenic radionuclides (to at least 30 cm) and a ^{210}Pb sediment accumulation rate of ~0.8 cm/yr., the bulk organic and inorganic ^{14}C ages range from 500 to 2630 and 6550 to 11130 ^{14}C yBP, respectively, over the same depth intervals. The microlaminated nature of the sediment precludes down-core mixing as a viable explanation for any observed disparities. Furthermore, the bulk ^{14}C ages for the two carbon reservoirs fail to show a steady increase with depth, instead displaying highly variable profiles that closely parallel each other and mimic the sulfur geochemical evidence for non-steady-state behavior. Collectively, these observations are consistent with a time-varying balance between inputs via primary production and those reflecting the reworking of older terrestrial and/or marine calcium carbonate and organic matter (OM). Consequently, the reactivity of the bulk organic-carbon reservoir has varied temporally in concert with the relative fluxes of fresh labile marine OM and reworked refractory phases. Although a refined interpretation hinges on planned species-specific analysis of the organic fraction, the present findings highlight the risks inherent in any bulk radiocarbon determination of sediment accumulation rate.

This work was performed in part by the U.S. Department of Energy at Lawrence Livermore National Laboratory under contract # W-7405-Eng-48.