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The Mediterranean thermohaline circulation during the Last Glacial Maximum inferred from a 1/8° resolution oceanic model

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The Mediterranean thermohaline circulation (THC) is very sensitive to climatic conditions. Two main controlling factors explain this variability, namely the west-east density gradient and the sea level that strongly influences the exchanges through the Gibraltar and the Sicily straits. We investigate the impact of these two factors during the Last Glacial Maximum (LGM, 21 000 years ago). Indeed during that period in addition to cold climatic conditions, the sea level was decreased by 120m compared to the present one. A 1/8° resolution ocean numerical model based on the OPA model is used. The LGM forcing and properties were built from the LGM configuration of the IPSL coupled model and from MARGO SSTs. Three oceanic simulations are then performed. The control simulation (MED8-P) reproduces present climate and Mediterranean Sea conditions. In the second simulation (MED8-T) the sea level was decreased to its LGM level, while the atmospheric forcing is the present one. The third simulation (MED8-G) reproduces the oceanic LGM configuration (LGM sea-level and forcing). The main result of the MED8-T simulation is a weakening of 65% of the transport at Gibraltar due to the sea level decrease. Since in MED8-G, the East-West temperature gradient is reinforced compared to that in MED8-P, the decrease in mass transport associated with the sea level lowering is partly counteracted. The anti-estuarine circulation of the Mediterranean Sea is thus maintained. Further diagnosis as water mass formation and salinity content are conducted to describe the main characteristics of the THC during this period.