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Influence of the atlantic thermohaline circulation on neodymium isotopic composition at the last glacial maximum, a modelling sensitivity test.

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Thermohaline circulation is highly expected to play an important role in the climate system. Paleo-circulation proxies such as δ13C, Cd/Ca or even 231Pa/230Th suggest a relationship between the Meridional Overturning Circulation (MOC) strength and the rapid climate change, but they still give contradictory interpretations. Neodymium isotopic composition (Nd IC) is a quasi conservative geochemical tracer of water masses in the ocean interior that has been used as a proxy of past ocean circulation. Recent studies of Nd IC records in ferromanganese oxide components of a South Atlantic core suggest a close relation between thermohaline circulation and North Atlantic climate changes during the last deglaciation (Piotrowski et al., 2004). We have modelled the Nd IC during the Last Glacial Maximum (LGM) and the Holocene, with the Ocean Global Circulation Model NEMO, in its ORCA2 (2°) configuration, in order to test the influence of oceanic circulation on oceanic Nd IC distribution. The modelling is performed following the approach developed in Arsouze et al. (2007), where the boundary exchange is the only source/sink of the tracer in the ocean. Three different LGM oceanic circulations resulting from different forcing scenario have been tested. Results show a more radiogenic Nd IC than Holocene during LGM in the three scenarios. This difference is due to the influence of both changes in bathymetry (lowering of sea level, presence of ice sheets and its associated changes for the inputs of the tracers) and in oceanic circulation. LGM simulations partially reproduce the Holocene/LGM Nd IC gradient observed in the existing data. Some large differences in Nd IC are observed in the Atlantic basin for the three simulations

(confirming the potential of Nd as a paleo-circulation tracer), but they provide similar performances when comparing with the data in the south Atlantic ocean.

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