Model intercomparison leads to GISS GCM improvement

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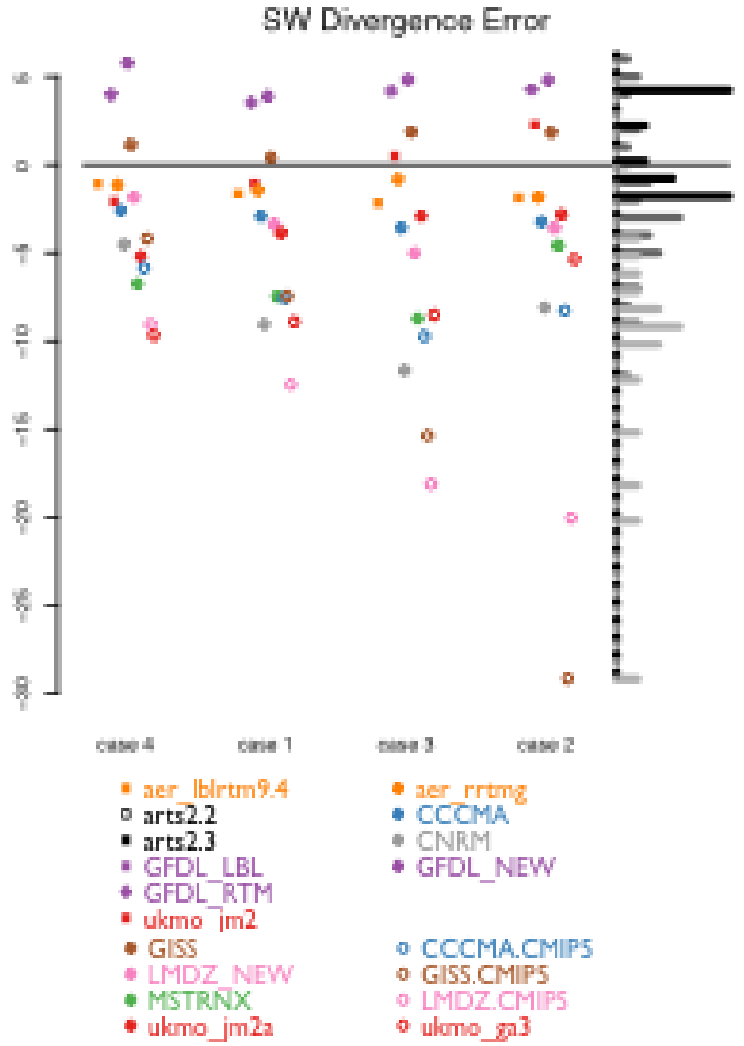
A sizable collection of global climate modeling centers participated in an intercomparison of radiative transfer flux calculations and forcings from quadrupling of CO_2. Four aerosol- and cloud-free atmospheric profiles were considered and comparisons were made relative to a line-by-line radiative transfer model.

- Radiation parameterizations used in GCMs were found to be more accurate than their predecessors.
- Of greatest concern to the GISS GCM team were longwave (LW) absorption errors up to 10 W m^{-2} and shortwave (SW) absorption errors nearly reaching 30 W m^{-2} for the moistest atmosphere for the GISS CMIP5 code; SW errors shown as open dark red circles here.
- Post-CMIP5 fixes had already reduced LW errors to less than 2 W m^{-2}. The intercomparison led to modifications to SW spectroscopy that reduced SW errors to less than 2 W m^{-2}, shown as filled dark red circles
- The effect of these errors on global climate are minor.



Errors in shortwave atmospheric absorption forcing for four present-day cases in order of increasing water vapor column. Errors are relative to line-by-line computations from LBLRTM code.

Reference:

R. Pincus, E. Mlawer, L. Oreopoulos, A. Ackerman, ... M. Kelley, et al.: Radiative flux and forcing parameterization error in aerosol-free clear skies. *Geophys. Res. Lett.*, provisionally accepted.