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The impact of tidal dissipation changes on the Last Glacial Maximum AMOC

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The global mean sea-level decrease of 120 – 130 m during the Last Glacial Maximum (LGM; 26 – 19 kyr BP) is thought to have substantially altered semidiurnal tidal dynamics in the glacial North Atlantic. This more than doubled global open ocean tidal dissipation in comparison to present day and increased the amount of energy available for diapycnal mixing which is important for driving the global meridional overturning circulation. Reconstructions of the glacial ocean have generally suggested a more sluggish Atlantic meridional overturning circulation (AMOC) during the LGM together with weaker mixing. Here, we investigate the impact of tidal dissipation changes on the LGM AMOC and the carbon cycle using the intermediate complexity ocean model UVic coupled to the biogeochemistry model MOBI forced with three different LGM dissipation estimates. The simulations are constrained with LGM $\delta^{13}C$ and radiocarbon data from sediments. Our results suggest that our simulations, as previously inferred, most closely agree with a weakened LGM AMOC (8 – 9 Sv), and importantly, that the agreement is consistent with increased LGM tidal mixing. These results firstly imply that a weakened AMOC state can occur with stronger tidal mixing without hampering the agreement with the sediment isotope data. Secondly, this work highlights the importance of considering tidal dissipation changes when modelling the paleo-ocean.