Constraining the influence of plant community change on the sedimentary *n*-alkane $^2H/^1H$ record in a temperate saltmarsh

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Palaeohydrological studies typically interpret shifts in sedimentary *n*-alkyl lipid δ^2H signals as evidence of changes in the δ^2H of precipitation and/or aridity. This approach implicitly assumes that any temporal shift in plant species, which vary isotopically and in the amount of *n*-alkyl lipids they produce, is insignificant compared with the environmental δ^2H signal. The purpose of this contribution is to assess the potential impact of plant community change on sedimentary *n*-alkyl δ^2H values, and evaluate methods for detecting and quantifying these vegetation shifts.

Firstly, we formulated a conceptual model to investigate the potential influence of vegetation change on the δ^2H signal of the *n*-C_{29} alkane incorporated into sediments at Stiffkey saltmarsh, Norfolk, UK. Secondly, we evaluated whether *n*-C_{29} $\delta^{13}C$ values could detect changes in vegetation inputs to the marsh sediments. Finally, we considered whether a concentration-weighted isotope mixing model could identify and quantify vegetation shifts in the *n*-alkane record from a ~500yr old sediment core from Stiffkey.

Results from the conceptual model suggested that vegetation change alone could drive shifts of up to 40‰ in the δ^2H signal of *n*-C_{29} incorporated into sediments, with *n*-C_{29} $\delta^{13}C$ values unable to identify inputs from the different C_3 plants at the marsh. Sediment core *n*-C_{29} δ^2H values showed a positive shift of 50‰ between 1630 and 1820, with an associated change of <1‰ in $\delta^{13}C$. The isotope mixing model identified changing plant inputs down-core that coincided with this $^2H/^1H$ excursion. As large-scale hydrological trends during this period are unlikely to fully account for this shift, we conclude our sedimentary δ^2H record has been strongly influenced by changes in marsh vegetation cover.

These findings highlight that plant community change can play an important role in controlling sedimentary *n*-alkyl δ^2H signals. Further, our results suggest that linked analysis of sedimentary *n*-alkyl $\delta^{13}C$ values may not detect vegetation shifts, especially in settings where C_3 plants dominate. New integrative approaches are therefore required to ensure that the role of plant community change can be fully accounted for when interpreting the sedimentary *n*-alkyl $^2H/^1H$ record.