Sr and Nd Isotope systematics of Samchampi-Samteran Alkaline Complex, Karbi-Anglong, Northeastern India: Implications for Kerguelen Plume-Related Mantle Source Characteristics

ABHISHEK SAHA 1 , JYOTISANKAR RAY 1 , SOHINI GANGULY 1 ,CHRISTIAN KOEBERL 2 and MARTIN THÖNI 2

¹Department of Geology, University of Calcutta, 35, Ballygunge Circular Road, Kolkata 700 019, India ²Department of Lithospheric Research, University of Vienna, Althanstrasse 14, A-1090 Vienna, Austria

Alkaline magmatism marks the initiation and cessation of the main flood basalt event in a Continental Flood Basalt (CFB) province and provides valuable information about the incubation and evolution of a plume beneath a relatively stable, intracratonic platform. Most often, ultramafic-mafic-alkaline-carbonatite complexes are spatially and temporally associated with CFB volcanism. The emplacement of alkaline-carbonatite magmas is facilitated by lithospheric uparching, crustal thinning followed by fracturing and rifting caused by the impact of mantle plume impinging onto the base of a continental lithosphere.

The Samchampi (26° 13' N: 93° 18'E)-Samteran (26° 11'N: 93° 25'E) alkaline complex occurs as a near circular stock like intrusion within Precambrian basement gneisses in the Karbi-Anglong district of Assam, North Eastern India. The intrusive complex comprises of a broad compositional lithospectrum including syenites, alkali pyroxenite, ijolite-melteigite, shonkinite-malignite. Carbonatite and nepheline syenite traverse the pluton as later dykelets. Lumpy and sporadic occurrences of vanadium bearing titaniferous magnetite ore bodies have also been recorded within the complex. Pockets of phosphatic non-clastic sediments occasionally overlie the igneous members. The lineament controlled emplacement of Samchampi-Samteran complex is a part of ultramafic-mafic- alkaline-carbonatite magmatism of Shillong Plateau, representing latest differentiation phases of Sylhet Trap basalts in North Eastern India. The eruption of Rajmahal-Sylhet flood basalts on the eastern and north eastern Indian shield (~117 Ma) is believed to mark the initiation of Kerguelen plume activity beneath the Indian plate.

Critical evaluation of Sr and Nd isotopic compositions (87 Sr/ 86 Sr_{initial} between 0.7055618 and 0.7073680 and 143 Nd/ 144 Nd_{initial} between 0.5119905 and 0.5124486) suggests that the rocks were derived from an enriched mantle (~EM II) source. The observed geochemical characteristics of the rocks indicate derivation by low degree partial melting of a metasomatized mantle peridotite. The geological, geochemical and isotopic data fingerprint a spatial and temporal association of the complex with the Keguelen plume.

Keywords: ultramafic-mafic- alkaline- carbonatite complex, Samchampi-Samteran, Kerguelen plume, alkaline magmatism, metasomatism