C20C - Climate of the 20th Century: The summer North Atlantic Oscillation

<u>Christopher Folland</u>[†]; J Knight; H Linderholm; D Fereday; S Ineson; J Hurrell [†] Met Office, United Kingdom Leading author: <u>Chris.Folland@metoffice.gov.uk</u>

Summer climate in the North Atlantic-European sector possesses a principal pattern of year-to-year variability that parallels the well-known North Atlantic Oscillation in winter. This summer North Atlantic Oscillation (SNAO) is defined here as the first empirical orthogonal function (EOF) of observed summertime extratropical North Atlantic pressure at mean sea level. It is shown to be characterized by a more northerly location and smaller spatial scale than its winter counterpart. The SNAO is also detected by cluster analysis and has a near-equivalent barotropic structure. Although of lesser amplitude than its wintertime counterpart, the SNAO exerts a strong influence on northern European rainfall, temperature, and cloudiness through changes in the position of the North Atlantic storm track. The SNAO is also quite strongly correlated with Sahel rainfall, cloudiness and temperature; we explore the rainfall link using CLIVAR Climate of the Twentieth Century (C20C) model integrations and observations. On interdecadal time scales, C20C model, coupled model and observational results indicate that SNAO variations are modulated by the Atlantic multidecadal oscillation. SNAO variations extend far back in time, as evidenced by reconstructions of SNAO variations back to 1706 using treering records. Central England temperature is used to validate this reconstruction. Finally, two Hadley Centre coupled climate models are shown to simulate the present-day SNAO quite well. They predict a trend toward a more positive index phase under increasing greenhouse gas concentrations. This suggests a long-term likelihood of increased summer drought in northwest Europe.