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Evolution of tides and tidal dissipation over the last glacial cycle

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Simulations of the tides from the Last Glacial Maximum (26.5 – 19 kyr BP) to the present show large amplitude and dissipation changes, especially in the semi-diurnal band during the deglacial period. New reconstructions of global ice sheet history and sea levels allow us to extend the tidal simulations back to cover most of the last glacial cycle. Climate during this period was far from stable with periods of ice sheet advance and lower sea levels interspaced with ice sheet melting and sea level increases. Here, using the sea level and ice history from Gowan et al., 2021, we present simulations of tidal amplitudes and dissipation from 80 kyr BP to present using the tide model OTIS. Our results show large variations in amplitudes and dissipation over this period for the M_2 tidal constituent with several tidal maxima. Due to the lower sea levels and altered bathymetry open ocean dissipation was enhanced with respect to present day levels for most of the glacial cycle. This result is important in the context of historical ocean mixing rates. For the semi-diurnal K_1 tide, in contrast, changes are mainly local or regional.