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Sedimentology and depositional environment of neoproterozoic stromatolitic limestones of Langrial and Miranjani areas, Lesser Himalayas, Pakistan

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Stromatolites are a helpful tool in predicting age, depositional environment and correlation of stratigraphic sequences over vast continents. Stromatolites are the signature of the Neoproterozoic age (1 billion years – 538.8 million years) to about 300 million years. This study highlights the detailed study of two stromatolitic limestone (Langrial and Miranjani) units of Hazara Formation, Lesser Himalayas, Pakistan, at various scales from outcrop, macroscopic and microscopic levels. These stromatolitic limestones are well known, but detailed sedimentological work was not present. The rock types of the two units were differentiated based on their field examination using hand lens, testing with 10% diluted solution of HCl for carbonate rocks, as well as the stratigraphic column of the area. The field photographs taken were geo-referenced by Picasa software V. 3.9. Almost 500 field photographs were taken during the study. Petrographic thin sections of thirty rock samples were made based on facies types. The facies of the limestone units of the Hazara Formation were determined using section measurement. The limestone is grey nodular limestone, with no observed sedimentary structures. The nodules are about 5-10 cm. The limestone beds are about 40-110 cm thick. There are four types of facies present in this formation, namely, carbonate mudstone facies, stromatolitic facies, nodular limestone facies, and thin to thick-bedded limestone. The facies indicate a variety of depositional environments. Petrography reveals that the limestone is dominantly micritic in nature. It also shows that the limestone is parallel laminated, non-laminated, with no bivalves, foraminifera or recognizable fossils. It also shows the presence of feldspar, quartz and clay minerals. Here, in the Hazara Mountains, limestone units are bounded by turbidites, which are deep sea deposits. However, these stromatolitic limestones form in a very shallow marine environment like tidal flats in modern environments. Such stromatolitic limestones also occur in Neoproterozoic rocks of Sri Lanka, Nepal and India. Their study can help understand the occurrence of these limestone deposits in highly deformed Lesser Himalayas and the palaeogeography of the Indian Plate.

Keywords: Carbonates, Limestone, Neoproterozoic, Stromatolites, Tidal flats