Potential salinity effects on leaf wax lipid δD values from submerged aquatic macrophytes in paleo-climatic records

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The hydrogen isotopic composition of sedimentary lipid biomarkers has become a reliable tool for reconstructing past climatic and hydrologic changes. In particular, δD values of terrestrial leaf wax lipids have been a focus of research and a better understanding of competing environmental and plant physiological factors affecting their δD values has been achieved. Less knowledge exists about the factors influencing aquatic plant lipid biomarker δD values, although these lipids are abundant in many lacustrine sediments. For example, the potential influence of water salinity changes, which have been shown to affect δD of algal biomarkers, have not been studied so far. There is evidence from downcore data, such as a sedimentary record from Lake Karakul, Pamir, that salinity changes throughout the last 30 ka might have biased δD of aquatic derived *n*-C_{23}-alkanes, since other effects cannot solely explain the observed magnitude of isotopic variability.

Therefore, we conducted a laboratory experiment to test the effect of salinity on the isotopic composition of aquatic plant biomarkers. We analyzed samples of sago pondweed *Potamogeton pectinatus*, a common submerged species which occurs worldwide and can tolerate relatively high salinities. We compared δD values of plants grown from tubers in nutrient solution at four salinity levels. Isotopic fractionation factors ε of -134 ± 11‰ (*n*-C_{23}) were calculated for plants grown in freshwater nutrient solution, while greater fractionation was observed at salinity levels of 10 (-164 ± 12‰) and 15 (-171 ± 15‰). Our results demonstrate that biosynthetic isotopic fractionation can increase by 30-40‰ at higher salinity. This response might be induced either by stress, as plant growth rates were lower at higher salinities, or other mechanisms that remain to be elucidated. A potential salinity effect on δD values of aquatic lipids needs to be further examined, since this would impact the interpretation of downcore isotopic data in paleohydrologic studies.