## Changes of interannual NAO variability in response to greenhouse gases forcing

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Observations show that there was change in interannual North Atlantic Oscillation (NAO) variability in later 1970s. This change was characterized by an eastward shift of the NAO action centres, a poleward shift of zonal wind anomalies and a downstream extension of climate anomalies associated with the NAO. The NAO interannual variability for the period after the 1970s has an annular mode structure and that penetrates deeply into the lower stratosphere, indicating a strengthened relationship between the NAO and the Arctic Oscillation (AO). In this study we have investigated possible causes of these changes in the NAO by carrying out experiments with an atmospheric GCM. The model is forced either by doubling CO2, or increasing sea surface temperatures (SST), or both. Results indicate that SST and CO2 change both force an eastward shift in the pattern of interannual NAO variability and the associated poleward shift of zonal wind anomalies, similar to that seen in observations. The effect of SST change can be understood in terms of mean changes in the troposphere, especially Eady growth rate. The effect of CO2 change, however, can not be understood in terms of mean changes in the troposphere. However, the significant response in the stratosphere is characterized by strengthened climatological polar vortex and enhanced interannual variability. These results could suggest an important role for the stratosphere in explaining the recent eastward shift in the pattern of interannual NAO variability and its related climate anomalies. They also imply that enhanced and eastward extended mid-latitude westerlies in the troposphere might not be a necessary condition for the poleward and eastward shift of the NAO action centres in the mid-1970s.