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Recent Eruptions of the Lone Active Volcano on the Barren Island in the Andaman Sea: Arc Magmatism within a Rift Tectonic Environment

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The Barren Island volcano (BV) in the Andaman Sea shows three distinct cycles of volcanic activities: (i) first cycle - Pliocene ($^{40}Ar/^{39}Ar$ plateau age of 1, 65 to 2.67 Ma); (ii) second cycle between 1787 - 1832 AD, and (iii) the third cycle - three successive pulses between (a) March-October 1991, (b) December 1994-June 1995 and (c) the ongoing eruption commencing on 28 May 2005 still continuing. There is another Quaternary island volcano in the Andaman Sea called Narcondam (NV). The BV and NV lies on the SE Asian volcanic rim that extends from Sumatra in the SE to Myanmar in the north. The Andaman Sea and the surrounding region belong to a large rift tectonic province. The pattern of present day seismicity of this area is also unlike that of the Sunda Arc. The latter indicates a well-defined Benioff zone, while the Andaman earthquakes are largely shallow focus and show diffused pattern of distribution. The Sunda trench, which is traceable all along the south flank of Sumatra also disappears towards north as the Nicobar islands approach.

The bulk rock composition of BL ranges across the fields for basalt, basaltic andesite and andesite. The 2005 lava is olivine basalt similar to the 1994-'95 lava. Their overall textural patterns indicate a prolonged partial crystallization with intermittent perturbations in the sub-terranean shallow magma chambers. BL shows moderately fractionated PGE abundances with significantly higher Pd content than that of both orogenic and inorogenic basalts. The REE distribution patterns suggest varying source composition and/or degrees of partial melting. The Sr, Nd, and Pb isotope data show only minor variations: ($^{87}Sr/^{86}Sr$ = 0.70380 to 0.70405, ε_{Nd} = +4.1 to +6.8, and $^{206}Pb/^{204}Pb$ = 18.20 to 18.29). The geochemical signature of BL largely points to back-arc magmatism.

It is believed that the 2005 resurgence of BV after nearly ten years' dormancy may have apparent link with the 2004 Sumatran mega-thrust earthquake and its subsequent aftershocks in the Andaman Sea region.

Key words: Barren Island Volcano, back-arc magmatism, rift tectonic province, Sumatran mega-thrust earthquake