Luminescence age constraints on the Pleistocene-Holocene transition recorded in loess sequences across SE Europe - DTU Orbit (17/11/2019)

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Here we investigate the timing of the last glacial loess (L1) - Holocene soil (S0) transition recorded in loess-paleosol sequences from SE Europe (Ukraine, Romania, Serbia) 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-IRSL290 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 IRSL290 protocol proved unreliable for dating such young samples. Based on these ages and the threshold of the magnetic signal enhancement the onset of soil formation has been placed around 16.6 ± 1.1 ka at Roxolany (Ukraine), 13.5 ± 0.9 ka at Mošorin (Serbia) and between 17.6 ± 1.4 ka and 12.4 ± 1.0 ka at Râmniciu Sărat (Romania). The trend observed in the magnetic parameters reflects the intensity of pedogenesis induced by regional climate amelioration during the Late Glacial, but the onset of magnetic susceptibility enhancement precedes the stratigraphic boundary of Pleistocene-Holocene dated at 11.7 ka in ice core records.

Thus, magnetic susceptibility indicates a gradual increase in pedogenesis after Termination 1 (~17 ka in the North Atlantic) at the sampling sites. Based on current data, it is not possible to define a synchronous threshold of change for all sections. However, the trend in the magnetic susceptibility data closely reflects the gradual transition from Last Glacial Maximum (LGM) towards the Holocene, with the onset of humus accumulation (A1 horizon) possibly linked to the prevalence of full interglacial conditions.

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