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Stable Middle Miocene seawater isotopes in the eastern North Atlantic Ocean

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The Middle Miocene is a phase of gradual climate cooling, CO_2 decline and major episodes of seaward Antarctic ice expansion across the Middle Miocene Climate Transition. The global benthic foraminifera oxygen isotopes ($\delta^{18}O_{benthic}$) show a long-term increase by approximately 1‰, reflecting bottom water cooling and increase in global ice volume, although the latter is subject of debate. Here, we used a relatively new proxy based on hydrogen isotopes of long-chain alkenones ($\delta^{2}H_{C37}$), produced by Haptophyte algae, to reconstruct surface seawater isotopes (e.g., Schouten et al., 2006; Weiss et al., 2019; Gould et al., 2019). This proxy is, in contrast to $\delta^{18}O_{benthic}$, not temperature dependent. Enabling us to reconstruct the isotopic evolution of the surface seawater from marine sedimentary records up to 40 Million years ago.

Here, we compare foraminifera based oxygen isotope and alkenone based hydrogen isotope reconstructions of seawater from a shallow sediment record covering the Middle Miocene (IODP Site U1318, 409 m water depth, eastern North Atlantic Ocean, Sangiorgi et al., 2021). The local $\delta^{18}O_{benthic}$ record shows a strong long-term increase across the Middle Miocene Climate Transition in agreement with global benthic stacks. However, our reconstructed surface seawater $\delta^{2}H$ shows no long-term increasing trend and when correcting the local $\delta^{18}O_{benthic}$ record for subsurface temperature with TEX^{H}_{86}, the bottom seawater $\delta^{18}O$ record also shows no long-term trend. Our findings are in line with recently published records using clumped isotope temperatures which suggest a long-term decrease in temperature during the Middle Miocene large enough to explain the trend in oxygen isotopic composition of the benthic foraminifera without the need for a change in ice volume.