



Climate impacts of the Southern Annular Mode simulated by the IPCC AR4 models

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The Southern Annular Mode (SAM) has a well established impact on climate in the Southern Hemisphere. The strongest response in surface air temperature is observed in the Antarctic, however the influenced area extends well beyond the Antarctic with statistically significant effects on temperature and precipitation being detected as far north as 20S. Changes in both stratospheric ozone and greenhouse gases can drive changes in the SAM and so exert changes in the SH climate. It is therefore important to ensure that models used in climate change studies adequately reproduce the link between the SAM and climate variables. Here we report on how this link is reproduced in the IPCC AR4 coupled climate models. We demonstrate that models are able to simulate spatial patterns of responses in temperature and precipitation reasonably well although model skills as measured by root mean square difference with ERA-40 reanalyses vary from model to model. There is some correlation between model skills in simulating responses in temperature and precipitation, with models good in temperature being also good in precipitation. All models underestimate the surface temperature response to the SAM, as measured by spatial standard deviation. Beyond surface air temperature and precipitation we report on modelled responses in sea surface temperature and sea ice. The SAM-induced trend in these variables as simulated by models is discussed.