Systematic biases of ACCESS-GC models in simulating and predicting tropical climate

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This study aims to assess the systematic biases presented in ACCESS-S and GC models. Assessments are performed based on 27-year AMIP experiments of UM GA6 and GA7 and 100-year free coupled model simulations of GC2 and GC3 with two different resolutions (N96 and N216). The results show similar systematic biases of both GC2 and GC3 in simulating the tropical climate. In particular, the simulated tropical east-west Walker Cell is weaker than the observed, in consistent with a dry bias around the Maritime Continent and wet biases in the Indian Ocean and western Pacific. This bias can be largely traced back to the model errors in the GA6 and GA7. Besides, the simulated influences of ENSO and IOD events on the Maritime Continent region and Australia are too weak in both the AMIP and free coupled model runs. In general, it is found that the high-resolution (N216) models perform better than the coarse resolution (N96) models do.

Seasonal-to-multi-year prediction skill is assessed using two ensemble hindcast experiments (ACCESS-S1 and DePreSys3) with the N216 resolution GC2 model. Both the hindcasts show a similar climate drift in the tropics due to the systematic bias of the GC2 model. While the atmospheric climate shift occurs immediately within the first days, the ocean takes a much longer time (about one year) before drifting to the model's intrinsic bias. Cooler-than-the-observed SST develops in the eastern equatorial Pacific within the first 12 months before it shows an intrinsic warm bias. A severe positive IOD type of bias is seen in the Indian Ocean, particularly during June-December. By removing the model drifts, ENSO can be skilfully predicted up to five seasons ahead. However, ENSO's impacts on the Australian precipitation are not well predicted. Detailed assessments of the model performance and prediction will be presented at the conference.