Evolution of the Western Himalayan Foreland Basin – B. P. Singh, CAS in Geology, Banaras Hindu University, Varanasi - 221 005, India. (E-mail: drbpsingh1960@gmail.com)

The western Himalayan foreland basin developed as a result of the India-Asia collision in front of the rising Himalaya beginning 58 Ma ago. The earliest sequences in the Jammu area are classified as the Subathu Formation and the latter are classified as the lower Murree and the upper Murree formations, and the Siwalik Group. The Subathu Formation contains chert breccia, bauxite, carbonaceous shale and coal, limestone and khaki shale possessing larger foraminifera and oyster shells in the lower part, and purple shale and marl in the higher-up. Two to three, isolated coal seams occurring in the Subathu Formation have a thickness of 0.15 m-7.0 m in the Jammu area. The coals are dominated by vitrain bands and vitrinite macerals those give bright appearance to them and the maximum vitrinite reflectance (R_o max.) is 1.93%. The lower Murree Formation is largely comprised of planar-bedded, cross-bedded and laminated sandstone facies, laminated siltstone facies and brown mudstone facies. The brown mudstone facies hosts pedogenic calcretes at several levels. The upper Murree Formation consists of planar-bedded, cross-bedded and laminated sandstone facies and yellowish brown mudstone facies. This formation contains fossil wood and leaf impressions at many localities. In the higher-up the Lower Siwalik Subgroup contains sandstone-mudstone and siltstone mudstone facies. The mudstones are highly bioturbated containing *Thalassinodes* and *Imbriculus* trace fossils. The middle Siwalik Subgroup is mainly sandy and is characterised by the occurrence of multistoried sandstones. The sandstones are chiefly cross-bedded and also, exhibit scour and fill structures. Channel facies are very much evident in this succession. The upper Siwalik Subgroup is comprised of sandstone, conglomerate and mudstone, besides bentonitic clay beds. The Subathu Formation developed in a coastal system where limestones deposited on the barrier bars and the shales deposited in lagoons. The coal represents the initial transgressive phase that deposited in swamps adjacent to lagoons. The sediments of the lower Murree formation deposited in a tide-dominated estuary and the upper Murree Formation deposited in a river-dominated estuary. In the higher-up the sandstone and conglomerate-containing Siwalik

Group was deposited in the meandering and braided rivers. The river system was axial in the beginning followed by transverse during the upper Siwalik sedimentation.

Petrographic study of the sandstones of the lower Murree and the upper Murree formations show the occurrence of quartz, feldspar and rock fragments of phyllite, quartzite and siltstone and shale. In Q-F-L and Qm-F-Lt diagrams, the sandstones occupy the recycled orogen field. Heavy minerals study of these sandstones shows the presence of staurolite, tourmaline and garnet. The lower Siwalik succession contains heavy minerals such as tourmaline, staurolite, garnet, epidote, zircon and spinel, besides opaques. The middle Siwalik succession contains staurolite, kyanite, garnet epidote and zircon among non-opaque heavy minerals. The upper Siwalik succession contains staurolite, kyanite, sillimanite, garnet, epidote and zircon among the non-opaque heavy minerals. The three subgroups of the Siwalik Group show the similar zonation in terms of the occurrence of staurolite, kyanite and sillimanite in other areas too of the Himalaya similar to the Jammu area and can be correlated based on them. The Subathu shales were mainly constituted of the sediments derived from metamorphic rocks of the Ladakh and Kohistan arc and the Indus-Suture zone and the limestones suggest sediment starvation. The sandstones and mudstones of the Murree Group were derived from the metamorphic rocks occurring in the Higher Himalaya and sedimentary sequences of the Tethyan Himalaya. The occurrence of the staurolite further suggests that the provenance had been a low grade metamorphic rock during the sedimentation of the Murree sequences. The lower and middle Siwalik sandstones were mainly constituted of the sediments derived from the Higher Himalaya, while the upper Siwalik sandstones were contributed from the sediments derived from the lesser Himalaya. Furthermore, the chemical compositions of the Subathu shales and Murree sandstones representing foreland sediments suggest that they have either intermediate composition between the active and passive margins or same as the passive margin.

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