Simulated South Atlantic transports and their variability during 1958-2007: results, problems, challenges and future plans

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South Atlantic transports, as simulated by a global ocean-sea ice model forced with interannually varying air-sea reanalysis datasets, are analyzed for the period 1958–2007. The ocean-sea ice model is configured at three different resolutions: from eddy-permitting to coarsened grid spacing. A particular focus is given to the effect of eddy fluxes and inter-ocean exchanges on the South Atlantic Meridional Overturning Circulation (SAMOC), as well as on the main factors contributing to the interannual variability during the integration period. Major discrepancies are associated to both the parameterization of eddy fluxes and the coarse representation of the bathymetry. The refined grid spacing model produces higher values of both SAMOC index, defined as the maximum of the zonally-integrated northward cumulative volume transport (CVT) from surface to bottom across ~34°S, and meridional heat transport (MHT). All models show high correlations between SAMOC index and MHT, as well as a strengthening of the transports in the 1980–2007 period. The strengthening of the SAMOC index is mainly dominated by surface and mode waters in all models. In surface and intermediate layers, the regions contributing to this trend are located east of 40°W. These changes are compensated by the strengthening of the poleward transport in deeper layers, mostly in the western part of the basin. The MHT trend is connected with the combined effect of a heat transport increase through the Drake Passage and a reduction of the heat loss through the eastern section between Africa and Antarctica, mainly associated with a strengthening in heat entering into the basin through the Agulhas system.