Geophysical Research Abstracts
Vol. 15, EGU2013-12793-1, 2013
EGU General Assembly 2013

Abrupt Climate Events Recorded in Chinese and Central Asian Loess Sequences

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Past climate dynamics associated with the Eurasian continent have been extensively studied. However, the impact of intra-hemispheric-scale climate variability on the entire Eurasian landmass, as well as the self-generated effects of the continent on the global climate system, is still a matter of investigation . While western Atlantic polar and tropical air masses penetrate into the continent and are transformed as they cross Eurasia, the interior regions of Eurasia strongly influence Earth's climate system. Significant cooling and heating of Central and High Asia drive interactions between atmospheric and oceanic processes and regulate teleconnection patterns across the Northern Hemisphere.

This paper utilizes high resolution particle size data from the Central Asian loess sequence at Remisowka, Kazakhstan, and the long studied, monsoon-influenced Chinese loess sequence at Xifeng, to reconstruct past atmospheric circulation and aeolian dust dynamics within interior Eurasia since the last interglacial period. The observed dynamics in aeolian dust transport closely mirror d18O and fine dust variations measured in Greenland ice cores, suggesting a correlation with short-term climate oscillations (DO events) recorded therein. An Asian origin of fine aeolian dust preserved in Greenland ice cores has been discussed previously, and recent papers reveal a close link between Asian aeolian dust dynamics and DO events recorded in Greenland ice cores.

In this context, data presented here represent the first Central and East Asian aeolian dust records in which DO events are recorded, providing a means to test hypothesized links between short-term climate variability recorded in Greenland and associated climate dynamics at Asian dust source areas. Ultimately, the data extend existing hypotheses, suggesting that the Central and High Asian mountains are a crucial element within the sensitive glacier-desert-dust response system in interior Eurasia and may be considered a pacemaker of suborbital global climate changes and an initiator of abrupt climate oscillations in the Northern Hemisphere.