S06-05

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Timing of abrupt changes in eolian sedimentation from 30 to 23 ka in the Dunaszekcso loess record, south Hungary

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Millennial scale warm-cold oscillations in air temperature over Greenland and rapid sea surface temperature changes were recorded in ice cores and North Atlantic sediments for the last glaciation. These events must have been associated with profound environmental changes in Europe. Indeed, millennial scale oscillations in grain size records were found in loess deposits of Europe and Asia. Unfortunately, the timing of these events are still unresolved due to chronological uncertainties on the order of thousands of years.

Here we present a high precision loess chronology and derived Bayesian age-depth model from the Dunaszekcso loess record based on 48 AMS ^{14}C ages from charcoals and mollusc shells. The age modeling used Bacon and mean 95% confidence ranges are 485 yr. Sedimentation rates calculated from the age-depth model vary between 0.6-1.7 mm year^{-1} and estimated bulk dust flux range from 892 to 2525 g m^{-2} yr^{-1}. Both the sedimentation rate and dust flux display millennial scale variations, together with the bulk loess median grain size (D_{50}) that is considered an integrated proxy of wind strength, dust source distance and aridity. While an increase of dust flux and D_{50} with time is apparent, such a trend cannot be seen in the quartz grain size measures (Q-D_{50}, Q-D_{90}: proxies of average and maximum wind strengths). This observation implies that wind speeds were relatively constant in the 30 to 23 ka interval, while the turbulence of the flow was extremely varying (i.e. strong/rapid changes in the frequency/magnitude of dust storm events). While the grain size proxies show 300-500 yr lags for 30 to 28 ka in comparison with the NGRIP dust record (Ca^{2+}), they relatively closely follow it for 27-23 ka. Whether this is a real response of the eolian system or just independent temporal proxy variability with similar frequency contents is yet unknown.