Geophysical Research Abstracts
Vol. 14, EGU2012-7471, 2012
EGU General Assembly 2012

Freshwater pulse experiments in a coupled climate model with bistable AMOC: testing the theory

T. Graham, L. Jackson, M. Menary, and M. Palmer
UK Met Office Hadley Centre, United Kingdom (tim.graham@metoffice.gov.uk)

A collapse of the Atlantic meridional overturning circulation (AMOC) could have severe consequences for the climate of Northern Europe and may impact the climate of the whole planet (e.g. Vellinga and Wood, 2002). Several paleoclimate studies have suggested that such events have occurred in the past and may have been responsible for large shifts in Earth's climate. Although such events have been simulated in simple box models and models of intermediate complexity most GCMs have been unable to produce these events.

Several recent papers (e.g. Rammstorf, 1999; Pardaens et al., 2003; Drijfhout et al., 2010, Hawkins et al., 2011) have suggested that the direction of freshwater transport by the AMOC at the southern boundary of the Atlantic Ocean (Fov) may be crucial to the stability of the AMOC. Observational estimates suggest that the AMOC exports freshwater from the Atlantic Ocean (Fov < 0) whereas in almost all models without flux adjustments the AMOC imports freshwater (Fov > 0).

The latest UK Met Office Hadley Centre climate model (HadGEM3) has a negative Fov as a result of reduced upper ocean salinity biases in the South Atlantic. This suggests that the AMOC may be less stable than in previous models. We will present the first results from a series of freshwater pulse experiments where freshwater is rapidly added to the North Atlantic Ocean to see whether the AMOC will collapse, and furthermore whether it will recover to its initial state.