



Mechanisms for the glacial AMOC response: a lesson for the future?

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The simulation of the Atlantic Meridional Overturning Circulation (AMOC) is an important aspect of coupled AO-GCMs used to predict future climatic changes. The response of the AMOC has implications for the European climate. Although the past does not contain any analogues for the future, it can provide a benchmark for our understanding of mechanisms. Here we analyse the AMOC response during the Last Glacial Maximum (LGM), an extreme cold period that occurred 21000 yrs ago. Large continental ice sheets and reduced greenhouse gas concentrations shape the LGM climate. This study includes nine simulations with both GCMs and Earth system Models of Intermediate Complexity, mostly carried out within the framework of the Paleoclimate Modelling Intercomparison Project. It is examined whether the mechanism put forward in the literature for a glacial AMOC reduction in one model also plays a dominant role in other models. In four models the AMOC reduces during the LGM (by 20-40%), there is a slight reduction in one model and four models show an increase in AMOC strength (by 10-40%). It is found that a major controlling factor is the density contrast between Antarctic Bottom Water (AABW) and North Atlantic Deep Water (NADW) during the LGM as compared to the modern climate. In five out of nine models a reduced (enhanced) AMOC during the LGM is associated with relatively more (less) dense AABW at its source region. In only two models is the AMOC response directly related to the response in net evaporation, while the accuracy of the modern control state has some impact too.