Geophysical Research Abstracts
Vol. 16, EGU2014-5600, 2014
EGU General Assembly 2014

Sea surface temperature and sub-surface density fingerprints of the AMOC in CMIP5 models

Chris Roberts (1), Freya Garry (2), and Laura Jackson (1)
(1) Hadley Centre, UK Met Office, Exeter, UK, (2) National Oceanography Centre, Southampton, UK

We use simulations from ten coupled climate models to calculate patterns of sea surface temperature (SST) and sub-surface density change associated with decadal AMOC variability. We evaluate models using observational constraints and find that models with a better representation of the AMOC at 26.5 °N also have a better simulation of vertical stratification in the North Atlantic sub-polar gyre. In the models that compare best with observations, positive AMOC anomalies are associated with reduced Labrador Sea stratification and increased mid-ocean (800-1800 m) densities in the sub-polar gyre. Maximum correlations occur when AMOC anomalies lag Labrador Sea stratification and sub-surface density anomalies by 2-6 years and 0-3 years, respectively. In all ten models, North Atlantic warming follows positive AMOC anomalies, but the patterns and magnitudes of SST change are variable. We also evaluate the utility of Atlantic mid-ocean density and Labrador Sea stratification indices for detecting changes to the AMOC in the presence of increasing CO_2 concentrations. We find that non-zero trends in mid-ocean density are identifiable (although not attributable) significantly earlier than trends in the AMOC. For this reason, sub-surface density observations could be a useful complement to transport observations made at specific latitudes that may help with the more rapid diagnosis of basin-scale changes in the AMOC. Finally, we conclude that it is not yet possible to detect a robust trend in the AMOC using mid-ocean densities or transport observations from 26.5°N.