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First Holocene floating varve chronology in Central Asia from the Lake Chatyr Kol sediment record (Kyrgyz Republic)

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We present the first floating varve chronology in arid Central Asia of a finely laminated lake sediment record from the high-mountain Lake Chatyr Kol (Kyrgyz Republic). The record was retrieved from the deepest part (~20m) of the lake basin and comprises seasonal laminations (varves) from $11,619 \pm 603$ years BP to 360 ± 40 BP years. The identification of varves is based on seasonal deposition models established from continuous thin section analyses of the entire sediment profile. The varves comprise a complex pattern of six different micro-facies types throughout the Holocene. All varve types include a pronounced clastic-detrital sublayer, but the composition of their summer sublayers varies between organic, diatom, calcite, and aragonite sublayers. Based on replicate varve counts on overlapping petrographic thin sections an uncertainty of ± 5 % has been calculated for the varve chronology. The chronology is floating because in the uppermost part of the sediment profile varves have been only occasionally formed or preserved which prevented from continuous varve counting in this interval. Instead, the non-varved interval has been dated with ^{210}Pb and ^{137}Cs γ -spectrometry providing an age for anchoring the floating chronology to the absolute time scale. The resulting chronology is supported by two ^{14}C ages obtained from terrestrial plant macrofossils. In contrast, radiocarbon dating of aquatic materials showed significantly older ages and prove reservoir effects. Through comparison with the varve chronology changes in reservoir effects throughout the Holocene have been determined. We find a stepwise decline of reservoir ages from up to ~6150 years in the early Holocene to lowest reservoir ages of less than 1000 years in the late Holocene. In addition to their value as chronological tool, changes in varve thickness and seasonal sublayer composition are used as proxies for hydro-climatological reconstruction of Holocene climate evolution.

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