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A coastal wetland stable organic carbon isotope and geochemical database from NW Europe and its application in Holocene sea-level reconstruction

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The measurement of stable carbon isotope (δ13C), elemental geochemistry (organic carbon to total nitrogen (Corg/Ntot) and total organic carbon (TOC)) in bulk organic coastal sediment deposits is a developing technique in palaeosea-level research. The uptake of this technique in Northern Europe is limited compared to North America, where the common existence of isotopically distinctive C3 and C4 vegetated coastal marshes permits their distinction in the sediment record, along with associated reference water levels. The reduced range in δ13C between organic matter sources in C3 estuaries can make the identification of elevation-dependent environments in the sediment record challenging. This is compounded by the potential for post-depositional alteration in bulk δ13C values, and by the lack of contemporary environmental analogues in some urbanized estuaries due to extensive coastal wetland reclamation. A compiled database of contemporary bulk organic stable carbon isotope and geochemical (C/N, TOC) observations (n=142) from coastal wetland and estuarine deposits in North West Europe is presented. Partitioning Around Medoids analysis distinguishes samples originating in reedswamp / fen carr from samples originating in tidal-flat / saltmarsh environments. After correcting for the Suess effect on contemporary δ13C values of bulk organic matter, binary logistic regression is used to calculate the probable origin of coastal sediment deposits, based on the similarity between deposited and contemporary bulk organic sediment δ13C, C/N and TOC values. The upper saltmarsh to reedswamp transition is closely related to tidal elevation and its identification in the sediment record permits the use of δ13C, C/N and TOC values to infer the position of former relative sea-level. The NW European δ13C, C/N and TOC database increases the range of modern analogues for δ13C, C/N and TOC values in Holocene coastal deposits and the method presented here facilitates the application of δ13C, C/N and TOC analysis in RSL reconstruction studies throughout NW Europe.