Using Deep Convective Clouds to Characterize Relative Radiometric Bias in Shortwave Spectrometers
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Poster
Deep Convective Clouds (DCC) have been successfully used to characterize radiometric biases across detector arrays in satellite-based spectral radiometers such as MODIS or GOES-ABI. DCCs are useful as homogeneous standard scenes in visible and near infrared wavelengths, and are particularly effective at identifying relative radiometric biases between different detectors on the same instrument. DCC reflectance is very high, and spatially homogenous across order 10 km scales. The clouds' high altitude means that the reflecting layer is above spatially heterogeneous absorbers and scatterers in the troposphere such as water vapor and aerosols.
The standard technique utilized by MODIS and other similar sensors is to use observations in the thermal infrared to identify DCCs, which are the coldest Earth view scenes in tropical regions.

Shortwave spectrometers used for greenhouse gas retrieval most commonly measure at short wave infrared wavelengths, and thus lack equivalent measurements in the thermal infrared to identify DCCs. However, we show through comparison to co-located OCO-2 and Aqua MODIS data, that a non-scattering Differential Optical Absorption Spectroscopy (DOAS) retrieval can be used to identify DCC scenes directly from shortwave spectrometer data. For OCO-2, DOAS retrievals from the weak CO2 band at 1.6 μm show the best correlation with MODIS thermal infrared brightness temperatures for DCCs. The technique is then applied to the full data records of both OCO-2 and OCO-3 to evaluate each sensor's relative radiometric bias across the eight spatial footprints.
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