Along-arc heterogeneity in crustal architecture and subduction input at the Sunda arc in Java, Indonesia

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Evaluating the relative contributions in Sunda arc lavas from subducted components and material assimilated as melts pass through the crustal basement is complicated by the variable nature of the upper Eurasian Plate (thickness ± composition) and lower Indian Ocean Plate (age of the subducting crust and variation in the type and amount of sediment deposited on it). Detailed geochemical and isotopic study of several volcanic centres along Java: Salak, Gede Volcanic Complex (GVC), Guntur, Merapi and Ijen Volcanic Complex (IVC) has been carried out to constrain Sunda arc petrogenesis and examine the geodynamic framework of the arc.

Comparison of IVC, GVC and Salak lava geochemistry, new Hf-isotope data for Merapi and Guntur and data from other volcanoes of Java located along the volcanic front has revealed significant spatial geochemical variations along Java. $^{87}Sr/^{86}Sr$ broadly increases from ~0.7045 to ~0.7060 in volcanic rocks from Krakatau (west of Java) to Merapi Volcano in Central Java. Further east of this point $^{87}Sr/^{86}Sr$ isotope ratios of Javan volcanic rocks are lower (~0.7042) and relatively constant. A correlation between maximum $^{87}Sr/^{86}Sr$ ratio and the summit elevation of each volcanic edifice in West and Central Java indicates that some of the isotopic variation may be related to lithospheric thickness. A transition in crustal architecture is likely between Central and East Java, which we interpret as the south-eastern limit of pre-Tertiary Sundaland crust.

Relatively low Ba/La, moderate Sr/Nd and a positive correlation between Nd and Hf isotope ratios for West Javan volcanic rocks is consistent with the incorporation of subducted sediment dominated by a terrigenous component. In contrast, relatively high Ba/La and Sr/Nd, and substantially less variation in $^{176}Hf/^{177}Hf$ amongst Central and, particularly, East Javan volcanoes is consistent with greater involvement of subducted pelagic sediment and stronger slab-fluid imprint. The along-arc variation in sediment type involved in magma genesis reflects the decreasing thickness of turbidite deposits on the down-going Indian Ocean lithosphere eastwards from Sumatra to Java.