

# The Fate of Subducted Continental Crust in the Earth's Mantle: Evidence from the Samoan Hotspot

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**Abstract:** Substantial quantities of terrigenous sediments are known to enter the mantle at subduction zones, but little is known about their fate in the mantle. Subducted sediment may be entrained in buoyantly upwelling plumes and returned to the Earth's surface at hotspots, but the proportion of recycled sediment in the mantle is small, and clear examples of recycled sediment in hotspot lavas are rare. Here we report remarkably enriched  $^{87}\text{Sr}/^{86}\text{Sr}$  and  $^{143}\text{Nd}/^{144}\text{Nd}$  isotope signatures in Samoan lavas from three dredge locations on the underwater flanks of Savaii island, Western Samoa. The submarine Savaii lavas represent the most extreme  $^{87}\text{Sr}/^{86}\text{Sr}$  isotope compositions reported for ocean island basalts to date. The data are consistent with the presence of a recycled sediment component (with a composition similar to the upper continental crust) in the Samoan mantle. Trace-element data show affinities similar to those of the upper continental crust including exceptionally low Ce/Pb and Nb/U ratios that complement the enriched  $^{87}\text{Sr}/^{86}\text{Sr}$  and  $^{143}\text{Nd}/^{144}\text{Nd}$  isotope signatures. The geochemical evidence from these Samoan lavas significantly redefines the composition of the EM2 (enriched mantle 2) mantle endmember, and points to the presence of an ancient recycled upper continental crust component in the Samoan mantle plume.