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Stable oxygen isotopes in NW European coastal waters: new palaeoceanographic perspectives

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Pronounced seasonal variability, particularly in the surface ocean heat flux, imparts an important control that drives thermal stratification of the tide-dominated middle and high latitude shelf seas. Bottom water temperature and salinity data, resolved on a grid 20′ latitude by 30′ longitude, were combined with a regional synthesis of the salinity: δ^{18}O relationship in order to generate a spatial and temporal understanding of oxygen isotopes in seawater around the shelf seas of NW Europe. The data are expressed according to equilibrium calcite ($\delta^{18}O_{Eq.calcite}$) and, in the shallow mixed water column, exhibit large seasonal changes which are primarily driven by bottom water temperature. Annual bottom water temperature varies from $<$3ºC to $>$17ºC in the southern North Sea, generating a seasonal $\delta^{18}O_{Eq.calcite}$ signal of up to 3.2 ‰. The amplitude of the seasonal $\delta^{18}O_{Eq.calcite}$ signal is significantly dampened (0.1 - 0.2 ‰) in deeper, thermally stratified shelf waters. Maps of the monthly distribution $\delta^{18}O_{Eq.calcite}$ provide the first systematic overview of the spatial and temporal changes on the NW European shelf and highlight the importance of understanding seasonal growth on the incorporation of geochemical signatures into marine organisms.