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 (L1) - Holocene soil (S0) 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. SAR-OSL dating of 4–11 μm, 63–90 μm and 90–125 μm quartz provided consistent ages in the loess-paleosol sites investigated, while the post-IR $IRSL_{290}$ protocol proved unreliable for dating such young samples.

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. 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 prevail over topdown soil formation during the Pleistocene-Holocene transition in the investigated sites (Roberts, 2008).

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