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The stable carbon isotope composition of bulk organic sediment as a proxy for paleoclimate reconstruction – an overview

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The δ^{13}C value can be analysed in bulk organic matter, cellulose or in other specific compounds extracted from sediments. A few studies reported a systematic offset between δ^{13}C of cellulose and that of the bulk organic matter in mosses. This offset appears to be quite constant in well-preserved peat. This may suggest that δ^{13}C of the bulk organic matter is a valid reflection of the variation in environmental parameters. Here, we present few case studies from Europe [1], USA [2] and South America [3], how δ^{13}C of bulk organic matter could be interpreted and used for paleoclimate studies and applied for interpretation of paleoclimate records from Central America [4,5].

We used an alternative proxy for interpretation of palaeoclimate conditions based on a peat core taken from the southern Peruvian Andes (4809m a.s.l.), where other proxies are not available due to high altitudes and relatively low precipitation. The δ^{13}C value of Distichia peat reflects mainly the relative variation of the mean air temperature during subsequent growing seasons [3] and allows reconstructions of palaeotemperature changes. In contrast, peat organic carbon concentration (C % wt) records mainly wetness in the valley, directly corresponding to the changes in runoff in the upper glaciated part of the catchment. Our studies demonstrate how the δ^{13}C value and carbon content variations in Distichia peat can be interpreted and used for verification of other multiproxy records, particularly those which are challenging for accurate dating, even potential limitations of the use for bulk organic matter exist.

References

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