COMPARISON BETWEEN HOLOCENE AND MODERN EROSION RATES IN THE CATCHMENT OF THE 300 MW BASPA II HYDROELECTRIC POWER PLANT (INDIA, NW HIMALAYA)

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300 MW Baspa II is India’s largest private hydroelectric facility that has been built exactly on top of a relict rock avalanche (Baspa Valley, NW Himalaya, India). The Baspa River is an important left-hand tributary to the Sutlej River. Geologically, the hydroelectric installation is located in the Higher Himalayan Crystalline, just above the active Karcham Normal Fault, which is reactivating the Early Miocene Main Central Thrust, one of the principal Himalayan faults. The area is seismically active and mass-movements are common. Around 8200 years before present the Baspa River was blocked behind this rock avalanche dam, which created a c. 260 m deep palaeo-lake. The whole palaeo-lake was completely filled with sediments in about 3100 years, making the Sangla palaeo-lake a very rare example of a mass-movement dam with exceptional long duration.

The archive of the lacustrine sediments have been used to reconstruct environmental changes as well as seismic activity during its existence. At least five levels of soft-sediment deformation have been recorded in the exposed part of the lacustrine sediments of Sangla palaeo-lake, including brecciated laminae, overturned laminae, folds, faults and deformation bands, separated by undeformed deposits. They are interpreted as seismites, indicating at least five earthquakes within ca. 2500 years of sedimentary record, strong enough to cause liquefaction.

The special location of the hydroelectric power plant on top of the palaeo-lake represents an extraordinary opportunity to evaluate the short-term, river load and hydrological parameters measured during the planning and operational stages of Baspa II with the long-term parameters from the palaeo-lake sediments from the catchment. The Early to Mid-Holocene erosion rates of the Baspa catchment estimated from the volume and duration of deposition of the lake sediments are at 0.7-1.0 mm yr^{-1}, almost identical with the modern erosion rates calculated from river gauge data from Baspa II.