



Holocene monsoon variability inferred from Targo Xian peat bog in the Tangra Yumco basin, central Tibetan Plateau

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The Tibetan Plateau is the greatest plateau on Earth with an average altitude of 4,500 m asl. Due to its high elevation, large area and significant role in the formation of the Asian Monsoon Systems (e.g., Indian Ocean and East-Asian Summer Monsoon) it is considered to react very sensitive to climate variations. The numerous lake systems on the Tibetan Plateau represent excellent archives reflecting variations in the strength of the monsoon system in terms of hydrological changes expressed in lake level fluctuations. For example, terraces and lacustrine deposits around the saline lake Tangra Yumco indicate lake level highstands up to \sim 215 m higher than the present lake level.

To study Holocene lake level variations we investigated a 3.6 m long sediment core recovered from a peat bog (near the Targo Xian settlement, $30^{\circ}46'N$, $86^{\circ}40'E$) on a recessional lake level terrace \sim 150 m above the present shoreline of Tangra Yumco. In particular, our analyses of sedimentological (grain size), geochemical (CNS and ICP-OES) and mineralogical (XRD) data allow a detailed and high-resolution interpretation of the hydrological conditions during the Holocene. The existence of two carbonate layers in the Targo Xian record, separated by a sand layer and intercalated in peat sequences at the bottom and top of the core, provide evidence for two stable lake stages at the coring position.

Peat at the bottom of the core, which is radiocarbon-dated to $11,130 +130/-345$ cal BP, indicates wetland conditions similar to the Recent situation (Miehe et al., submitted). After a transition zone, a layer of pure aragonitic lake marl gives evidence for a lake stage. During this stage, high values of the total inorganic carbon (TIC) and Ca/Ti ratios as well as low C/N ratios point to a stable lake due to wet climatic conditions. This carbonate layer can be correlated with a 2-3 m thick carbonate layer found in outcrops around the present lake Tangra Yumco presenting a high lake level until approx. 2.3 ($+/-0.2$) ka BP (OSL age, Long et al. 2012). Results of former investigations of other lakes on the Tibetan Plateau (e.g., lake Nam Co (Kasper et al., 2012)) point to a strong Indian Ocean Summer Monsoon during the Early to Mid Holocene. In the presented record, a falling lake level and a possible desiccation of the coring location is shown by a coarse sand layer including gravel. Another lake marl section above is well delimited from the other sections in its mineralogical composition as it is composed by calcite reflecting an additional lake stage at the coring site. This led to the assumption, that this second lake stage was characterized by a smaller lake with a higher detrital input which existed until approx. $930 +45/-135$ cal BP. After an oscillation of dry and wet (peat production) phases a constant peat bog developed and is still present.

References:

- Kasper, T. et al. (2012): doi: 10.1016/j.quascirev.2012.02.011
Long, H. et al. (2012): doi: 10.1016/j.quageo.2011.11.005
Miehe et al. (submitted): JOPL