

Decadal variability and predictability of the North Atlantic Oscillation

*Rosemary Eade^{1,2}, David Stephenson², Doug Smith¹, Adam Scaife^{1,2}, Leon Hermanson¹, Nick Dunstone¹

1. Met Office Hadley Centre, 2. University of Exeter

The winter of 1962/63 was the coldest in the UK in over a century while the mildest winter occurred in 1988/89. For countries to be resilient against the impacts of large weather variations in the future, it is important to assess the likelihood of seeing such extreme fluctuations and understand the physical drivers. In Europe and North America, these fluctuations are related to a combination of year-to-year variability and low-frequency variability of the North Atlantic Oscillation (NAO). The NAO is now a significant source of predictability for seasonal forecasts in these regions, however the signal-to-noise ratio of the ensemble mean to total variability in these ensemble predictions has been shown to be anomalously small, which means the real world is more predictable than our climate models suggest. Here we provide a new evaluation of the ability of climate models to simulate and predict longer-term variability and extreme trends in the NAO. For this we use statistical analyses of the observations and climate model simulations, and assess predictability with a large multi-model ensemble of decadal predictions. We also investigate the drivers of NAO variability and trends using new results from the CMIP6 Decadal Climate Prediction Project and the Polar Amplification MIP.

Keywords: Decadal variability, North Atlantic Oscillation, Polar Amplification, Trend analysis