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Delta 13C in the glacial Atlantic Ocean: A model-data comparison

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We compare a compilation of more than 240 sediment core delta 13C data from the glacial Atlantic Ocean with three-dimensional simulations using a marine carbon cycle model. The carbon cycle model employs circulation fields which were derived in previous glacial ocean/climate simulations. All sediment data have been thoroughly quality-controlled, focusing on epibenthic foraminiferal species (such as Cibicidoides wuellerstorfi or Planulina ariminensis) to improve the comparability of model DIC delta 13C and sediment core foram shell delta 13C. The best agreement with reconstructions is obtained for a model run which exhibits significant changes of the meridional overturning circulation in the Atlantic Ocean. In this scenario North Atlantic Deep Water (NADW) shoals to a depth above about 2 km and weakens by about 40% compared to the present day. Conversely, Antarctic Bottom Water flow intensifies and compensates for the weakened NADW transport into the South Atlantic. Moreover, the modelled abyssal ocean is very cold and very saline which is in line with other proxy data evidence.