The relationship between Caribbean precipitation, sea surface temperature, and largescale vertical motion in IPCC AR4 models

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A regime sorting analysis is used to identify Caribbean precipitation, sea surface temperature and large-scale vertical circulation relationships and biases within coupled (CMIP3) and uncoupled (AMIP) Intergovernmental Panel on Climate Change 4th Assessment Report (IPCC AR4) general circulation models. The regime sorting results are also analyzed with respect to the type of convective parameterization used. This analysis shows that an oversensitivity of precipitation to both SST and vertical circulation (as represented by ω at 500hPa) is inherent in the atmospheric models with models using a spectral type convective parameterization causes uncoupled models to overestimate Caribbean mean precipitation. In coupled models, however, errors in the frequency of occurrence of SSTs (the distribution is cold biased) and deep convective vertical circulations (reduced frequency) lead to an underestimation of Caribbean mean precipitation.