Validation of OMPS LP Ozone Profiles with Satellite, Ozonedonde and Lidar Measurements

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Approach

Dataset used

- OMPS v2.0, combined profile, center slit only. For sondes and lidars comparison, visible profile is used.
- OSIRIS MART v5.07 provided by University Saskatchewan.
- MIPAS v6.0 provided by ESA.
- SCIAMACHY v5.02 provided by ESA.
- GOMOS v6.01 provided by ESA.
  - ENVISAT and OMPS measurement only overlapped during March/April 2012.
- Ozonesondes and Lidars were collected by the AVDC, downloaded from NDAAC, WOUDC, SHADOZ, NOAA data archives.

Coincidence criteria

- 3° latitude, 10° longitude, same day measurement, 250km apart (50km for MLS).

Percent difference was calculated and averaged for 10° latitude zone.

Tangent height offset

- TH offset was estimated by adjusting OMPS ozone profile's TH vs correlative measurement using maximum correlation.

OMPS LP- MLS

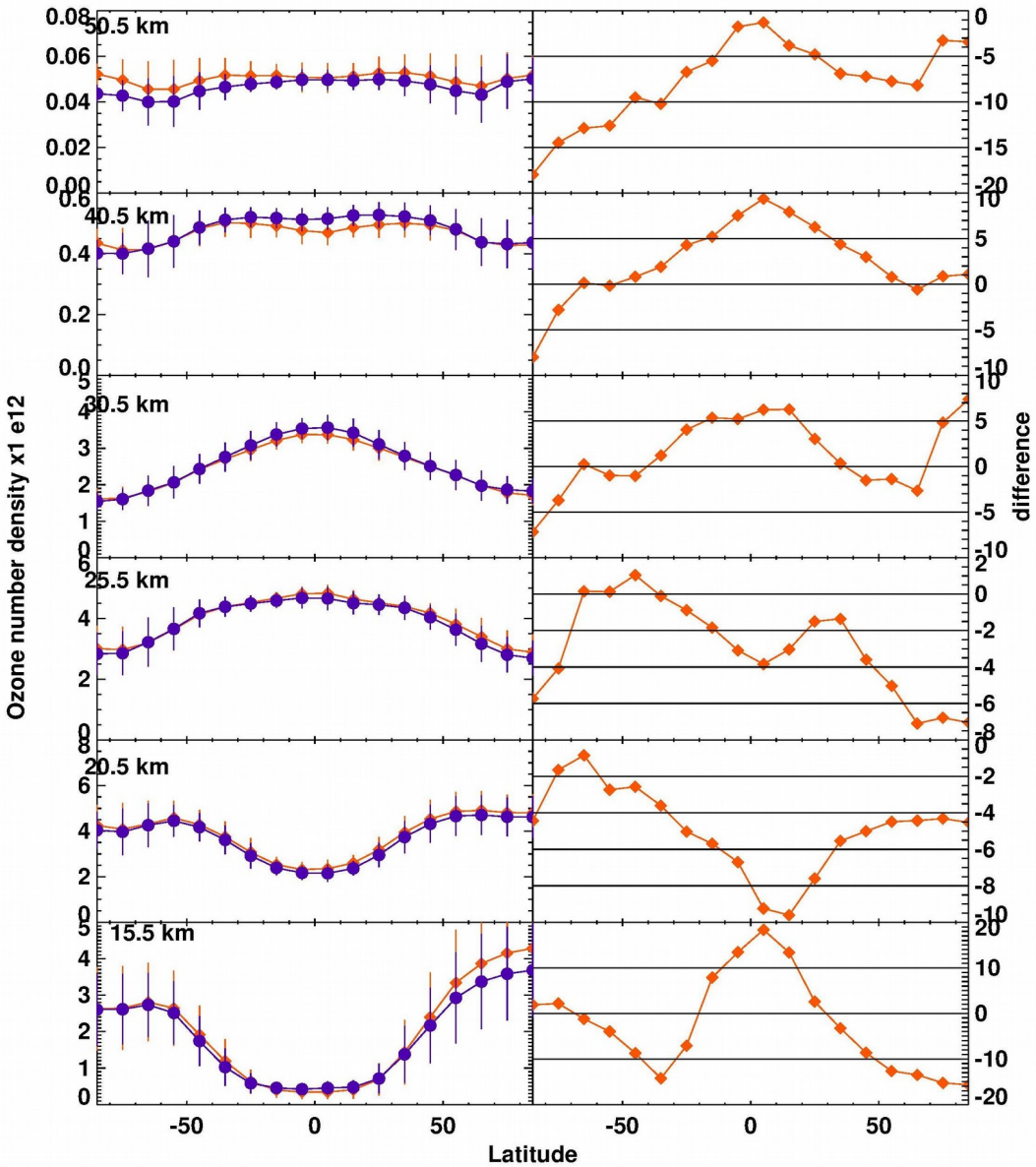


Figure 2: Left panel is mean ozone profile at selected altitudes for MLS (red) and OMPS LP (blue) vs. latitude. Right panel is the percent difference between the two instruments.

OMPS LP- MLS

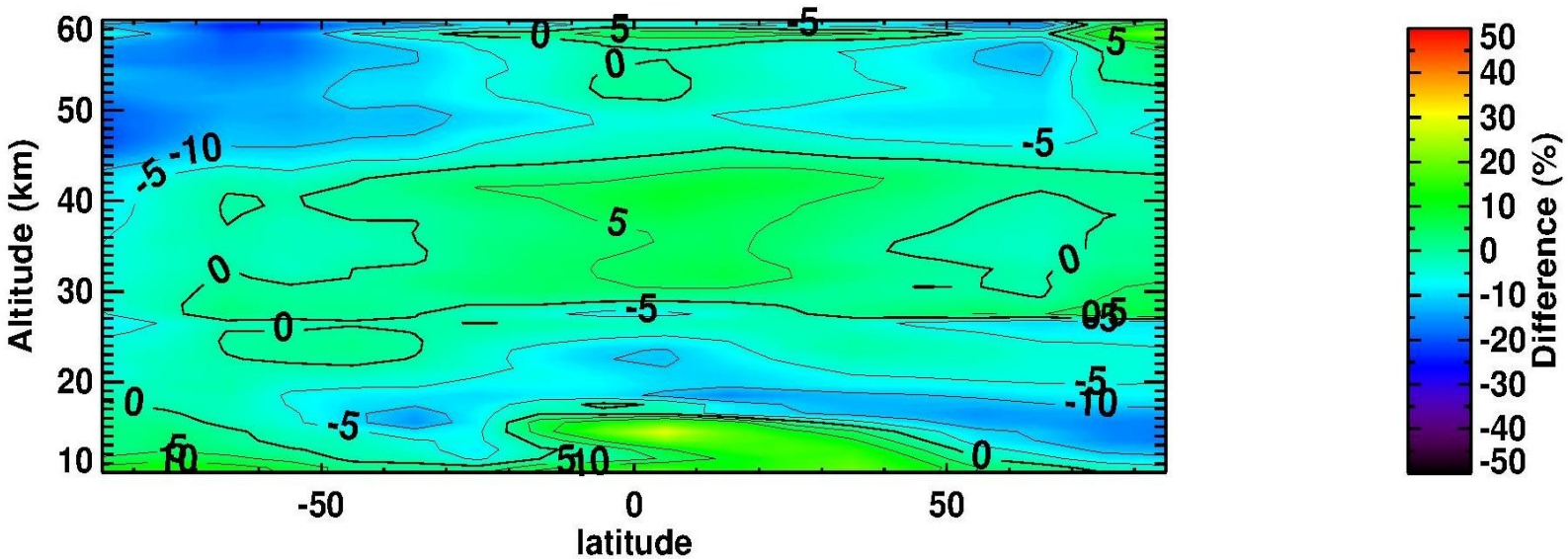


Figure 3: Zonal mean plot of the relative difference for OMPS LP – MLS in percent (2012-2014).

OMPS LP - OSIRIS

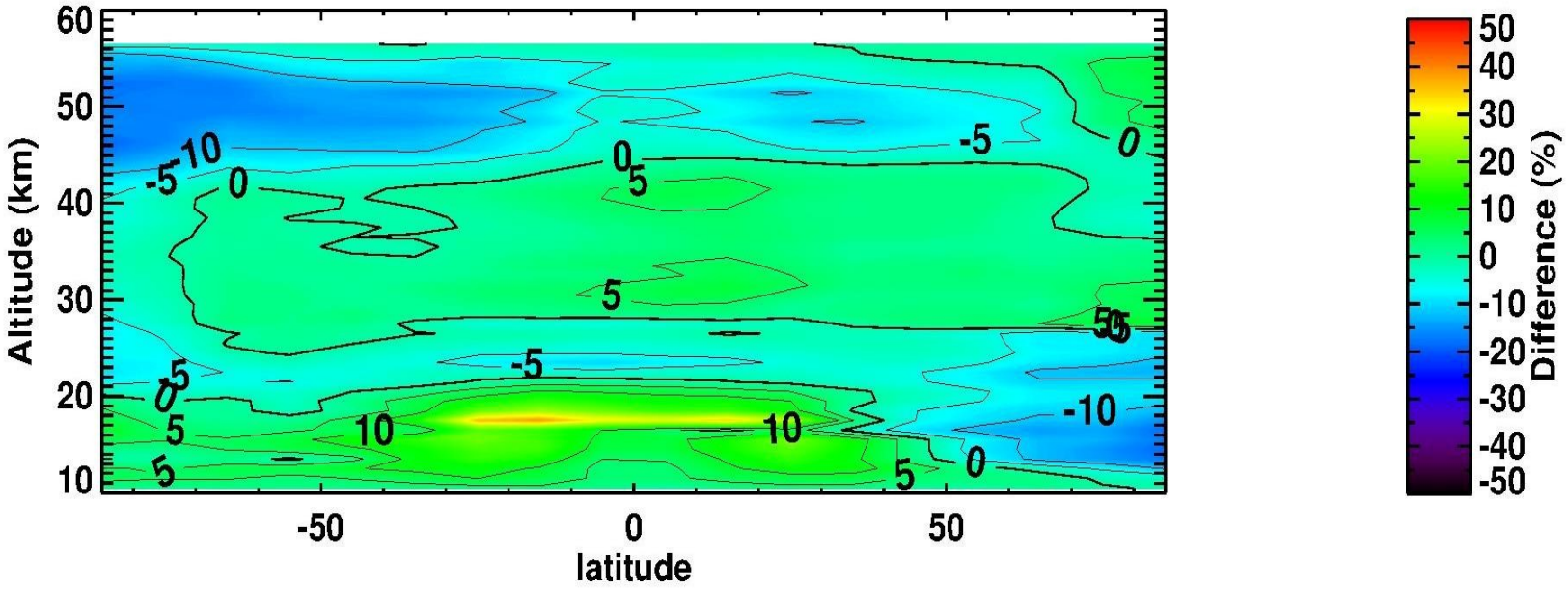


Figure 4: Same as fig. 3 but for OMPS LP - OSIRIS

OMPS LP - MIPAS

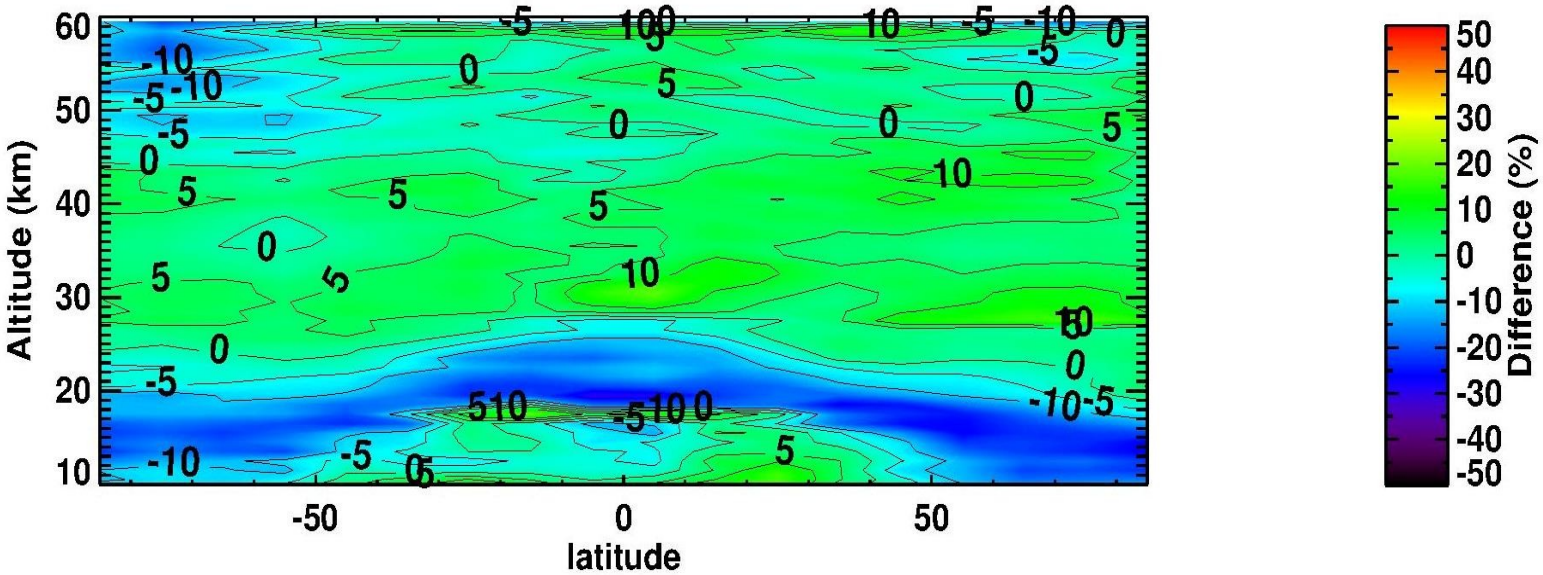


Figure 5: Same as fig. 3 but for OMPS LP – MIPAS for Mar/Apr 2012.

OMPS LP - SCIAMACHY

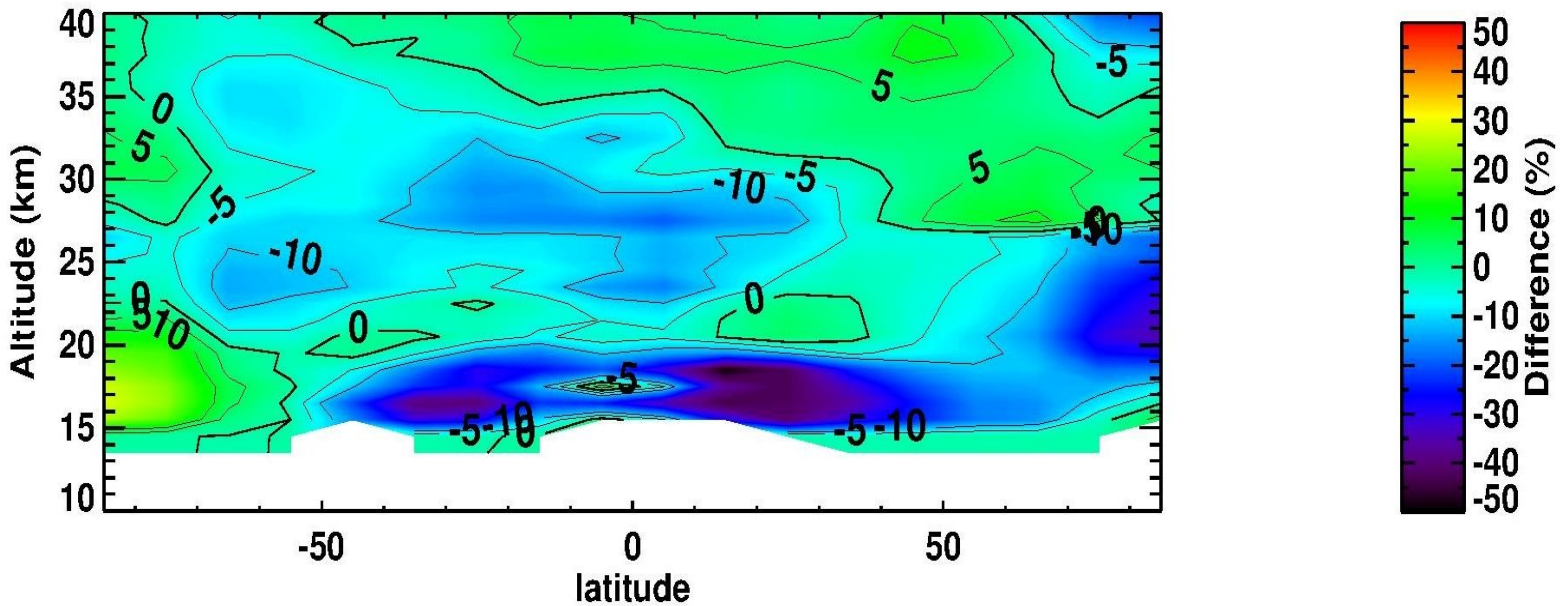


Figure 6: Same as fig. 4 but for OMPS LP – SCIAMACHY.

OMPS LP - GOMOS

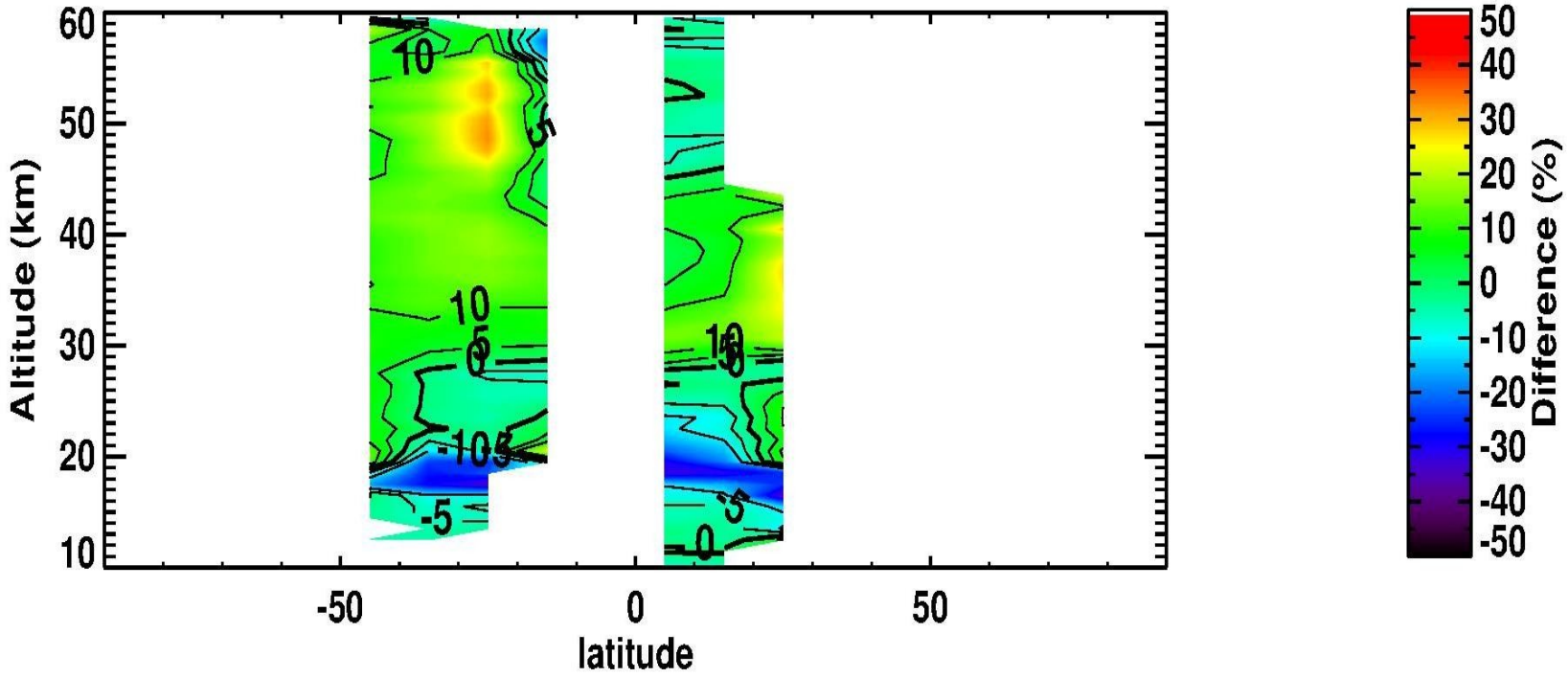


Figure 7: Same as fig. 4 but for OMPS LP – GOMOS.

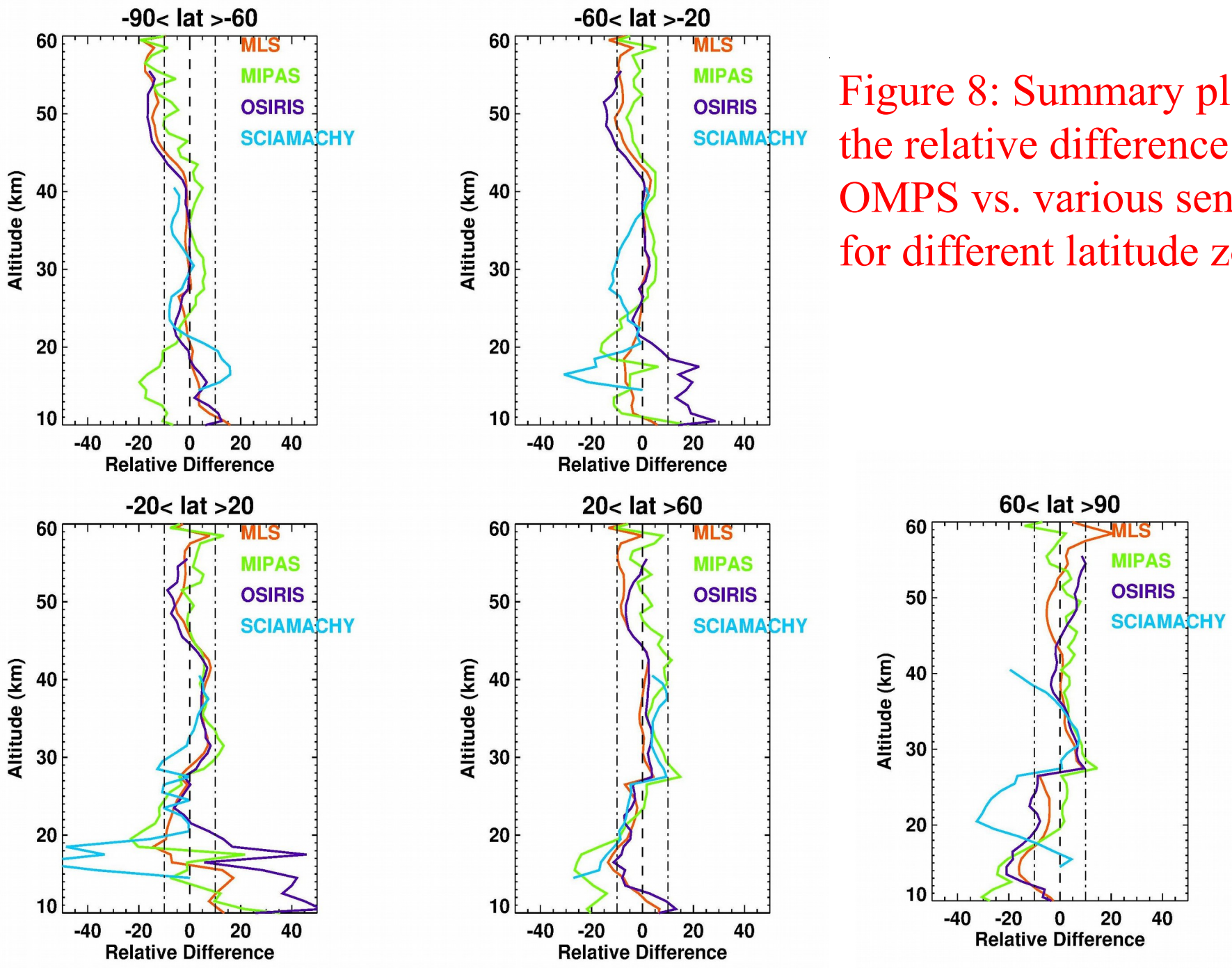


Figure 8: Summary plot of the relative difference of OMPS vs. various sensors for different latitude zones

OMPS LP – Sondes and Lidars

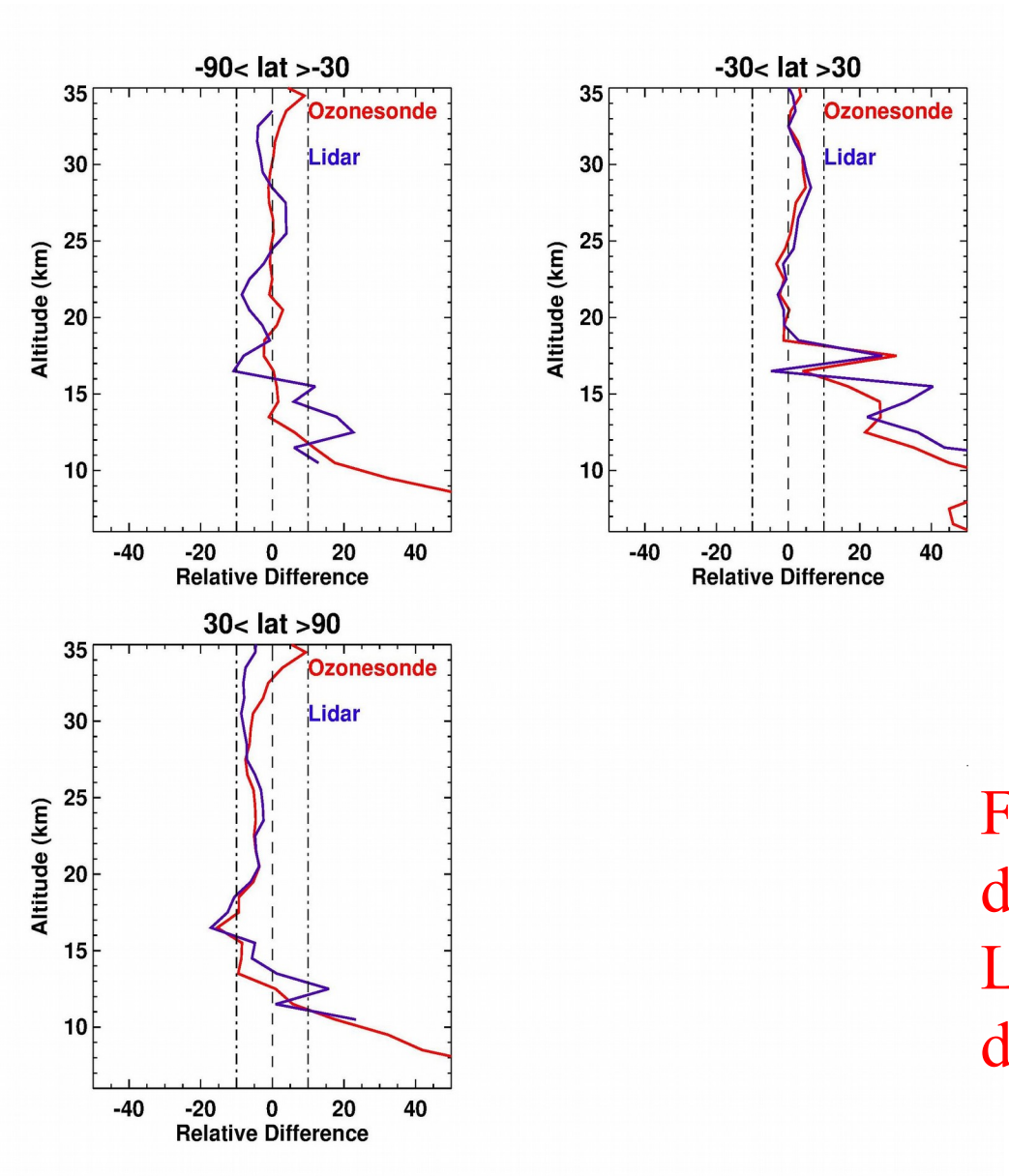
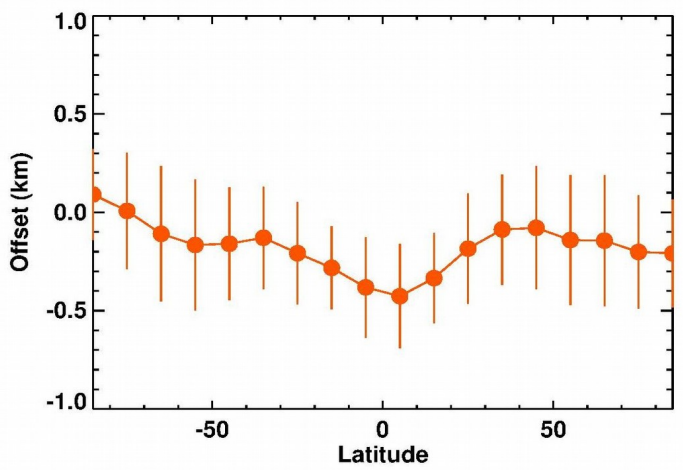


Figure 9: Plot of the relative difference of OMPS vs. Lidars and Ozonesondes for different latitude zones

Altitude Registration



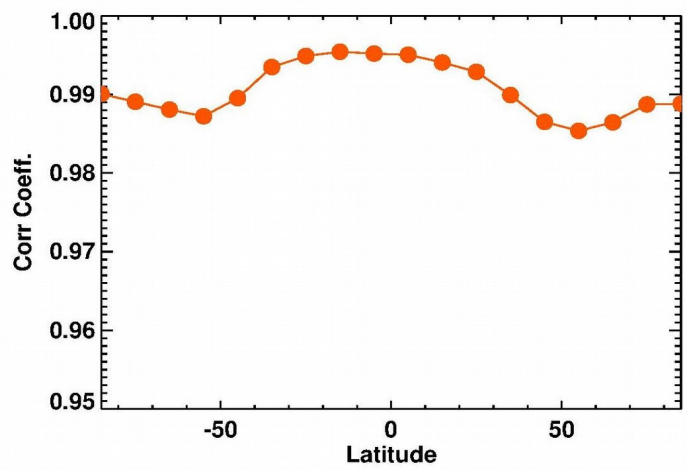
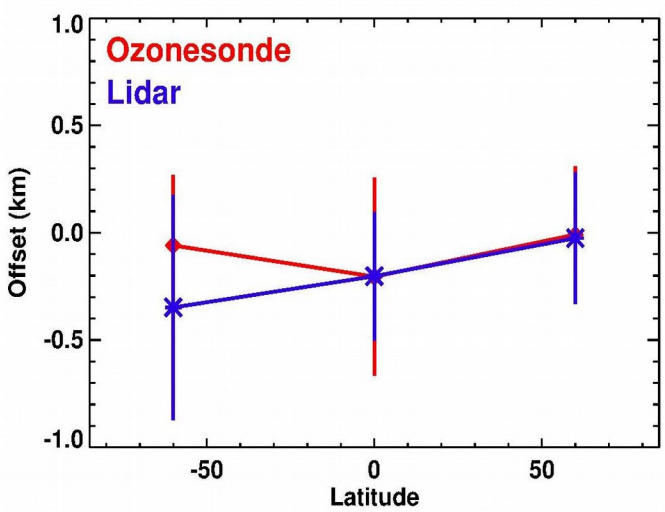


Figure 10: Left is plot of the estimated Tangent Height offset of OMPS LP profiles against MLS for different latitude zones. Right is the correlation coefficient.



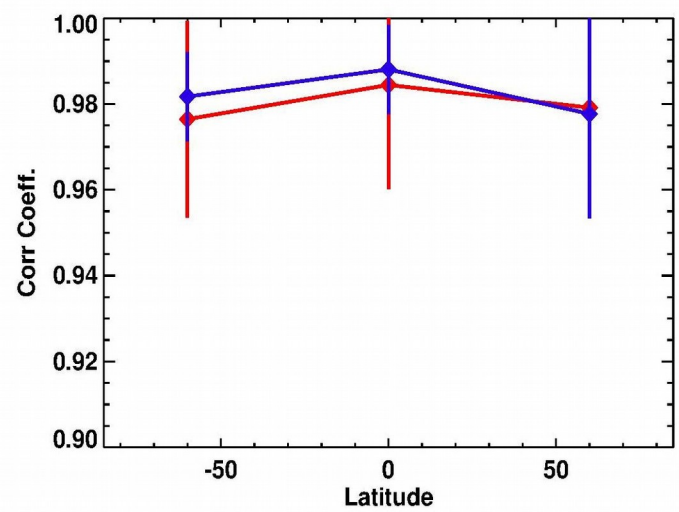


Figure 11: Same as figure 10 but for ozonesondes and Lidars

Summary

- In general, the agreement with correlative measurements is within 5% over an altitude range of 20-40 km.
- Above 40 km, the difference is ~5-10% in the southern and northern hemispheres.
- In the lower stratosphere above the tropopause, OMPS is 5-10% smaller in the tropics and northern hemisphere.

Known Issues

- Altitude registration errors, ~150-200 m
- Aerosol effect; the lack of aerosol corrections is evident in the lower stratosphere, in the tropics and northern hemisphere.
- Straylight errors could be the reason for the bias above 40 km in the NH/SH.
- Polar Mesospheric clouds (PMC) and Polar Stratospheric Clouds interference.
- Disagreement between UV and visible retrievals, mainly in the northern hemisphere.
  - Possible cause is straylight and aerosol contamination

Planned improvements

- New aerosol dataset and corrections
- New and improved clouds dataset
- Improved straylight corrections