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Multiple episodes of Palaeogene-Neogene felsic volcanism recoded from Andaman Islands, India – correlation with felsic volcanism of SE Asia

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In Andaman and Nicobar Islands, India the volcaniclastic sequence represented by felsic tuff and tuffaceous sediments are exposed in different stratigraphic levels and serve as marker horizons for stratigraphic correlation. The tuffs occur in three distinct stratigraphic levels: a) in between top part of Eocene Mithakhari Group and basal part of Oligocene Andaman Flysch Group, b) basal part of Lower Miocene Archipelago Group interbedded with siliciclastic sediments and c) mid part of Archipelago Group (Mid-upper Miocene/Pliocene) interbedded with carbonate sediments. This indicates to at least three episodes of Palaeogne-Neogene explosive volcanism in the arc setting suggesting to the presence of a paleoarc in this zone and signifying to active subuction from Eocene. The sedimentation of both the Mithakhari Group (Eocene) and Andaman Flysch Group (Oligocene) terminates with a volcanic episode. Volcanic episodes also repeat during Mio-Pliocene as repetitive tuff beds interbedded with siliciclastic and carbonate sediments. The volcaniclastic units have been classified into four different facies types (Facies A, B, C and D). Facies A and B are exposed in the main Andaman group of Islands interbedded with siliciclastic sediments whereas Facies C and D are exposed in Archipelago group of islands, interbedded with siliclastic-carbonate sediments. The tuffs are extremely fine grained rock composed of minute glass shards (20-150 µm), with subordinate amounts of broken phenocrysts /crystals of quartz and plagioclase set in fine glassy groundmass. The glass shards exhibit a variety of morphology ranging from platy, sickle, bicuspate, tricuspate, curved, crescent and horn shaped features without any welding, suggesting to its sub-aerial pyroclastic nature with transport under cold conditions [1]. Scoured base, normal grading, good sorting with crystal and glass rich layers indicate transport in subaqueous conditions. According to the abundances of the phenocrystic crystals this volcaniclastic rocks has been classified as vitric to crysto-vitric felsic tuff. Compositionally the tuffs of facies-A, B & D fall in the overlapping field of dacite and rhyolite, whereas the tuffs of facies-C fall in the overlapping field of andesite and dacite. The trace element discrimination pattern show considerable

enrichment and significant variation in both LILE and HFSE. The concentration of the trace element abundances of some LILE (e.g. Rb, Ba, Zr) for tuffs of facies-A are the maximum followed by facies-B. High values of Zr/Nb and Zr/Y and the Zr-Nb discriminatory diagram suggest the origin of Facies-A & B tuffs of in a convergent / compressional plate margin, whereas the tuffs of Facies-C & D occupy the extensional field. Felsic volcanism during Miocene age has also been reported from the south to southeastern side of the subduction complex i.e. Sumatra- Java Arc [2] and also from the eastern side i.e. Sundaland shelf [3]. Hence the Sumatra arc recording volcanic activity during early to middle Miocene time along with continental crust below it could be the source for dacitic pyroclasts in the Andaman Island. The felsic tuffs from different facies of the Andaman Islands are isotopically variable with a range in $^{87}Sr/^{86}Sr$ being 0.7058 – 0.7195 determined by LA-ICPMS. The wide range of $^{87}Sr/^{86}Sr$ variation for tuffs of facies A and B between 0.7058 -0.7195 and 0.7055 – 0.7114 for tuffs of facies C & D suggests to the chemically zoned magma source with variable and extensive continental crustal contamination.

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