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Leaf wax n-alkane patterns from plants and topsoils in the semi-humid to arid southern Caucasus region as a base for paleoenvironmental reconstructions

Marcel Bliedtner (1), Hans von Suchodoletz (2), Imke Schäfer (1), and Roland Zech (1)

(1) Institute of Geography and Oeschger Centre for Climate Change Research, University of Bern, Switzerland (marcel.bliedtner@giub.unibe.ch), (2) Institute of Geography, University of Leipzig, Germany

Leaf waxes of terrestrial plants are relatively resistant against degradation and can thus serve as valuable biomarkers that are preserved in various sedimentary archives for millenia. Particularly long-chain n-alkanes are increasingly used for paleoenvironmental studies as they have the great potential to reconstruct past changes in vegetation and climate. However, prior to any robust interpretation of the homologue patterns of long-chain n-alkanes, reference samples from modern vegetation and topsoil material should be investigated at a regional scale, because it has been questioned recently, whether n-alkane patterns are suitable to distinguish between different vegetation types at a global scale (Bush and McInerney, 2013). Apart from Central and Southeastern Europe (Zech et al., 2013; Schäfer et al., 2016), systematic regional studies are still largely lacking.
To address this issues and to test the potential of leaf wax n-alkanes for paleoenvironmental studies in the semi-humid to arid southern Caucasus region, we investigated the influence of different vegetation types on the leaf wax signal in modern plants and topsoil material in eastern Georgia. We sampled modern plant and topsoil (0-5 cm) material from (i) grassland sites that included steppe, cultivated grassland and meadows, and (ii) from sites that are dominated by deciduous hornbeam forests.
The n-alkane results show distinct differences between samples from sites with grassland and deciduous forests and thus corroborate our results from Central and Southeastern Europe (Schäfer et al., 2016): n-Alkanes from grassland sites are mainly dominated by C31 and C33, while n-alkanes from deciduous sites show high abundances of C27 and C29. Thus, chain-length ratios allow to discriminate between these vegetation types and have a great potential when used for paleoenvironmental reconstructions at least in this region. We updated the existing end-member model of Zech et al. (2013) which accounts for degradation effects and allows semi-quantitative reconstructions of past changes in vegetation types.

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