AMOC variability and its impacts on the global climate

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Using the GEOS-5 coupled model, we study the variability of the Atlantic meridional overturning circulation (AMOC) and its impacts on the global climate. Our approach is to utilize the idealized data assimilation technology developed at the GMAO. The technique "replay" allows us to assess, for example, the impact of the surface wind stresses and/or precipitation on the ocean in a very well controlled environment. By running the coupled model in replay mode we can in fact constrain the model using any existing reanalysis data set. We replay the model constraining (nudging) it to the MERRA reanalysis in various fields from 1948-2010. The fields u,v,T,q,p_s are adjusted towards the 6-hourly analyzed fields in atmosphere.

The simulated AMOC variability is studied with a 500-year-long segment of a replay experiments of GEOS-5 coupled model. Here, the variability is examined further by a measure to quantify how much AMOC variability has been influrenced by atmospheric forcing. The simulated impact of the AMOC on the multi-decadal variability of the SST, sea surface hight (SSH) and sea ice extent is studied. The simulated AMOC variations in the replay runs are found to be significantly anticorrelated with the Arctic sea ice extent anomalies and significantly correlated with the SST on multi-decadal time scales in the nother Atlantic sector. The AMOC collapse and its impacts on the global climate will be show in this study.