Magma interaction with lower and upper crustal rocks beneath the Norikura Volcanic Chain, central Japan

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Nd and Sr isotopes in lavas from Norikura Volcanic Chain were examined. Primary basalt lavas would have interacted with lower crustal rocks with high Sr and Nd isotope ratios, whereas andesite and dacite to rhyolite lavas, differentiated from the primary basalts, would have interacted further with high-Sr, low-Nd upper crustal rocks.

Late Cenozoic lavas of the Norikura Volcanic Chain vary from basalt (Ueno Basalts, SiO2 47-53 wt.%) through andesite (Nomugi-Toge Volcanic Rocks and Quaternary volcanics) to rhyolite (Hida Volcanic Rocks, SiO2 65-73 wt.%). The lavas display extremely wide isotopic variations, with 87Sr/86Sr ratios ranging between 0.7042 and 0.7081, and 143Nd/144Nd from 0.5124 to 0.5129.

Nd isotopic ratios in the primary basalts are commonly high, but Sr isotopes show wide variation. Suites of andesites or dacite to rhyolites collected from individual eruption centers have almost similar Sr isotopic variation with the primary basalts, however, each of them show progressive increase in Sr isotope ratios, coinciding with rapid decrease in Nd

ratios. The differing isotopic characteristics between the primary asalts and differentiated lavas form distinct trends in Nd-Sr isotope systematics. Geobarometric estimates suggest the primary basalt lavas were emplaced in the lower crust, whereas the differentiated lavas formed at mid- to upper-crustal levels. The contrasts in isotope systematics between the basalts and the differentiated lava suites can be explained by assimilation of differing crustal rocks. The basalt lavas interacted with lower crustal rocks with high Sr and Nd isotope ratios, whereas the differentiated lavas interacted further with high-Sr, low-Nd upper crustal rocks.