Changing pattern of water level trends in Eurasian endorheic lakes as a response to the recent climate variability

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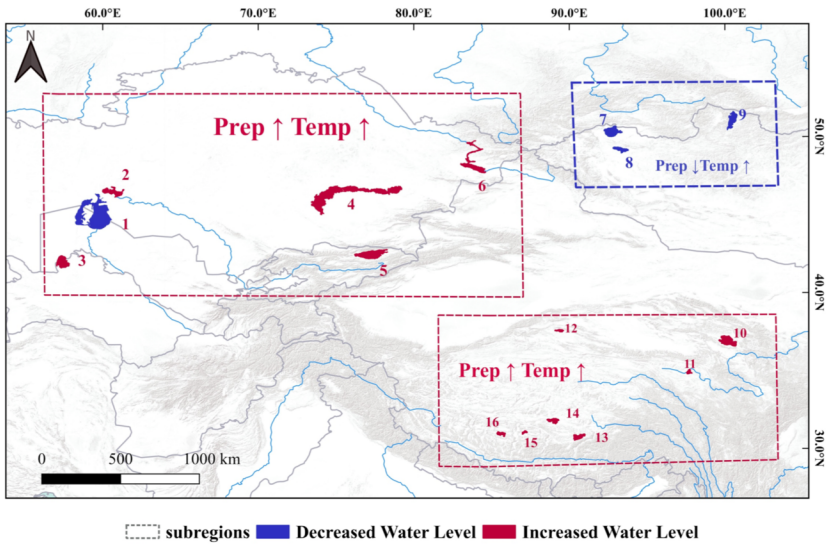
Abstract

Lake level is a sensitive integral indicator of climate change on global and regional scales, especially in enclosed endorheic basins. Eurasia contains the largest endorheic zone with several large terminal lakes whose water levels recently underwent remarkable variations. To address the common patterns of these variations and their links to global climate change, we investigated interdecadal variabilities in lake levels in 15 selected large lakes located at three neighboring Eurasian endorheic regions—Central Asia, the Tibetan Plateau, and the Mongolian Plateau. Satellite altimetry data revealed a heterogeneous pattern of lake levels among the three regions during the period of 1992-2018: the lake levels increased significantly in Central Asia and the Tibetan Plateau but decreased in the Mongolian Plateau. The water levels of Central Asian and Tibetan lakes revealed a shift in their trends during the observation period: the increasing trend was more evident since 1997 in Central Asia, since 2005 in the northern part of the Tibetan Plateau and since 1998 in the southern part of the Tibetan Plateau. To further quantify the climatic factors contributing to these patterns, precipitation and air temperature records were analyzed by merging three global gridded climate datasets and then applying cumulative analysis and change point tests. The precipitation over the lake basins was considered the main contributor to the heterogeneous pattern of lake levels in the three regions. The shift in air temperature in around 1997 and the shifts in precipitation in around 1998 and 2005, mainly contributed to the turning point of the trend of lake levels in those regions. Our findings reveal the linkage of the heterogeneous pattern of lake water levels to climatic factors in adjacent endorheic basins, providing a further understanding of the hydrological regime in the largest endorheic zone and its sensitivity to climate change.



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