Combining ^{10}Be surface exposure- and OSL dating to reconstruct Holocene lake-level fluctuations: a case study at Tangra Yumco (southern Tibet)

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Numerous lakes are situated on the Tibetan Plateau are internally drained and whose water supply depend mainly on climatic factors. Many of these lakes are surrounded by conspicuous lake terraces and beach ridges, which indicate former lake highstands and significant environmental changes in the past. Dating these geomorphological markers is of utmost relevance to establish a solid time frame for climate change in the region.

Tangra Yumco is one of the largest lakes on the Tibetan Plateau and exhibits the highest strath terraces of all lakes on the entire plateau (i.e. ~180-185 m above the present lake level at 4545 m a.s.l.). The lake is situated on the southern Tibetan Plateau in a north-south trending, actively subsiding graben system. The geological setting of Tangra Yumco provides an ideal research opportunity to test the applicability of different dating methods. Difficulties in applying ^{14}C dating have been reported in lacustrine environments on the entire Tibetan Plateau due to a spatially and temporally variable reservoir effect [1]. In this study, we apply two independent dating methods to date former lake level-highstands: ^{10}Be surface exposure dating and Luminescence dating.

Samples for exposure dating have been collected from strath terraces at two elevations (~140 m and ~180-185 m above the current lake level) from three different sites. Different types of bedrock as well as amalgamated quartz clasts and granite boulders lying on top of the terraces were sampled at these sites. For OSL dating we sampled sediments from beach ridges at the northern and southeastern lake shore giving a high-resolution sequence of the last lake-level drop. This sequence extends from a recent beach ridge near the current water level up to a height of ~140-145 m above the current lake level.

So far ^{10}Be exposure- and feldspar Luminescence dating yielded Holocene ages. ^{10}Be dating of mainly bedrock samples gave consistent ages that constrain the age of the highest terrace at 7.6 ± 0.6 ka, whereas the lower terrace level has an age of 4.3 ± 0.3 ka [2]. OSL dating mostly of feldspar give deposition ages indicating a high-resolution lake level curve documenting the falling water level during the Holocene. In summary, the age data constrain well how the lake level has decreased over the past ~8 ka.

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Key words (for online publication): Tibet, Lake, Luminescence Dating, cosmogenic ^{10}Be, numerical dating