Palaeolake reconstruction along River Indus in Ladakh, NW India: a climate tectonics perspective

Debarati Nag and Binita Phartiyal

Birbal Sahni Institute of Palaeobotany, 53 University Road, Lucknow-226007, UP, India
debarati_nag@yahoo.co.in

Indus River draining out from the Mount Kailas, western Tibet flows in a longitudinal valley which forms the first order topography of the Himalayan mountain belt. The NW-SE trending river valley is confined to the Indus suture zone in spite of strong deformation and uplift along its course. The tectonics, climate and surficial processes are the keys that control the geomorphology of the river valley. The river flows through the center of Ladakh (Trans-Himalaya) situated in the NW part of India is the only region that comes under the influence of westerly disturbances and the Indian summer monsoon only during Abnormal Monsoon Year[1]. Being situated in a high altitude arid land environment and a lack of vegetation cover, rock avalanches and slope failures are of common occurrences which are triggered by both climate and tectonic activities. The debris avalanches are responsible for the blocking of the drainages and formation of lakes. Presence of such lakes has been recorded from many locations along the valley. Two major palaeolakes namely Rizong-Uley Tokpo (~17-14 ka BP) Spituk-Gupuk (~10.5-1.5 ka BP) signify the post LGM warmer periods and Holocene warming [2].

The present work aims at studying and reconstruction of other such palaeolake deposits from the lower reaches of the Indus River in the Indian territory. This study is necessary to fill the gap in knowledge of the climate data in the Late Quaternary from the terrestrial records. In this region the influence of uplift of the orogen on climate and the climate on the surface morphology is very pronounced. Four palaeolake and a lithalsa unit have been mapped downstream Leh. A conspicuous difference in the altitude of occurrence of the deposits has been noted. While two of the palaeolake deposits occur at ~300 meters from the present day river level, the other two sections are 10 meters above the river level. The present study is intended to find clues for the formation of the lakes whether controlled by tectonic activity or due to the influence of climate or both and to reason out whether the occurrence of the deposits at such contrasting altitudes is a function of a single event or two events. Radiocarbon and OSL dating is being conducted to establish the chronology of these lakes as well as the fluvial sediments in their vicinity. All the geomorphological features have been taken into account to construct the landscape evolution and the ancient/palaeo course of the Indus, which seems at a higher level as well as further north in some part of the study area. The sections are generally composed mainly of clay silt and sand and associated with several meters of fluvial sediments, with a mixed facies signifying interchanging sedimentary environment. The percentage range of clay (68%) and silt (25%) and minor sand (7%) for the Saspol section is noted and the clay-silt lacustrine deposit is punctuated by sandy influxes at 3 stages between base-1.3m, 3-4.2m and 5.1-7m. Preliminary magnetic studies including Low field magnetic susceptibility and ARM shows the peak coincides with the coarse size sediments. Overall a multi proxy approach including mineral magnetism, textural analysis, elemental analysis and chronology are being used to address the problem.

[1] Bookhagen, B., Thiede, R.C., Strecker, M.R., 2005. Late Quaternary intensifeid monsoon phases control landscape evolution in the northwest Himalaya. Geology 33, 149-152.
[2] Phartiyal, B., Sharma, A., Kothari, G.C., 2013. Existence of Late Quaternary and Holocene Lakes along The River Indus region of Trans-Himalaya, NW India: Implications to climate and tectonics. Chin Sci Bull 58, doi 10.1360/tb-2013-suppl008.

Key words: Indus, Trans-Himalaya, Ladakh, Late Quaternary, Palaeolake