Migration of arc volcanism during mid-Miocene in NW Sumatra: Geochemical constraints and tectonic implications

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Sumatra lies on the western Sunda arc which were formed by the Australian Plate subducting beneath the Sundaland. Here, new age and geochemical analyses results in NW Sumatra are reported. Volcanics from Tertiary (16.5 and 20.1 Ma in zircon U-Pb dating, TV) and two Quaternary volcanoes (Seulawah volcano (SV) and Geureudong volcano (GV)) were collected in this area. The Tertiary volcanics are located on the Woyla Nappe terrane from the SW side of the fault, and volcanic rocks from SV and GV were collected from the opposite of the fault in the West and East Sumatra terrane, respectively. Both of them are basalts to andesites and belong to mid- to high-K calc-alkaline series. GV have higher concentrations of K_2O (1.7 to 2.8 wt.%), LREEs ($(La)_n$ = 91 to 132), compatible elements (e.g., Ba, Sr, Th, U) and lower ε_{Nd} (ε_{Nd} = +0.6 to -0.2) than SV (K_2O = 0.8 to 1.7 wt.%, $(La)_n$ = 55 to 74, and ε_{Nd} = +2.8 to +2.1) as a result of different degrees of partial melting at different depths. According to the isotopic variations, crustal contaminations can be occurred in the Tertiary volcanics (ε_{Nd} from +6.5 to +2.3) and source contamination can be recognized from each volcanoes (ε_{Nd} in basalts changes from +6.5 (TV), +2.4 (SV), to +0.5 (GV)). We interpret the migration of arc volcanism as a consequence of the aseismic oceanic ridge subduction. Before the ridge reached to the Trench, the older volcanics were erupted on the volcanic front. The younger, warmer, and therefore more buoyant oceanic lithosphere resisted to subduction and changed the dip angle of the subducted slab to form these younger volcanoes after the Quaternary.