Geophysical Research Abstracts
Vol. 18, EGU2016-15235, 2016
EGU General Assembly 2016

Leaf waxes and compound-specific δD analyses in a Holocene fluvial sediment-paleosol sequence from the upper Alazani River, SE-Georgia

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Leaf waxes of terrestrial plants are relatively resistant against degradation and serve as valuable biomarkers preserved in various sedimentary archives. Compound-specific D/H analyses on leaf waxes are increasingly used to reconstruct past climate and environmental conditions. Here, we present a n-alkane and compound-specific δD record from a Holocene fluvial sediment-paleosol sequence along the upper Alazani River in eastern Georgia.
Generally, such records from fluvial sedimentary archives must be divided into a catchment signal recorded in the fluvial sediment layers and a local in-situ signal recorded in the intercalated paleosols. The n-alkane homologue pattern shows a clear catchment versus in-situ signal. The paleosols are dominated by n-alkanes derived from the local vegetation, mainly grasses throughout the Holocene. The fluvial sediment layers contain leaf waxes derived from the forested catchment, although with relatively high contributions from grasses between 8 and 5 ka, possibly indicating more arid conditions. Because of the well-known altitude-effect on the isotopic composition of precipitation, we had expected more depleted δD values for the fluvial sediment layers, i.e. the catchment-derived samples, and more enriched δD values for the paleosols, i.e. the low altitude, in-situ signal. This is, however, not the case, and we speculate that the altitude effect might be offset by evapo-transpirative enrichment of tree leaf water and leaf waxes. The catchment and in-situ δD records both show a minor trend to more enriched values during the Holocene, while the recent topsoil is most depleted. Interpretation of these isotope records is not straight-forward and requires disentangling the effects of changing vegetation, source signal and local climate.