

Exploring the stability of the AMOC in HadCM3

Laura Jackson, Hadley Centre for Climate Prediction and Research, UK Met Office

Several studies have proposed that the transport of fresh water into the Atlantic by the Atlantic Meridional Overturning Circulation (AMOC) is a good indicator of the stability of the AMOC. The argument is that the sign of this index (F_{ov}) indicates the sign of the advective feedback of fresh water, and hence whether a stable 'off' state of the AMOC can exist. We present analysis of this index from current Hadley Centre global climate models (GCMs) and show that, whilst free running GCMs indicate a negative advective feedback ($F_{ov} > 0$), flux adjusted versions of HadCM3 indicate of positive feedback ($F_{ov} < 0$), consistent with observations.

We explore the stability of HadCM3 through idealised hosing experiments and compare the role the advective feedback plays in these transient experiments to that predicted by theory. Our results show that this index does indicate the sign of the advective feedback and also has a significant impact on the stability of the AMOC, although other factors play a role.