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Advantages of luminescence dating over radiocarbon dating for determining the age of late Quaternary lake high stands in China

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In the interior of the Tibetan Plateau (TP), the present climate is arid, with widely distributed enclosed saline lakes. In 1990s, field investigation revealed that complete shorelines 60-160 m higher than present lake level were common in this area, suggesting a warm and humid climate during the highstand times. 14C dating showed that the highest shorelines were formed during 40-25 ka, and the phenomenon was then termed 'Greatest Lake Period (GLP)'. In contrast, the global climate during 40-25 ka was in the late Marine Isotope Stage (MIS) 3, a cold and dry period. Since then, a growing number of geomorphic evidence and 14C dating results confirmed this observation, and the supportive evidence was also reported in the nowadays arid areas (Tengger Desert, Badain Jaran Desert, and Taklimakan Desert in northwestern China) adjacent to the TP. Reconstructions showed that, in the Tibetan Plateau, the temperature was 2-4 ^{0}C higher than present, and the precipitation also 50-100% higher than present during the GLP.

Since 2008 we systematically dated the representative sections in the Tibetan Plateau, Tengger Desert, and Mu Us desert, etc, to test the 14C chronologies. We showed that the previously 14C dated ages of 25-40 ka are now OSL dated to be about 100 ka, indicating that the deposits of highstand lake level belong to the MIS 5, instead of MIS 3a. We suggest that in arid northern China 14C ages older than 25 ka may require re-investigation due to underestimation. We suggest that, unless in situ buried charcoal can be found for 14C dating, luminescence dating has obvious advantages over 14C methods for sediments with ages older than 25 ka. Our new chronology put the paleoclimatic proxies of the Tibetan Plateau in better agreement with global records.