Geophysical Research Abstracts
Vol. 15, EGU2013-959, 2013
EGU General Assembly 2013

High-resolution OSL chronology of a sediment core from Lake Nam Co on the southern Tibetan Plateau: Comparison with radiocarbon dating

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Numerous studies on lake sediment cores from the Tibetan Plateau aimed to reconstruct spatial and temporal changes of the late Glacial and Holocene monsoon variations, which are characterized by fluctuations in precipitation and expansion of monsoonal air masses across the Plateau. Accurate and reliable dating of lacustrine deposits is of crucial importance in both the reconstruction of palaeolake and palaeoclimate evolution and the understanding of the mechanisms for climate changes, especially abrupt changes of regional-hemispheric hydrological circulation. Radiocarbon dating is the most commonly used method for establishing chronologies of lake sediments. However, 14C dating of such sediments could be problematic due to the lack of organic matter or a reservoir effect, which appears common in radiocarbon dating of lacustrine sediments from the Tibetan Plateau. In this study, ca. 10.5 m long core (NC core) was retrieved from the water depth of 93 m at Nam Co Lake, which is the second largest saline lake in China, located on the southern Tibetan Plateau. For this core, high-resolution samples (23 samples) were obtained for optically stimulated luminescence (OSL) dating. Quartz of fine-grain (4-11 μm) fraction were extracted from this samples for OSL dating, which is compared with the 14C chronology of NC core based on accelerator mass spectrometry (AMS) dating of bulk organic matter of 22 samples. The sample from the top of NC core was dated to approximate zero age, indicating the sediments bleached well before deposition. Luminescence behaviors of the study samples further confirmed the robustness of OSL ages. Comparison between OSL and 14C ages suggested that: (1) two kinds of ages are in agreement within error from top to 1.8 m, (2) from 1.8 m to the base of NC core, the 14C ages show a general trend to ca. 4 ka higher ages than the OSL ages. Although 14C dating overestimate the ages from 1.8 m to base, they still show the general trend in sedimentation rate as demonstrated by the OSL ages. The reason for this 14C-age overestimation is thought to be due to the hard-water reservoir effect, which is variable through time. In addition, based on these OSL age estimates, sedimentation rates were calculated. It's suggested that the sedimentation rate is much higher at 18-13 ka than that at 13-0 ka. The high sedimentation rate during 18-13 ka (late Glacial) in Nam Co Basin is thought to due to the global deglacial warming and the regional strengthened Asia monsoon, as well as the status of low lake level at the last glacial maximum (LGM).