



Changes in the Arctic Oscillation under increased atmospheric greenhouse gases

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The Arctic Oscillation (AO) under increased atmospheric concentration of greenhouse gases (GHG) was studied by comparing an ensemble of simulations from 13 coupled general circulation models (from the IPCC Fourth Assessment Report) with GHG at the pre-industrial level and with GHG and aerosols at the late 20th century level. For the winter months (November to March), a quadratic polynomial fit of the gridded sea level pressure (SLP) anomalies to the AO index yielded a linear AO pattern and a quadratic AO pattern (i.e. a pattern which varies as the square of the AO index). The quadratic AO pattern averaged over the 13 models agrees with that found from the observed SLP data (1950-2005). The change in the linear AO pattern as GHG increased reveals positive SLP anomalies centred over the Gulf of Alaska, and weaker negative SLP anomalies over eastern Canada and North Atlantic – a pattern resembling the quadratic AO pattern. How the quadratic pattern introduced a change in the linear pattern when there was a change in the mean climate from increased GHG is explained. The quadratic AO pattern itself has positive SLP anomalies receding from Europe but strengthening over the Gulf of Alaska and surrounding areas as GHG increased.