



Changes of Interannual NAO Variability in Response to Greenhouse Gases Forcing

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Observations show that the centres of action of interannual variability of the North Atlantic Oscillation (NAO) shifted eastward in the mid-1970s. In this study, the impact of increasing concentrations of atmospheric greenhouse gases on the interannual NAO variability has been investigated using an atmospheric GCM, forced by either doubling CO₂, or increasing SST, or both. In the case of SST forcing the SST anomaly is derived from a coupled model simulation forced by increasing CO₂. Numerical experiments demonstrate that the mean tropospheric response shows some resemblance to the NAO and the centres of action of interannual NAO variability are shifted toward the east in response to changes in both SST and CO₂. Further sensitivity experiments have shown that the mean NAO-like pattern is predominantly the response to the change in SST while both SST and CO₂ changes make a contribution to the eastward shift of interannual NAO variability centres. The large warming in the upper troposphere in the tropics in response to SST change increases the baroclinicity and Eady growth rate. Corresponding to this is a poleward shift of both the zonal jet and the downstream extension of the Atlantic stormtrack. The eastward shift of interannual NAO variability centres in response to direct CO₂ change is associated with the enhancement of the stratospheric polar vortex and this implies the role of stratosphere-troposphere interaction in the change of interannual NAO variability.