Variability of the South Atlantic ocean heat content in an eddy-resolving and a non-eddy-resolving General Circulation Model

Recent studies suggest that changes in the South Atlantic ocean heat content induced by variations in the South Atlantic Meridional Heat Transport (MHT) could play an important role in global monsoons and extreme weather events. In the conventional view, the MHT is largely modulated by deep convection activity in the high-latitude sinking regions in the North Atlantic. However, recent studies suggest the possibility of the southern origin of MHT anomalies associated with Agulhas leakage. Previous studies are mostly based on coarse resolution climate models, which do not explicitly represent mesoscale eddies in the ocean. In order to explore the impact of mesoscale eddies on heat content variability, we analyze and compare results from low- and high-resolution fully-coupled climate model simulations to determine the main drivers of the heat content variability, to quantify the impact of the northern versus southern origin of this variability and to investigate the differences/similarities in low- and high-resolution simulations. Results suggest that ocean circulation (i.e., meridional heat transport convergence) is the main driver of heat content variability in both low and high resolution models. However, the origin of the MHT convergence anomalies differs in the two models. In the eddy-resolving coupled model, MHT at the southern boundary has the main impact on heat content variability. On the contrary, MHT at the northern boundary dominates in the non-eddy resolving model. Additionally, the heat content variability in the low-resolution simulation is largely controlled by the Ekman transport, whereas the Ekman transport plays a minor role in the high-resolution simulation. Further analyses on the potential causes of the different behavior in the two models will be presented.