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Land/sea warming ratio in response to climate change: IPCC AR4 model results and comparison with observations

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Climate model simulations consistently show that in response to greenhouse gas forcing surface temperatures over land increase more rapidly than over sea. The enhanced warming over land is not simply a transient effect, since it is also present in equilibrium conditions. We examine 20 models from the IPCC AR4 database. The global land/sea warming ratio varies in the range 1.36-1.84, independent of global mean temperature change. In the presence of increasing radiative forcing, the warming ratio for a single model is fairly constant in time, implying that the land/sea temperature difference increases with time. The warming ratio varies with latitude, with a minimum in equatorial latitudes, and maxima in the subtropics. A simple explanation for these findings is provided, and comparisons are made with observations. For the low-latitude (40oS-40oN) mean, the models suggest a warming ratio of 1.51 +/- 0.13, while recent observations suggest a ratio of 1.54 +/- 0.09.