Systematic winter SST biases in the northern Arabian Sea in HiGEM and the CMIP3 models

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Analysis of 20th century simulations of the High resolution Global Environment Model (HiGEM) and the Third Coupled Model Intercomparison Project (CMIP3) models shows that most have a cold sea-surface temperature (SST) bias in the northern Arabian Sea during boreal winter. The association between Arabian Sea SST and the South Asian monsoon has been widely studied in observations and models, with winter cold biases known to be detrimental to rainfall simulation during the subsequent monsoon in coupled general circulation models (GCMs). However, the causes of these SST biases are not well understood. Indeed this is one of the first papers to address causes of the cold biases. The models show anomalously strong north-easterly winter monsoon winds and cold air temperatures in north-west India, Pakistan and beyond. This leads to the anomalous advection of cold, dry air over the Arabian Sea. The cold land region is also associated with an anomalously strong meridional surface temperature gradient during winter, contributing to the enhanced low-level convergence and excessive precipitation over the western equatorial Indian Ocean seen in many models.