Geophysical Research Abstracts
Vol. 21, EGU2019-9694, 2019
EGU General Assembly 2019

Temperature domination of AMOC weakening indicating non-recovery in a GCM freshwater forcing study

Rosalind Haskins (1), Kevin Oliver (1), Laura Jackson (2), Richard Wood (2), and Sybren Drijfhout (1)

(1) University of Southampton, NOCS, School of Ocean and Earth Sciences, Southampton, United Kingdom (rkh1g14@soton.ac.uk), (2) Met Office Hadley Centre, Exeter, UK

The Atlantic meridional overturning circulation (AMOC) is projected to weaken due to anthropogenic climate change, partially via ice melt freshening the North Atlantic Ocean. In order to mitigate climate change it is important to consider the reversibility of temporary forcing and understand the mechanical processes involved in environmental tipping points. We use temporary freshwater forcing in a global climate model to investigate the roles of temperature and salinity in the AMOC response. This study finds that the freshwater hosing initially directly reduces the strength of the AMOC. However, as the AMOC weakens the mixed layer depth reduces and surface properties are less effectively mixed down. A buoyant surface cap forms, reducing ocean heat loss to the atmosphere. This leads to the development of a warm anomaly beneath the surface cap, which becomes the primary driver of AMOC weakening. When the hosing is removed simulations dominated by salinity recovered, while those dominated by temperature generally did not. We use salinity and temperature budget analysis to understand the role of surface and ocean feedbacks in the recovering and non-recovering ocean states.