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600.000 years of Quaternary landscape history in Southeastern Europe: A lipid biomarker perspective.

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In the middle and lower Danube Basin loess paleosol sequences of several decametre thickness are widely distributed. They constitute valuable long-term archives for the reconstruction of Quaternary climate and landscape history. Our knowledge about the vegetation history is up to now mainly deduced indirectly based on the interpretation of paleopedologic features or transferred from pollen data of long term peat cores in neighbouring areas (e.g. Tenagi Phillipon, Greece). The paleosol sequences in this area indicate a trend of aridization and / or cooling during the Pleistocene. Older interglacial soils, for instance the S5 (formation of Marine Isotope Stages MIS 13-15), are often interpreted as fossil "forest soils", whereas younger interglacial soils such as the S1 (MIS 5) and the recent soils are described as (fossil) "steppe soils".

Biomarkers could have a huge potential to contribute to this discussion. Especially n-alkanes could be promising, since they are useful for a chemotaxonomic classification of recent plant material and relatively stable against degradation. Furthermore, they already have been successfully applied in other paleoecological studies [1]. The sections Stari Slankamen/Batajnica (Serbia) and Mircea Voda (Romania) are situated in an area of present day forest steppe to steppe vegetation. Both sites exhibit the typical pedostratigraphic succession of the region, comprising more than 600 k.y. of landscape history [2]. For the biomarker analyses the paleosols were sampled continuously in 10 to 50 cm intervals depending on horizontation, the intercalated loess units were sampled representatively. Alkane analyses were performed according to a modified procedure of Zech and Glaser (2008) [3]. Additionally, pollen analyses were conducted on selected samples.

As the n-alkane distribution of many tree species are dominated by the homologues C27, whereas in grasses C31 and/or C33 predominate, the C27/C31 is traditionally used to distinguish between tree and grass dominance. Since today forest patches in this steppe area potentially would be dominated by Acer tataricum and Quercus pubescens, both showing a high C29 abundance, we apply C27 and C29 as proxy for tree vegetation and C31 and C33 as proxy for grass vegetation. The depth profiles of both, the C27/31 and C29/C31 ratio, are similar, indicating no fundamental increase in tree dominance comparing fossil "forest soils" with the fossil and recent steppe soils. However, we will show that systematic trends within most loess paleosol couples are indicated, suggesting an increase in tree abundance during the end of a loess forming period and in the early or middle part of interglacial paleosol formation. Towards the end of the soil formation periods a decline of tree abundance would be indicated. Summarizing, it is possible to conclude continuous grass vegetation for these sites during glacial and interglacial conditions with relatively high but variable admixtures of trees or shrubs as indicated by high relative abundances of C29. Also most of the pollen data support mixed grass-tree vegetation or grassland (taking account of far distance pollen transport). Though pollen reflect vegetation patterns on a more regional scale, even they do not show higher tree percentages for the assumed fossil "forest soil" compared to the fossil "steppe soils". In contrast to the interpretation of the n-alkane patterns, the pollen results support the traditional picture of treeless grass vegetation. Yet, not only our n-alkane data but also recent findings of wooden charcoal in southern Hungarian loesses question this paradigm [4].

The interpretation so far is based on the assumption that alkane pattern does not change in course of degradation.

Several studies indicate that this can not be hold anymore. Therefore, our further interpretation will focus on a correction of the preserved long-chain n-alkane ratios and deduced vegetation patterns for degradation effects using the OEP (odd over even dominance) as degradation indicator.

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