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Magnetism of Danubian Loess - Enviromagnetism, Magnetic Stratigraphy and Relative Palaeointensity Records from Pleistocene Loess of the Middle and Lower Danube Basin

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Abstract

Aeolian dust sediments (loess) are beside marine/lacustrine sediments, speleothemes and arctic ice cores the key archives for the reconstruction of the Quaternary palaeoenvironment in the Eurasian continental mid-latitudes. The Eurasian loess-belt has its western end in the Middle (Carpathian) and the Lower Danube Basin where one can find true loess plateaus dating back more than one million years and comprising a semi-continuous record of Pleistocene environmental change. The loess-palaeosol sequences (LPSS) of the region allow inter-regional and trans-regional comparison and, even more importantly, the analysis of temporal and spatial trends in Pleistocene environments employing magnetic methods, even on a hemispheric scale.

Since the seminal work of Heller & Liu (1982, 1984) magnetic polarity stratigraphy and mineral magnetic parameters as function of stratigraphy became well established chronostratigraphical tools and fundamental palaeoclimate proxies in loess research, respectively. Magnetic susceptibility (X) and its dependence on the frequency of the applied field (X_{fd}) turned out to be beside grain size and geochemical indices a highly sensitive proxy for environmental changes during loess accumulation. The application of X and X_{fd} as palaeoclimate proxy in the Eurasian loess steppe environments is based (1) on the mineralogical homogeneity of the loess and (2) on the neo-formation of ferrimagnetic minerals in the course of silicate weathering and pedogenesis. The latter obviously depends largely on the temporal variation of soil humidity and thus the temporal course of palaeoclimate. Hence, increasing pedogenesis goes along with the enhancement of the mineral magnetic signals.

The paper discusses results of published and still ongoing palaeomagnetic and enviromagnetic studies from the Danubian loess province: 1) the detailed record of the Matuyama-Brunhes polarity change in the Stari Slankamen (Vojvodina, Serbia) loess key section; 2) the 1 Ma composite enviromagnetic record from the South Carpathian Basin (Stari Slankamen & Titel-Plateau, Vojvodina, Serbia) allowing trans- Eurasian correlation ; 3) dating the last glacial cycle loess from Süttö (Hungary) by relative palaeointensity; 4) the high resolution mineral magnetic record from the last glacial/interglacial loess from the Urluia quarry (Dobrogea/Black Sea coast, Romania) revealing millennial-scale environmental fluctuations.

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