Geophysical Research Abstracts
Vol. 17, EGU2015-7917, 2015
EGU General Assembly 2015

The Northern Hemisphere winter stationary wave response to global warming in CMIP5

Isla Simpson, Richard Seager, Mingfang Ting, and Tiffany Shaw
Lamont-Doherty Earth Observatory, Columbia University, United States (isla@ldeo.columbia.edu)

During the Northern Hemisphere winter, models tend to predict a poleward shifting of the zonal mean mid-latitude westerlies under anthropogenic greenhouse gas emissions. Locally, however, changes in the stationary waves tend to dominate, resulting in considerable deviation from this around the longitude circle, with important implications for regional climate change.

Past studies have demonstrated diversity in the stationary wave response to global warming and differ in their views of the mechanisms involved in producing it. Here we will explore the stationary wave response to global warming in the CMIP5 dataset and demonstrate a strong consensus on a wavenumber 5 stationary wave response with a particular phasing that contributes to hydroclimate change across North America and Europe, such as wetting on the west coast of the USA, drying in the south west USA and drying in the eastern Mediterranean.

The mechanisms responsible for producing this multi-model mean response are explored using a stationary wave model. It is demonstrated that, to first order, it is produced by changes in the zonal mean basic state, in agreement with the majority of previous stationary wave modelling studies. The relative importance of different features of this basic state change such as Arctic amplification, enhanced tropical upper tropospheric warming, stratospheric cooling and their associated zonal mean zonal wind responses will be explored. Through an understanding of the mechanisms involved in this stationary wave response we can begin to assess our confidence in whether the real world will behave as the models do and understand any diversity among the modelled responses.