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Isotopic evidence for recycling of Rodinia supercontinent in the Cretaceous Pacific superplume

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Earth's mantle heterogeneity documented by geochemistry of oceanic basalts has been commonly attributed to recycling of crustal materials, which are thought to be present as eclogitic/pyroxenitic bodies within the convecting peridotite-dominated mantle. However, their origin and recycling timescales are difficult to constrain from the composition of mantle-derived magmas because partial melting process effectively dilutes the signatures by mixing with ambient peridotite. Here we present isotopic evidence of crustal recycling in the Pacific convective mantle, remained intact in a mantle-derived quartz-garnet clinopyroxenite xenolith from Malaita, Solomon Islands. The xenolith has lower 206Pb/204Pb, 143Nd/144Nd and higher 87Sr/86Sr, 207Pb/208Pb ratios than most oceanic basalts, showing some affinities with the hypothesized recycling source so-called EM-1 or DUPAL-type. The timescale and material, mainly constrained by its extent of Hf-Nd isotopic decoupling, indicate the pollution of southern Pacific mantle by the subduction or delamination of lower continental crust developed as the collisional suture of Rodinia supercontinent. We infer that forepassed amalgamation of Rodinia played significant role on the generation of Pacific plateaus, frequently referred to as Cretaceous superplume event, because the xenolith actually resurfaced by mantle upwelling that created the gigantic Ontong Java Plateau.