OMPS LP O_3 Product Status & Outlook

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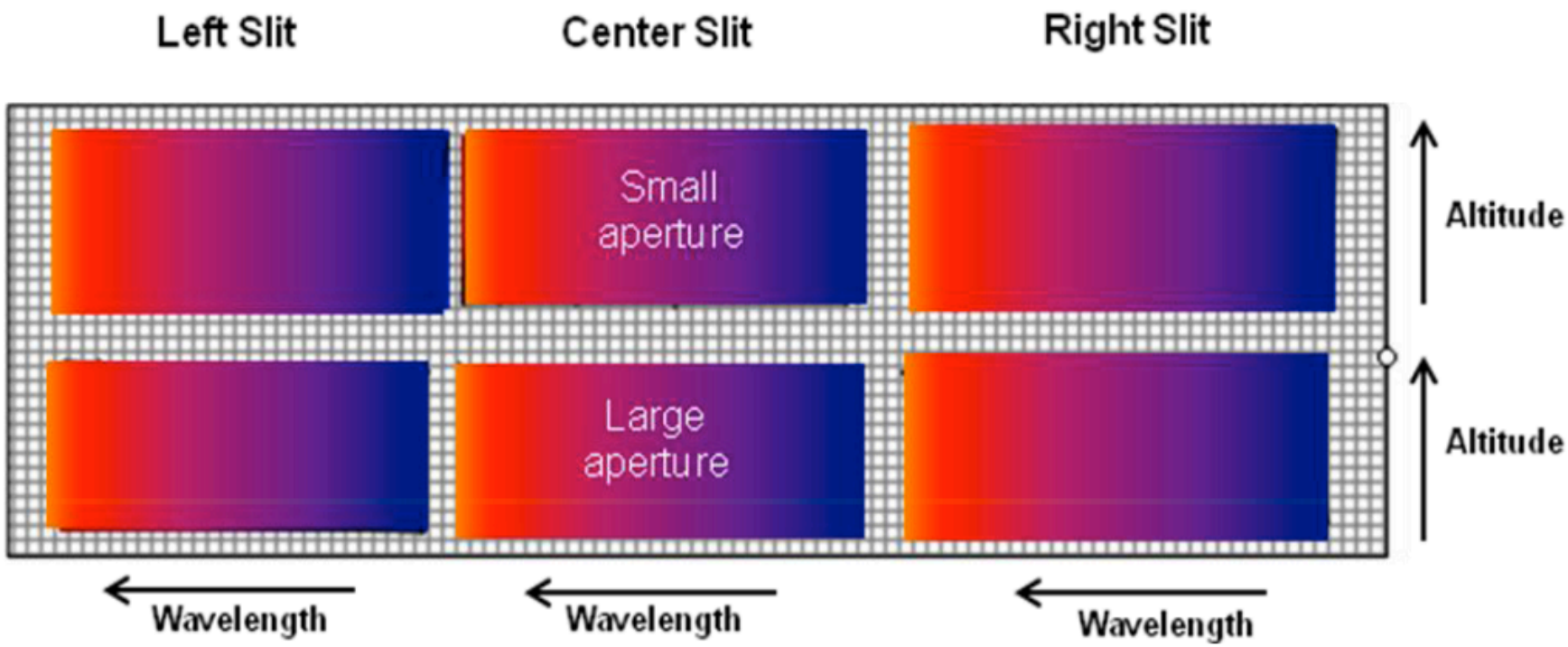
Status

- V2 data released in Aug
- Data quality improved over V1 but still not “MLS-quality”
- 4 Issues have been Identified
  - Altitude registration errors
  - Aerosol Effects
  - Stray light errors
  - Thin cirrus and PSC contamination

Sources of Altitude Registration Errors

- Error in alignment of SNPP star-tracker and/or OMPS-LP.
- Flexing of S/C bus at OMPS location wrt to star-tracker, located near VIIRS.
- Relative alignment errors of 6 OMPS-LP images on the FP.
- Distortion of LP focal plane due to thermal effects that change along the orbit and seasonally.

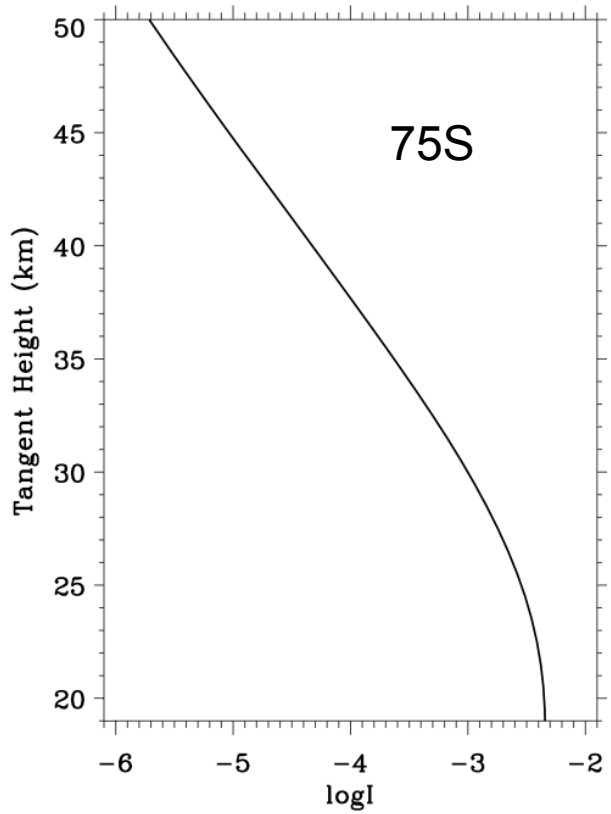
LP Focal Plan Schematic

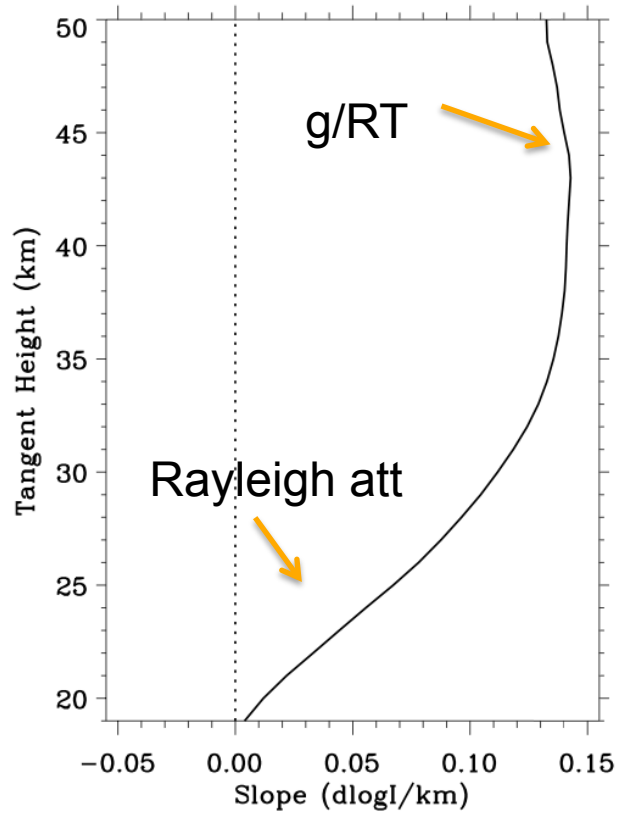


Altitude Registration Methods

- 350 nm radiance ratio (aka RSAS)
  - Affected by aerosols
- 305 nm/60 km radiance
  - Requires accurate P(z) profiles near 60 km
- 305 nm peak height
  - Requires external O_3 data near 45 km

Altitude Reg. using 350 nm Radiance Ratio
(proposed in ~1993)

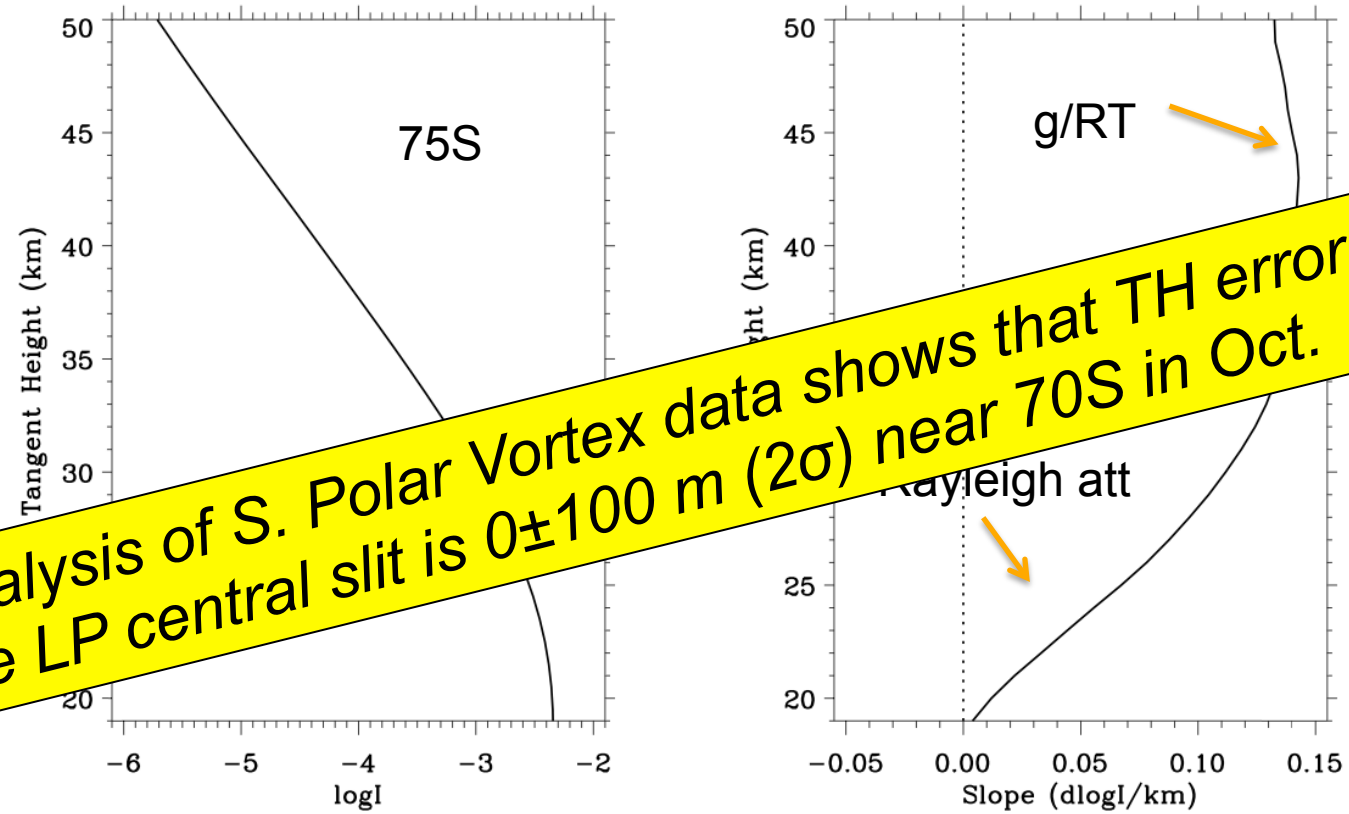




- 35/20 km radiance ratio varies by ~12%/km.
- Not affected by calibration and reflectivity but affected by strat aerosols.
- Works best in the S. polar region, particularly inside the S. polar vortex, which appears to be aerosol-free above 20 km.

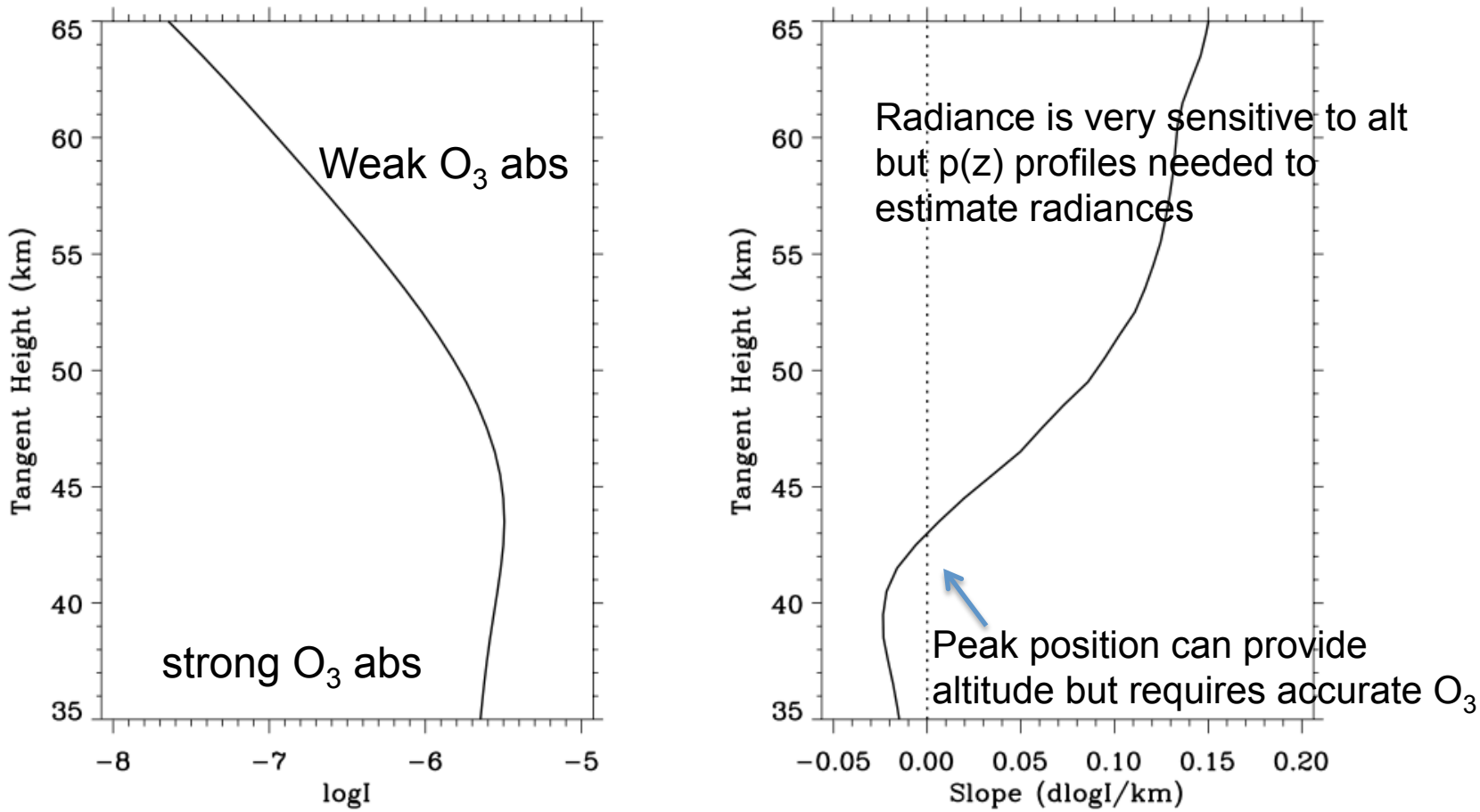
Altitude Reg. using 350 nm Radiance Ratio

(proposed in ~1993)



Analysis of S. Polar Vortex data shows that TH error of the LP central slit is 0±100 m (2σ) near 70S in Oct.

Alt Registration using 305 nm



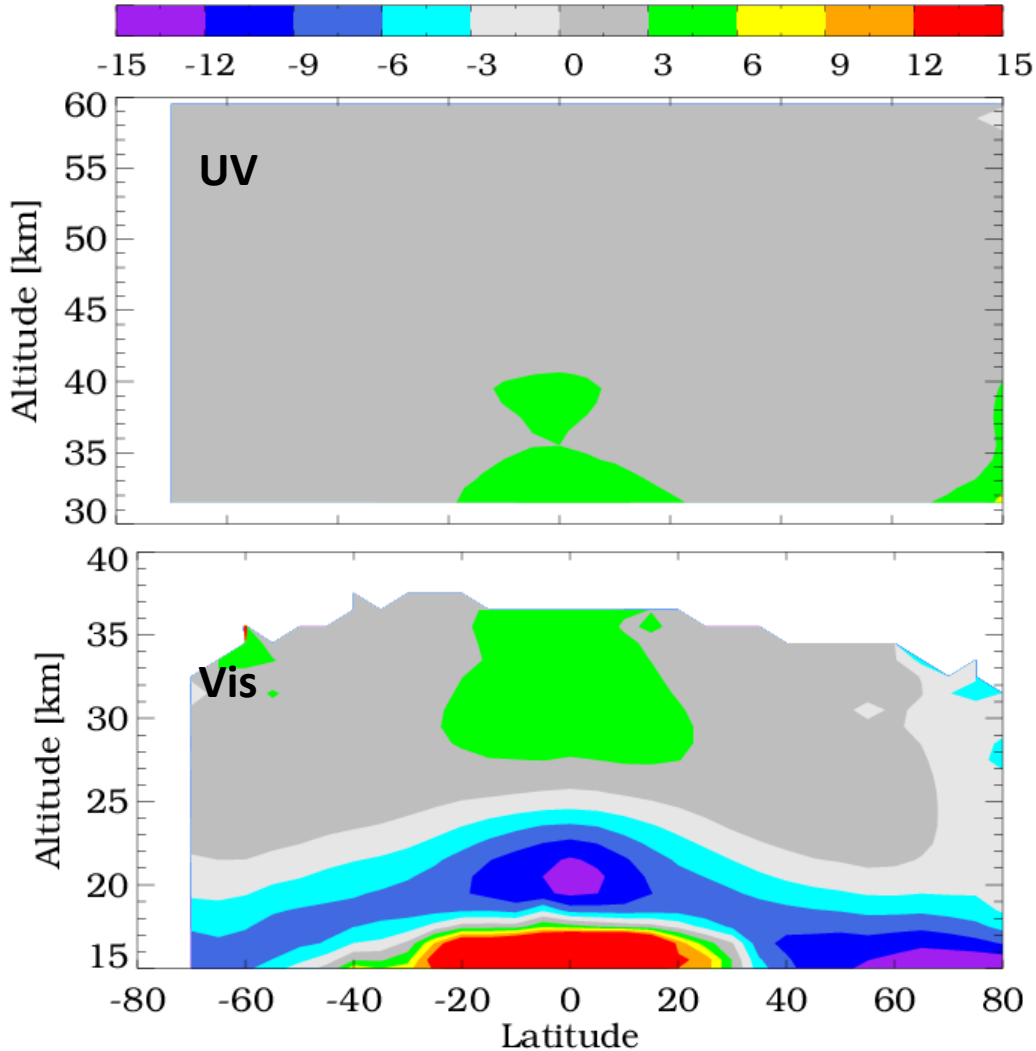
- Lat and seasonal dep of GMAO p(z) profiles agree very well with MLS up to 65 km so relative error in LP TH can be directly determined from 305 nm/60 km radiances.
- However, there are unresolved issues with absolute errors in GMAO and MLS p(z) profiles near 60 km, so this method is not suitable for determining abs error in TH.

MLS GPH uncertainties

Z*	Region	Resolution Vert. × Horiz. / km	Precision[a] / meters	Modeled bias uncertainty / m	Observed bias uncertainty / m	Comments
	<0.001 hPa	—	—	—	—	Unsuitable for scientif c use
	0.001 hPa	10–13 × 220	±110	700±150	−450	
	0.01 hPa	8–12 × 185	±85	600±100	−100	
64 km	0.1 hPa	6 × 165	±60	500±150	0	
48 km	1 hPa	7 × 165	±45	300±100	100	
32 km	10 hPa	4.3 × 165	±35	200±100	100	
16 km	100 hPa	5.2 × 165	±30	150±100	150	
	261 hPa	5.3 × 170	±35	100±150	150	
	1000 – 316 hPa	—	—	—	—	Unsuitable for scientif c use

MLS documents indicate that they may have ~400 m error in GPH near 60 km, even though they agree well other measurements

O_3 error due to aerosols estimated using SAGE climatology

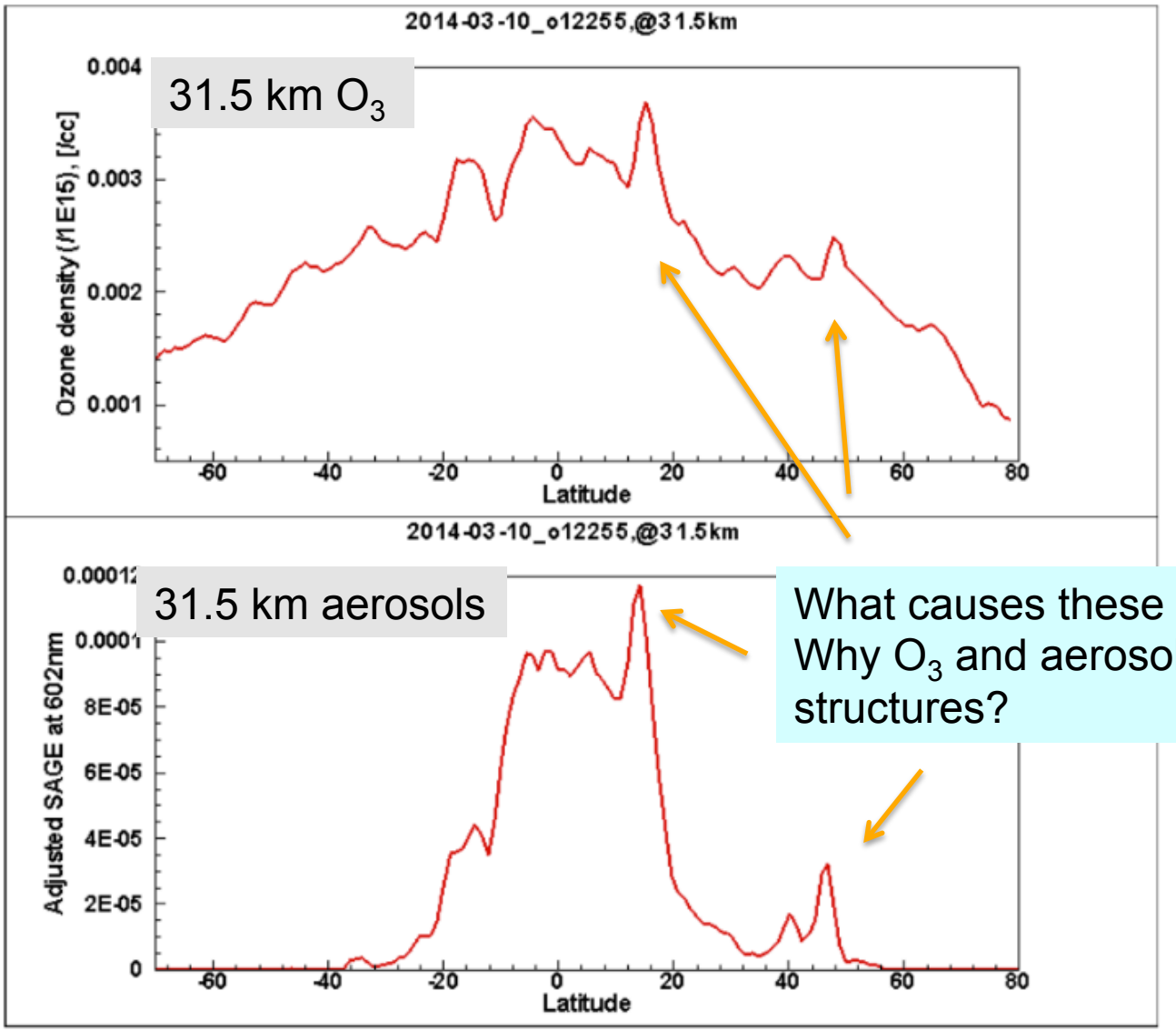


A method to correct O_3 error by scaling SAGE aerosol climatology scaled to match LP radiances at 675 nm is currently being tested

Outlook

- Release V2.5 algorithm in 2-3 months
  - Better altitude registration
  - Aerosol correction using scaled SAGE climatology
  - Better stray light correction
  - Better check for thin cirrus and PSC
- V3 algorithm Development
  - Phase 1: Improve Chappius band O_3 retrieval
  - Phase 2: Improve GMAO P(z) profiles between 35-70 km using 350 nm LP radiances
  - Phase 3: Improve UV retrieval

An Interesting Result from V2.5



What causes these structures?
Why O_3 and aerosols see similar structures?