NATURAL ENVIRONMENT RESEARCH COUNCIL

Rapid Climate Change

University of Reading

RAPID PEER-REVIEWED PUBLICATION

TITLE: Tropical and extratropical responses of the North Atlantic atmospheric circulation to a sustained weakening of the MOC

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NON-TECHNICAL SUMMARY OF WORK*:

The HadCM3 climate model is used to investigate changes in Atlantic winter-time jet streams and storminess under an artificial shutdown of the Atlantic Meridional Overturning Circulation (AMOC).

- Compared to the control climate model simulation there is an increase in the storm activity over the North Atlantic. Storm activity penetrates farther eastwards into the European continent, notably over northern Scandinavia.
- These simulations suggest that the increase in storm activity may be due to an increase in the number of storms rather than an increase in the intensity of each individual storm. Strengthened westerly flow from the Atlantic brings cooler, drier air over continental Europe. Changes in the tropical Atlantic lead to an enhanced subtropical jet over the Mediterranean and eastwards towards India

The main physical driver of the changes in the storm track is the increased north-south surface temperature gradient (associated with the cooling in the North Atlantic as a result of the reduced heat transport when the AMOC collapses) leading to conditions more favourable for storm development.
While the strength of westerly winds increases on average, there is no evidence of a change in the distribution of the North Atlantic Oscillation (NAO) index, which is used to measure the year-to-year variability of the westerlies. However the geographical influence of the NAO extends east. This has some implications for interpreting real-world historical climate records from times before instrumental observations began: these records may have been influenced by a changed NAO pattern in periods of weakened AMOC.