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# Petrographic Analysis of the Early Tertiary Subathu Formation rocks from the Kalakot Area, western Himalayan Foreland Basin, India

Dr. Sanjay Karlupia

Associate Professor, Govt. MAM College, Jammu, India

**Abstract:** *The megascopic and microscopic investigations of the Early Tertiary sediments of the Subathu Formation identified nine facies exhibiting cyclic arrangements in the Subathu Formation in Jammu area, with top of the formation showing tidal cyclicality in the form of alternating thick marl and thin limestone laminae. The abundance of pyrite framboids indicate strongly reducing conditions and their early diagenetic origin in the presence of adequate amounts of iron and sulphur. Small phosphate nodules probably formed just beneath the sediment-water interface. The high ash contents of carbonaceous shales and coals and euxinic conditions probably causing high sulphur content was due to the intermittent sedimentation. The benthic foraminiferal assemblage present in the lime-mudstone indicates a sub tidal bathymetry falling. The lime-mudstone was deposited in low-energy conditions in a turbid lagoon. The presence of mud cracks reveals shallowing of the basin and exposure of the sediments. The coarse-grained limestone with full of oyster shells indicates high-energy conditions. Mixed fresh and brackish water fauna indicate an estuary or outer tidal-flat, suggesting infrequent flooding during high wind-tides under prolonged exposure originated purple shale in supratidal zone.*

## 1. Introduction

The Himalayan Foreland Basin (HFB) originated due to the collisional tectonics between the Indian and the Eurasian plates, with the initial phase of collision having taken place c. 50 Ma ago. The collision became more intense during the Eocene, causing the egress and shifting of the deformation front towards the south, leading to the formation of the peripheral foredeep (foreland basin). The peneplanation of the egressed parts supplied the sediments which accumulated in the foreland basin as Subathu Formation. The present investigation comprises detailed field studies as well as megascopic and microscopic analyses of the Early Tertiary sediments of the Subathu Formation to ascertain the depositional environment.

## 2. Regional Geology

The basement of Cenozoic rock in the HFB is of the Sirban Limestone Formation which occurs as inliers unconformably overlain by the Subathu Formation. The Eocene Subathu Formation is in turn followed by the Murree Group and Siwalik Group with no major hiatus. The Stratigraphic sequence of the Tertiary rocks is given in the table (Table 1):

beds of massive dolomitic limestones interbedded with chert bands of variable thickness. These dolomitic limestones vary widely between the two end members viz: dolosparites and dolomucrites and also show many micro structural features like microvugs, micro veins, etc. The sedimentary structures are thin beddings, ripple marks, desiccation cracks and stromatolites.

The chert Breccia is a sedimentary breccia which occurs above the Sirban limestone and below the Subathu formation at Kalakot. This represents rapid sedimentation, probably along an escarpment or in the fault zone. The age assignment for the chert breccia is difficult but certainly it is older than Eocene and younger than Sirban Limestone. The chert breccia is composed of angular fragments of chert and limestone cemented by calcareous and siliceous cement. The breccia is of intraformational type, having disintegrated and decomposed fragments of Sirban Limestone arranged in a bedded form. The thickness of the chert breccia is about 6 to 10 m in Kalakot area.

The Subathu Formation, named after the Subathu town near Dharampur (district Solan, H.P.), consist of a basal pisolitic laterite overlain by a thick succession of green, grey and red shales associated with impure limestones. Presence of the laterite rocks at the base of the succession indicates a