Geophysical Research Abstracts
Vol. 13, EGU2011-917, 2011
EGU General Assembly 2011

Late Pleistocene Aeolian Dust Dynamics in Central Asia and their Teleconnection with Short-term Climate Oscillations and Abrupt Climate Events in the Northern Hemisphere

Björn Machalett (1,2), Eric A. Oches (3), Eddie Haam (4), Zhongping Lai (5), and Wilfried Endlicher (2)

(1) Aberystwyth University, Institute of Geography and Earth Sciences, Aberystwyth, Wales, UK , (2) Humboldt-Universität zu Berlin, Institute of Geography, Department of Climatology, Unter den Linden 6, D-10099 Berlin, Germany, (b.machalett@nakula.de), (3) Bentley University, Department of Natural and Applied Sciences, Waltham, Massachusetts, USA, (4) Harvard University, Applied Mathematics, Cambridge, Massachusetts, USA, (5) Chinese Academy of Science (CAS), Qinghai Institute of Salt Lakes, Xining, China

Past and present climate dynamics, i.e. large-scale ocean circulation and coupled synoptic atmospheric circulation patterns, associated with the Eurasian continent are well studied and receive ongoing scientific interest. 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 considerable debate. While western Atlantic polar and tropical air masses penetrate into the continent and are modified and 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 (Tibetan Plateau) drive interactions between atmosphere and ocean processes and regulate teleconnection patterns of the Northern Hemisphere.

This paper utilizes high resolution particle size analyses from the Central Asian loess sequence at Remisowka, Kazakhstan, to reconstruct the dynamics of past synoptic atmospheric circulation patterns and aeolian dust transport within interior Eurasia since the onset of the last interglacial period. The observed dynamics in aeolian dust transport (particle size record) closely mirror δ18O and fine dust variations seen in Greenland ice cores, suggesting a correlation with short-term climate oscillations (Dansgaard-Oeschger – 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 Central and East Asian aeolian dust dynamics and DO events recorded in Greenland ice cores. The onsets of individual DO events were slightly preceded by decreasing Greenland dust deposition.

In this context, our data represent the first Central Asian aeolian dust record in which DO events are recorded, providing a means to verify hypothesized links between short-term climate variability recorded in Greenland and associated climate dynamics at Asian dust source areas. Ultimately, the data extend existing theories, 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.