



Opportunities and challenges for the use of molecular proxies in environmental reconstructions

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The last decades have seen a dramatic increase in the use of organic matter from soils and sediments as molecular proxy for reconstructing past dynamics of vegetation and climate. Applications range from the use of changes in preserved leaf wax lipid patterns or $\delta^{13}\text{C}$ signatures of organic matter to reconstruct shifts in vegetation composition, to the use of changes in $\delta^2\text{H}$ patterns as a past humidity / precipitation proxy. Particularly exciting in this respect are recent developments with respect to combining various molecular proxies. For instance by compound specific $\delta^{13}\text{C}$ and $\delta^2\text{H}$ analysis of selected lipids that themselves are used as vegetation proxy. However, as with all scientific development, all that glitters is not gold. Together with great promise, successful application of molecular proxies to reconstruct past environmental change also comes with several important challenges. For instance, to what extent are plant lipid patterns used for vegetation reconstruction affected by genotypic plasticity of the producing plant species? How might the heterogeneity of environmental and biochemical processes on/in different plant species interfere with the successful use of $\delta^2\text{H}$ and $\delta^{13}\text{C}$ patterns? What is the influence of differences in input routes into a soil or sedimentary archive, e.g. aboveground vs. belowground, on the desired reconstruction? In this presentation I will discuss both the opportunities and the challenges of the use of organic matter as molecular proxy in environmental reconstructions, using several recent examples of research from our group.