Hyperobliquity of Changlang Block of eastern Arunachal Pradesh, India and the role of Mishmi Block, India and Hukawng Block, Myanmar in its development

Farha Zaman, Uttam Goswami, and Devojit Bezbaruah
Department of Applied Geology, Dibrugarh University, Dibrugarh, India (zaman.farha@outlook.com)

Plate tectonic history of northeast Indian subcontinent can be viewed as a window to the evolution of Southeast Asia. One such important tectonic feature is the northern most part of Indo-Burmese Ranges where this research work has been carried out. Here we propose an evolutionary model that shows northward moving ‘horse-tail’ feature of the Hukawng Block from the Burma basin, pushed this region towards the rigid Mishmi Block and Upper Assam shelf, that caused the hyperoblique pattern of the ranges. It is the juxtaposition of the three continental blocks: India-Asia-Burma, where there are tectonic and geomorphic influences in the Block from both the Himalayan and Indo-Burmese orogeny. Stress distribution among north-easterly moving Indian plate and comparatively stiff Eurasian and Burma plates, within the India specific reference frame, is resulting in further changes. The study area mainly falls under Changlang district of Arunachal Pradesh, India; and the regional study has been done in the quadrangle from 26° to 28°N in latitudes and 95° to 97°E in longitudes. Morphotectonic study, lineament analysis, fault system characterisation, focal plane mechanism along with dynamic topography, seismic tomography and gravity anomaly have been incorporated in the field evidences. Morphotectonic study for Noa-Dihing River basin has resulted in a value of 56.59 for Asymmetric Factor, which shows similar asymmetry result like in the Chi (χ) analysis. This SW-ward tilted basin is moderately asymmetrical with Transverse Topographic Symmetric Factor value of 0.42. This indicates that the major river basin along with other subbasins are under the influence of active oblique rotational component. The regional lineaments are showing mean orientations of N11°E-S11°W, N70°W-S70°E and EW whereas some local trends of minor lineaments, in some places have mean orientations of N40°W-S40°E, N82°WS82° E and N42°E-S42°W. In Mishmi block the major regional trends are N35°W-S35°E and N40°E-S40°W comprising of probable cross-faults. In Hukawng Block, the lineament orientation changes from N50°W-S50°E in the west to N30°W-S30°E, N-S and N15°E-S15°W in the central valley region (north of Jade mines) and then to N50°E-S50°W in the eastern side. Major fault systems are mostly thrust, with some showing very low angle slip component, along with some oblique slip faults (e.g. Noa-Dihing River). The dynamic topography and seismic tomographic studies indicate presence of a high seismic velocity zone beneath Mishmi block indicating the crystalline rock materials. The block is still actively exhuming. Moreover,
Changlang and Hukawng blocks have undergone uplift and then phases of subsidence during the last 20Ma. This indicates that the Low Velocity materials that are present underneath were subjected to some crustal deformations. This tectonic process has also resulted in gravity anomalies. The role of massive and rigid Mishmi block, comprising older crystalline rocks and, later forming Burma basins formed the oblique rotation of the Changlang block which is observed from all stated methods. Hukawng Block, which is controlled by the motion of Sagaing Fault, have influenced the Changlang Block by its varied strike-slip stress components. Moreover, Indo-Burmese Ranges also has an influence on this block and vice-versa.