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Radiogenic isotope (Nd, Sr, K'/Ar) and geochemical evidence for orbitally paced variations in clay provenance over the past 160,000 years at Site U1474, Natal Valley, SW Indian Ocean

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International Ocean Discovery Program (IODP) Expedition 361 drilled Site U1474 in the northernmost Natal Valley (31°13.00′S, 31°32.71′E, 3045 m water depth), approximately 88 nautical miles south-southwest of Durban, South Africa, and nearby the outlet of the Tugela River [1]. Site U1474 is within a sediment-filled basin bounded by the southeastern African margin and the Mozambique Ridge, on a contourite drift deposited under the influence of northward-flowing deep water (NADW) entering the Indian Ocean. At the surface, the site is also close to the beginning of the fully constituted Agulhas Current, which flows south along the KwaZulu-Natal coast of southeastern Africa. The average sediment accumulation rate at Site U1474 is approximately 4 cm/kyr, and the sediment composition ranges from 40 to 60% carbonate and terrigenous sediment, with variations in carbonate concentration strongly correlated with precession. Work on the last 270 kyrs on the nearby site survey core CD154-10-06P demonstrated a strong precession pacing of the Fe/K measured by XRF scanning, which was interpreted as related to precipitation variation along the southeastern coast of Africa [2].

The XRF scanning data from Site U1474 also demonstrates clear precession pacing in the elemental ratios such as Ca/Fe and Fe/K [3,4]. This study aims to investigate the clay provenance and mixing relationships of sediments from Site U1474, through radiogenic isotopes (Nd, Sr, K'/Ar) and geochemical analyses, to reconstruct past rainfall variability along the southeast African margin and explore the links between orbital forcing and terrigenous sediment input. We observe variations in the geochemistry of the clay fractions over the last 160,000 years that indicate mixing from more than two sources. Additionally, radiogenic isotope values fall within a mixing triangle defined by the compositions of the Zambezi, Limpopo and Tugela rivers. Analysing these mixing relationships will enhance understanding of how orbital signals are expressed in the sediment record.

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