Reconstruction of a Late Pleistocene paleorelief in Lower Austria

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Introduction

Geomorphodynamic and pedogenetic processes were studied on the summit of Kranawetberg (a paleolithic site) and the north-facing slope towards a dry valley (Langer Grund) on the east boundary of the Austrian dry loess region Weinviertel near the standard sections “Stillfrieder Komplex” and “Stillfried B” (Fink, 1979; Peticzka et al., 2007). The paleolithic (Gravettien) site was studied since 1994, therefore several drillings and sections were already analysed (Peticzka and Riegler, 2004). Furthermore, the results of drillings, which were carried out in 2004, were available for the entire slope of the Kranawetberg (see Fig. 1). These datasets were interpreted and combined to a three dimensional Model of the summit, which provides a view into Late Pleistocene landscape development.

Methods

Both datasets were combined after defining pedostatigraphic units in two different ways. We used ramm-core-drilling and sampled pedostatigraphic units for laboratory analyses. Grain size distribution and carbonate content were analysed to confirm the field survey from the summit to the valley floor.

The samples of paleolithic excavation were grouped by model-based clustering (Fraleys & Raferty, 2002). The Algorithm is based on the assumption of mixtures of multivariate normal densities in the dataset and uses maximum likelihood estimation for the parameters.

For computational work we used open-source software: Debian Linux "Release Sarge" (Operating System), PostgreSQL (Databasemanagementsystem), R (Statistics), GrassGIS & NViz (visualization).

Results

The studies show the occurrence of two pedocomplexes, one originating from an interglacial period (Cambisol/Chernosern), the other gives evidence of an interstadiol period (weak B-Horizon). A transection of the slope between summit and valley button shows the development of the interacting pedocomplexes. Under the Upper Pleniglacial loess the interstadiol pedocomplex is traceable from the summit to the backslope. The underlying interglacial pedocomplex covers parts of the shoulder continuing on the backslope. In the footslope and the valley bottom no paleohorizons were found (see Fig. 3).

Conclusion

The thinning out of the interglacial pedocomplex is the result of denudational processes on the summit. The upper horizons of the interglacial pedocomplex and the interstadiol horizons are mixed in the backslope. This situation implies downward movement of material also during the interstadiol soil development. On the southfacing part of the summit, the interstadiol pedocomplex strikes out, which indicates increased denudational processes.

References


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Fig. 1. Location of the studyarea and map of drillings.

Fig. 2. Flowchart: recorded data (rectangles), processing (trapeziums), thematic outcomes (dottes rectangles), interpretations (dotted circle).

Fig. 3. Pedocomplexes of the north-facing slope from Kranawetberg to Langer Grund

Fig. 4. Output of the Model-Based Clustering.

Fig. 5. Visualization of the summit with NViz.

Fig. 6. 3D-Model, View NW, Elevation 235 m