Using GEOS-5 Aerosols to Inform the OCO-2 CO_2 Retrieval

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The primary goal of Orbiting Carbon Observatory 2 (OCO-2) is to use hyperspectral measurements of reflected near-infrared sunlight to retrieve column mean carbon dioxide (CO_2) with the accuracy and precision needed to improve our estimates regional carbon fluxes. These accuracy requirements can only be met, however, if the light path modification effects of clouds and aerosols are taken into account. The current OCO-2 aerosol parameterization is simplistic and the corresponding retrieved aerosol information compares poorly to AERONET. In this work, we create a more complex aerosol parameterization to better inform the CO_2 retrieval algorithm. Specifically, we evaluate the impact of 3D aerosol fields from the Goddard Earth Observing System Model, Version 5 (GEOS-5) on the retrieved column mean CO_2 from OCO-2. By fitting a Gaussian profile to the GEOS-5 aerosol profiles and ingesting them with low uncertainty into retrieval algorithm we hope to better constrain the retrieval and reduce errors in X_{CO2}. Here, we present results of a comparison between the retrieved X_{CO2} measurements and Total Carbon Column Observing Network (TCCON). Future studies include modifying the OCO-2 retrieval algorithm to be able to ingest full GEOS-5 vertical profiles of aerosol as well as addressing the bias by incorporating a stratospheric aerosol component from temporally and spatially averaged Cloud-Aerosol Lidar and Infrared Pathfinder Satellite Observations (CALIPSO) measurements.

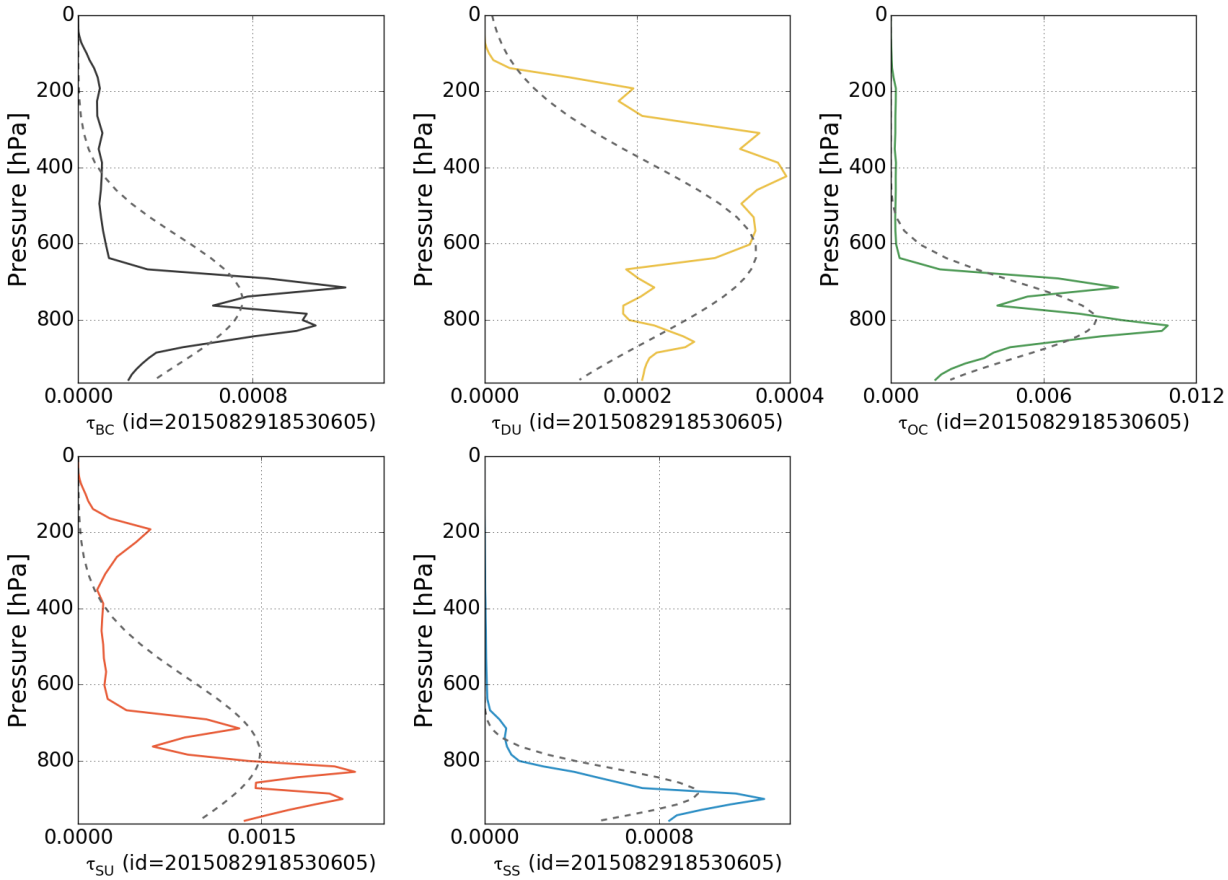

Figure 1. Example of fitting Gaussians to the GEOS-5 aerosol profiles in order to ingest them into the OCO-2 retrieval algorithm.