Turbidite sequence from the Precambrian Ramban Formation of Jammu & Kashmir Himalaya, India – Pratap Chandra Dhang, 177, Balitikuri Sethpara, Howrah 7-11 113, West Bengal (*E: pratap09.isi@gmail.com*)

Precambrian succession in Jammu & Kashmir occurs at different tectonic levels (Sub-Himalayan Sequence (SHS), Lower Himalayan Sequence (LHS) and Higher Himalayan Sequence (HHS)) having different deformational pattern and varying degree of metamorphism. The occurrence of turbidite sequence from the Autochthonous Fold Belt (AFB) of the LHS, well exposed around the Ramban region of Jammu & Kashmir is reported here. AFB succession is bounded by Murree thrust on the south and Panjal thrust (equivalent to Main Central Thrust or MCT) on the north. Being a low grade metamorphic rock, the bedding planes and sedimentary structures are still preserved. The rocks are dipping at an angle of 45-55° towards N-NE. The well exposed slope-cut sections can be traced along the newly constructed road (for railway project) of about 35 km from Harog (N33°15'19";E75°06'33") via Sumbar (N33°17'42"/E75°07'16") to Bajmasta (N33°17'56"/E75°09'56"). Earlier the area was inaccessible and the sections were not available, but now-a-days one can easily access this area. The exposed rock succession from Harog (alt. 730 m) to Bajmasta (alt. 1250 m) with 45° dipping of bedding planes provide ample scope for the sedimentologists for logging and sampling to gather very good information.

This report is centred on the sequence belonging to the upper part of the Ramban Formation of the AFB. Stratigraphically, the Ramban Formation lies at the middle of the AFB and comprises (i) lowermost bluish grey phyllite and slate with bands of gypsum, (ii) medium to fine grained meta-sandstone and slate, and (iii) uppermost grey to dark grey slate and phyllite with grey meta-sandstone having thickness of about 1260 m. The lowermost Sauni volcanics (suites of basalt and orthoquartzite) of AFB lithologically and stratigraphically considered equivalent to the similar succession from the Himachal Himalaya, which is dated around 1.8 to 1.9 Ga. Therefore, it has been inferred that the sedimentation in the AFB succession began during early Palaeoproterozoic. The 1.8 to 1.9 Ga age is also related to the widespread rifting and basin opening stage in the Precambrian Himalaya. The stromatolite bearing Sincha Formation overlying the Ramban and Bhimdasa formations of AFB has been considered as equivalent to Sirban limestone and Krol Formation of late Riphean age (equivalent to Neoproterozoic). Agglomeratic slate of Carboniferous age unconformably (angular unconformity) overlies the Sincha Formation, which indicate the long period of non-deposition and erosion before the deposition of Carboniferous agglomeratic slate.

In this reconnaissance study, it is observed that the gypsum bands with the phyllite and slate occurs in the lower part of the Ramban Formation. In addition to the gypsum bands, the preserved sedimentary structures like mud cracks, ripple marks, mud clasts, etc. indicates supratidal-intertidal condition. The disappearance of gypsum bands and the occurrence of alternate bands of meta-sandstone and slate with fining-upward succession and presence of cross-stratification, ripple marks, pebble layers, etc. in the middle part of the formation

indicate deepening-up. The uppermost part of the formation is characterised by repetitive alternate beds of slate, phyllite and metasandstone (cyclic nature). The beds are tabular with sharp basal contacts with occasional erosional contacts. The bedding planes can be traced over large extension along strike. Beds are usually massive often graded (normally) and cross-stratified. Well preserved Bouma sequences are also present with abundant sole marks, load casts, transverse scour moulds. Often the meta-sandstone beds are laterally continuous and extended with tabular pattern and thickening-upward cycles resembling to lobes and sheet sands of sub-marine fans, whereas the metasandstone beds with cross-stratifications indicates presence of channels. Therefore, the disposition of strata and sedimentary structures suggest the deposition was the result of turbidites in sub-marine fan, which have been deposited in mature passive plate margin. The Shimla Slate, which is thought to be equivalent to the Ramban Formation is also a turbidite deposit.

From the above discussion, it may be inferred (detail study is required for better inference) that the depositional environment of the Ramban Formation ranges from shallow marine to deep sea. It is clear from the earlier studies that the sedimentational history in the AFB occurred in marine environment, with numerous shallowing-up and deepening-up cycles, throughout the Precambrian. The rifting phase started around 1.8-1.9 Ga, which is also equivalent to the age of breaking up of Columbia Supercontinent. The existence of mature passive margin fans indicates gradually the basin attended maximum sea-level rise during the deposition of the upper part of the Ramban Formation. According to some workers the probable source of sediments for this basin was the Aravalli-Delhi Supergroup and also the Banded Gneissic Complex and Bundelkhand granite-gneiss on the southern part. An angular unconformity occurs over the L. Riphean Sincha Formation, which may be the sign of basin inversion around 1 Ga, i.e. during the formation of Rodinia Supercontinent or Grenvillian Orogeny. However, the basin was not closed by then and the sedimentation again continued after a period of non-deposition and erosion. Finally the occurrence of Piparan Granite (~0.5 Ga), which has been considered as equivalent to the Pan-African Orogeny and the formation of Gondwana Supercontinent, marks the abrupt end of sedimentation that continued uninterrupted since 1.8-1.9 Ga.

Therefore, the sequence of AFB including the sub-marine fan sequence of Ramban Formation is very significant, which may provide focus on the evolution of the Precambrian sequence in the Jammu & Kashmir Himalaya. Detail basin analysis including lithostratigraphy, chronostratigraphy, sequence stratigraphy, petrography and facies analysis with tectonic studies may help in the reconstruction of palaeogeography with provenance and change of provenance, if any. Further this will also point out the position of India with respect to others during this mature passive margin condition and the duration of this condition.

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