



Universität
Basel

Research Project

ALPWAX - Developing a molecular ISOSCAPE for an alpine watershed to mechanistically assess the spatial variability of leaf wax lipid dD values in plants, soils and sediments.

Third-party funded project

Project title ALPWAX - Developing a molecular ISOSCAPE for an alpine watershed to mechanistically assess the spatial variability of leaf wax lipid dD values in plants, soils and sediments.

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Organisation / Research unit

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Department

Project Website <https://botanik.unibas.ch/forschungsgruppen-der-botanik/nachhaltige-landnutzung/projects/alpwax/>

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Status Completed

Leaf wax lipids are long-chained hydrocarbons that are vital components of plant cuticles. Leaf wax lipids are abundant in leaves, soils and sediments and can persist in the environment over millions of years. What makes leaf wax lipids unique is that their stable hydrogen isotope composition (dD) contains information on precipitation and evapotranspiration. With this exceptional combination of properties, leaf wax lipids and their dD values are now being celebrated as the much-needed (eco)hydrological proxies that provide information on the hydrological cycle across new spatial and temporal scales. The processes determining the dD values of leaf wax lipids on the level of an individual leaf are beginning to be well understood. Little is, however, known on the watershed level variability of leaf wax lipid dD values and on the spatial variability of the abiotic (precipitation) and biotic (evapotranspiration) hydrological signals that are recorded in leaf wax lipid dD values. Moreover, the integration of the inherent variability of leaf wax lipid dD signals that has been observed within and among different plant communities into the soil and sediment record is presently unknown. Despite their enormous potential these uncertainties have to date prevented the application of leaf wax lipid dD values as quantitative hydrological proxies. The proposed research project will use an ETH experimental watershed in the Swiss Alps as a model system to study the spatial variability of leaf wax lipid dD values within and among plant communities, soils and sediments to assess the abiotic and biotic drivers of this variability at the landscape level. The key goal of the project is to establish linkages between the known processes that determine leaf wax lipid dD values at the leaf level with 1) the spatial variability of those same processes at the watershed level; and 2) the processes that ultimately integrate that variability in leaf wax lipid dD values in the soil and sediment record across the watershed. A particularly novel aspect of the proposed research is the development of the first molecular isoscapes, literally maps of the variation in leaf wax lipid dD values that are based on mechanistic models. These isoscapes will allow for the first time a mechanistic spatial assessment of abiotic and biotic information that is recorded in the dD values of leaf wax lipids in plants, soils, and sediments across an entire watershed. The proposed research will allow a much-improved quantitative interpretation of leaf wax lipid dD values from sediment records when these are used as hydrological proxies in paleohydrological applications. In addition, the proposed investigations will open the door to employ leaf wax lipid dD values for novel geospatial applications, e.g. in tracing the flow of organic compounds across a watershed and from terrestrial ecosystems to the ocean.

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Add publication**Published results**

3342696, Newberry, Sarah L.; Kahmen, Ansgar; Dennis, Paul; Grant, Alastair, n-Alkane biosynthetic hydrogen isotope fractionation is not constant throughout the growing season in the riparian tree *Salix viminalis*, 0016-7037, *Geochimica et cosmochimica acta*, Publication: JournalArticle (Originalarbeit in einer wissenschaftlichen Zeitschrift)

Add documents**Specify cooperation partners**