INTRODUCTION

- The limb scatter technique combines relatively high spectral resolution (0.3-3 km) and a near global coverage of the sunlit hemisphere.
- The main goal of the mission is to produce accurate long-term measurements for total column ozone and ozone concentration vertical distribution over the whole Earth atmosphere.
- The OMPS LP sensor is a triple-slit prismatic spectrometer that simultaneously image the whole vertical extent of the Earth’s limb over the wavelength region of 290-1000 nm. One slit is located just above the sunlit ground track, and the other two are 4.25 deg on each side. 256 km in space and full global coverage is obtained in 4 days. See Figure 1.
- For the ozone profile retrieval, the measurement vector is made of altitude normalized wavelength pairs and triplets, following the technique described by Flittner et al. (2000). Retrailments using radiance data from both the ultraviolet (UV) and visible (VIS) wavelength are performed separately. The final product is 3 separate profiles. Visible profile (550-575 nm), UV profile (260-600 nm), and combined profile 0-600 nm, merged at 25.8 km. Version 2 data was released on August 2018. Main changes are:
  - Implement static tangent height adjustment (500 m), to a total 170 km, plus intra-orbit TH adjustment.
  - Implement intra-slit and seasonal wavelength scale adjustment.
  - Improved multiple gazup/aperter merging
  - Use of GMAO products for ancillary data instead of NCEP
  - Use of 15° tangent instrument for S-NP
  - Turn off explicit aerosol correction in ozone retrieval
  - Revised retrieval normalization altitude and wavelength selection
  - Report ozone products for all three slits, but recommend corner slit for use.
  - Ozone profile retrieved in number density and altitude, also available in mixing ratio vs. pressure.

(A) NeMIPAS and OMPS measurement overlapped on March/April 2012 only.
(B) NeMIPAS and OMPS measurement overlapped on March/April 2012 only.

Figure 1A: Plot of typical daily ground track of OMPS LP for three slits. (B) is for OMPS-LCC images. Each image is collected twice: long and short integration. Uploaded sample table control downloaded pixels.

RESULTS

- Known Issues
  - Error in alignment of S-NP star tracker and OMPS-LP
  - Relative alignment errors between 6 OMPS LP slits.
  - Flewing of S/C bus at OMPS location with respect to star tracker.
  - Detection of LP focal plane due to thermal effects.
  - Correlation measurements can provide estimate of the tangent height

- Estimated TH error within ±5 km for tropics. ±50 km for the equator. ±500 km for the polar regions.

Figure 2: Left panel is mean ozone profile at selected altitudes for MLS (red) and OMPS LP (blue) vs. latitude. Right panel in the percent difference between the two instruments.

Figure 3: Zonal mean plot of the relative difference for OMPS LP vs. OISR. The correlation coefficient is within 0.95, except for the tropics, ~0.55. Possible cause is PSCs.

Figure 4: Same as fig. 3 but for OMPS LP – OISR.

Figure 5: Same as fig. 4 but for OMPS LP – MIPAS.

Figure 6: Same as fig. 4 but for OMPS LP – SCIAMACHY.

Figure 7: Same as fig. 4 but for OMPS LP – GOMOS.

SUMMARY

- The agreement with correlation measurements is within 3% over an altitude range of 20-40 km.
- Above 40 km, the difference is ~5-10% in the northern and northern hemispheres.
- The lower stratosphere above the tropopause, OMPS is 5-10% smaller in the tropics and northern hemispheres.
- Known Issues
  - Altitude registration errors, ±150 m.
  - Aerosol effect; Negative bias in the lower stratosphere, mostly in the tropics and northern hemisphere.
  - Errors for OMPS LP was released on August 2018. Main changes are:
  - Implement static tangent height adjustment (500 m), to a total 170 km, plus intra-orbit TH adjustment.
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  - Improved multiple gazup/aperter merging
  - Use of GMAO products for ancillary data instead of NCEP
  - Use of 15° tangent instrument for S-NP
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Planning improvements
  - Now aerosol dataset and corrections
  - New and improved clouds dataset
  - Improved straylight corrections

Figure 8: Plot of the relative difference of OMPS vs. Lidar and Ozonesondes for different latitude zones. Right panel in the percent difference between the two instruments.

Figure 9: Plot of the relative difference of OMPS vs. Lidar and Ozonesondes for different latitude zones.

Figure 10: Left is plot of the estimated tangent height offset of OMPS LP profiles against MLS for different latitude zones. Right panel in the correlation coefficient.