Superplume Activity in Mikir Hills Massif, Northeast India: Impact on Metallogeny

D. Majumdar
Dept. of Applied Geology, Dibrugarh University, Assam, India, PIN 786 004.

The Achaean Super plume related events of Mantle Overturn Magmatic and Orogeny (MOMO) was indicated in the Mikir Hills Massif (MHM) of Northeast India as early as 2.7 Ga with the formation of the Basement Gneissic Complex. The crustal extensional event in the early Proterozoic (~2.1-1.9 Ga) of MHM was marked by volcanogenic rift phase overlain by a non-volcanic thermal subsidence phase. Consequent magmatic suites are either predominantly mafic, felsic or bimodal, with minor suites of intermediate igneous rocks. With time, the igneous activities take a brief halt and the Neo-Proterozoic sedimentary sequences of Shillong Groups were formed. Subsequent episodic juvenile crust formations were led by the surges of super plumes at ~1.2-1.1, 0.8-0.7, 0.6-0.5 Ga. All these events of episodic surges have direct bearing with the global upsurges of similar nature.

The Phanerozoic Superplume activities of Kerguelen (~ 117Ma) resulted plume – lithosphere interaction, causing outpouring of continental flood basalt in the massif (Mikir Trap). The episode of carbonatite magmatic events in the massif can be seen as the result of the reactivation of the palaeo-rifts during Maastrichtian (~65 Ma). After this, no evidence of Superplume activity has been noted in the entire MHM.

The MHM, thus, must have witnessed the processes of welding, accretion and dispersion of the UR, Rodinia and Gondwana Supercontinents till attaining the present geographic location. However, the undeformed nature of almost all the magmatic rocks, except Achaean Gneissic complex indicates that the Plateau might have attained stability since Proterozoic and no further orogenic movements have taken place.

Certain felsic magmatic suites of MHM formed during Proterozoic (~2.1-1.9 Ga) bears distinct chemical parameters which are favourable for porphyry copper mineralization. All the major suites of felsic igneous rocks show enrichment in K, Rb, Th, U, La, and Ce relative to Phanerozoic analogues. The geotectonic model for the mineralized hosts preferred, has the felsic igneous rocks derived from under plated sources which are progressively accreted to the base of the crust, as a result of a series of extensional episodes. There are no direct compositional analogues of modern subduction-related igneous sequences in the massif suggesting that subduction related processes dominate in the production of the igneous suites. There are also no recognizable ophiolites, ocean-floor crust, or other evidence of a Wilson cycle.

The felsic rocks, particularly of Proterozoic, in places, are mineralized; likewise, the basic dykes carry traces of sulphide mineralization. The carbonatites are reportedly

enriched in P, Sr, Nb, U and Y. Recent reports suggest good indication of base metal occurrences of Porphyry type in a part of Kaziranga magmatic suite.

References:

[1] Blevin, P.(2004): Metallogeny of granitic rocks. Ishira Symposium, Geoscience, Australia,pp 1-37.

[2] Majumdar , D. and Dutta, S.(2006): Geochemistry and petrography of Kaziranga polyphase granitoids and their metallogeny. Jour. Of Appl. Geochem.,v.8 (1) pp 25-36.

[3] Majumdar , D. and Dutta, S.(2007): Geological investigations on sulphide ore occurrences in magmatic complex, Mikir Hills, Assam, IGC Bull v.1 (2) pp 7-20.

[4] Hussain, M. and Ahmad,T. (2009): Geochemical characteristics of the granitoids of Mikir Hills massif of Shillong Plateau, Northeast India: implication for Pan African Magmatic Activity. In: (Eds.) Talat Ahmad, Francis Hirsch, and Punya Charusiri, Geol. Anatomy of India and the Middle East, Jour. Of the Virtual Explorer, Electronic Ed., ISSN 1441-8142, v.32.