

Episodic fluviolacustrine deposits of Indus River Basin: a case study of Spituk palaeolake sequence

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Fluviolacustrine Late Quaternary deposits are exposed all along the Indus River and its tributary rivers in Ladakh region of NW Himalaya. These deposits are generally formed by the tectonically induced blockading of rivers and found perched over the country rocks or sediment fills. Contemporary surface earth processes mainly weathering and erosion have removed the larger portion leaving behind only few records in discrete manner.

A >30 m thick fluviolacustrine deposit is exposed on right bank of the Indus River at Spituk (~4 km downstream of Leh town). The entire section shows two episodes of intense fluvial activity followed by calm lacustrine environment represented by thick varve deposition. Within the fluvial regime, several depositional cycles have been recorded wherein fining upward sequence is easily evident. Multiple levels of syndepositional sedimentary/seismic structures in the section further signify active tectonics in the region. Ripple formation further indicates the effect of intense winds removing the less cohesive coarser grains leaving behind wavy book type deposits.

Geochemical signatures show that the coarser fraction of the initial fluvial episode is dominantly derived of granitic source and comparable with Upper Crustal Composition (UCC), however, the finer sediments has appreciable amount of carbonate fraction indicating differential weathering in the source region. The upper fluvial sequence show a shift in the provenance, wherein probably limestone is the major contributor. The lower lacustrine phase shows carbonate dominated yellow clay sequence, whereas the upper sequence has organic rich grey and Fe-Mn-Cr rich pink color varve deposits. The upper ~17 m thick lacustrine phase is more pronounced compared to the lower fluviolacustrine deposition.

The AMS radiometric and OSL dates suggest that the entire deposit is formed in the time bracket of ~3-10 ka. The important point is that the two lacustrine phase deposits show marked difference in their chemical composition. The lower phase has more or less uniform texture and composition while the upper phase shows typical varve formation having marked difference in their composition. This indicates pronounced seasonality in a typical glacial setting.

Key words: Indus, Spituk Paleolake Sequence, Ladakh