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## Changes in the hydrodynamic intensity of Bosten Lake and its impact on early human settlement in the northeastern Tarim Basin, eastern Arid Central Asia

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The climate of eastern arid central Asia (ACA) is extremely dry and early human settlement and civilization in the region were dependent upon a potentially unstable water supply. Thus, knowledge of the history of hydrological fluctuations is essential for understanding the relationship between humans and the environment in the region. Here we present a record of variation in lake hydrodynamic intensity based on the grain size of suspended lacustrine silt isolated from the sediments of Bosten Lake, which feeds a river flowing to the northeastern Tarim Basin. The results show that lake hydrodynamic intensity was very weak, and/or that the lake dried-out completely, during the early Holocene (12.0–8.2 ka). Then it increased with two distinct centennial-millennial-scale intervals of weak intensity occurring during 4.7–3.5 ka and 1.2–0.5 ka. Notably, increases in lake hydrodynamic intensity occurred some 2.2 kyr prior to an increase in local precipitation and effective moisture. We speculate that this was a consequence of relatively high early summer temperatures during 8.2–6.0 ka that resulted in an increased water supply from melting snow and ice in mountainous areas of the catchment. Thus, we conclude that changes in the hydrodynamic intensity of Bosten Lake during the Holocene were affected by changes in both temperature and precipitation. The variations in the hydrodynamic intensity of Bosten Lake since the middle Holocene also influenced water availability for the human population that occupied the downstream area of the northeastern Tarim Basin. A persistent increase in hydrodynamic intensity during 2123–1450 B.C. may have been responsible for human occupation of the region that contains the noted archaeological sites of Xiaohe and Gumugou Cemetery. In addition, a drastic decrease in hydrodynamic intensity at around 400 A.D. likely caused the emigration of the inhabitants of Loulan.