

Quantification and Evaluation of Long-term Tropospheric TROPESS Ozone Trends using CrIS, AIRS, and OMI Satellite Products and MOMO-Chem Reanalysis Products

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Abstract

We present an analysis of long-term tropospheric ozone profile and column products retrieved from observations made by multiple satellite instruments by the Tropospheric Ozone and its Precursors from Earth System Sounding (TROPESS) project which is a NASA effort that provides retrievals of atmospheric ozone utilizing radiances from a variety of different satellite instruments. The multispectral retrievals of ozone utilize the Multi-Spectra, Multi-Species, Multi-Sensors Retrievals of Trace Gases (MUSES) retrieval framework to produce consistent estimations of ozone from different satellite radiances. TROPESS ozone data products are retrieved from the Atmospheric Infrared Sounder (AIRS) from 2002 to present, the Ozone Monitoring Instrument (OMI) from 2005 to present, the Cross-track Infrared Sounder (CrIS) instruments from 2016 to present, and combinations of AIRS and OMI from 2005 to present. The satellite ozone products have been validated against global ozonesonde data, as a part of the Tropospheric Ozone Assessment Report II (TOAR-II) working group activity. Satellite-sonde bias is quantified both globally and regionally, dating from 2002 to the present. We present results for tropospheric profiles of ozone, tropospheric ozone columns, and total ozone columns. Satellite ozone tends to be biased high compared to sonde measurements, and the bias has remained steady with time. We show ongoing work wherein the averaging kernels for each TROPESS product are applied to the ozone reanalysis from the JPL MOMO-Chem chemical reanalysis framework to investigate the impact of satellite vertical sensitivity and spatial sampling on ozone distribution. Long-term trends in tropospheric ozone are compared between the satellite products and chemical reanalysis products, which will be used to explore the causes of differences between each product and the drivers of long-term changes in tropospheric ozone.

Early Career Scientist

YES, I am an early career scientist.

IGAC Activities

TOAR: Tropospheric Ozone Assessment Report