Radiogenic Isotope Tracers of Marine Sediment Provenance in the Limpopo Catchment

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The composition of terrigenous sediments provides information on their sources and extent of weathering, and this information can contribute to understanding past climates. In this study we sought to use this approach for the Limpopo catchment. Sr, Nd, and Ar isotope and major and trace element data were obtained for eight samples spanning the last 250,000 years from terrigenous clay samples from core MD96-2048, recovered off the coast of Mozambique at the mouth of the Limpopo River. The Limpopo River is the second largest river on the eastern side of Africa and drains primarily Archaean-age gneisses, as well as the Bushveld complex, the Karoo Supergroup, and the Waterberg group. It provides sediment flux $12.2x10^6$ m^3/a and water discharge of 5 km^3/yr to the Indian Ocean from eastern Africa. Today it is within the tropical climate zone, at the very southern edge of the region seasonally influenced by the Intertropical Convergence Zone, and is also influenced by the greater Agulhas Current system. The radiogenic isotopes show a range of 0.754 to 0.773 $^{87}Sr/^{86}Sr$, -19.4 to -22.5 εNd, and K/Ar ages between 347 and 562 Ma; the K/Ar ages represent the apparent age calculated from the terrigenous clay fraction of the sediment. The chemical index of alteration ranges from 86.9 to 88.9, and cation exchange capacity from 5.86 to 8.69 meq/100g; these vary weakly with the radiogenic isotopes. 40Ar/39Ar ages of several small detrital muscovite grains yielded ages between 1 and 2 Ga, and more individual grain analyses are underway. In addition to a strong correlation among the terrigenous geochemistry proxies, the radiogenic isotope data appear to follow environmental proxies from the same core, indicating that changes in climate can potentially be reflected in the terrigenous sediment record. Plotting the isotopes against one another suggests mixing of at least three sources.