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# Quantitative paleosalinity reconstruction with water isotopes: perspectives from an isotope-enabled climate model study during the last glacial

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Quantitative paleosalinity reconstructions with reasonable uncertainties remain a challenge in paleoceanography. The calibrations of the water isotopes with salinity is a common method used but large uncertainties can be associated to this approach. In this study, we use the water isotopes-enabled fully coupled three-dimensional model of intermediate complexity iLOVECLIM to simulate the climate and water isotopes during the last glacial maximum (LGM) and Heinrich event 1. We investigate how water isotopes can be used as reliable proxies to quantitatively reconstruct past changes in seawater salinity. Our results demonstrate 1) that quantitative salinity reconstruction during glacial conditions based on present-day d18O-salinity spatial slope can lead to very important errors (up to 25 psu in certain regions) 2) that the use of model-derived temporal slopes, may allow to reduce these error bars on paleosalinity reconstruction 3) that quantitative reconstruction of salinity based on the d2H measurement of alkenones (d2Ha) might be possible if the slope and the intercept of the regression between the fractionation factor d2Ha- d2Hsw and salinity can be sufficiently tightly constrained in open ocean conditions and 4) that pairing water isotopologues have a strong potential to reduce uncertainties on quantitative paleosalinity reconstructions, also under glacial boundary conditions.