Late Holocene hydroclimatic variations over the high-central Asia and its relationship with the North Atlantic Ocean

Jianghu Lan[a, *], Hai Xu[b, *], Enguo Sheng[c], Keke Yu[d], Kangen Zhou[a, e], Dongna Yan[a, e], Yuanda Ye[a, e], Huixian Wu[a, e], Tianli Wang[a, e]

[a] State Key Laboratory of Loess and Quaternary Geology, Institute of Earth and Environment, Chinese Academy of Sciences, Xi'an 710061, China

[b] Institute of Surface-Earth System Science, Tianjin University, Tianjin 300072, China

[c] State Key Laboratory of Environmental Geochemistry, Institute of Geochemistry, Chinese Academy of Sciences, Guiyang 550002, China

[d] Key Laboratory of Disaster Monitoring and Mechanism Simulating of Shaanxi Provience, Baoji University of Arts and Sciences, Baoji 721013, Shaanxi, China

[e] University of Chinese Academy of Sciences, Beijing 100049, China

Corresponding authors.

E-mail address: lanjh@ieecas.cn (J.L.) and xuhai@tju.edu.cn (H.X.)

Climate change and associated changes in hydroclimatic variations can have important effects on environment, ecology, population, and human civilization, as well as cultural development. Thus knowledge of the climate changes and its underlying potentially mechanisms during the late Holocene is essential for understanding both the regional and global climatic dynamics, and for accurately evaluating future climate trends under the context of anthropogenic climatic warming. The hydroclimatic variations of in central Asia are highly sensitive to changes of hemispheric-scale atmospheric circulation systems. In order to fully understand its long-term variability and relationship between hydroclimate and atmospheric circulation system, we present a high-resolution lascustrine record of hydroclimatic variations over the late Holocene from Lake Sayram, central Tianshan Mountains, central Asia, based on the total organic carbon (TOC), total nitrogen (TN), ratio of carbon and nitrogen (C/N), carbonate content and grain size. Our results revealed 4 substantially increased precipitation periods at the interval of 4000-3780, 3590-3210, 2800-2160 and 890-280 cal yr BP and 1 slightly increased precipitation period between 1700 and 1370 cal yr BP, which are broadly coincide with other existing records from the mid-latitude Westerlies-dominated central Asia (including the

northern Tibet Plateau). Comparison of our record with reconstructions of the North Atlantic Oscillation (NAO) index from Greenland and of the Southern Alps flood activity (an indicator of NAO index), and solar irradiance for the past 4000 years shown that increased precipitation periods in Lake Sayram region present more negative NAO index, stronger Southern Alps flood activity and lower solar irradiance, which emphasizes the influence of solar irradiance and southern migration of the entire circum-North Atlantic circulation system, especially the main pathway of the mid-latitude Westerlies, on central Asia precipitation.