Geochemistry and Sr-Nd-Pb-Hf isotopic composition of late Cenozoic Tengchong lavas, SW China

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The Late Cenozoic Tengchong Volcanic Field (TVF) in Southwest China is a cluster of mafic continental intra-plate lavas, represented by 68 volcanic cones spanning an area of ca. 800 km^2. We present major and trace element data and Sr-Nd-Pb-Hf isotope ratios of lava rocks from the area and, in combination with published data, aim to constrain modes of emplacement and the geochemical character of their mantle source(s). Indices of magmatic differentiation show a clear trend with isotope composition, marking a classic case of assimilation-fractional-crystallization (AFC) processes during the genesis of these rocks. Three samples, identified as the most primitive samples based on major and trace elements, are interpreted to be derived from the source of the rocks without major modifications and represent the isotope signature of their mantle source. Modelling of a best-fit scenario indicates that the isotope and trace element character of these samples can be reproduced by ca. 1-4% partial melting of a metasomatised mantle source, composed of 1-5% of a global subducting sediment (GLOSS) component added to a depleted MORB mantle. In line with this scenario, we assign their average radiogenic isotope composition to the present-day enriched part of the SCLM underneath SW China. We ascribe these isotopic signatures to ancient modifications of parent-daughter ratios in the SW Chinese SCLM by past subduction-related metasomatism. Accordingly, we cannot identify the previously proposed enriched geochemical reservoirs (EM-1, EM-2) or so-called DUPAL mantle in the source of the Tengchong volcanics, but only processes that lead to similar isotopic signatures. In the absence of an active plume component, we infer that the Tengchong volcanism is triggered by passive upwelling of hot, re-enriched lithospheric mantle in an extensional setting associated with the rotation of the Indian subcontinent. Because fertile (metasomatised) mantle sections will preferentially melt, the TVF lavas are a direct product of decompressional melting of re-enriched sub-continental lithospheric mantle.