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Benchmarking climate model top-of-atmosphere radiance in the 9.6 micron ozone band compared to TES and IASI observations

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The TOA (top of atmosphere) flux for the 9.6 micron ozone band is a fundamental quantity which is predicted by IPCC chemistry-climate models but has never been tested directly against satellite measurements. Errors in this quantity propagate to errors in sensitivity of TOA flux to the vertical distribution of ozone, or Instantaneous Radiative Kernel (IRK) and consequently affect the uncertainty in the estimate of ozone radiative forcing from pre-industrial to present day.

We compute the ozone band flux and the IRK, from Aura-TES and MetOP-IASI spectral radiance measurements. The IRKs from TES and IASI explicitly account for more dominant radiative processes such as clouds and water vapor, due to the spectrally resolved absorption features, and allow attribution of changes in ozone RF to vertical changes in ozone and ozone precursor emissions. The continuation of the TES record of infrared ozone spectra with long-term IASI data will allow accurate predictions of future ozone forcing and an assessment of the feedback from changes in the hydrological cycle on ozone RF. Here we present initial comparisons of satellite observed TOA ozone band fluxes and IRKs with RRTMG (Rapid Radiative Transfer Model-GCM applications) in the NCAR CAM-chem chemistry/climate model and with the GISS radiative transfer model.