



Comparison of land-surface humidity between observations and CMIP5 models

Robert Dunn, Kate Willett, Andrew Ciavarella, Peter Stott, and Gareth Jones
Met Office, Hadley Centre, Exeter, United Kingdom (robert.dunn@metoffice.gov.uk)

We compare the latest observational land-surface humidity dataset, HadISDH, with the CMIP5 model archive spatially and temporally over the period 1973-2015. None of the CMIP5 models or experiments capture the observed temporal behaviour of the globally averaged relative or specific humidity over the entire study period. When using an atmosphere-only model, driven by observed sea-surface temperatures and radiative forcing changes, the behaviour of regional average temperature and specific humidity are better captured, but there is little improvement in the relative humidity.

Comparing the observed and historical model climatologies show that the models are generally cooler everywhere, are drier and less saturated in the tropics and extra tropics, and have comparable moisture levels but are more saturated in the high latitudes. The spatial pattern of linear trends are relatively similar between the models and HadISDH for temperature and specific humidity, but there are large differences for relative humidity, with less moistening shown in the models over the Tropics, and very little at high altitudes.

The observed temporal behaviour appears to be a robust climate feature rather than observational error. It has been previously documented and is theoretically consistent with faster warming rates over land compared to oceans. Thus, the poor replication in the models, especially in the atmosphere only model, leads to questions over future projections of impacts related to changes in surface relative humidity.