

Publication

Sources and abundances of leaf waxes in aerosols in central Europe

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Author(s) Nelson, Daniel; Knohl, Alexander; Sachse, Dirk; Schefusse, Enno; Kahmen, Ansgar Author(s) at UniBasel Kahmen, Ansgar ; Nelson, Daniel ;

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Keywords Hydrogen isotopes; Leaf wax; Aerosols; n-Alkanes; Biomarkers; Lakes; Sediments Atmospheric transport is an understudied mechanism for leaf wax hydrogen isotope applications that contributes to mobilizing and depositing these compounds on the surface of the Earth. While previous efforts have identified the importance of atmospheric leaf wax deposition in remote marine locations, the processes are not well constrained on land in temperate latitudes where lakes are common and sedimentary leaf wax hydrogen isotope values are an attractive tool for understanding past precipitation changes. This work presents results from a field study that was conducted in 2010 and 2011 at Hainich National Park, Germany in order to evaluate the quantity and sources of leaf waxes in the atmosphere. Aerosols were sampled at approximately weekly intervals inside the forest canopy, and n -alkane distributions and hydrogen isotope values were compared with those from major tree species surrounding the sampling site. Despite sampling in what was expected to be a major production center, the distribution and hydrogen isotope values of atmospheric n -alkanes bore little resemblance to those of the local vegetation. Comparison with local meteorological data and to 10-day and 36-h back air mass trajectories indicated shifting effects of winds and temperature, and that mesoscale transport processes were more important than long-range mechanisms. Back trajectories also highlighted source effects, with easterly winds coinciding with relatively lower leaf wax hydrogen isotope values from more continental regions. These results suggest that leaf wax aerosols average over spatial scales that exceed typical surface catchment areas for small lake systems, even in forested areas, yet that the area over which these compounds are derived is still relatively regional. Depositional fluxes were also estimated in order to assess the potential importance of atmospheric transport to sedimentary archives. Although difficult to constrain, these estimates suggest that atmospheric deposition may be non-negligible for lake systems in cases where inputs from rivers or surface runoff are limited. Together, these observations provide new insights on how leaf waxes from different sources are integrated during aeolian transport and the spatial scales over which these processes occur.

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