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Neotectonic impact and Palaeohydrology of Gaxun Nur Basin (NW China) during the Late Quaternary

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The Gaxun Nur Basin – enclosed by the Tibetan Plateau in the south and the Gobi Altay in the north – has continuously evolved as a strong continental endorheic depositional environment for the last 250,000 years. The Hei River drainage system originates in the Qilian Shan (>5,000 m a.s.l.) fed a crescent-shaped series of terminal lakes at its far end (Gaxun Nur, Sogo Nur and Juyanze).

Large scale geomorphological mapping from Landsat-data, Corona-Images and SRTM – elevation data shows widespread features of faults within the whole basin (Hartmann 2003). Main lineaments have been proved by geophysical investigations (Hoelz et al. 2007). Geomorphological discontinuities (e.g. inverted channels, concave alluvial fans,..) in order of their underlying processes of fluvial, aeolian and lacustrine origin allow a stratigraphic placement. Dating of lake deposits within and between geomorphological units yield the chronological frame of tectonic movement and environmental change as well.

The 230m long core D100 in the centre of the basin (ca. 28,000 km^2) shows the start-up of more or less continuous lacustrine deposition at ca. 250,000 yrs BP. A large set of radiocarbon datings of the upper ca. 90m suggests an increasing subsidence rate since MIS 4 within the whole basin. (Wünnemann et al. 2007)

A 26 m high cliff section of gravel-covered lake sediments within the Juyanze Palaeolake indicates a strong subsidence of the lake bottom of 3.6m/1000yrs since 18 kyrs BP. Geophysical investigation indicates a lowering of the western basin along a fault system as a continuation of a duplex structure developed further south at Gurinai depression (Hoelz et al. 2007).

The rhombic shape of the modern dry Gaxun Nur, fossil cliffs, well preserved beach ridges and gravel covered top-sets of lacustrine sediments indicate local displacements of morphological features. Flat flower structures along a WNW-trending fault indicate young tectonic movements related to the Tian Shan fault system. The displacements of lake sediments at the southern margin of the modern Gaxun Nur basin imply a subsidence of at least 0.81m/1000 yrs since 25 kyr as a result of a pull-apart development due to the left stepping faults in a sinistral system.

Frequently lakes are of tectonic origin. Their sediments and nearby catchment topography provide an excellent archive for reconstructing young tectonic movement. In this respect palaeohydrological reconstruction of lake catchments has to consider the occurrence of tectonic. In classical proxies of hydrological changes, both signals in the same archive interfere with each other. Complex system variables derived from large datasets by multivariate approaches are able to dissolve the processes (Hartmann & Wünnemann 2007).

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