Universität Basel

Research Project

HYDROCARB: Hydrogen isotopes in plant-derived organic compounds as new tool to identify changes in the carbon-energy metabolism of plants and ecosystems during the anthropocene be retained.

Third-party funded project

Project title HYDROCARB: Hydrogen isotopes in plant-derived organic compounds as new tool to identify changes in the carbon-energy metabolism of plants and ecosystems during the anthropocene be retained.
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Department
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Status Completed

HYDROCARB is motivated by the enormous potential that stable hydrogen isotope ratios (δ2H values) in plant compounds have as hydrological proxy, but in particular as new proxy for the carbon metabolism in plants. Current
conceptual models suggest that δ2H values in plant organic compounds are composed of (i) hydrological and (ii) metabolic signals. The hydrological information that is contained in δ2H values of plant material is now well
understood and is often applied in (paleo-) hydrological research. In contrast, the metabolic information that is contained in plant δ2H values is mostly unknown. Intriguing recent research suggests, however, that metabolic signals
in the δ2H values of plant organic compounds reflect the balance of autotrophic and heterotrophic processes in plants. This suggests that exciting and previously unknown opportunities exist to exploit δ2H values in plant compounds for
information on the carbohydrate metabolism of plants, which would be relevant for a broad range of biological and biogeochemical disciplines.
The goal of HYDROCARB is to perform the experimental work that is now needed to identify the key biochemical and physiological processes that determine the metabolic information that is recorded in the δ2H values of plant
organic compounds such as leaf wax lipids, lignin and cellulose. With this HYDROCARB will provide the basis for semi-mechanistic models that will allow (i) disentangling hydrological from metabolic signals in plant δ2H values
and (ii) identifying the precise physiological processes with respect to a plants carbohydrate metabolism that can be deducted from the δ2H values of different plant compounds. If successful, HYDROCARB will establish with
this research δ2H values in plant organic compounds as a powerful new proxy that will allow groundbreaking and innovative research on plant and ecosystem carbon cycling, which has implications for plant biology, biogeochemistry
and the earth system sciences.

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