Paper Number: 1435

Geochemical provenance of Tertiary sediments in the North-Eastern India: understanding tectonic uplift and weathering in the Himalayas

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The collision of the Indian and Eurasian plates and evolution of the mighty Himalayas make the Cenozoic Era most exciting period in Indian geological history. Despite being the focus of several studies, issues pertaining to the collision of the Indian and Eurasian plates and Himalayan evolution remain poorly understood [1]. One of the reasons may be the biasness of available works towards the Neogene time, compared to the Palaeogene which is poorly exposed and has poorly resolved stratigraphy and age control. While inconsistencies still persist in timing of various events recorded in sediments due to lack of extensive studies, recent works have shown that the sedimentary deposits in the peri-Himalayan geological terrains can be best archives to understand the tectonic evolutionary history of the Himalaya, provenance and paleodrainage evolution in the hinterland [2].

In this work, various geochemical parameters and radiogenic isotopes (Sr-Nd) of the sedimentary deposits from the north-eastern region of Indian sub-continent comprising the Bengal Basin and Indo-Burman Ranges have been studied. To-date, these sedimentary deposits, developed as a composite shelf-slope-basinal system deposits under a passive margin setup, have not been thoroughly investigated for their stratigraphy, age and provenance studies. The sedimentary deposits mainly consist of sandstones and shales and stratigraphically, divided as the Disang, Barail, Surma, Tipam and Dupi Tila Groups representing Paleogene-Neogene sedimentation [3]. These sediments have been targeted for understanding sedimentary provenance and chronology of events of the proto-Himalayan tectonics and erosion. Early Himalayan uplift and erosion are often linked to change in Earth's climate during the Cenozoic and sharp rise in the marine $^{87}Sr/^{86}Sr$ value since ca. 40 Ma [4]. The study seems promising to provide more support to these hypotheses. The Late Paleogene Barail Group, extensively exposed in India, was deposited during the time represented by a disconformity in other parts of subcontinent, and therefore, its study can be useful to understand the Oligocene Himalayan events.

Our preliminary results suggest a major change in provenance of sediments occurred during the Late Paleogene with thick deposition of deltaic sediments (Barail Group). We envisage that this huge volume of sediments, characterized by a marked increase in weathering indices (e.g., CIA, PIA), was linked to early uplift, weathering and erosion in eastern–central Himalayas apparently sustained by strong monsoon systems. Probably, until Late Eocene, Himalaya attained critical height and provided sufficient topographic barrier to the southern winds loaded with moisture and developed the first monsoon system. A recent study from Myanmar support existence of monsoon-like patterns in rainfall during Late Eocene [5].

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