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Alkenones and hydrogen isotopic composition of n-alkanes as indicators of past temperature and hydrological variability from Lake Toyoni (Japan).

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A better understanding of decadal to centennial climate variability is vital to improve the accuracy of near future climate prediction. Hokkaido represents a region which has limited paleo-climate data and is sensitive to climate change. Throughout the instrumental period (last $\sim$150-years), temperature and rainfall in Hokkaido, Japan show a link to the Pacific Decadal Oscillation (PDO) and the East Asian Summer Monsoon (EASM). However, conditions prior to the instrumental record are unknown and it is unclear if the PDO and EASM have always been the dominant drivers of climate in this region.

A 250-cm long sediment core from Lake Toyoni, Hokkaido was retrieved to investigate lake temperature and hydrological changes over the past 1000-years using alkenone paleothermometry and the hydrogen isotope values of plant waxes, respectively. Here we present the first lacustrine alkenone record from Japan, including genetic analysis of the alkenone producer. C37 alkenone concentrations in surface sediments are 18μg C37 g^{-1} of dry sediment and the dominant alkenone is C37:4 . 18S rDNA analysis revealed the presence of a single alkenone producer in Lake Toyoni and thus a single calibration for reconstructing lake temperature based on alkenone unsaturation patterns. Temperature reconstructions over the past 1000 years suggest lake water changes of 8-19°C which is in line with water temperature changes observed in Lake Toyoni. Hydrologic variations inferred from the hydrogen isotopes of plant waxes suggest that the large fluctuations ($\sim$40‰ represent changes in temperature and source precipitation in this region. These results suggest that alkenones and the δD(HPW) preserved in Lake Toyoni record regional climate changes over decadal timescales. These fluctuations will be discussed in relation to globally recognised climate events, specifically the Medieval Warm Period and the Little Ice Age