

# Quantitative analysis of water balance and the driving forces for Yan lake expansion from 2015 to 2018 in the Hoh Xil region, Tibetan Plateau

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## Abstract

Accelerated expansion of the Yan Lake basin since 2010 has been confirmed by dramatic increases in area determined by remote sensing images and measurements of rapid water level rise (2015–2018). However, the underlying causes of this expansion remain unclear. In this study, lake area, water levels, and volume fluctuations were investigated and the water balance reconstructed. The results showed the Lake Yan area, water level, and volume increased to 59.9 km<sup>2</sup>, 7.91 m, and 14.17 Gt, respectively, by 2018, with 60%–70% of the increase during August to October within 1 yr. Over the past 40 yrs, lake area, level, and volume of lake Yan varied in three stages: slight increase (1980s–2011), rapid increase (2011–2013), and steady increase (2014–2018). A Mann-Kendall analysis suggested that precipitation and air temperature continuously increased at 2.22 mm yr<sup>-1</sup> and 0.05°C yr<sup>-1</sup>, respectively. As for the glacier, meltwater was 1.0±0.2 Gt and accounted for a smaller proportion of the lake water supply. The lake water balance identified increased net precipitation as the dominant factor (71%) for the increase in lake water storage, followed by groundwater (16%) and glacial meltwater (15%). These estimates provide the first quantitative evaluation of the water balance components in the Yan Lake basin, which could provide insights into the responses of Tibetan lake dynamics to climate change.

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# Figures

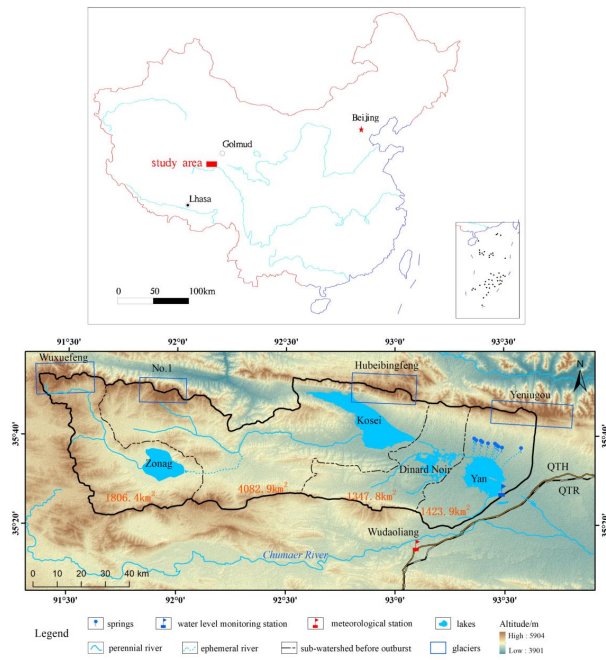


Fig. 1. The location of the study area, and features within that area important to the study.