



## **The tropical biases in IPCC AR4 climate models**

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The tropical climate and variability play a key role in global weather predictions, climate predictions and climate change projections. However, they are not well simulated by the state-of-the-art general circulation models (GCMs), and the problems are generally referred to as the “tropical biases”. The most prominent tropical biases are the double-ITCZ (Intertropical Convergence Zone) problem, the El Nino/Southern Oscillation (ENSO) problem, and the Madden-Julian Oscillation (MJO) problem.

These tropical biases have been persisting in the last several generations of GCMs.

The major difficulties for understanding and alleviating these biases are twofold:

- (1) They all involve some forms of feedback, such as the ocean-atmosphere feedback and the wave-heating feedback, making it difficult to determine the real cause of the bias; and
- (2) The biases need to be traced back to specific model characteristics, such as certain aspect of the physical parameterizations, in order to provide useful guidance on how to improve the model simulations.

We will present the results on the tropical biases in IPCC AR4 climate models, including double-ITCZ, ENSO, MJO and convectively coupled equatorial waves. The multi-model intercomparison is combined with feedback analysis to understand the physical reasons of the tropical biases and find systematic dependence of the biases on specific model characteristics.