



The long-term freshwater budget and the relation to the MOC in the North Atlantic.

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Most climate models predict a weakening of the North Atlantic meridional overturning circulation (MOC) during the twenty-first century when forced by increasing levels of greenhouse gas concentrations. However the spread is large, even under identical forcing. Individual studies suggest that multidecadal changes in the MOC are strongly related to large-scale salinity anomalies and therefore to changes in the surface freshwater fluxes and freshwater transport. Using the CMIP3 database, the general relationship between the MOC and freshwater budget of the Northern Hemisphere has been analyzed for the twentieth and twenty-first centuries. This analysis supplies a relationship between oceanic and atmospheric processes.

The global warming leads to an amplified hydrological cycle which affects the vertical salinity and temperature profiles. The meridional changes in the ocean-atmosphere interaction diminish the meridional oceanic density contrast. In the North Atlantic sinking regions, these changes are strongly related to salinity anomalies at the surface. We find in the multi-model mean a strong freshwater export from the Arctic into the northern part of the North Atlantic, stressing the importance of a realistic representation of the hydrological cycle in the models.