

# How well does the Atlantic SST dipole index represent AMOC variability on decadal to centennial timescales?

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In the absence of direct observational data, the Atlantic SST dipole index has been proposed to approximate variations in the strength of the Atlantic meridional overturning circulation (AMOC) over the duration of the instrumental temperature record (e.g. Latif et al. 2006, Keenlyside 2008). Using coupled model results from CMIP5, here we investigate whether this index provides a good proxy for the AMOC variability on decadal to centennial timescales. We find that the power spectra of AMOC variations and the Dipole SST index share common spectral peaks in many models, and the two indices typically correlate with coefficients between 0.3 and 0.7 with a few year lead. However, this correlation in the multi-model ensemble average reaches only 0.5, explaining about a quarter of the AMOC variance. Further, we find that even for the models with the highest correspondence between the AMOC and the SST dipole, the correlation between the two indices is controlled mainly by SST variations in the North Atlantic. Taking into consideration the South Atlantic SSTs does not improve this correlation, and in many cases makes it even worse. We conclude that on decadal to centennial timescales the North Atlantic SST provides a better representation of AMOC variations, with the average sensitivity of about  $0.5^{\circ}\text{C}$  per  $1\text{Sv}$  as given by the CMIP5 multi-model ensemble.