Quaternary volcanic rocks from Central Burma: Geochemical characteristics and petrogenesis

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Abstract

Burma is located in the eastern margin of the India-Asia collision zone (Mitchell, 1993; Barley et al., 2003). The most significant geologic feature in the region is arguably the Sagaing Fault representing a dextral strike-slip fault system that links the eastern Himalayan Syntaxis in the north and the Andaman Sea in the south (Bertrand et al., 1998; Bertrand and Rangin, 2003; Lee et al., 2003). Thus, this region is actually situated in a unique or "transitional" position between contractional (Himalayan) and extensional (Andaman Sea) tectonic settings, which is furthermore characterized by the eruption of a series of volcanoes (Bender, 1983; Stephenson and Marshall, 1984; Maury et al., 2004) along the north-south-trending Sagaing Fault. In this paper, we report geochemical and Sr-Nd isotopic analyses of some of these volcanoes in the hope to better understanding their petrogenesis and tectonic significance. Although it has been proposed that the volcanism started since late Miocene time in localities (Bender, 1983), our samples consist only of Quaternary basalts and basaltic andesites recovered from Mt. Popa and Monywa areas.

Major element analyses of the Burmese rocks indicate a potash-rich nature, with most of the Mt. Popa samples (8 out of 12 analyses) plotting in the high-K calc-alkaline suite and all the Monywa samples (n= 5) in the shoshonitic suite. The latter may be classified as absarokite based on their trace element characteristics. All these Burmese volcanics show significant depletions in the high field strength elements (HFSE; e.g., Nb, Ta and Ti), enrichments in the large ion lithophile elements (LILE; e.g., Cs, Rb, Th, U) and light rare earth elements (LREE), and thus have overall incompatible trace element distribution patterns similar to those of arc magmas formed in the subduction zone. Moreover, the Burmese rocks show high Nd and low Sr isotopic rations ($\varepsilon Nd = +1$ to $+4$; $^{87}Sr/^{86}Sr \approx 0.7045$). Consequently, we propose that the magma source of the high-K calc-alkaline rocks from Mt. Popa is a juvenile mantle wedge in the region despite the Indian Ocean slab under this part of the Asian continent has already ceased its subduction. Besides, the Monywa Quaternary absarokite represent small degrees of melting of a phlogopite-bearing peridotite within the mantle wedge.

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