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Loess is the accumulation of dust, not evidence for aridity

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Loess-paleosol sequences (LPS) are valuable terrestrial archives for Quaternary climate and environmental changes. The famous sections on the Chinese Loess Plateau, for example, document the alternation of warm and humid interglacials (paleosols) and cold and more arid glacials (loess). This, at least partly, reflects the weakening of the monsoonal circulation during glacials and has led to the notion that loess in general documents more arid conditions. Paleosols, on the other hand, are often interpreted to document more humid conditions.
We studied the LPS Crvenka in the Carpathian Basin, southeast Europe, which spans the full last glacial cycle, and obtained results that do not fit the above concept: (i) The analysis of plant-derived long-chain n-alkanes indicates the presence of deciduous trees and shrubs during glacials, i.e. sufficient precipitation for tree growth, whereas tree-less grass steppes seem to have prevailed during the Eemian, the last interglacial. (ii) Compound-specific deuterium analyses on the alkanes show only little changes on glacial-interglacial timescale. When compared with the isotopic enrichment of the Mediterranean Sea during the last glacial, this likely documents a combination of increased rainfall, reduced evapo-transpiration and reduced temperatures. (iii) Novel lipid biomarkers derived from soil bacteria (GDGTs, glycerol dialkyl glycerol tetraethers) also indicate humid glacials (BIT index close to 1) and more arid interglacials (BIT<0.8).
Our results are in good agreement with modelling studies suggesting a southward shift of the westerlies during glacials, and aridization in the Mediterranean area in response to man-made global warming. More importantly, they remind us of an important fact: Loess is the accumulation of dust, but not (necessarily) evidence for aridity. Pedogenesis may simply not have been able to keep pace with high glacial dust accumulation rates related to intense glacial, periglacial and fluvial activity. Proxies independent of accumulation rates should be further developed and applied in LPS.