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Palaeomagnetic investigations in the loess/paleosol-sequence Aschet in Upper Austria and chronostratigraphic implications for the Middle Pleistocene in the Northern Alpine foreland

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The loess/paleosol-sequence Aschet in Upper Austria includes five paleosols with different intensity of pedogenesis. It represents the Middle Pleistocene covering layers on top of a classical fluvioglacial Günz terrace (TERHORST 2007). According to earlier paleomagnetic investigations all paleosols have formed during the Brunhes Chron (KOHL & KRENMAYR 1997). Noticeably, none of the geomagnetic excursions that occurred during this time period, have been observed during the earlier investigations of this profile, which could possibly be attributed to their very limited sampling density. The new comprehensive paleomagnetic investigations aimed at providing more detailed information concerning the chronostratigraphic setting of the sedimentary succession. Additional determinations of rock magnetic parameters aimed at a quantified reconstruction of the climate changes gained from changes in sediment magnetic properties. Variations in pedogenic formation of in situ formed magnetic phases in interbedded loess/paleosol sequences are strongly controlled by climate (EVANS & HELLER 1994).

Two profiles of 12 meters thickness were excavated, and 580 oriented samples were taken for laboratory investigations by using 8 ccm standard paleomagnetic sampling cubes. Most samples could be fully demagnetized by means of alternating-field demagnetization in up to 15 steps between 2 and 140 mT and the contribution from high coercivity components was generally low. Samples that exposed significant intensity of remanence after alternating-field treatment, were subsequently consolidated using non-magnetic stone-strengthener, and demagnetized thermally in the temperature range between 200˚C and 590˚C. The demagnetizations and additional mineral magnetic experiments proofed that the magnetic remanence mainly resided in two different magnetite-like phases; however both phases carried very similar vector components. The majority of the samples yielded characteristic remanence directions aligned in the direction of the recent earth magnetic field, which is virtually indistinguishable from the mid-pleistocene magnetic north direction. Though, six zones with partly strong deflection from the magnetic north direction indicating evidence for geomagnetic excursions could be recognized in this study. The climate related rock magnetic parameters yielded strong variation with depth in accordance with the lithology. Several marker horizons with strongly enhanced magnetic susceptibility, remanence intensity and other magnetic parameters could be distinguished.

The presented preliminary chronostratigraphy for the loess/paleosol-sequence Aschet derived from magnetic excursion stratigraphy and climate related magnetic proxies was based on the palaeopedological interpretation of the profile (TERHORST 2007). Recent compilations of internationally reputed excursions during the Brunhes Chron (COE et al. 2004; SINGER et al. 2002) and Isotope curves (LISIECKI & RAYMO 2005) served as a reference frame. A magnetic excursion observed in the lowermost part of the profile was tentatively assigned to CR3 (Calabrian Ridge 3), which established an age estimate of ca. 580 ka (isotope stage 15) for the soil formation. Among other observations, a striking match of the magnetic susceptibility variation with depth and the oxygen isotope curve was evident. Is has to be mentioned, that absolute age determinations using OSL analyses yielded significantly younger ages for the samples from the lower part of the section (M. FIEBIG, BoKu Vienna, pers.comm. 2006). Financial support for this study was provided by the Austrian Academy of Sciences.

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