

# Ozone Data Assimilation at NCEP

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# Why Ozone Data Assimilation?

- Ozone data assimilation provides a global 3D distribution of ozone.
- Ozone observations from satellite instruments are important to constrain the ozone field in global model.
- Accurate knowledge of the ozone distribution has potential to improve temperature forecasts in stratosphere.
- The time evolution of ozone contains wind information.
- Ozone analyses initialize ozone forecasts which are used for surface UV forecasts.

# O3 products used operationally at NCEP

## Actively Assimilated

- OMPS version 8 nadir profiler (NP) and nadir mapper (NM) from NPP
- OMI\_AURA (total column)

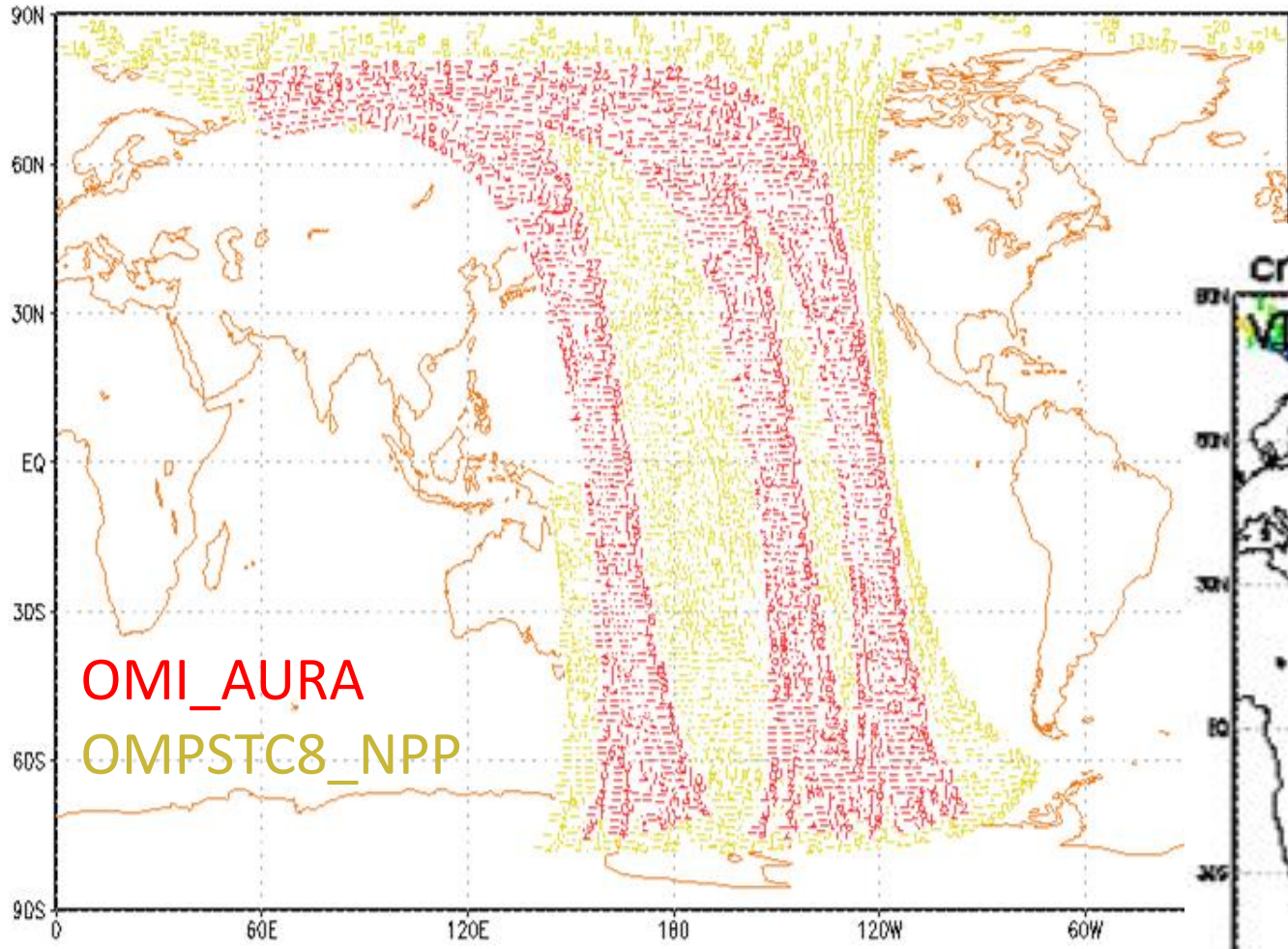
## Passively Monitored

- SBUV\_N19 version 8 nadir profiler
- GOME from Metop-A and Metop-B

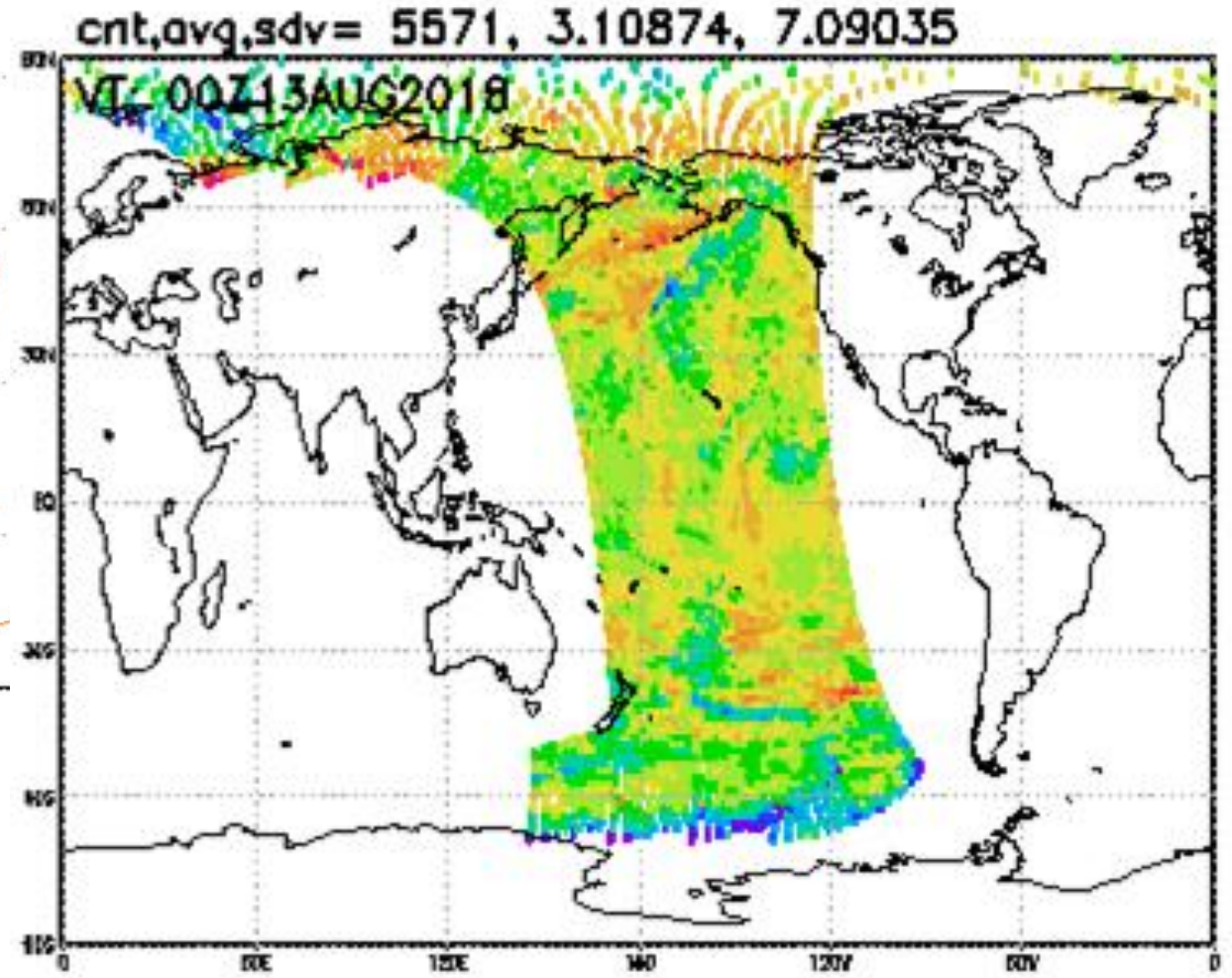
## To be used in future

- OMPS limb profiler (LP): under evaluation and can be monitored in the pre-implementation parallels
- OMPS NP and NM from N20

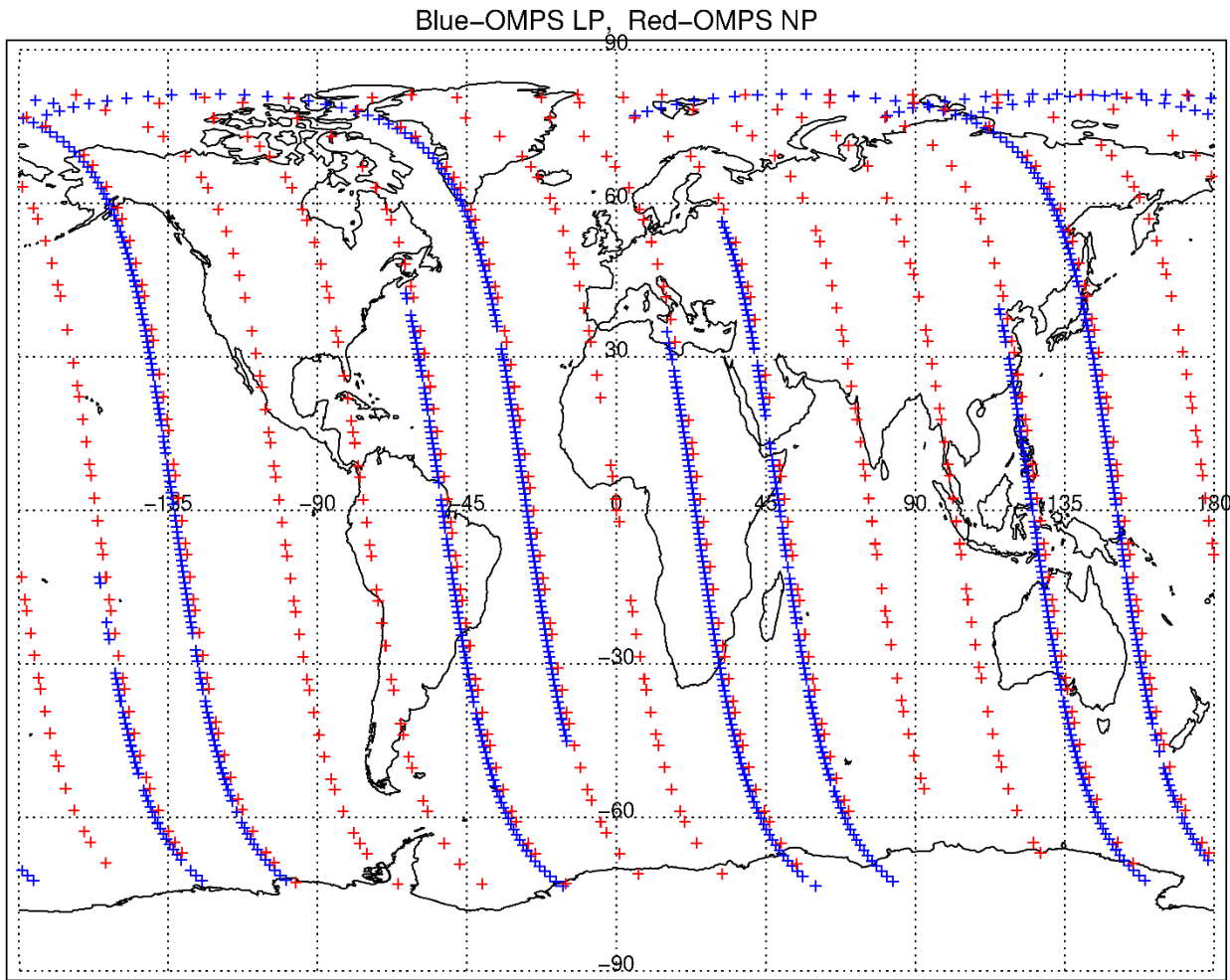
# total column O3 data coverage



OmF from OMPS nadir mapper

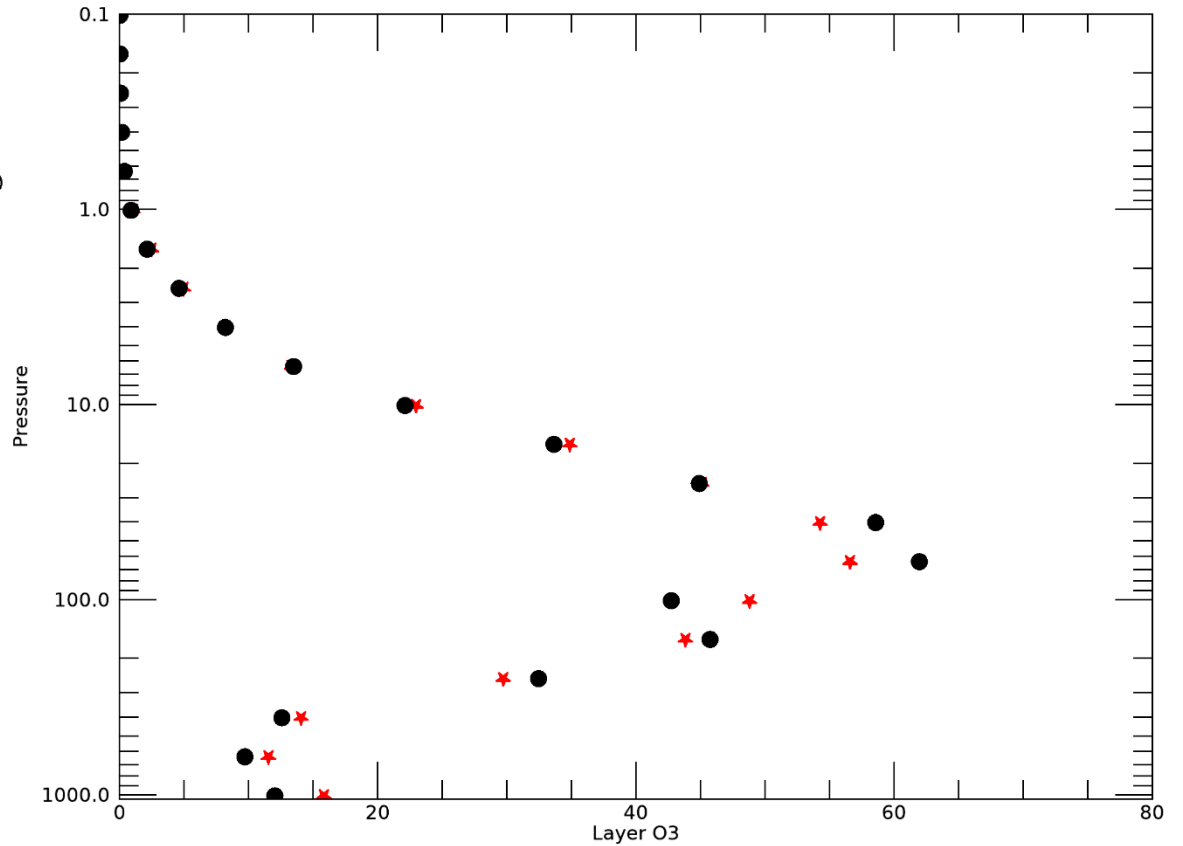


- OMPS nadir mapper has better coverage than OMI\_AURA.



OMPS profiler daily data coverage  
 blue: limb profiler  
 red: nadir profiler

**Obs** from OMPS nadir profiler VS **FCST**

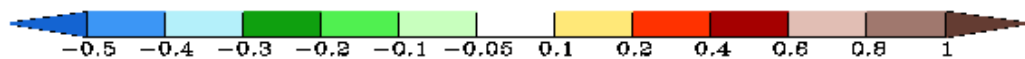
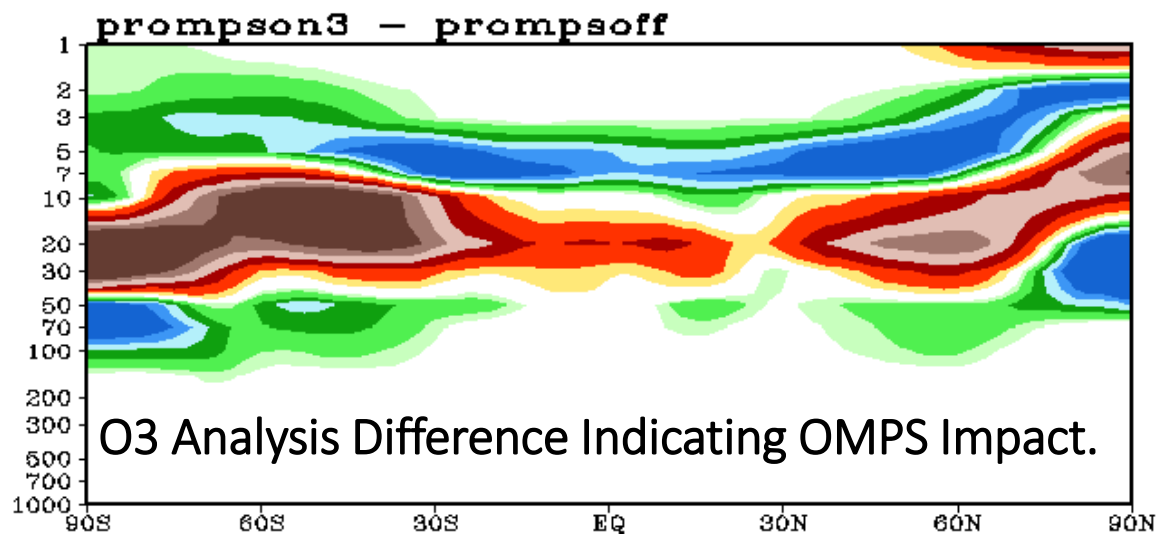
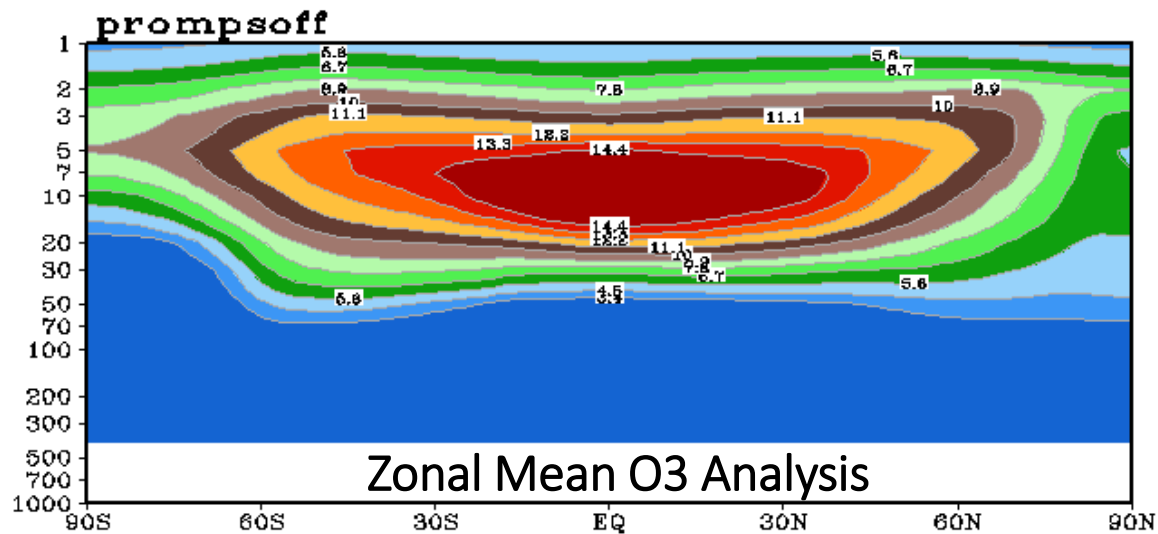


# OMPS\_NPP Assimilation

- Quality Controls (QC) for OMPS
  - QC for nadir profiler (NP):
    - Only accept total ozone error code 0 or 2 (high sza)
    - Only accept profile ozone error code 0, 1 (high sza) or 7(stray light correction applied)
  - QC for total column ozone from nadir mapper (NM):
    - only accept flags 0, 1, flag 2 is high SZA data which is not used
    - remove the data in which the C-pair algorithm (331 and 360 nm) is used
- Thinning for OMPS NM:
  - the product resolution is 50kmx50km but thinned to 150kmx150km

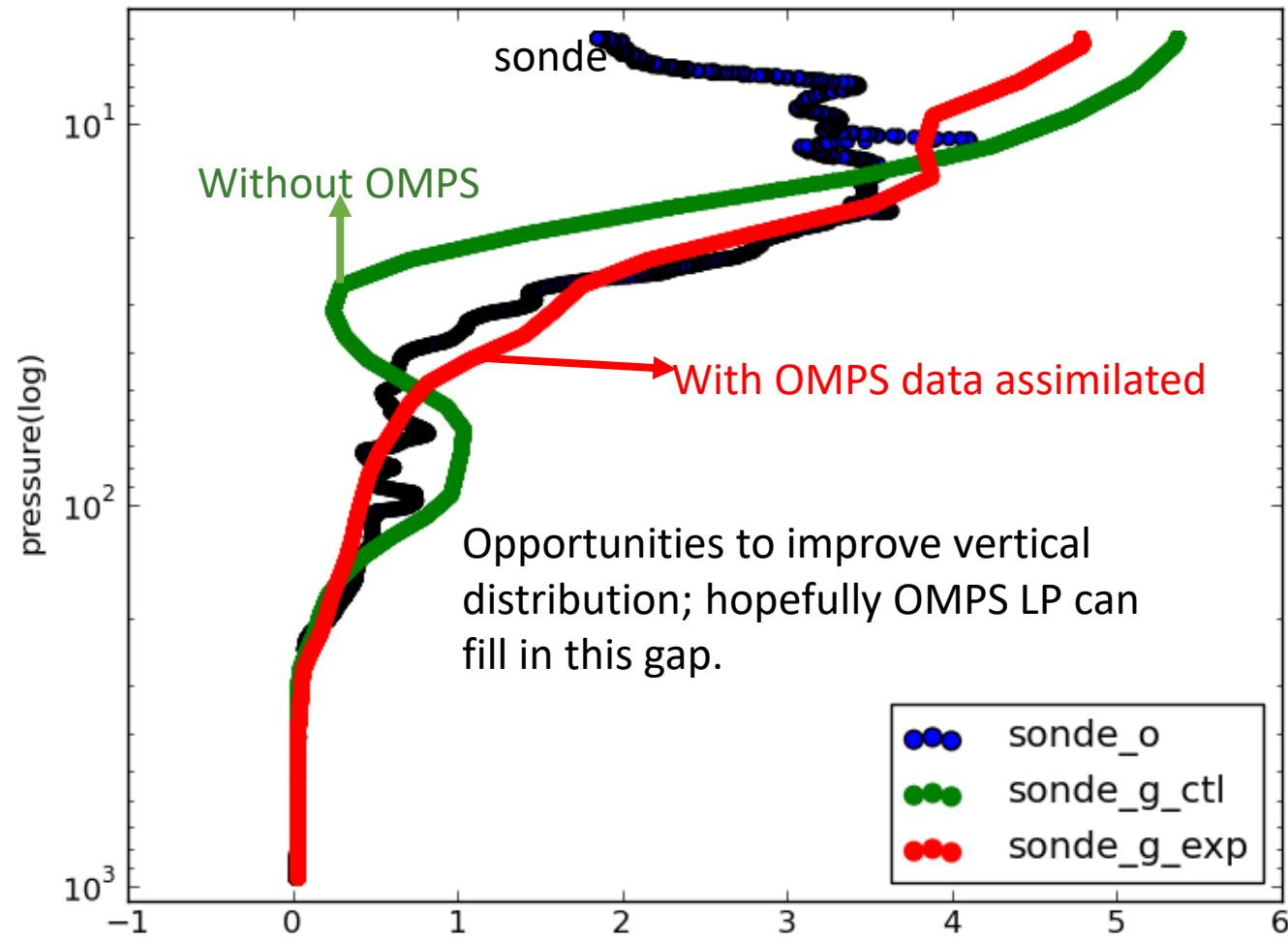
# Impact of OMPS\_NPP Assimilation

O3 (ppmg), 00Z-Cyc 10Sep2018-13Oct2018 Mean  
(ani ani ani ani) Post-Hour Average



JPSS/GOES-R Proving Ground / Risk Reduction (PGRR)

Comparison with independent O3 sounding



# Ozone Data Assimilation Monitoring

## Ozone Data Monitoring

Select Source:

[Time Series plots](#)  
[Horizontal data plots](#)  
[Summary plots](#)

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**Time Series**

Select Platform:

Select Data Type:

Geographic Region:

Statistic Type:

Level Groups:

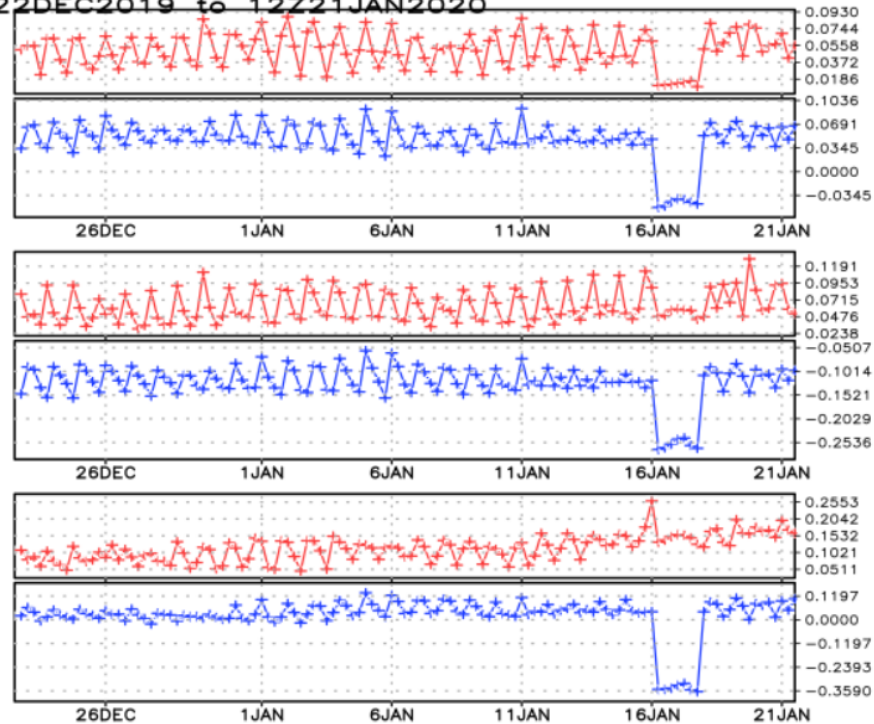
Net,run : GFS, gdas  
platform: ompsnp\_npp  
region : global (180W-180E, 90S-90N)  
variable: obs-ges  
valid : 12Z22DEC2019 to 12Z21JAN2020

pressure 0.639  
level 5  
avg: 0.0464849  
sdv: 0.0506995

\*\* IS NOT \*\*  
ASSIMILATED

pressure 1.013  
level 6  
avg: -0.125762  
sdv: 0.0629197

pressure 1.601  
level 7  
avg: 0.0212994  
sdv: 0.114989



dramatic changes in these time series indicate changes in quality of ozone data



# Challenges and Questions

- Lack independent ozone sounding data for validation.
- Recent development of CRTM on direct simulation of the UV radiances. Any work done on direct UV radiance assimilation?
- Further improvement on ozone analysis: finer horizontal and vertical structures. What are the potential benefits in users' applications?