

Agulhas Leakage and its impact on the AMOC in the CCSM4

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It has been speculated that Agulhas Leakage, and its associated injection of warm and salty Indian Ocean Waters into the South Atlantic is an important control on the strength, stability, and variability of the Atlantic Meridional Overturning Circulation (AMOC). Here we use Lagrangian techniques to study Agulhas Leakage in a state-of-the-art coupled climate model, the CCSM4. Analysis of 500 years of a pre-industrial control simulation shows that the interocean exchange is overestimated by about a factor 3, compared to observations; this can be ascribed to the poor representation of the inertial processes that control the Agulhas Retroflexion and Agulhas ring shedding in this class of climate models.

Additional analyses are performed to detect an impact of Agulhas Leakage on the variability of the AMOC. However, no such impact is found. One reason may be that the natural variability in the salinity field of the South Atlantic Ocean under Agulhas Leakage influence is too weak compared to observations. This can be traced back to biases in the salinity fields of the South Indian and Atlantic Oceans, which are too homogeneous. This is possibly in part caused by the fact that the coupling between these basins through Agulhas Leakage is too strong.