Constraining the Mechanisms of Detrital $^{87}Sr/^{86}Sr$ Variability in Southeast Atlantic Sediments

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Introduction:

Reconstruction of past modes of ocean circulation using geochemical proxies have yielded insight into how reorganizations of the Earth's ocean atmosphere system relate to climate change on glacial interglacial timescales (i.e., Broecker and Denton 1991). One such proxy is detrital clay. Detrital clays in deep-sea sediments are derived from sources that vary in their $^{87}Sr/^{86}Sr$ isotope composition according to their Rb to Sr ratio, age and geological history. This is due to the increase of ^{87}Sr via the radioactive decay of ^{87}Rb ($t_{1/2}=4.9*10^9$). Clays, the weathering products of continental rocks, are transported to the sea by winds, rivers and by ice rafting. Within the sea, surface and deep currents transport clays. Hence, at a given location, temporal variations in the isotope composition of detrital clays will yield information about changes in the source regions, mechanisms of input and/or transport within the sea.

Sources and patterns of deep-sea sediments can be deduced by looking at patterns of isotope ratios in spatially distributed sediments. Previous work has demonstrated that the detrital component of surface sediments in much of the South Atlantic ocean have low $^{87}Sr/^{86}Sr$ (0.704-0.717) whereas surface sediments from the southwest Indian Ocean have significantly higher values (0.721-.740). Goldstein et al. (1999) showed that patterns of $^{87}Sr/^{86}Sr$ in surface sediments of the southeast Atlantic reflect the regional surface currents. It follows that down-core detrital $^{87}Sr/^{86}Sr$ in strategically located cores may be sensitive to changes in the overlying surface currents.