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# U-series and Sr-Nd-Hf isotopic constraints on the petrogenesis of the 1815 Tambora magma

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The great Tambora eruption on Sumbawa, Indonesia in 1815, one of largest in recorded history, yielded extensive pyroclastic deposits from the eruption of 30-33 km3 of trachyandesitic magma, a comparatively rare magma type in volcanic arc settings. Based on samples from 1815 Plinian-fall deposits and ignimbrites, we present a study of the processes and timescales of magma genesis and differentiation beneath this rear-arc volcano located in the eastern part of the Sunda arc. Such information is crucial for the assessment of volcanic hazards at Tambora and similar volcanoes elsewhere, not least because of the possible role of magmatic processes in triggering volcanic eruptions. Major and trace element abundances, Sr, Nd and Hf isotopic ratios and U, Th and Ra isotopic compositions obtained on 1815 pumices and constituent mineral phases, allow us to assemble a picture of the physical processes of magma formation and evolution beneath Tambora prior to the cataclysmic eruption in 1815. Our results indicate that basaltic magmas parental to the trachyandesites erupted in 1815 originated from small degrees of partial melting of an Indian Ocean MORB-type mantle source, similar to that of the main volcanic front of the Sunda arc, modified by fluid-mobile elements from subducted oceanic crust and small amounts of subducted sediment. We suggest that trachyandesitic melts, generated in the lower arc crust, ascended rapidly to shallower crustal levels where they accumulated in a magma reservoir some 3-4 km below the surface, inferred from plagioclase-melt equilibria. Several pulses of compositionally similar magmas over a period of a few thousand years resulted in the incremental assemblage of the large volume of fairly homogeneous trachyandesitic magma erupted from Tambora in 1815.