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Luminescence age constraints on the Pleistocene-Holocene transition recorded in loess sequences

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Here we investigate the timing of the last glacial loess - Holocene soil transition recorded in loess-paleosol sequences across the Chinese Loess Plateau, the SE European loess belt and the Central Great Plains, Nebraska, USA by applying comparative luminescence dating techniques on quartz and feldspars. Equivalent dose measurements were carried out using the single-aliquot regenerative-dose (SAR) protocol on silt (4–11 μm) and sand-sized (63–90 μm and coarser fraction when available) quartz. Feldspar infrared stimulated luminescence (IRSL) emitted by 4–11 μm polymineral grains was measured using the post IR-$IRSL_{290}$ technique.

The paleoenvironmental transition from the last glacial loess to the current interglacial soil was characterized using magnetic susceptibility and its frequency dependence. Based on the OSL ages and the threshold of the magnetic signal enhancement the onset of soil formation started around Termination 1 (~17 ka in the North Atlantic) as observed in radiocarbon-dated regional benthic $\delta^{18}O$ stacks (Stern and Lisiecki, 2014) but before the stratigraphic Pleistocene/Holocene transition dated at 11.7 ka in ice core records (Svensson et al., 2008).

No major hiatuses in ages are identified in the investigated sites. A change in the sedimentation rate is generally observed at the Pleistocene-Holocene transition and no significant sedimentation change during the Holocene. Sedimentation rates of around 6 cm/ka are determined for the Holocene soil in most of the sites investigated.

The magnetic susceptibility indicates a gradual increase in pedogenesis after Termination 1 (□17 ka in the North Atlantic). Based on this, we infer that the upbuilding soil formation prevailed over topdown soil formation during the Pleistocene-Holocene transition in the investigated sites

(Roberts, 2008).

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