Stability and Soft Calibration of the Version 8 Total Ozone and Ozone Profile Algorithms Applied to Ozone Mapping and Profiler Suite (OMPS) Measurements to Continue Ozone Climate Data Records

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NOAA, through the Joint Polar Satellite System (JPSS) program, is advancing its polar-orbiting satellite suite with new instruments for weather forecast and climate monitoring. The first satellite, the Suomi National Polar-orbiting Partnership satellite (S-NPP), was launched on October 28, 2011 in partnership with NASA. The second one, NOAA-20, was launched on November 10, 2017. See https://www.polar.gov/instruments.html for information on the payload complement of other instruments. The Ozone Mapping and Profiler Suite (OMPS) onboard the S-NPP satellite (and future JPSS satellites) is the next generation of US operational spaceborne UV and ozone monitoring instruments.

The suite consists of two telescopes focusing three detectors measuring solar radiation scattered by the Earth’s atmosphere and solar irradiance by using diffusers. The OMPS consists of three spectrometers; two nadir viewing and one limb viewing, however only the products from the nadir instruments will be discussed here. The OMPS NM (total column ozone sensors) uses a single grating with a difference in etch to filter out 0.25-nm bands. The OMPS NP (nadir profiler sensor) uses a double monochromator and a CCD array detector to make measurements over a 0.42-nm range from 300 nm to 380 nm with 1.0-nm resolution. It has a 1¹° cross-track FOV and 0.27° along-track slit width. The OMPS V8 does not have a Limb Profiler.

The first five years of OMPS NM and NP Sensor Data Records have been reprocessed with the latest calibration coefficients and corrections for dark current, stray light and nonlinearity. The V8 total ozone and V8 ozone profile algorithms have been applied with adjustments to the absolute calibration to make create new components of the long-term ozone records. The figure above shows comparisons of the OMPS V8 Pro ozone profile total to the Dobson station record at Boulder CO. The figure shows that the profiles agree with NOAA-19 SBUV/2 and the estimate of optical path degradation explain the additional differences with the dark blue line connecting the reprocessed OMPS V8 Pro results. They show the effects of poor updates to the dark current producing an initial drift and then improvements as these move to weekly updates and a new stray light correction is introduced. The OMPS worked with the reprocessed OMPS V8 Pro products for all FOVs.

OMPS Nadir Mapper has a small degradation of dark current which can be estimated for the next generation of solar measurements. After soft calibration adjustments to agree with NOAA-19 SBUV/2, it records a consistent mean of the long-term ozone record.

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References


