Southern Hemisphere PSC Behavior as a Possible Influence on OMPS LP Ozone Values

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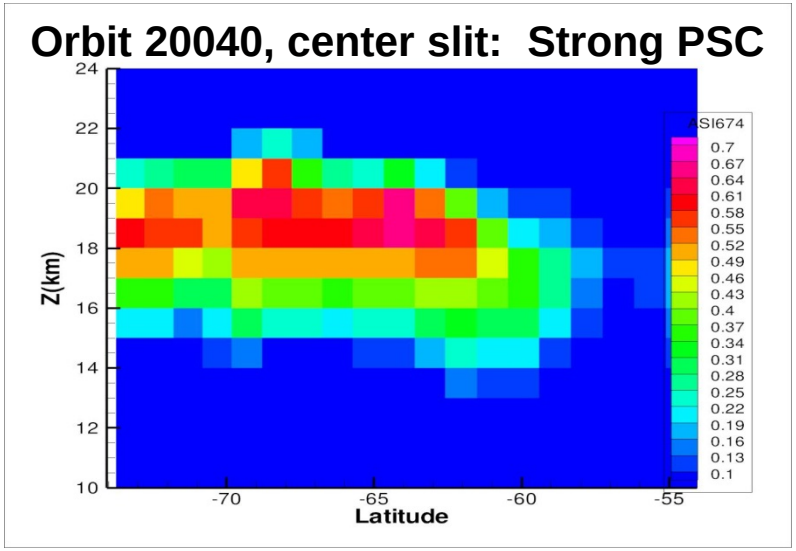
Background

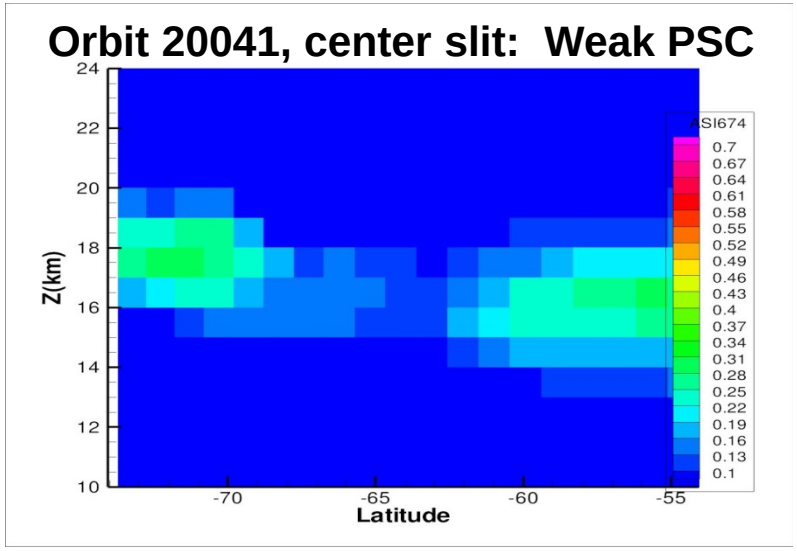
- Comparisons of OMPS LP and Aura MLS integrated ozone (12-30 km) for high SH latitudes (> 50°S):
  - Consistent bias seen for fall and winter months (April-August) during previous years (MLS > LP).
  - In 2015, bias during June-July is ~2x larger than during 2012-2014.
- Could increased polar stratospheric cloud (PSC) activity be responsible for low LP ozone values?
- Evaluate LP data (aerosol scattering index, cloud height) and compare to CALIOP observations.

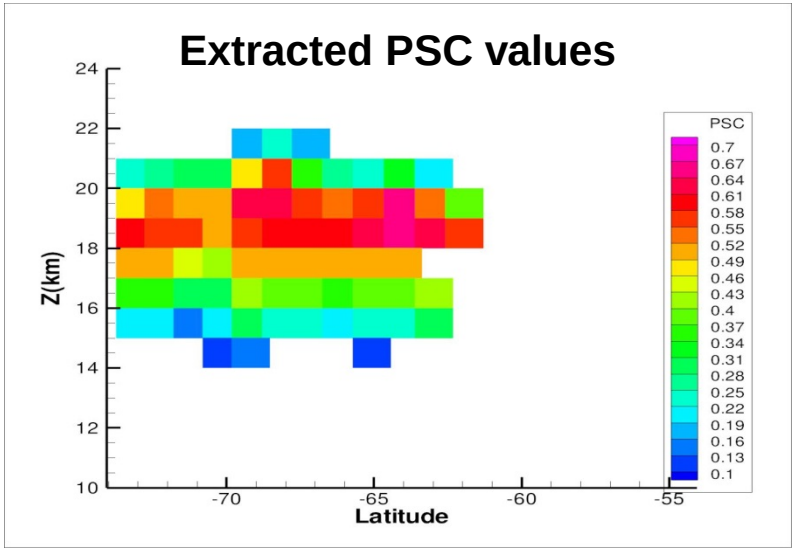
LP PSC Detection: Aerosol Scattering Index (ASI)

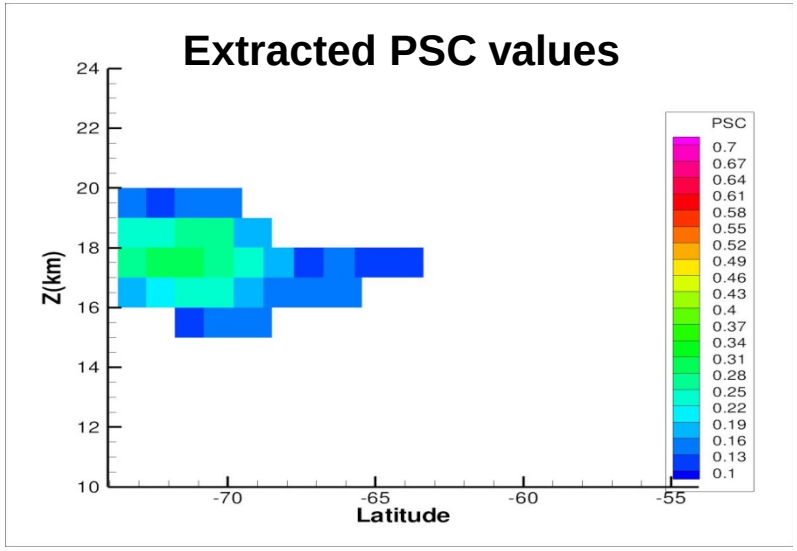
- Define PSC presence in Southern Hemisphere for any pixel using multiple tests:
  - ASI(674 nm) > 0.1
  - T(z) < -78°C
  - Z_{PSC} < 35 km
  - Latitude > 49°S
- Note that LP latitude sampling towards South Pole is limited during June-July.

PSCs Observed in LP ASI674 Data



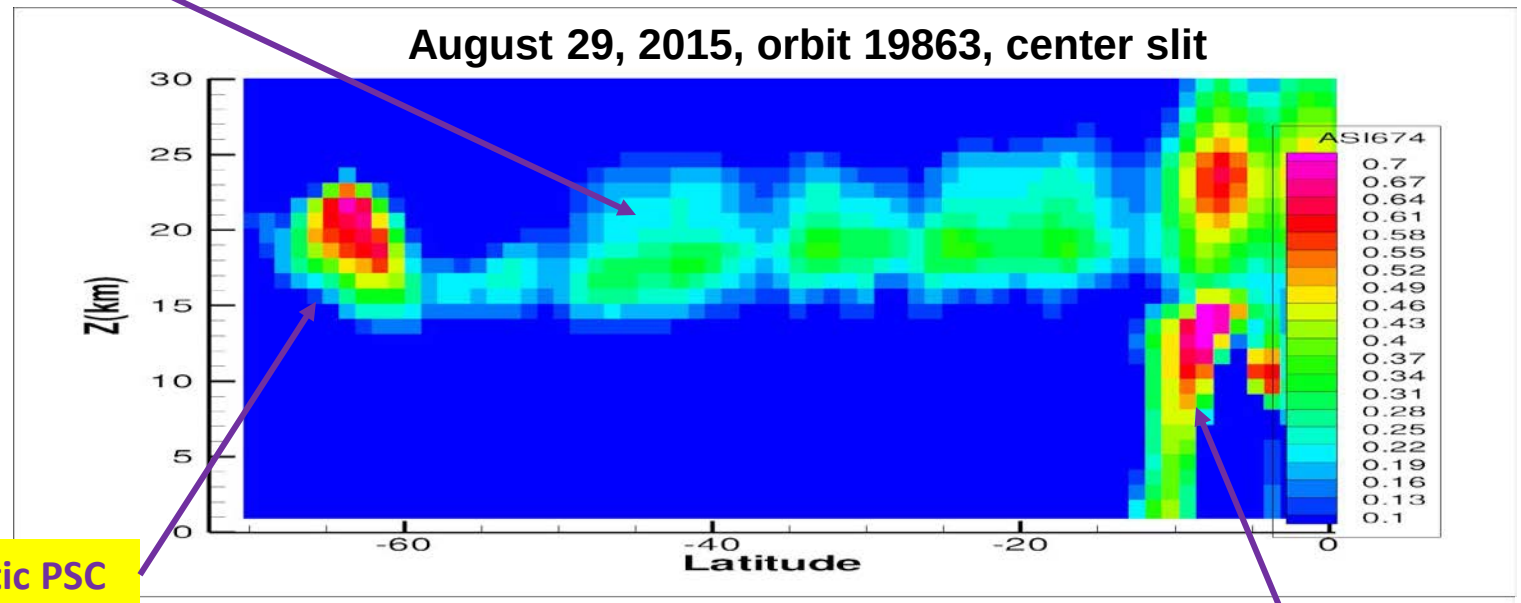






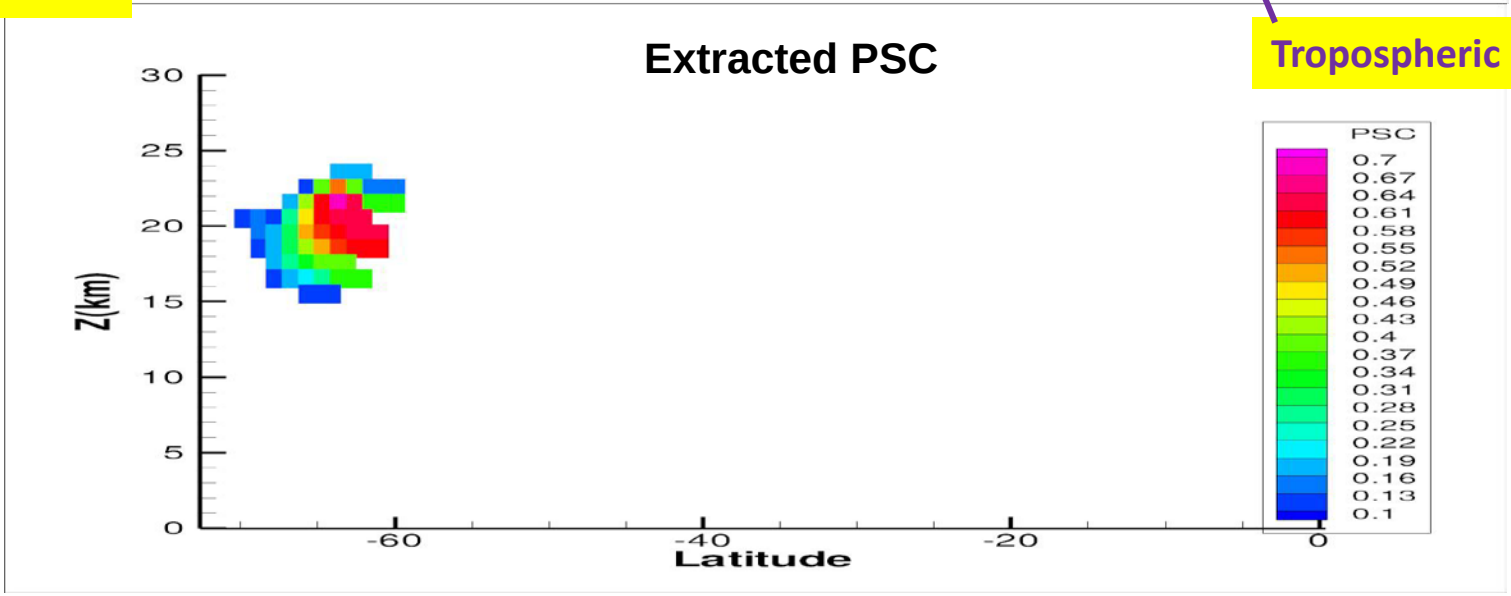
Identification of PSCs

Aerosol layer

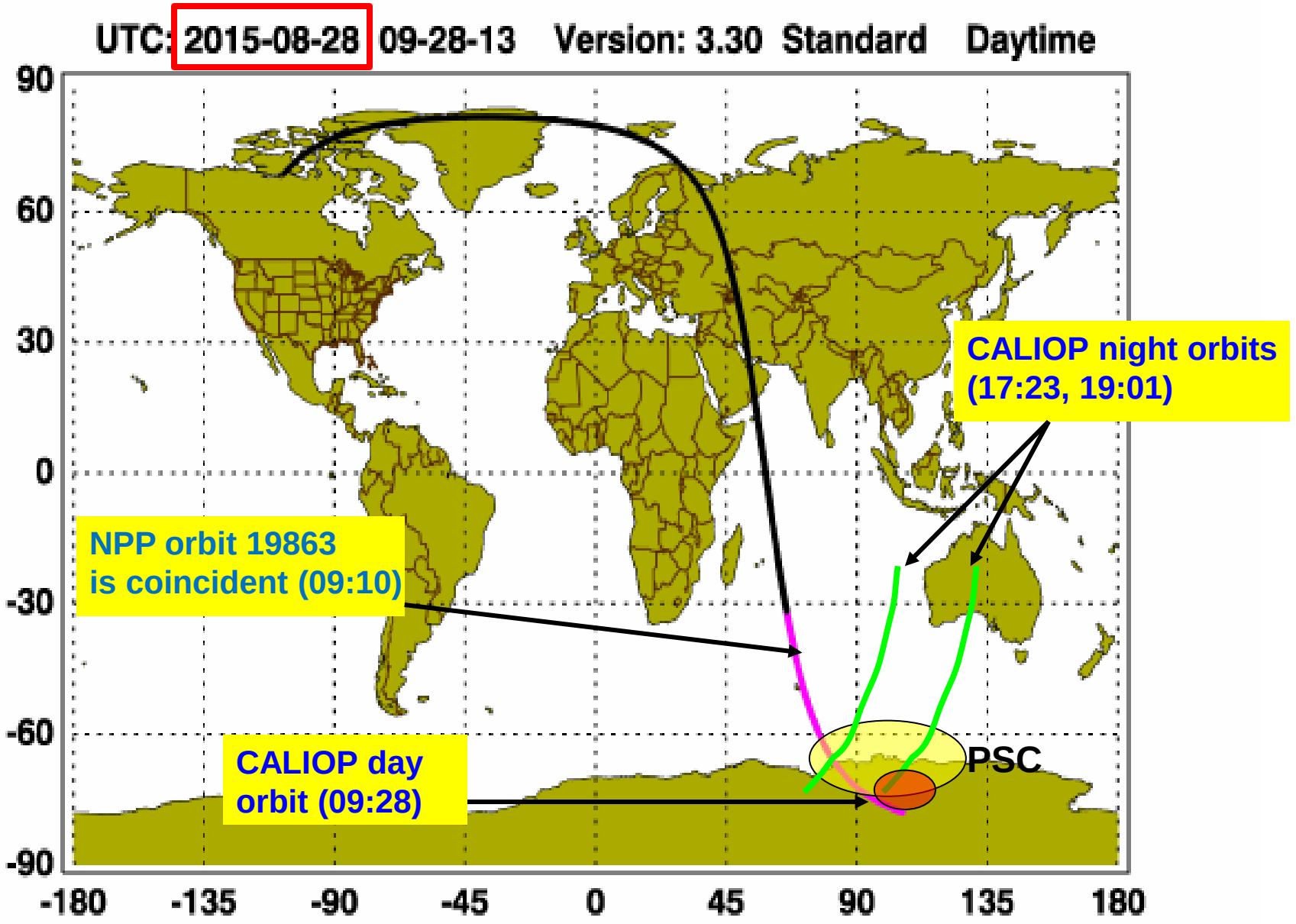


Antarctic PSC

Tropospheric cloud



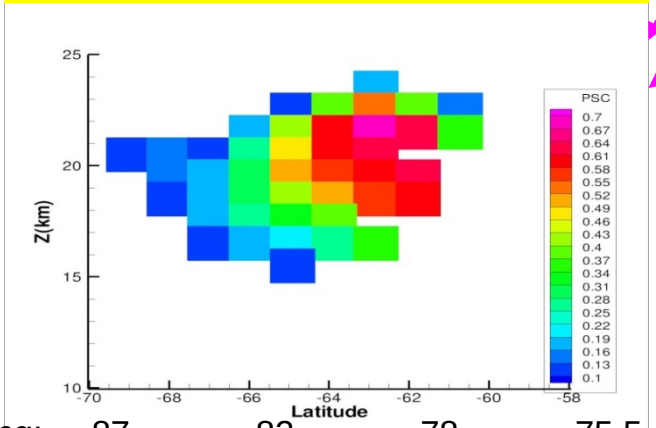
Comparison to CALIOP



CALIOP (*night*) vs. LP

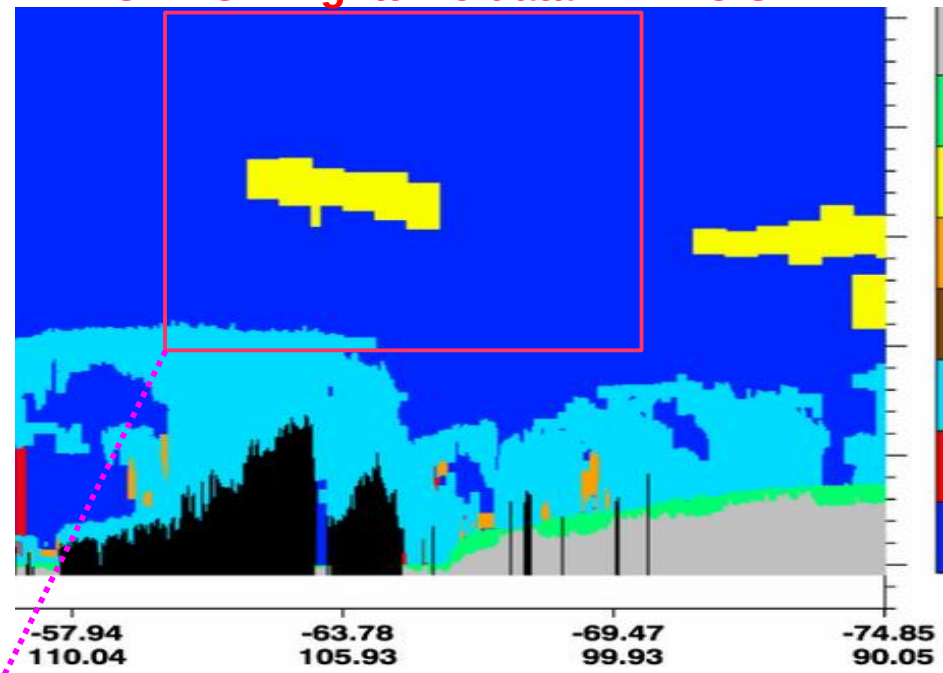
- CALIOP data extend farther towards pole than LP, show PSC layer extending to ~60°S.
- LP data show qualitative agreement for PSC layer in latitude and altitude (although measurements taken 8-10 hours earlier).

LP PSC Detection
8/28/15, orbit 19863C, 09:10 UT

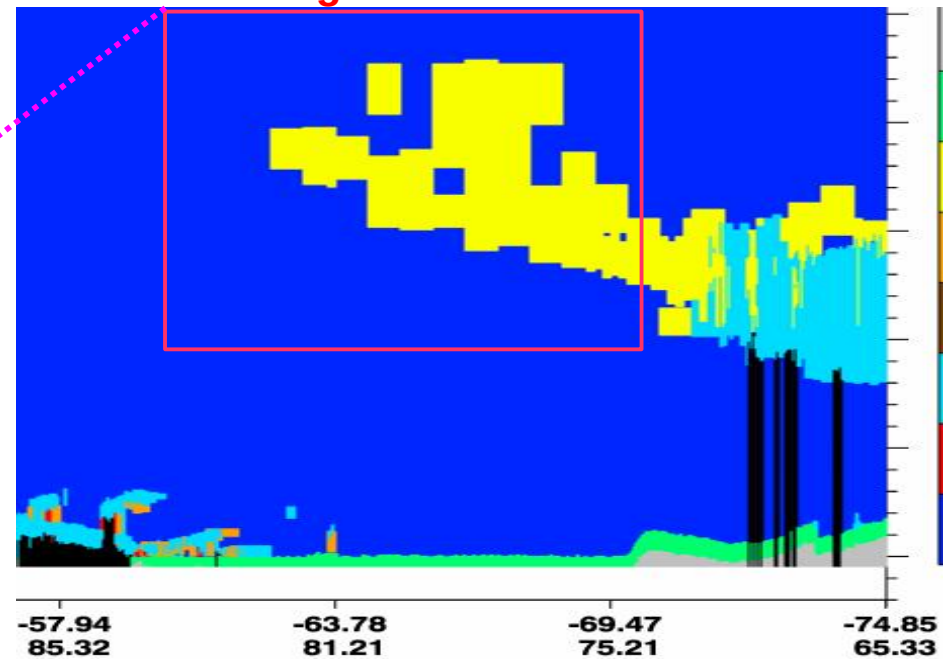


Long: 87 82 78 75.5

CALIOP nighttime data – 17:23 UT



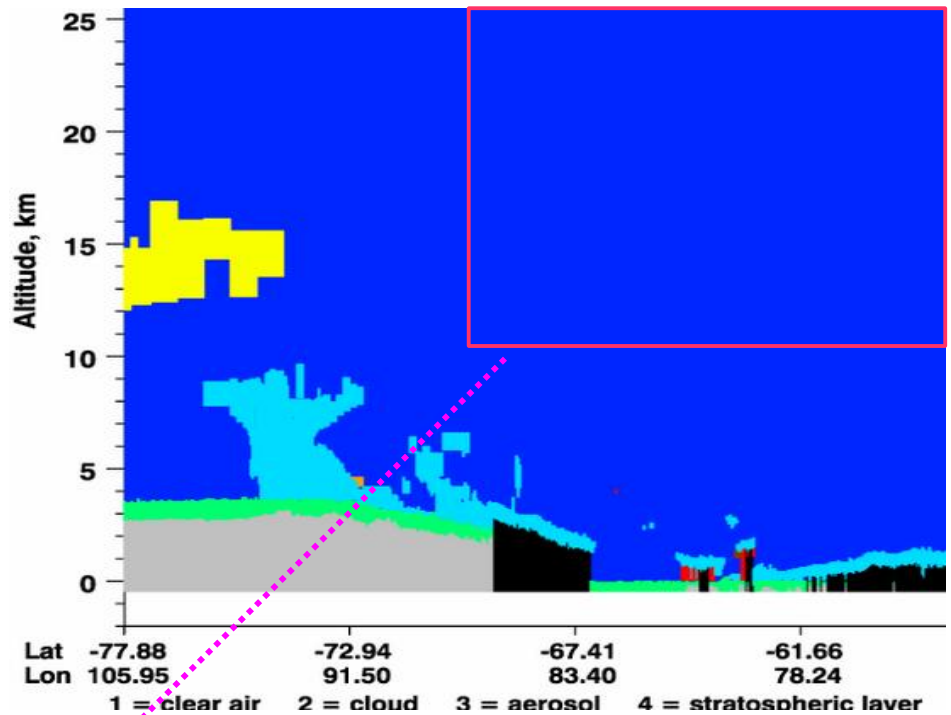
CALIOP nighttime data – 19:10 UT



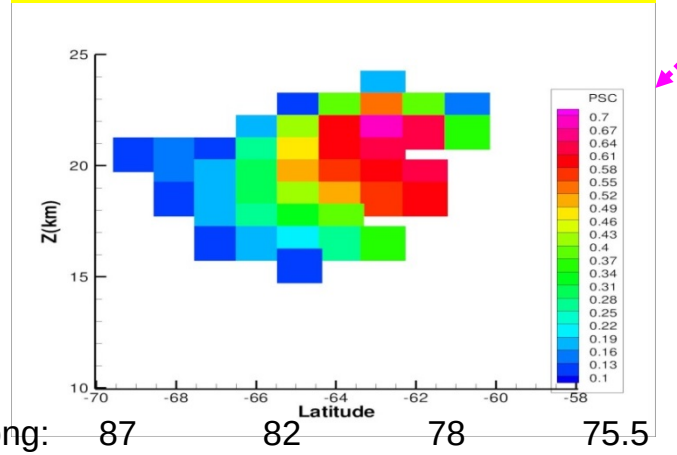
CALIOP (*day*) vs. LP

- CALIOP data show no evidence of PSC presence, even though observation times differ by less than 30 minutes.
- Higher sensitivity of LP ASI data for daytime PSCs is consistent with previous results for detection of aerosol layer.

CALIOP daytime data – 09:28 UT



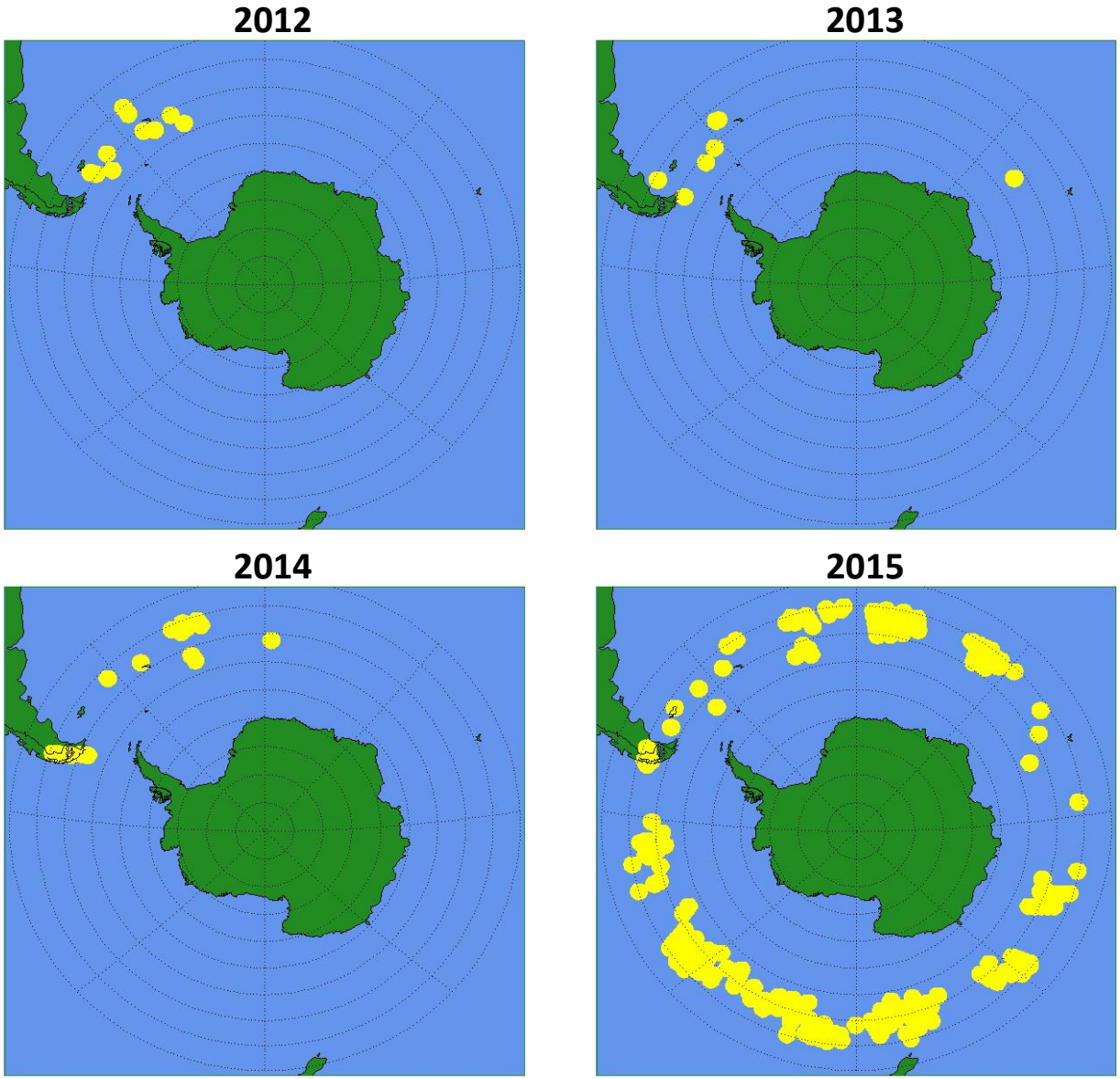
LP PSC Detection
8/28/15, orbit 19863C, 09:10 UT



Long: 87 82 78 75.5

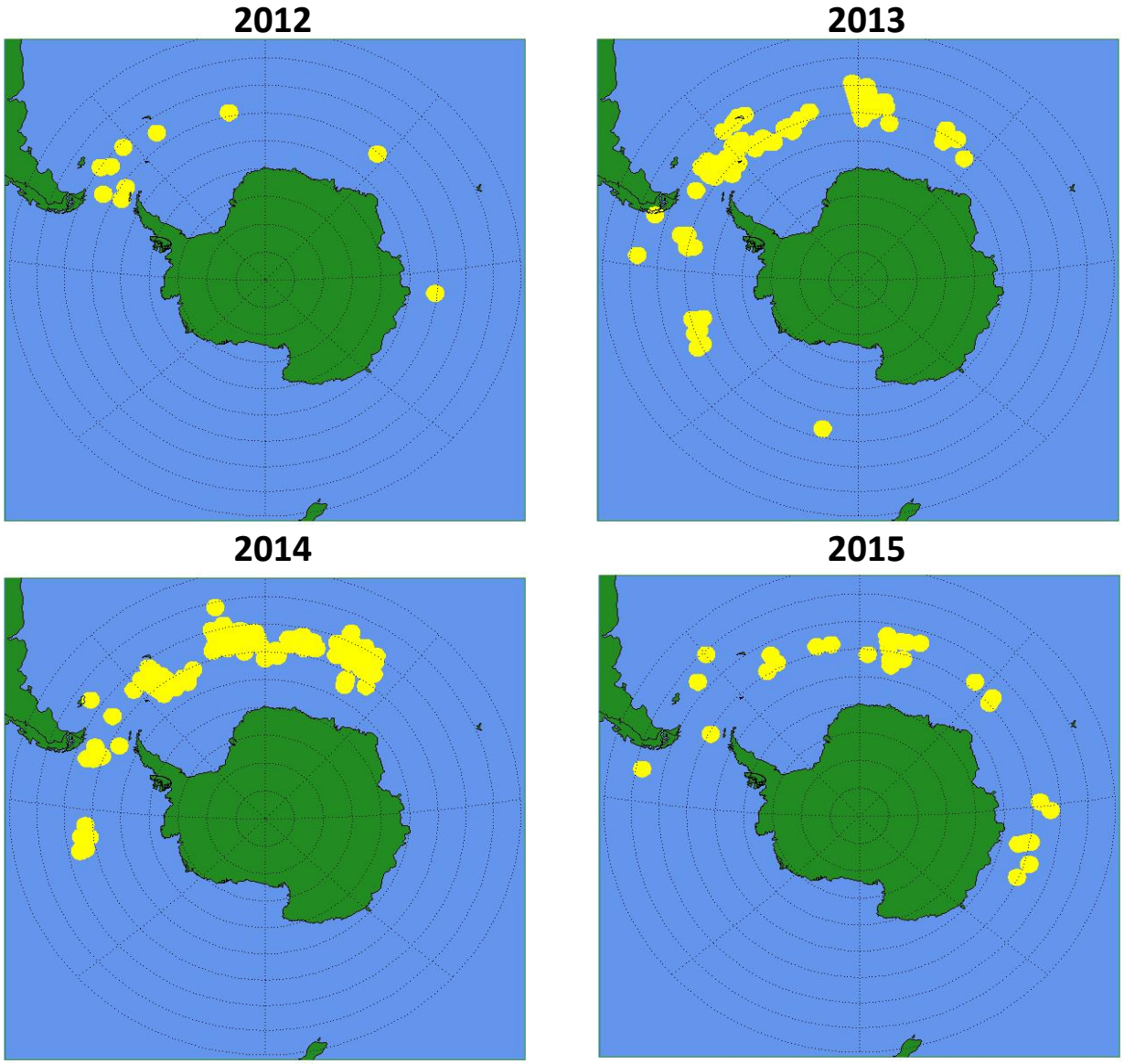
PSCs in LP Cloud Height Data - June

- Select clouds with z_{cloud} = 15-25 km.
- Limit search to latitude > 50°S.
- Note consistent population beyond tip of South America.
- 2015 data show <u>many</u> more PSCs than previous seasons.



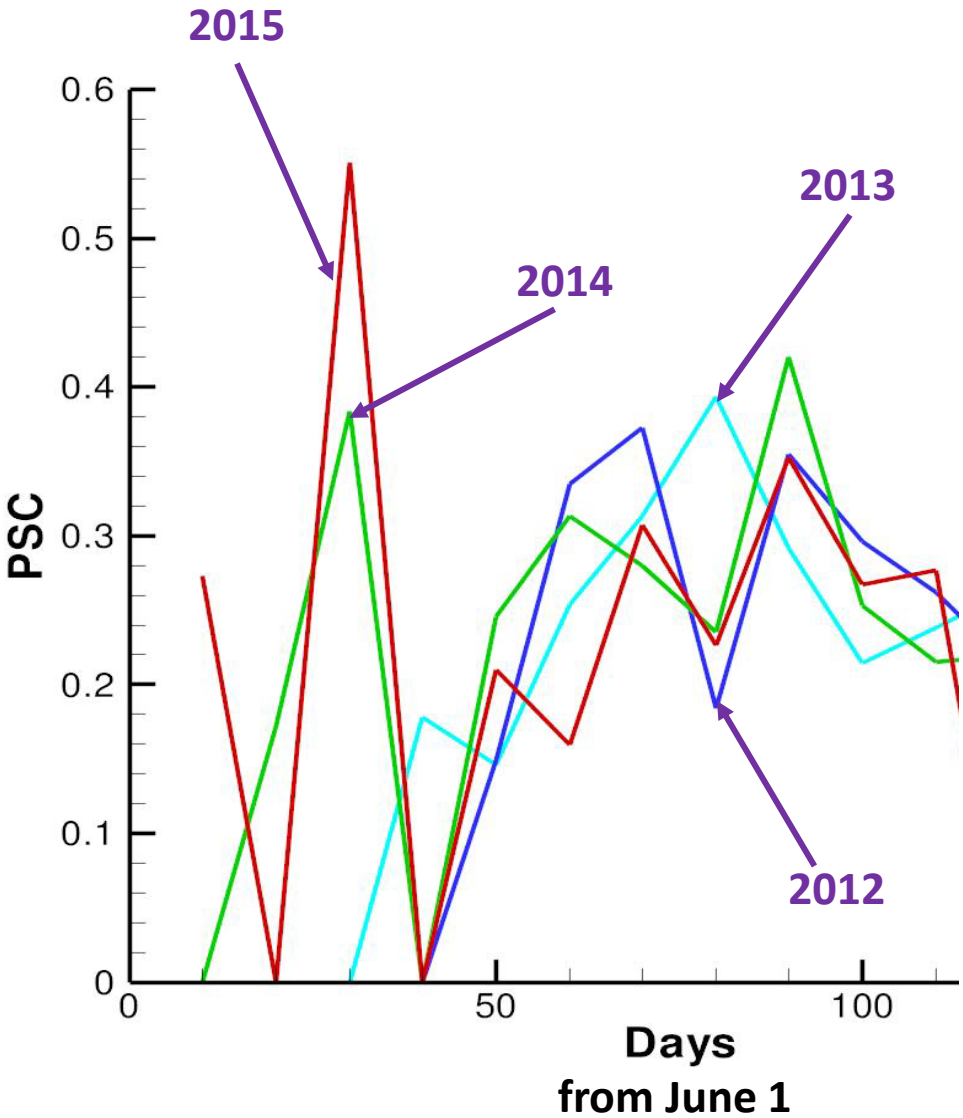
PSCs in LP Cloud Height Data - July

- Select clouds with z_{cloud} = 15-25 km.
- Limit search to latitude > 50°S.
- Distribution of clouds is more widespread in longitude.
- 2015 data are not exceptional relative to previous seasons.



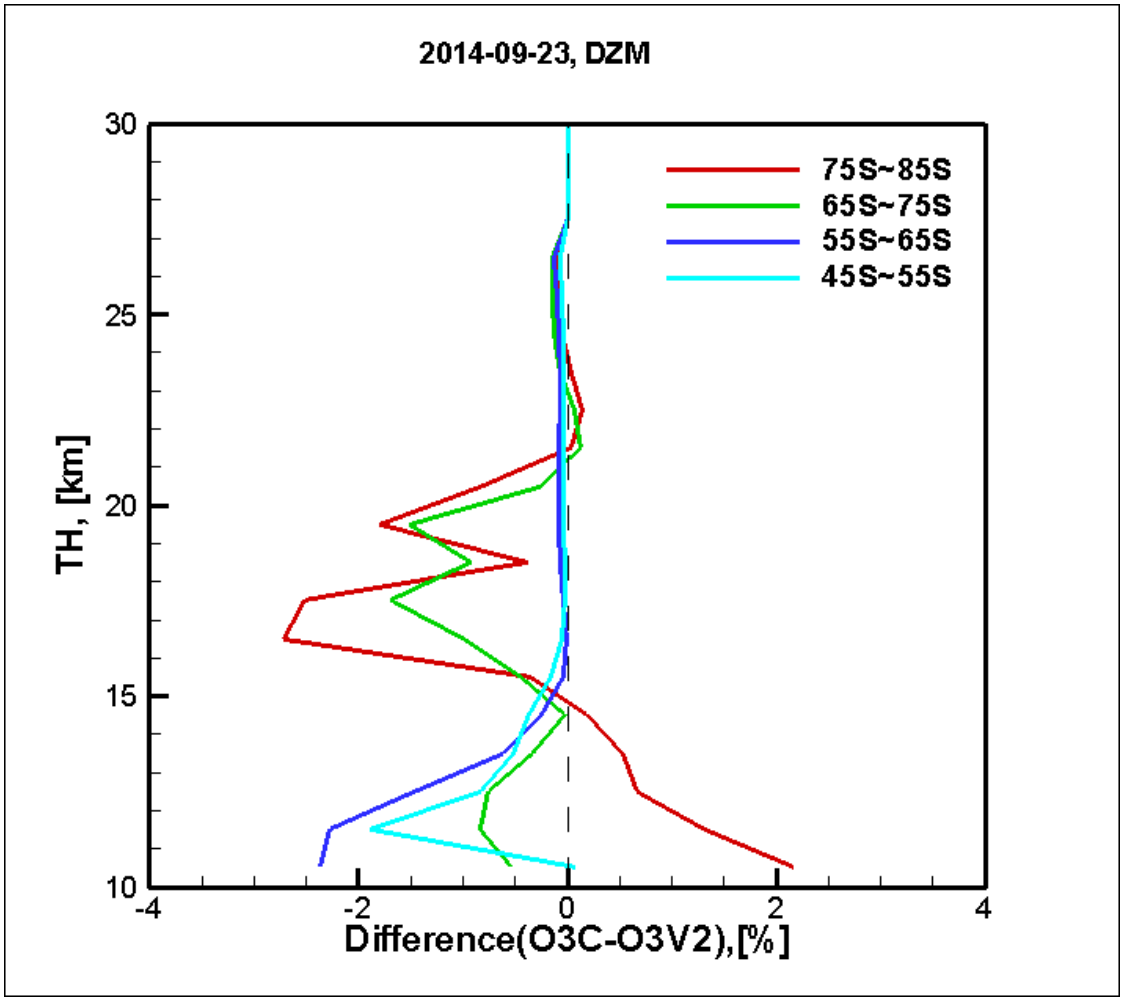
PSC "Density" Based on ASI Data

- Calculate average ASI value in PSC-flagged pixels for 10-day windows.
- Late June period in 2015 has stronger PSCs than in 2014 (no clouds in 2012, 2013).



Impact of PSCs on LP Ozone

- Triplet method reduces effect of aerosols and PSCs in LP visible ozone retrieval.
- Compare ozone retrievals using V2 cloud height (includes level of PSC) against retrievals using new LP cloud height (terminate retrieval above PSC).
- Results indicate slightly <u>less</u> zonal mean ozone at 15-22 km when PSC profiles are excluded.



Difference = Ozone[new_clouds] – Ozone[V2_clouds]

Summary

- OMPS LP has good sensitivity to daytime PSCs (better than CALIOP).
- LP PSC results are qualitatively consistent with CALIOP nighttime data.
- Significant increase in PSCs observed by LP during June 2015 relative to previous years.
- PSC frequency in July 2015 is similar to previous years, but intensity may be greater.
- Impact of PSCs on retrieved ozone values needs further study.