Session: B7 Oral presentation

Comparing the meridional heat transport at 26.5oN and its relationship with the MOC in two CMIP5 coupled models and in the RAPID-array observations

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Since variability on seasonal time scales has a significant influence on longer time scale behavior and can mask anthropogenic trends, CMIP5 climate models must be able to adequately simulate seasonal time scales in order to produce reliable predictions of climate change. The Atlantic Meridional Overturning Circulation (MOC) is associated with a large transport of heat northward and is one of the main driver of decadal oceanic variability. However the mechanisms of variability of the MOC are still not well understood because of the large model discrepancies and the lack of long-term observations. Recently, direct and continuous new estimates of the MOC and the associated Atlantic meridional heat transport (MHT) have become available through the RAPID-MOCHA observing system at 26.5^{o}N. These latest measurements highlighted the strong seasonal cycle of both the MOC and MHT. We assess the ability of two CMIP5 climate models, namely the GFDL CM2.1 and the NCAR CCSM4 coupled models, to reproduce the observed MHT at 26.5^{o}N and its relationship with the MOC. We examine the MHT both in terms of mean and annual cycle, and compare it with the observations provided by the RAPID-array. Consistent with RAPID estimates, the simulated MHT at 26.5^{o}N is dominated by the overturning component, with a much smaller contribution of the gyre circulation. We identify in both climate models systematic biases in the horizontal circulation that affect the total heat transport and partly explain why CCSM4 and CM2.1, like many CMIP5 coupled models, underestimate the Atlantic heat transport. We show that both models are able to reproduce fairly well the observed seasonal cycle of the MHT with a maximum in summer and a minimum in late winter/early spring. However the mechanisms driving this annual variability seem to be different in models and observations. Our results highlight the need to sustain the RAPID-MOCHA observing system to better characterize the variability of the MOC and the associated MHT on interannual to decadal time scales.