

Issues in Validating Model Simulated Land Temperature and Precipitation Trends

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Abstract

Recent 50-yr trends of surface temperature and precipitation in the landmasses surrounding the North Atlantic ocean (North America, Greenland, Europe and North Africa) have been strongly influenced by the warming trend of the tropical oceans. The fully coupled IPCC/AR4 models with prescribed radiative forcing changes generally fail to capture the spatial patterns of these trends. On the other hand, even uncoupled atmospheric models without the prescribed radiative forcing changes, but with the observed SST changes specified only in the tropics, are more successful in this regard. The tropical SST warming pattern in the coupled simulations compares poorly with the observed pattern, and the discrepancy can be largely attributed to model error rather than climate noise. This tropical modeling error needs to be reduced to increase confidence in regional climate change projections, in at least these “Atlantic Rim” regions.

It is important to ascertain the degree to which the above conclusion, with critical implications for society and climate policy, also applies to climate change projections in other regions of the globe. Doing so, however, requires better observational datasets than currently available to unambiguously establish even the sign of the recent 50-yr trends in many regions. The problem is especially acute for precipitation trends. Coordinated data rescue and reanalysis efforts that make use of all available observational information to generate credible trend estimates would appear to be an obvious first step for climate model validation in such regions.