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Palaeomagnetic Investigations in the Loess/Palaeosol Sequence Aschet in Upper Austria

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Paläomagnetische Untersuchungen in der Löss-Paläoboden-Schichtfolge von Aschet (Oberösterreich)

Zusammenfassung

Auf der Basis von paläopedologischen Analysen wurde unter Einbeziehung der paläo- und gesteinsmagnetischen Untersuchungen eine Chronostratigraphie für die Löss-/Paläoboden-Sequenz Aschet entwickelt.

Das Profil befindet sich auf der klassischen Günz-Terrasse und enthält fünf interglaziale Paläoböden, die von Lössschichten getrennt werden. Diese Profilsituation deutet auf ein Alter für die Terrassenablagerung von mindestens OIS14 hin. Eine magnetische Exkursion im basalen Profilabschnitt konnte der Exkursion „Calabrian Ridge 3" zugeordnet werden, welche einem Alter von 580 ka entspricht.

Abstract

On the base of palaeopedological analyses a chronostratigraphy for the loess/palaeosol sequence Aschet, derived from magnetic excursion stratigraphy and climate related magnetic proxies is developed.

The profile of the covering layers is situated on the top of the classical Günz terrace and includes five interglacial paleosols separated by loess layers, thus indicating a terrace age of OIS14 at minimum.

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).

1. Introduction

The loess/palaeoosol sequence Aschet in Upper Austria includes five palaeoosols 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 palaeoomagnetic investigations all palaeoosols have formed during the Brunhes Chron (KOHL & KRENMAYR, 1997). Notably, 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 palaeoomagnetic 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

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changes gained from changes in sediment magnetic properties. Variations in pedogenic formation of in situ formed magnetic phases in interbedded loess/palaeoosol sequences are strongly controlled by climate (EVANS & HELLER, 1994).

2. Palaeoomagnetic Investigations

Two profiles of 12 meters thickness were excavated, and 580 oriented samples were taken for laboratory investigations by using 8 ccm standard palaeoomagnetic 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 proved 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.

3. Conclusions

Several marker horizons with strongly enhanced magnetic susceptibility, remanence intensity and other magnetic parameters could be distinguished.

The presented preliminary chronostratigraphy for the loess/palaeoosol 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. It 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, Vienna, pers. comm., 2006).

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