



Robust and non-robust atmospheric responses to global warming

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The robustness of the atmospheric response to global warming is investigated by performing a set of control and global warming experiments using atmospheric general circulation models (AGCMs). The global warming climate is simulated by prescribing the AGCMs with a SST perturbation that is independent of the model or model settings. We have investigated the robustness of the response as horizontal resolution, the strength of the (parameterised) gravity waves are varied, and when the dynamical core (bgrid versus finite volume) or the AGCM (GFDL's AM2 versus the CCCma model) is changed. We focus on NH winter.

The NH zonal wind response in all experiments is characterized by an upward shift and strengthening of the subtropical jet. The extratropical zonal wind response is very non-robust. It is also in this region that the zonal wind in the control run varies non-linearly as horizontal resolution or the strength of the gravity waves is varied. Some other meteorological fields also show that non-linear behaviour in the control run is a warning sign for non-robustness in the response to global warming.

The SH zonal wind response varies from experiment to experiment. However, the part of the response that does not project on the Southern Annular Mode (SAM) is robust, as opposed to the part of the response that does project on the SAM.