

## Rarotonga magma as a mixing product of EM-1 and HIMU in the Cook-Austral volcanic chain, the South Pacific.

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We present radiogenic isotope (Os, Pb, Nd, Sr) and major and trace element data on lavas from Rarotonga Island, the Cook-Austral volcanic chain in the South Pacific, and examine the origin of the source of these lavas. Relationship between Ni, MgO and Os concentrations of the lavas indicates that Os contents in magma are controlled by fractionation of sulfide. Osmium concentration of the samples with high- Os and Ni (over 80 ppt and 100 ppm, respectively) are least affected by magma differentiation. Since Os is a highly compatible element and is readily removed from magma during sulfide crystallization, shallow-level assimilation of crustal material and sediment with extremely high  $^{187}\text{Os}/^{188}\text{Os}$  during magma ascent significantly alters the original Os isotopic compositions of magma. The lavas with low-Os, therefore, do not preserve the initial Os isotopic composition of magma and possess the elevated Os isotope ratios. The  $^{187}\text{Os}/^{188}\text{Os}$  ratios of the Rarotonga lavas with Os concentrations more than 80 ppt (or Ni > 100 ppm) fall in a relatively limited range from 0.1282 to 0.1343 with an average of 0.132, which is possibly the initial Os isotopic composition of the Rarotonga mantle source. Evaluation of published data on the Pitcairn lavas known as originated from EM-1 in the similar manner to that used for that of Rarotonga data suggests that the lavas with high-Os and Ni (over 80 ppt and 300 ppm, respectively) keep the original Os signature of EM-1 with least assimilation. The Os isotopic compositions of such samples lie in a small range between 0.1350 and 0.1381 with an average of 0.1369. This value is much lower than the value of approximately 0.15 widely accepted as the  $^{187}\text{Os}/^{188}\text{Os}$  of EM-1. If in the case, the Os-Pb-Nd-Sr isotopic data of the Rarotonga lavas suggest that they are mixing products of EM-1 and HIMU.

Keywords: Polynesia, hot spot, Rarotonga island, EM1, HIMU