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From mega-lake to salt playa, was there a tipping point for the collapse of the paleolake system in the Qaidam Basin, NE Tibetan Plateau?

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The modern Qaidam Basin (QB) is one of the highest and driest deserts on Earth and an important dust source in Asia. However, a large paleolake existed in the 150,000 km2 large basin during most of the Cenozoic. How and why this paleolake system collapsed is crucial for understanding of the dramatic drying processes in central Asia. We present a comprehensive assessment of a large data set of new oxygen isotope and grain size data and published proxy records from a drill core in the western QB spanning the period from ∼2.7 to near present, based on statistical, wavelet and recurrence quantification analyses. Moreover, we compare the QB paleolake evolution with East Asian summer monsoon (EASM) records in the nearby Chinese Loess Plateau. The results indicate a similar evolution pattern of the lake system in the western QB and the EASM system until ∼1.2 Ma, indicating a larger scale forcing of solar insolation change on both systems. A decoupling between the two systems was noticed after ∼1.2 Ma, under which drier intervals in the QB were synchronous with stronger EASM. We suggest that the congruence of decreasing amplitude of obliquity and eccentricity minima at ∼1.2 Ma facilitated ice sheet expansion which disturbed the response of both systems to solar insolation, and eventually led to their decoupling. At ∼0.9 to 0.8 Ma, synchronous minimum states in obliquity amplitude and eccentricity, and the meantime prominent reduction in CO_2 concentration, presumably forced continuously growing ice sheets. The resulting cooling may have reached a critical temperature that caused a negative water balance in the regional water cycle of the QB, leading to the collapse of Qaidam paleolake since ∼0.6 Ma.