Geophysical Research Abstracts
Vol. 13, EGU2011-11374, 2011
EGU General Assembly 2011

Reconstructing paleo-wind strength variability from loess grain-size distributions: an application to the late Quaternary Mangshan loess-paleosol sequence, China

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Previous studies have indicated that a genetically meaningful decomposition of (loess) grain-size distributions can be accomplished with the end-member modelling algorithm EMMA. Unmixing of a series of late Quaternary loess grain-size records indicates that the spatio-temporal grain-size variability is the result of two contrasting sedimentation patterns: (1) a background sedimentation pattern, reflected by the constant flux of a fine-grained loess component, (2) an episodic sedimentation pattern, reflected by the highly variable (glacial-interglacial scale) flux of two coarse-grained loess components (e.g., Prins et al, 2007; Vriend and Prins, 2007).

Here, we focus on the Mangshan loess-paleosol sequence in China, which is characterised by exceptionally high sedimentation rates, 0.45 m/kyr over the last 130 kyr, and coarse grain sizes, as a result of its proximity to the dominant source area: the Yellow River floodplain (Prins et al, 2009). We present a new approach which allows, by eliminating for instance the factor 'distance from source to sink', the construction of a direct indicator record of wind strength (East Asian Winter Monsoon Intensity) from the loess grain-size record.

Furthermore, the U–Th dated oxygen isotope records from nearby Dongge, Sanbao and Hulu caves in central China, provided the opportunity to establish a detailed and robust age model of the loess-paloesol sequence, based on the correlation with loess proxy records, i.e. magnetic susceptibility, carbonate content and grain size characteristics (Peterse et al, 2011). Therefore, we can directly compare the reconstructed EAWM grain-size proxy record with the generic East Asian monsoon climate records.

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