

Results from the RAPID array

Gerard McCarthy, David Smeed, Darren Rayner, Eleanor Frajka-Williams, Aurélie Duchez, Bill Johns, Molly Baringer, Chris Meinen, Adam Blaker, Stuart Cunningham and Harry Bryden

The RAPID/MOCHA/WBTS mooring array at 26°N in the Atlantic has been delivering twice daily estimates of the strength of the AMOC since 2004. A unique array, the observations have revolutionised our understanding of the variability of the AMOC on sub-annual, seasonal and, most recently, interannual timescales. An update to the AMOC timeseries has recently been produced. As well as extending the data, the timeseries to October 2012 contains several improvements to the calculation.

A dramatic low in the AMOC was observed in winter 2009/10, where the AMOC declined by 30%. This has been shown to have resulted in a sustained reduction in heat content of the North Atlantic. The 2009/10 dip in AMOC strength was followed by a second dramatic low in 2010/11. Historical analogues of double minima in successive winters have been identified in NEMO runs where they are associated with extreme negative values of the Arctic oscillation and have been linked with ocean re-emergence. Interestingly, there is also a link with surface air temperatures and, consequently, European wintertime conditions.

The latest update of the AMOC timeseries to October 2012 shows a continuing trend in the circulation at 26°N switching from an overturning to a gyre circulation. This leads to weakened southward transport of lower North Atlantic Deep Water, the strength of which from 2004-2012 is weaker than in historical measurements. The IPCC report in 2007 reported that the AMOC was 'very likely' to weaken in the 21st century. Maintaining the sustained observations of the RAPID array is key to observing this climate metric.