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New Diagnostics to Assess Model Performance

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The comparison of model performance between the tropics and the mid-latitudes is particularly problematic for observables like temperature and humidity: in the tropics, these observables have little variation and so may give an apparent impression that model predictions are often close to observations; on the contrary, they vary widely in mid-latitudes and so the discrepancy between model predictions and observations might be unnecessarily over-emphasized. We have developed a suite of mathematically rigorous diagnostics that measures normalized errors accounting for the observed and modeled variability of the observables themselves.

Another issue in evaluating model performance is the relative importance of getting the variance of an observable right versus getting the modeled variation to be in phase with the observed. The correlation-similarity diagram was designed to analyse the pattern error of a model by breaking it down into contributions from amplitude and phase errors.

A final and important question pertains to the generalization of scalar diagnostics to analyse vector observables like wind. In particular, measures of variance and correlation must be properly derived to avoid the mistake of ignoring the covariance between north-south and east-west winds (hence wrongly assuming that the north-south and east-west directions form a privileged vector basis for error analysis). There is also a need to quantify systematic preferences in the direction of vector wind errors, which we make possible by means of an error anisotropy diagram.

Although the suite of diagnostics is mentioned with reference to model verification here, it is generally applicable to quantify differences between two datasets (e.g. from two observation platforms).

Reference publication:
Koh, T. Y. et al. (2012), J. Geophys. Res., 117, D13109, doi:10.1029/2011JD017103.
also available at http://www.ntu.edu.sg/home/kohty