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The millennial-scale climatic variability in central Asia during last glacial

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In the North Atlantic and the surrounding region, more than 20 rapid millennial-scale climatic fluctuations occurred during the last glacial-interglacial cycle (Dansgaard et al. 1993). These oscillations, known as Dansgaard-Oeschger (D-O) and H-events. Simulate studies suggest that the millennial-scale climatic signals can spread to a wide area by atmospheric and oceanic circulations. However, it lacks such record in central Asia which is climatically characterized by arid and sensitive to climate change.

Here, we present the record of millennial-scale fluctuations from loess deposits in Tajikistan in Central Asia. The frequency-dependent magnetic susceptibility (X_{fd}, a moisture proxy) record in the Darai Kalon (DK) section (38°23'4"N, 69°50'1"N, 1561 m) can be readily matched with the NGRIP oxygen isotope curve, especially during the interval from 60-30 ka in which typical D-O cycles and H-events are well developed. Most of the long-lasting D-O cycles in Greenland, e.g., D-O 8, 12, and 14, are also evident in the Tajikistan loess. Similarly, the short-duration D-O cycles in Greenland, e.g., D-O 6, 7, 9, 10 cycles, have their damped counterparts in the Tajikistan loess. However, some significant differences in detail can be observed between the two records. The most distinct difference occurs in the case of last D-O cycle, which includes the well-documented Oldest Dryas (OD or H1), Bølling-Allerød (BA), and Younger Dryas (YD or H0) events, which are not clearly present in the X_{fd} curve.

The magnetic results support that the climate is humid in interstadials and dry in stadials in central Asia. And, the variation of humidity is much more remarkable in central Asia than in Chinese Loess Plateau which is climatically dominated by Asian Monsoon. It exhibits the humidity in central Asia is sensitive to millennial-scale climate oscillations during the last glacial. The comparison results further indicate propagations of millennial-scale climatic signals were different between these two regions. We assumed the former one is the Westerlier which can directly and effectively force the millennial-scale climatic variability in central Asia, and the latter one is thermohaline circulation and Asian Monsoon, the complex propagation weakened the millennial-scale climatic variability Northern China.