Goldschmidt 2026 Abstract
https://doi.org/10.46427/gold2026.34198

Tracing lithogenic fluxes and provenance in Southern Indian Ocean sediments using actinides (U, Th & Pu) and radiogenic isotopes

GEORGE H ROWLAND[1], JAKOB WEIS[1], TARYN NOBLE[1], DAVID P CHILD[2], MICHAEL A HOTCHKIS[2], CARISSA O'CONNOR[2], ELISABETH L. SIKES[3], ASHLEY TOWNSEND[4], JOSEPH CRESSWELL[1] AND ZANNA CHASE[1]

[1]University of Tasmania
[2]Australian Nuclear Science and Technology Organisation
[3]Rutgers University
[4]Central Science Laboratory, University of Tasmania

Measuring the quantity and sources of lithogenic material transported to ocean sediments allows reconstructions of the modern and past climatic processes that transport the material and enables an assessment of their impact on ocean systems. For example, in the Southern Ocean, where phytoplankton are limited by the supply of lithogenic micronutrients, changes to dust fluxes have been implicated in driving glacial–interglacial changes in CO_2 and climate ('the iron hypothesis'). Although dust is thought to dominate micronutrient supplies to the Southern Ocean, in the Indian sector, additional lithogenic inputs from iron-rich volcanic islands and the Kerguelen Plateau contribute additional inputs so that the relative importance of the distal *vs*. proximal nutrient sources is unclear.

To assess the quantity and provenance of lithogenic nutrient supplies to the Southern Indian Ocean during the late-Holocene we measured a suite of lithogenic isotopes and elements in a transect of core-top sediments spanning from the Australian continental slope to the central southern Indian Ocean, using ^{230}Th-normalised fluxes of trace metals to quantify lithogenic fluxes across the region.

Our ^{230}Th-normalised fluxes indicate decreasing lithogenic inputs moving away from the Australian continent, but also indicate a region of slightly elevated inputs at the most remote sites in our transect, close to volcanic islands. Using lithogenic elemental ratios and radiogenic isotopes we demonstrate mafic volcanic inputs contribute significantly to our sediments, especially at sites at the northern margin of the Southern Ocean.

In light of the non-continental origin of a large portion of the lithogenic tracers in our sediments, we test whether plutonium isotopes—thought to be remobilised with modern aeolian dust—can be used to trace purely continental inputs to our sites. To our knowledge we present the first ^{230}Th-normalised Pu fluxes to deep sea sediments, constraining part of the oceanic budget for this anthropogenic element.