

Slowing of the Atlantic meridional overturning circulation at 25° N

This guidance note has been prepared in response to an article by Bryden *et al* that appeared in the 1 December 2005 issue of *Nature* (see reference below) and has subsequently been reported in the media.

What is “Atlantic meridional overturning circulation”?

The Atlantic meridional overturning circulation carries warm upper waters north and returns cold deep waters south. This process is also known as North Atlantic thermohaline circulation, or sometimes (rather imprecisely) the Gulf Stream. This ocean current is partially responsible for the UK's relatively mild climate and is driven by the sinking of dense saline cold water off Labrador and Greenland.

Summary of the paper by Bryden *et al*

The results presented by Bryden *et al* have come from the NERC funded RAPID project which has been studying the Atlantic meridional overturning circulation. Measurements from ships along a transatlantic section along latitude 25° N have been used previously as a baseline for estimating the overturning circulation and associated heat transport. Bryden *et al* analyse a new 25° N transatlantic section and compare it with four previous sections taken over the past five decades (measurements taken in 1957, 1981, 1992, 1998 and 2004). Results suggest that the Atlantic meridional overturning circulation has slowed by about 30 per cent, mostly between 1992 and 1998.

While computer models suggest a weakening circulation in a warming world over the next century, they do not suggest a persistent change of this magnitude yet.

What do these findings mean?

This paper is based on five measurements only. Some points to note in relation to these findings:

- It is known that the Atlantic meridional overturning circulation is quite variable. It is not known if the observed data points are detecting the natural variability of the system or if it is a weakening trend that has been detected.
- The changes that were observed in the Atlantic meridional overturning circulation are of a magnitude that it would be expected to see cooling in the British Isles of 1°C and Scandinavia by 2°C. This cooling has not been seen in the Central England Temperature record.

These findings raise more questions than they provide answers. The RAPID project is continuing to monitor the Atlantic meridional overturning circulation until 2008 so we can better understand these findings. Other research on this subject is also being undertaken.

These results do not in themselves change the overall projection of how the Gulf Stream might change. Climate models continue to predict a weakening over the 21st Century and no comprehensive climate model predicts a shutdown. It is still thought that it is unlikely that there will be a shutdown over the next 100 years, although research continues to determine how “unlikely” this scenario is.

The issues highlighted by this paper do not provide a reason to avoid or delay taking action to adapt to the impacts of climate change. They instead emphasise why it is important to implement flexible adaptive options and seek no-regret and low-regret responses.

Reference:

Harry L. Bryden, Hannah R. Longworth and Stuart A. Cunningham, Slowing of the Atlantic meridional overturning circulation at 25° N, *Nature*, **438**, 655-657. 2005