



The Mono Lake Geomagnetic Excursion recorded in Loess

U. Hambach

Chair of Geomorphology, University of Bayreuth, Germany
(ulrich.hambach@uni-bayreuth.de)

The Mono Lake geomagnetic excursion (MLE) is among the youngest and one of the earliest found and better-documented excursions in the Brunhes Chron. It has been detected worldwide in marine and terrestrial sedimentary archives as well as in lavas from Hawaii. Recent age determinations and age estimates for the MLE centre around an age interval of approximately 32 – 35 ka.

Loess/Palaeosol sequences provide valuable palaeoclimatic information from continental areas, especially where other archives are rare or even absent. Loess is not only an excellent recorder of environmental changes but also a unique archive for the variations of the Earth's magnetic field and for palaeolithic archaeology.

In my paper, I report a rock and palaeo-magnetic investigation of the Upper-Würmian loess from an archaeological excavation at Krems-Wachtberg (Wachau, Austria). At this site, an Upper Palaeolithic cultural layer is developed in and covered by loess. The age of the cultural layer is about 27 ka (14C B.P. \geq 31 ka cal. 14C B.P.). An almost 8 metres thick loess pile was continuously sampled in two overlapping sections.

Magnetic susceptibility (MS) as function of depth resembles generally the lithology. Low MS-values represent pure unaltered loess, whereas higher values represent the enhancement of magnetic minerals caused by incipient soil formation. Anhysteretic remanent magnetisation (ARM) versus MS reveals an enhancement of superparamagnetic particles where MS is high. Consequently, the MS-variations with depth are taken as a palaeoclimatic record representing the climatic variations between drier and slightly more humid conditions at the transition from Middle to Upper Pleniglacial. Based on the MS-record I can establish a correlation of the loess pile at the Krems-Wachtberg site with the NORTH-GRIP isotopic record and with sedi-

mentological data from Maar-lake sediments of the Eifel area (ELSA), Germany. This correlation corroborates the dating of the loess at the excavation site to a time interval between 20 and 35 ka, covering Greenland Interstadials 2 to 6 and Heinrich Events 2 and 3. Hence, the age of the cultural layer is slightly older than 30 ka, both in NORTH-GRIP and ELSA time scales.

The directional palaeomagnetic record is of high quality and shows variations in the bandwidth of secular variation in the upper and in the lower part of the section, whereas in the central part shallow negative and oversteep inclinations reveal the record of a geomagnetic excursion. The shallow inclinations are preceded by and go along with westerly declinations, whereas the steep inclinations are preceded by easterly declinations. A relative palaeointensity (RPI) record was constructed by using MS and ARM as normalisers. This record corresponds quite well to the marine RPI stacks and thus provides additional dating. The peak of the directional excursion coincides with a relative minimum of RPI. The average RPI during the excursions interval, however, is significantly higher than during normal periods, contrary to what is usually reported. Furthermore, just before and after the directional excursion the highest values in RPI occur. The largest amplitude of the directional excursion does not correspond to the well defined minimum in RPI preceding this interval which is usually taken for the MLE in the marine RPI stacks. This offset between the RPI and the directional record may indicate the presence of strong non-dipole components and may also explain the blur in dating of the MLE.