Ecophysiological mechanisms that determine the leaf wax *n*-alkane δ^2H values of C3 and C4 grasses

B. GAMARRA[1], D. SACHSE[2] AND A. KAHMEN[1,3]

[1]Physiological Plant Ecology, Institute of Agricultural Sciences, ETH Zu¨rich

[2]Emmy-Noether Research Group 'Paleohydrology', Institut für Erd und Umweltwissenschaften, Universität Potsdam

[3]Sustainable Land Use, Department of Environmental Sciences – Botany, University of Basel

Leaf wax *n*-alkanes are long-chained hydrocarbons that are synthesized in the leaf cuticle of terrestrial plants. They are highly persistent in the environment for timescales of millions of years. Their δ^2H values are used as a powerful proxy to reconstruct past environments (e.g. hydrological cycle) and also as novel tool to understand plant physiological processes, especially plant-water relationships. Although there is growing consensus that leaf water δ^2H values influence the δ^2H values of leaf wax *n*-alkanes the magnitude of this effects, in particular for grasses remains unclear.

We will present the results of a study where we specifically tested the effects of leaf ^2H enrichment on leaf wax *n*-alkane δ^2H values.

The experiments were conducted in climate-controlled growth chambers. We found that leaf water ^2H-enrichment had a strong effect on the leaf wax *n*-alkane δ^2H values of both C3 and C4 grasses, where 50% and 30% of the leaf water ^2H enrichment was found in the *n*-alkanes of C3 and C4 grasses, respectively. We found a large variability of this effect within both, C3 and C4 species. We hypothesize that this variability can be attributed to two physiological processes: (1) Evapotranspiration could affect the contribution of the source water δ^2H to the leaf water pool. (2) A regeneration of *n*-alkanes after leaf maturity would imply that leaf wax *n*-alkane δ^2H values integrate plant-water relations for entire leaf growth seasons. Our data have important implications for the mechanistic interpretation of leaf wax *n*-alkane δ^2H values.