

# CPC Ozone Applications

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# Ozone Data Sets Used at CPC

- CPC has been monitoring ozone since the mid 1970's.
- Monitoring / Evaluation / Intercomparison
- SBUV/2
  - Operational v8.0
  - Recalibrated v8.0
  - Recalibrated v8.6
- SBUV(/2) Merged Cohesive CDR
  - Provided to NCEI
- OMPS
  - Nadir Profiler (v6, waiting for v8)
  - Nadir Mapper (v7 OOTCO, waiting for v8)
  - Limb Profiler (waiting to be provided operationally)
- GFS ozone analyses/forecasts
  - Evaluate what is assimilated and quality of forecasts
- NDACC Lidar
- Reanalyses
  - CFSR, MERRA, ERA-I, JRA-55, etc

# Operational / Recalibrated SBUV/2

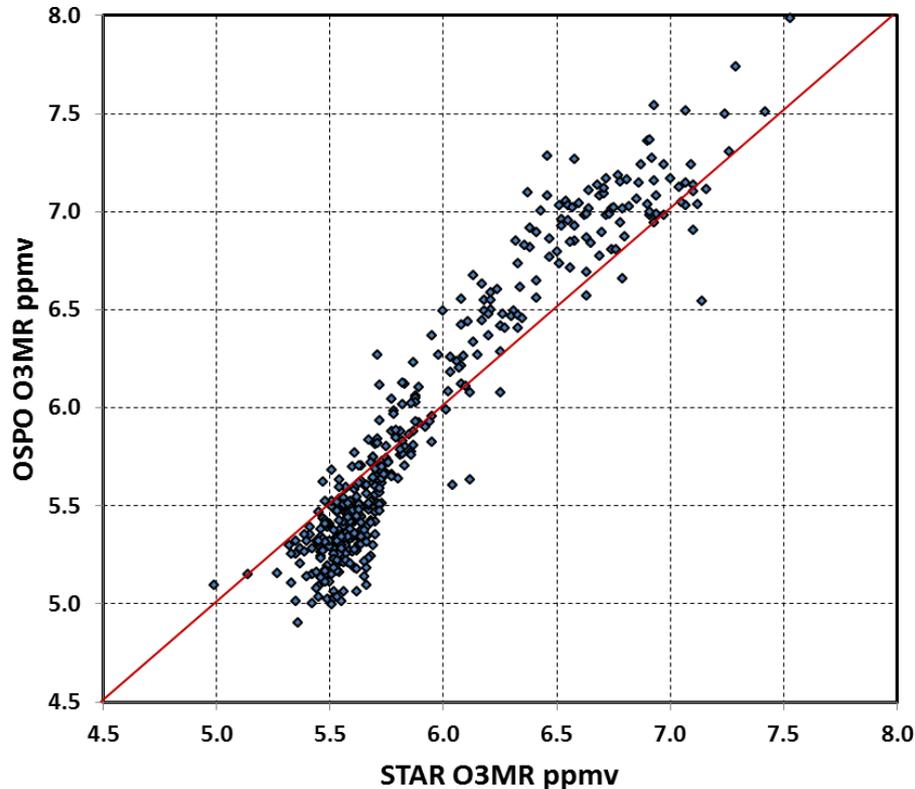
- Operational orbital SBUV/2 products are assimilated into the GFS/CFS and CPC analyses.
  - GFS : ozone forecasts : UV Index
  - CPC : ozone analyses : ozone hole area
- End-of-month recalibrated SBUV/2 products are used for monitoring long term trends
- CPC monitors both and inform OSPO and STAR when the two differ significantly.

# Diff between OSPO and STAR

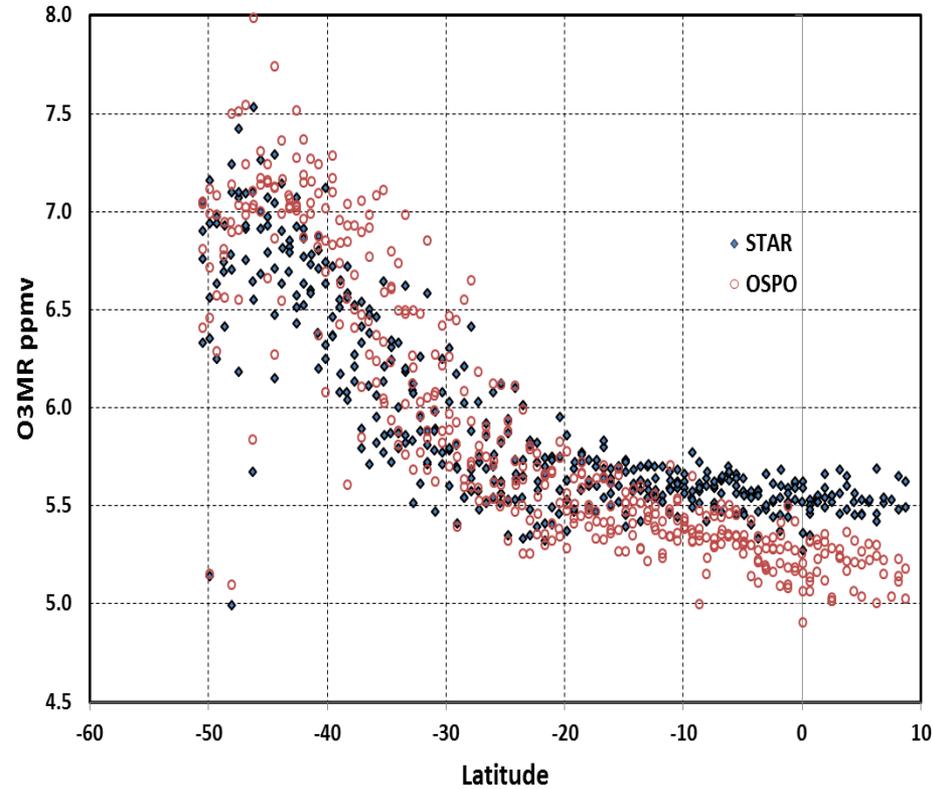
- OSPO : operational processing
- STAR : end of month reprocessing
- Disagree at 2 hPa
- 252nm channel
  - OSPO uses
  - STAR does not
- Which is right?
- Importance : OSPO is put into CLASS
  - STAR is used for long term monitoring

# Diff between OSPO and STAR

2 hPa - SH - Day 173, 2015



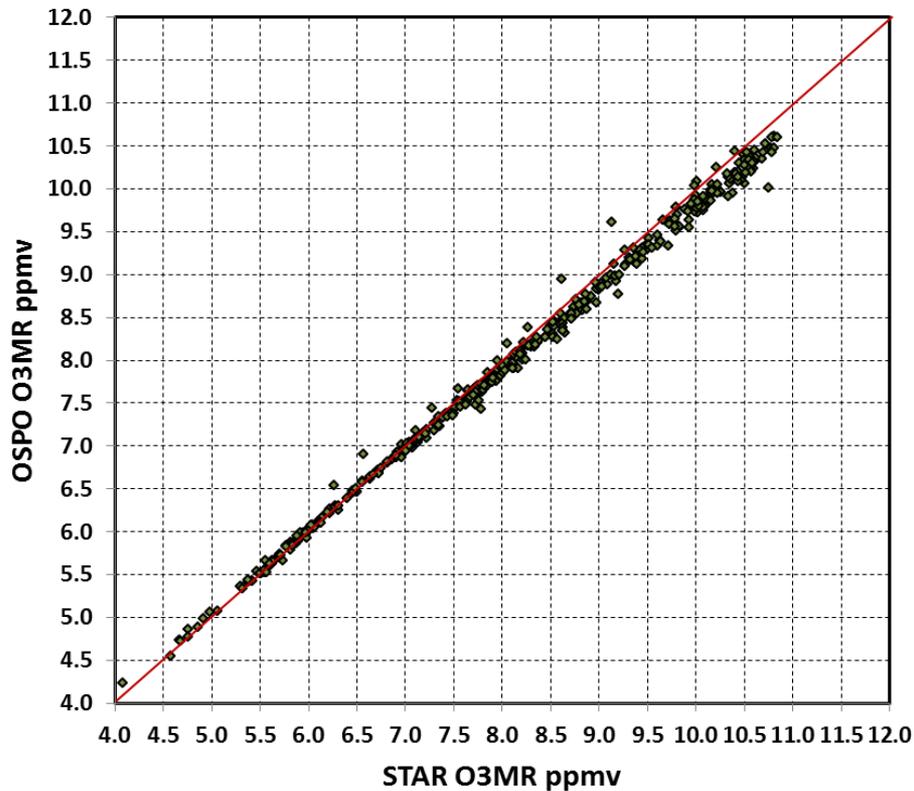
2 hPa - SH - Day 173, 2015



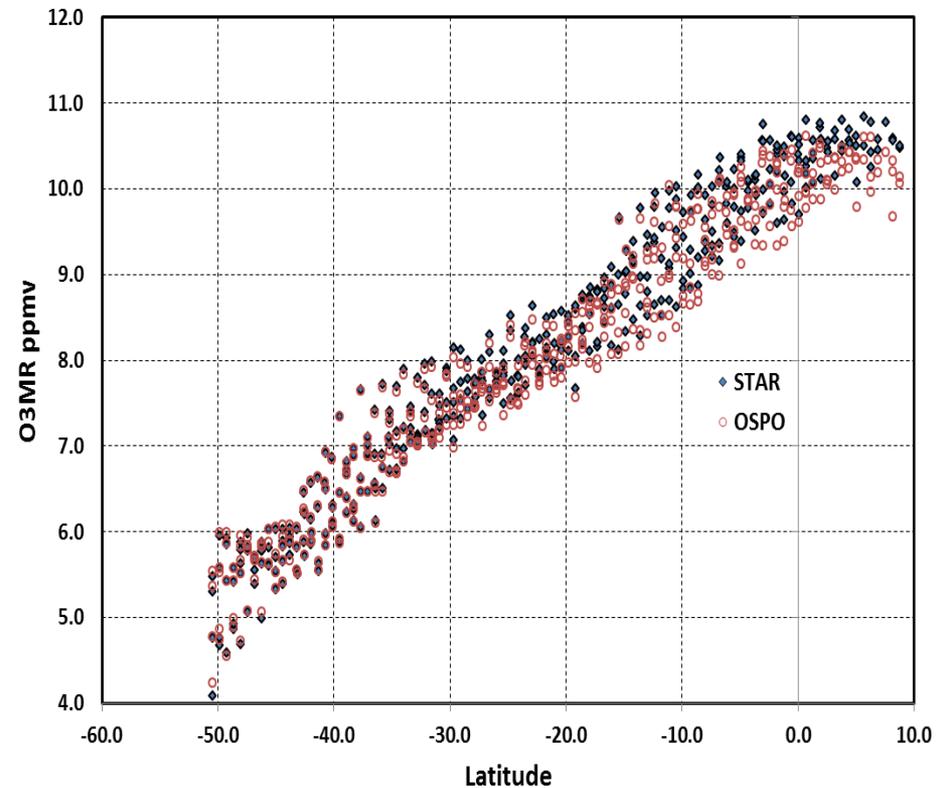
Disagreement in upper stratosphere

# Diff between OSPO and STAR

10 hPa - SH - Day 173, 2015



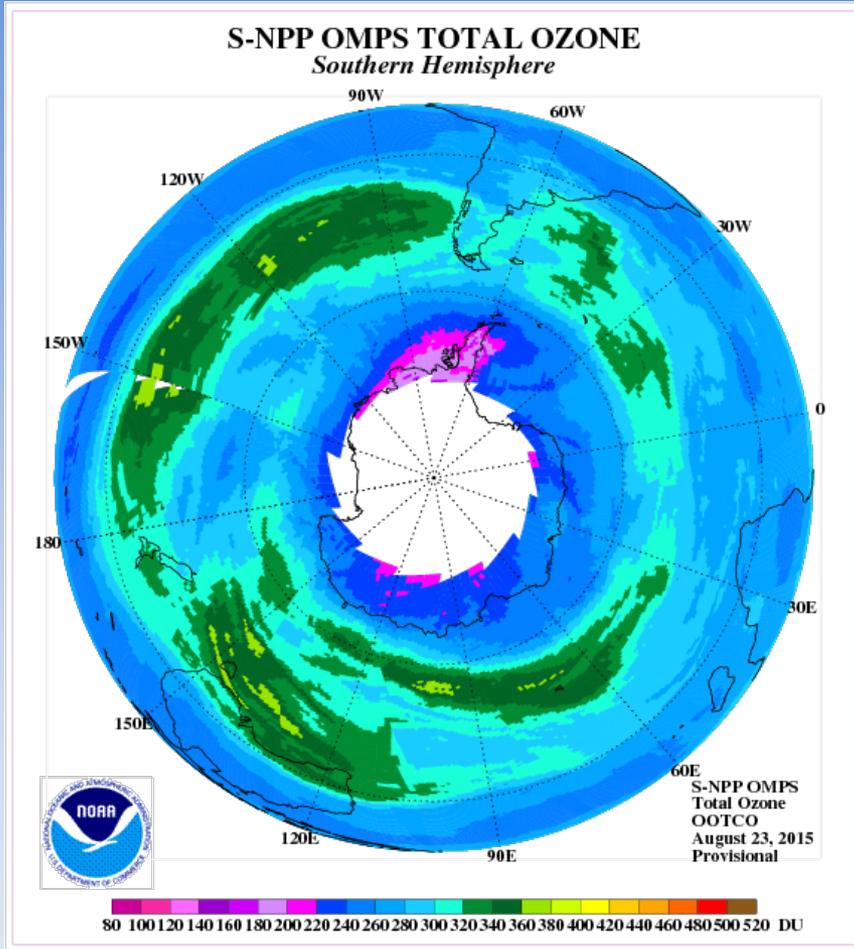
10 hPa - SH - Day 173, 2015



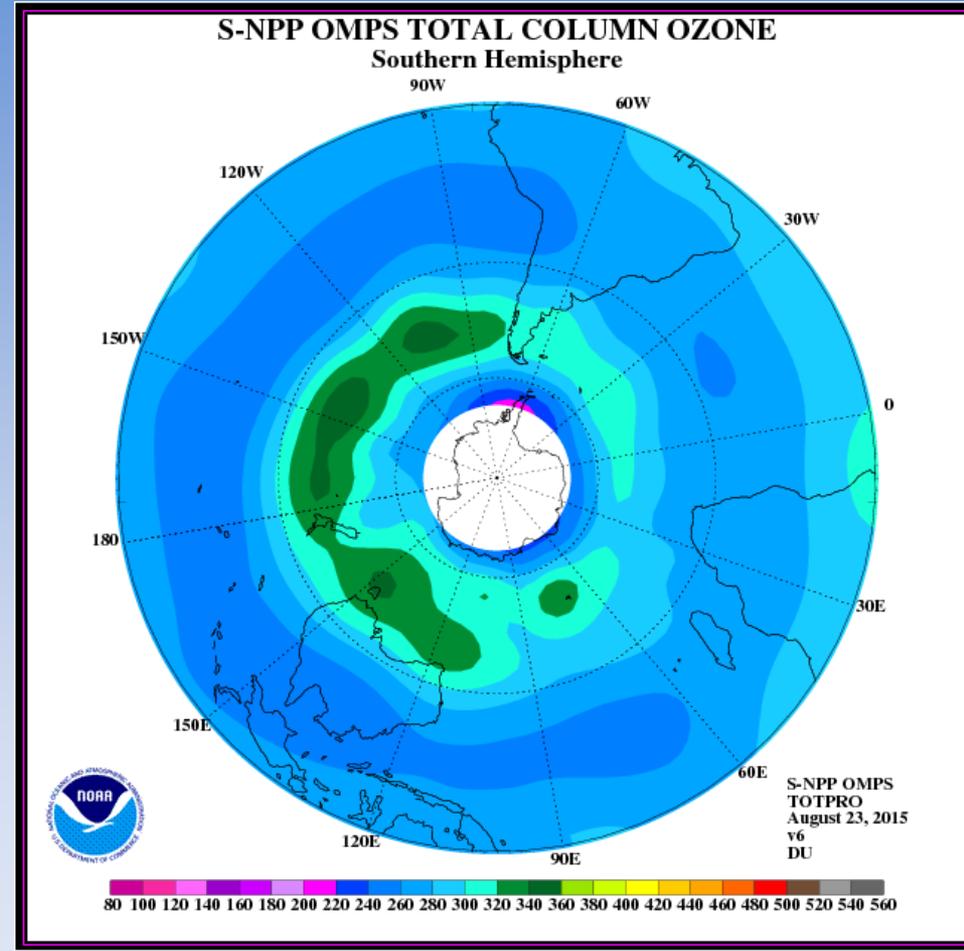
Agreement in middle stratosphere

# OMPS Ozone Analyses

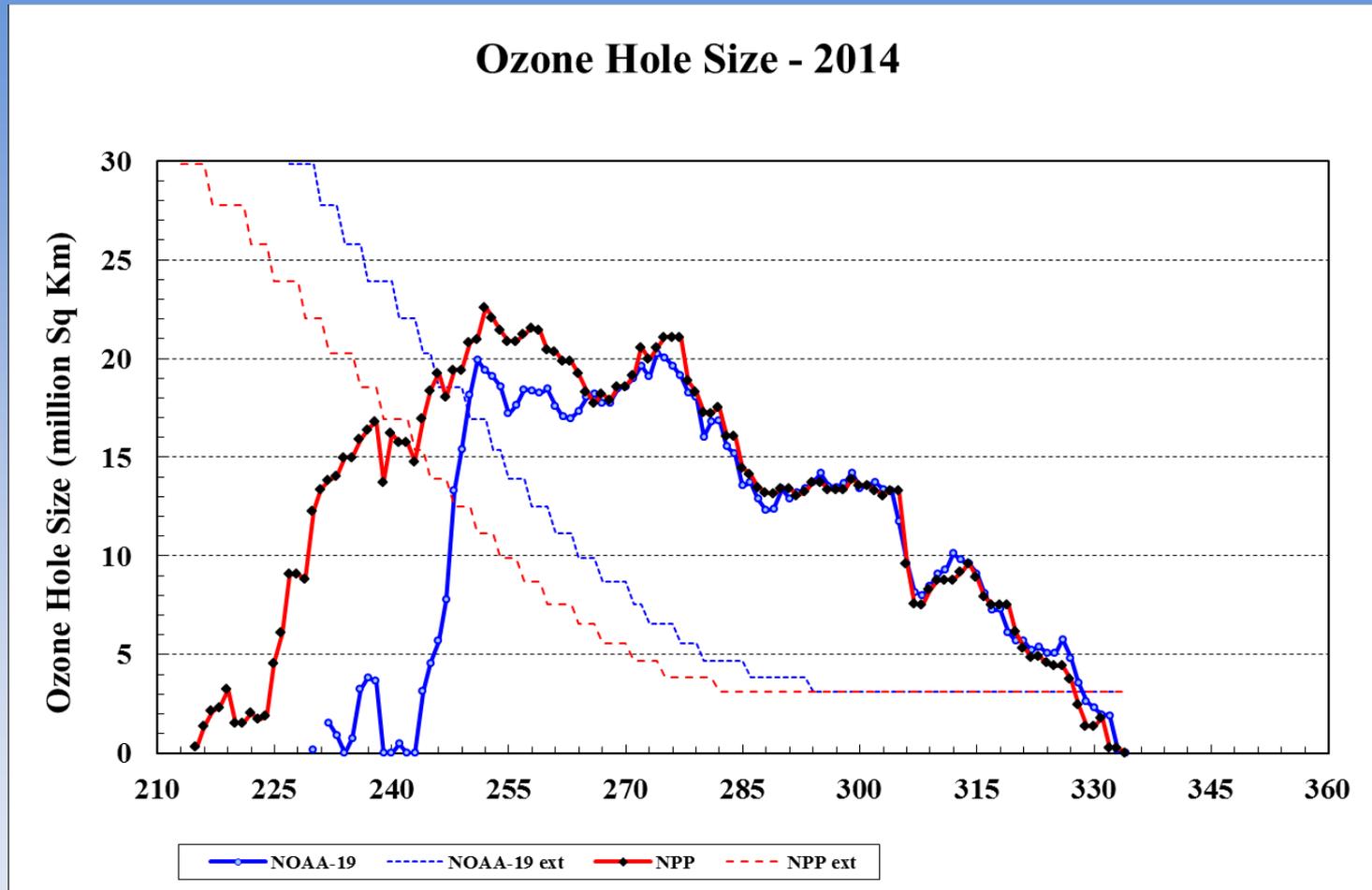
Total Column Mapper



Analysis using Total Profile

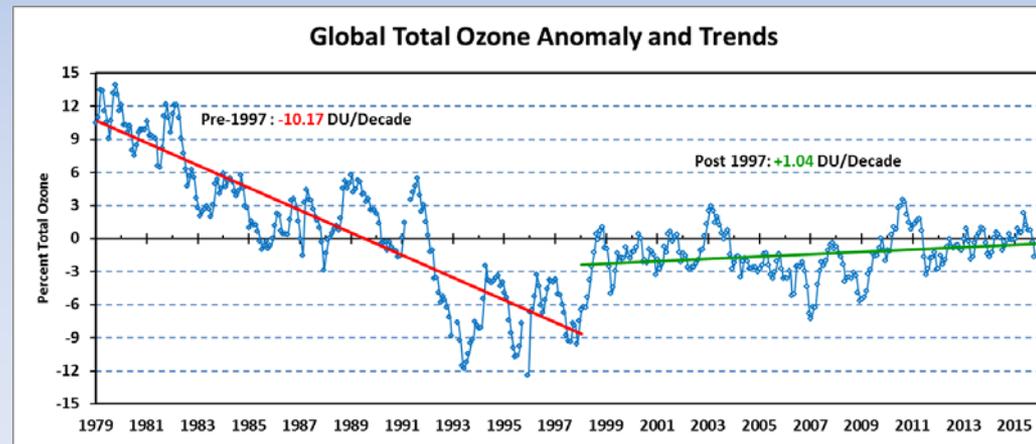
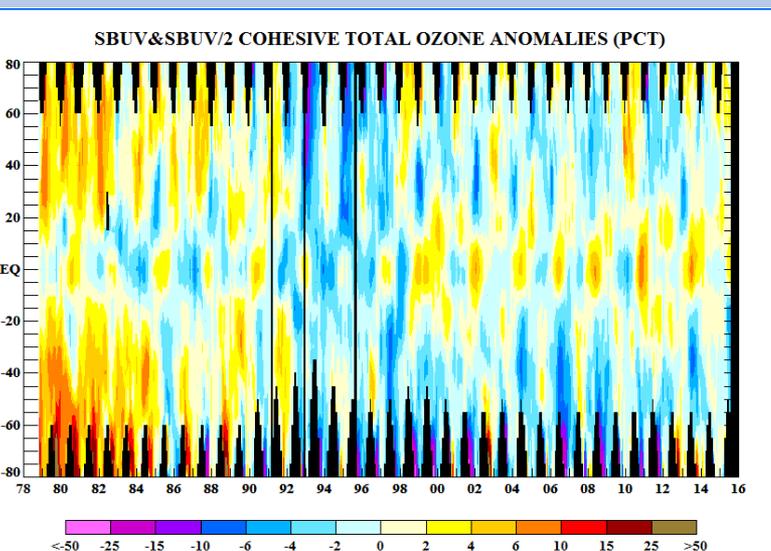
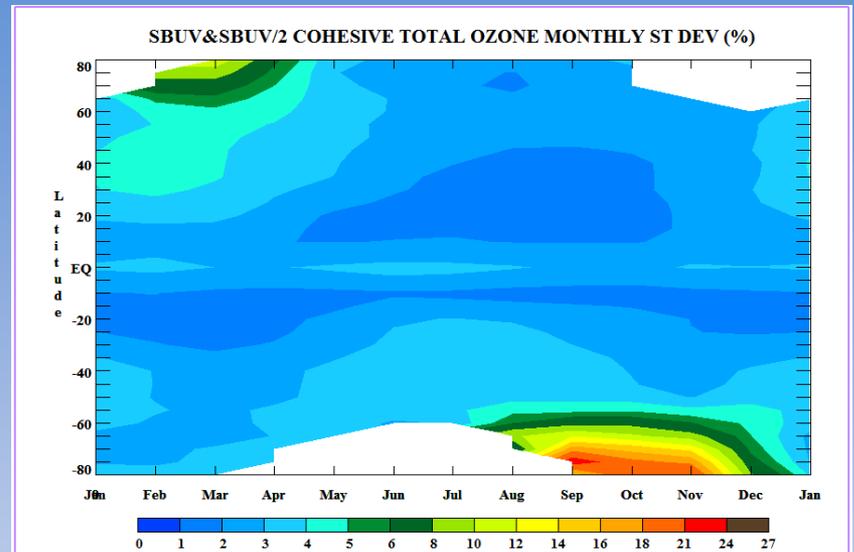
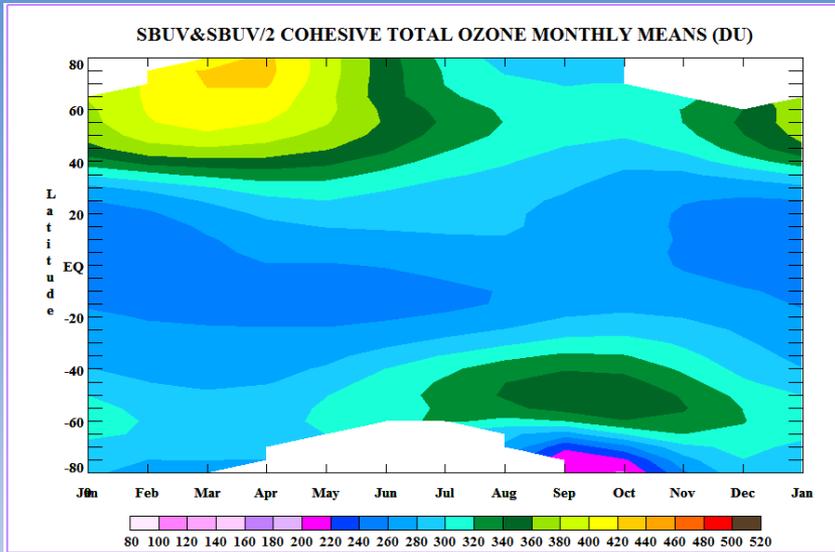


# OMPS Ozone Hole Monitoring



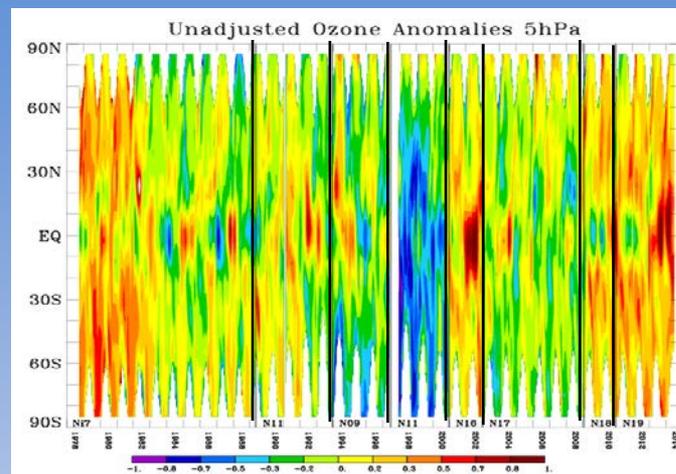
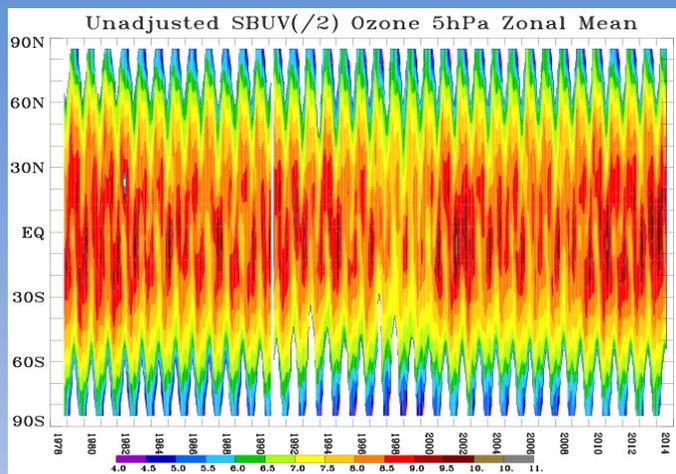
SNPP orbit allows for earlier observation of ozone hole than N19

# Long Term Total Ozone Monitoring



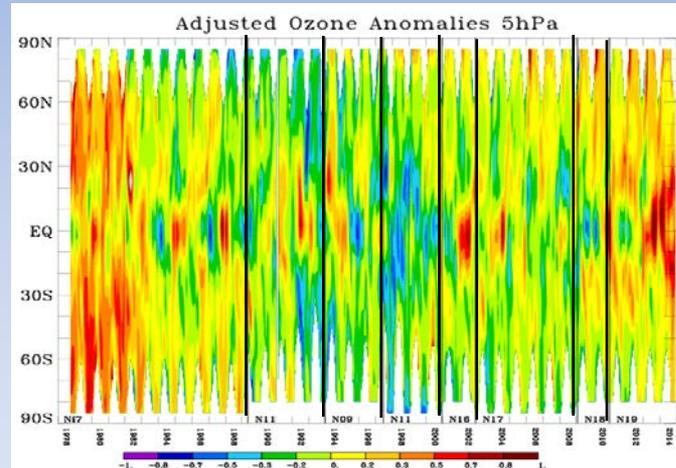
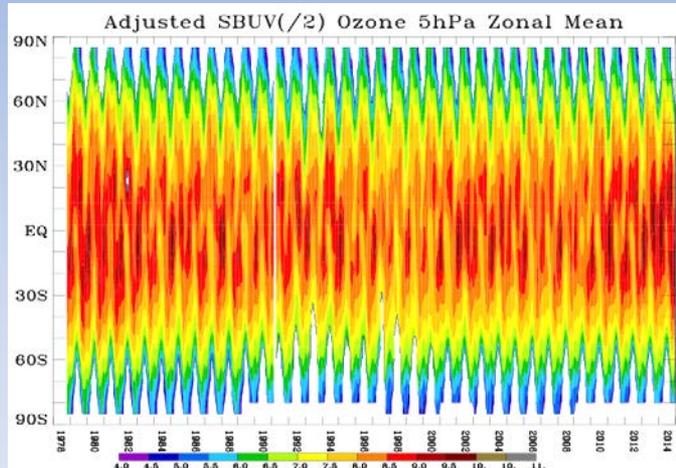
# Merged Cohesive SBUV(/2) CDR

v8.6  
unadjusted  
5 hPa O3MR

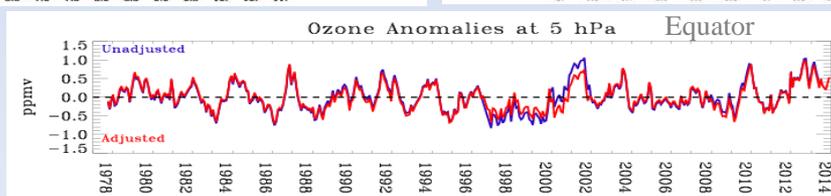


unadjusted  
5 hPa O3MR  
anomalies

v8.6  
adjusted  
5 hPa O3MR

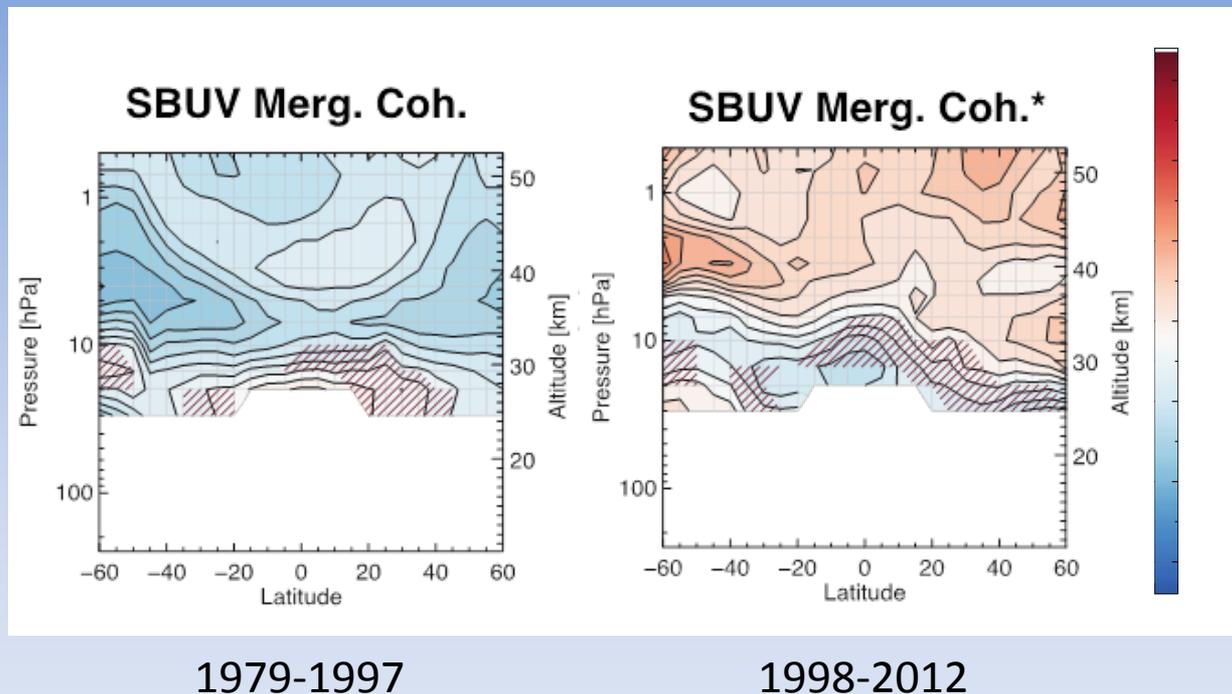


Adjusted  
5 hPa O3MR  
anomalies



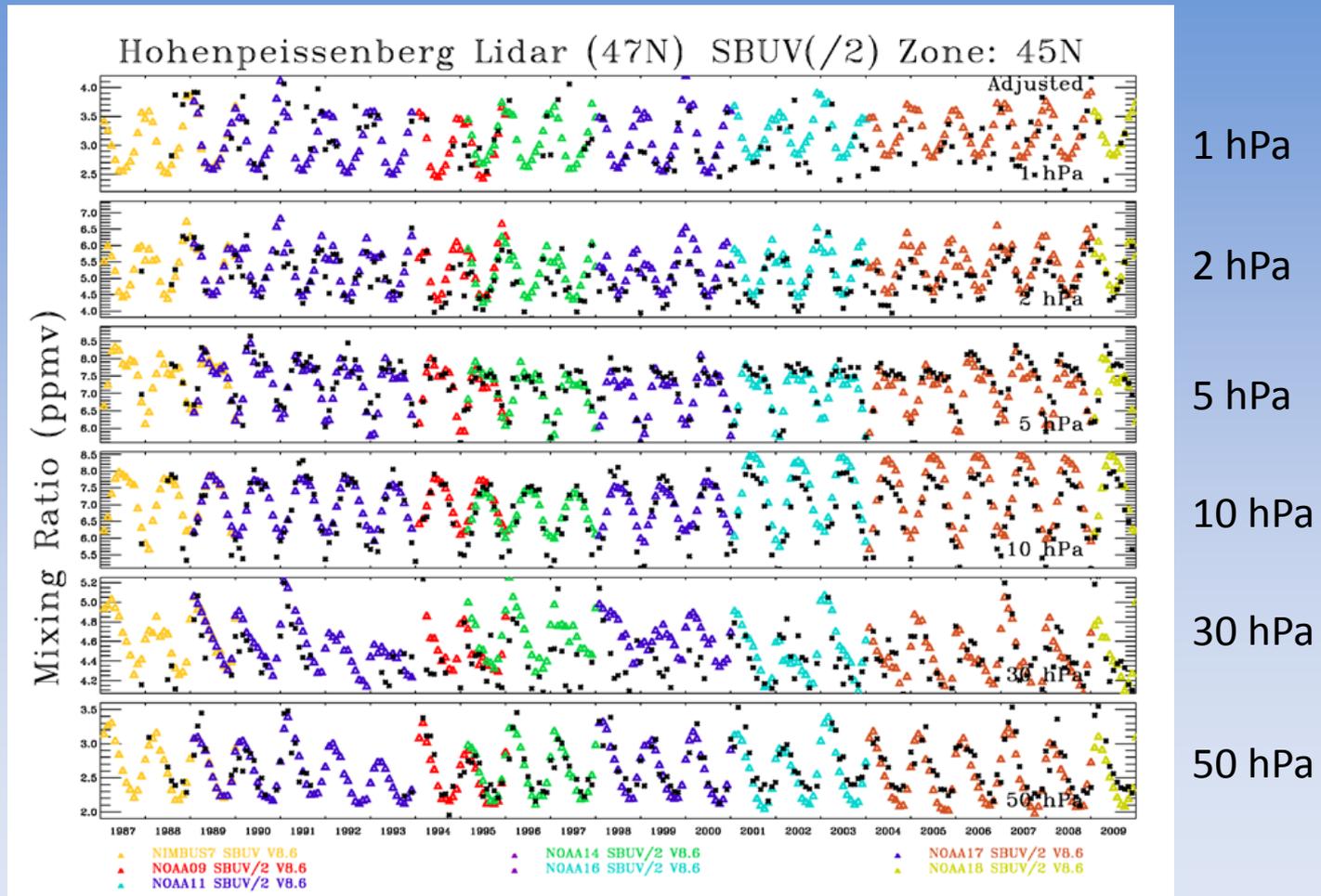
# Long Term Profile Ozone Monitoring

## Ozone Profile Trends (%/Decade)



*From Harris et al, 2015*

# Utilization of NDACC Ozone Lidar for Validation



Comparison of monthly mean adjusted zonal O3MR with monthly mean Lidar Obs

# GFS Large O-G Episode

- Obs-Guess is used for monitoring the operational GFS ozone production
- Was high between June 25 and Jun 30, 2015 at 2 hPa
- What was cause?
  - Model or data?
- An unusual wave one pushed the 2 hPa max values off of the pole favoring the Australia quadrant.

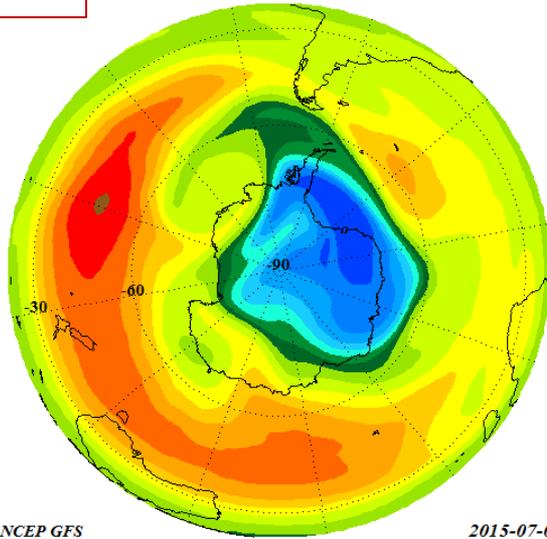
# Anal – Fcst Plots at 2 hPa

- Anl files for 2015070200
- F06 (Guess) files for 2015070118
- Analyses differ from forecast only where observations occur.
- Analysis adds ozone
- Analysis contours every 0.5 mg/kg
  - Blue is 5.0 mg/kg
  - Red is 11.0 mg/kg
- Difference contours every 0.05 mg/kg
  - 0 diff is contoured

# Anal – Fcst Plots at 2 hPa

**ANL**

2 hPa O3MR Analysis

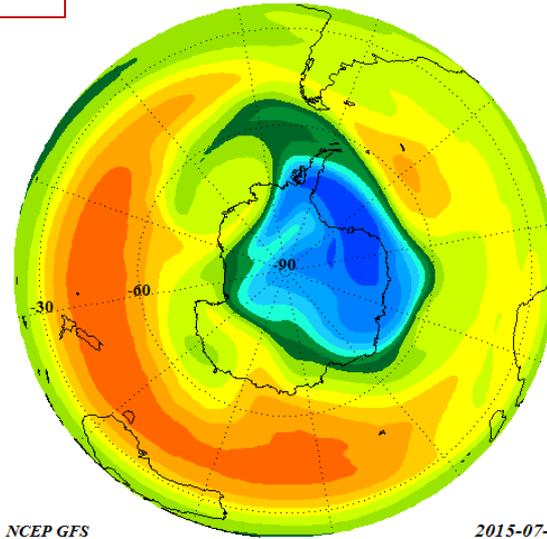


NCEP GFS

2015-07-02  
00UTC - ANL

**F06**

2 hPa O3MR Analysis

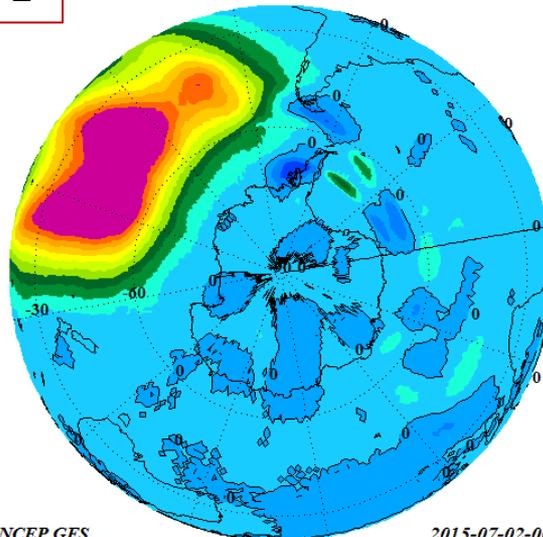


NCEP GFS

2015-07-01  
18UTC - F06

**A-F**

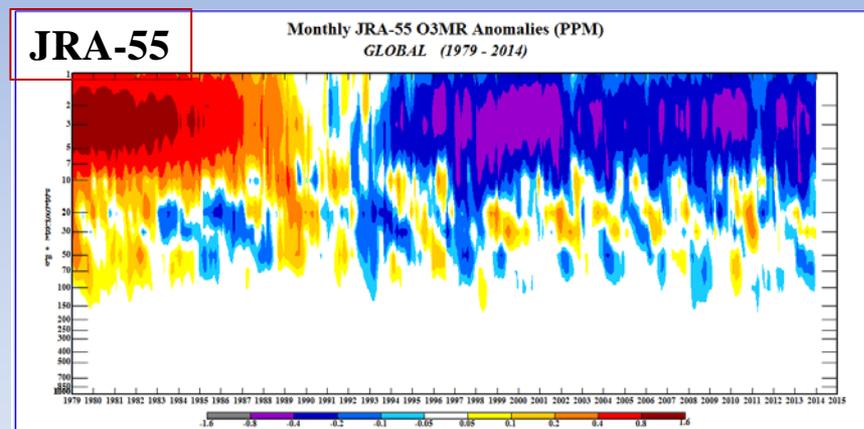
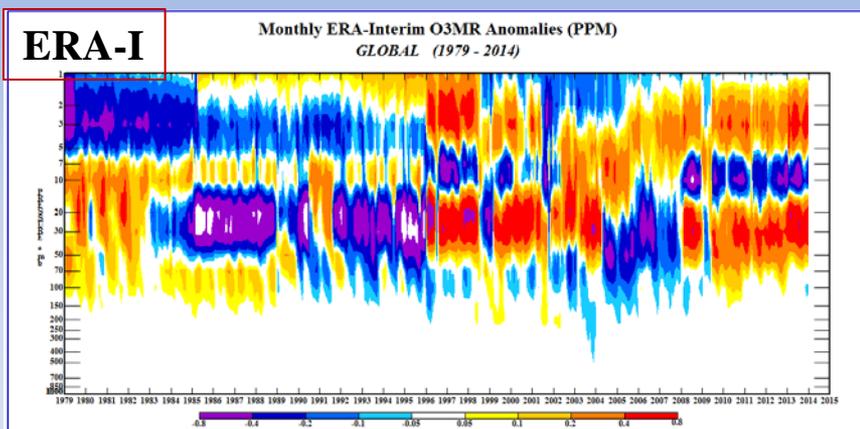
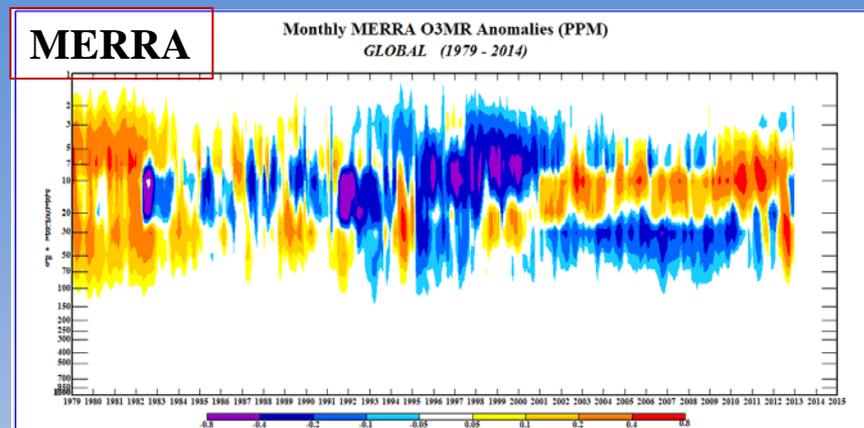
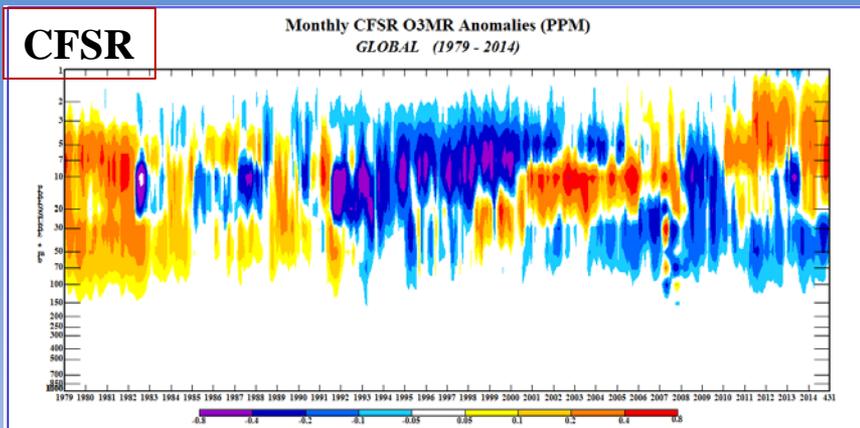
2 hPa O3MR Difference (A-F)



NCEP GFS

2015-07-02-00Z - anl  
2015-07-01-18Z - f06

# Ozone in Reanalysis



Global mean O3MR anomalies time series shows discontinuities in ozone sources  
Is assimilation of multiple sources better? Need to have similar characteristics.

# Summary & Pros about OMPS

- CPC has been monitoring ozone since the mid1970's.
- CPC monitors ozone on various time scales.
- CPC primarily monitors ozone via the SBUV(/2), OMI, and now OMPS.
- OMPS will continue SBUV/2 ozone monitoring heritage.
- OMPS provides additional ozone products to monitor ozone .
- OMPS Limb provides finer vertical resolution and extend down to cloud top
  - Needs to be assimilated ASAP after NM and NP
    - *Also means that NESDIS needs to provide in operations*
  - Will help NCEP AQ forecasts.
- Reprocessed OMPS needs to be available for users and reanalysis
  - Preferably in CLASS