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)

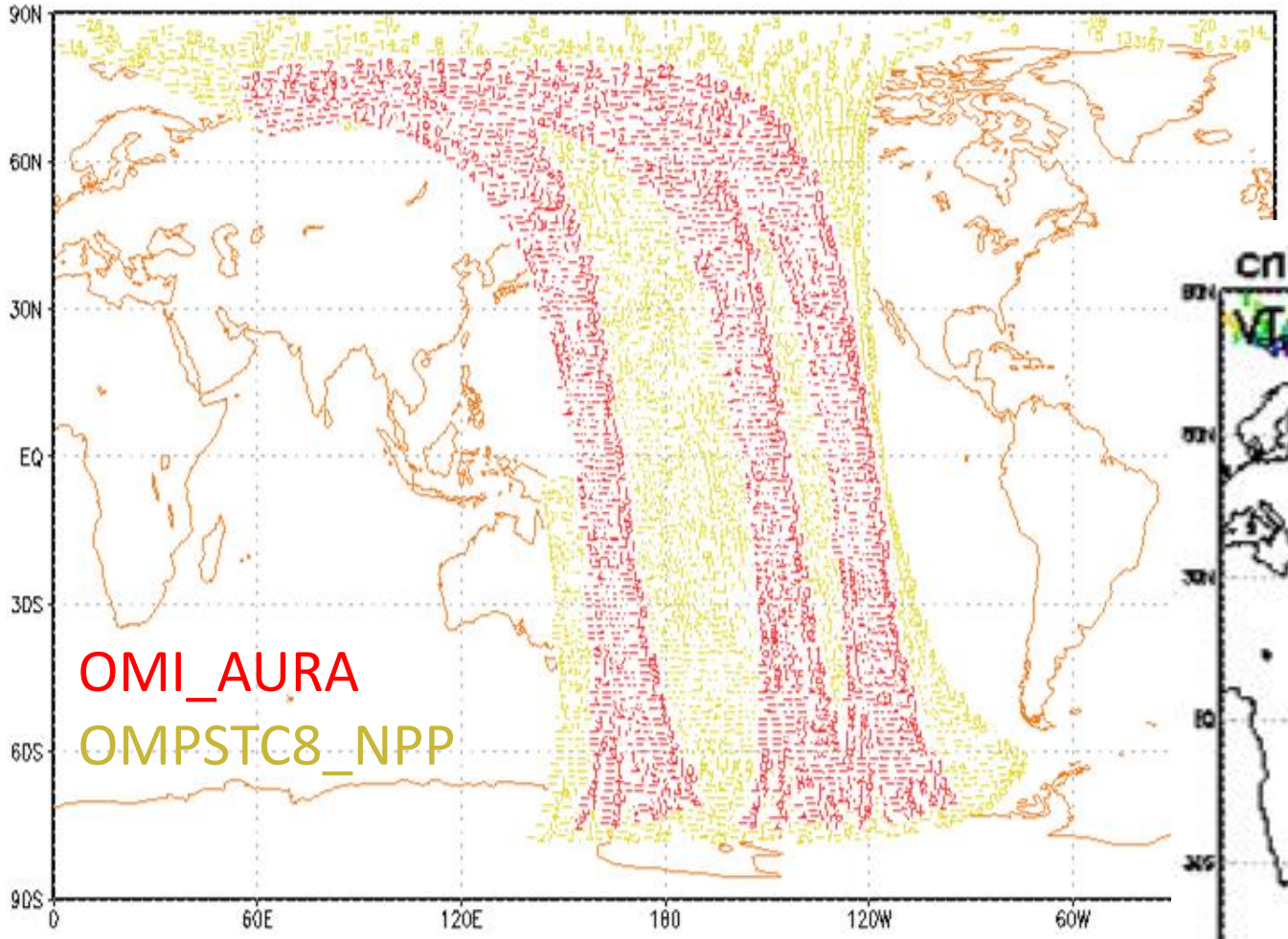
Passively Monitored

- SBUV_N19 version 8 nadir profiler
- GOME from Metop-A and Metop-B

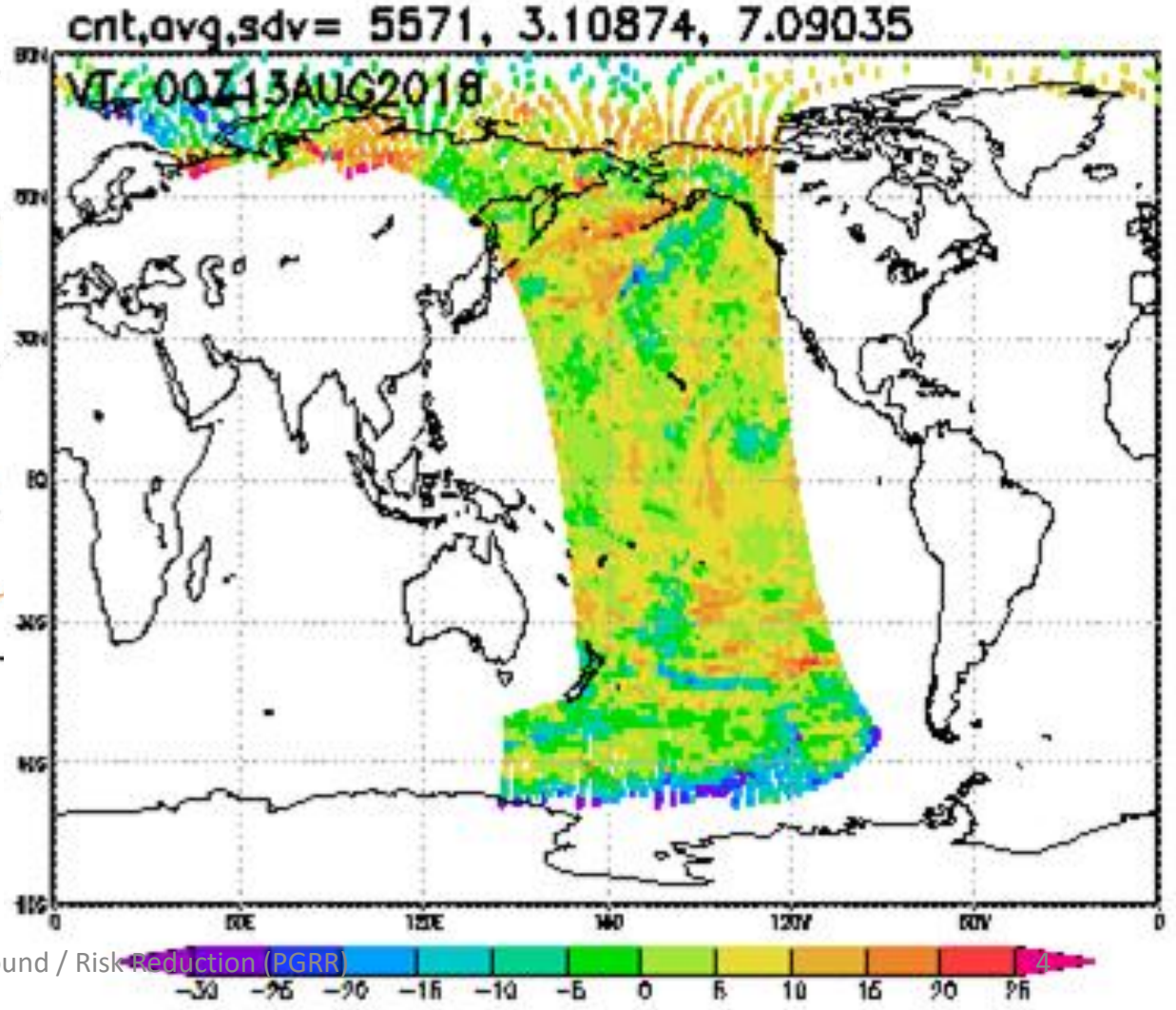
To be used in future

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

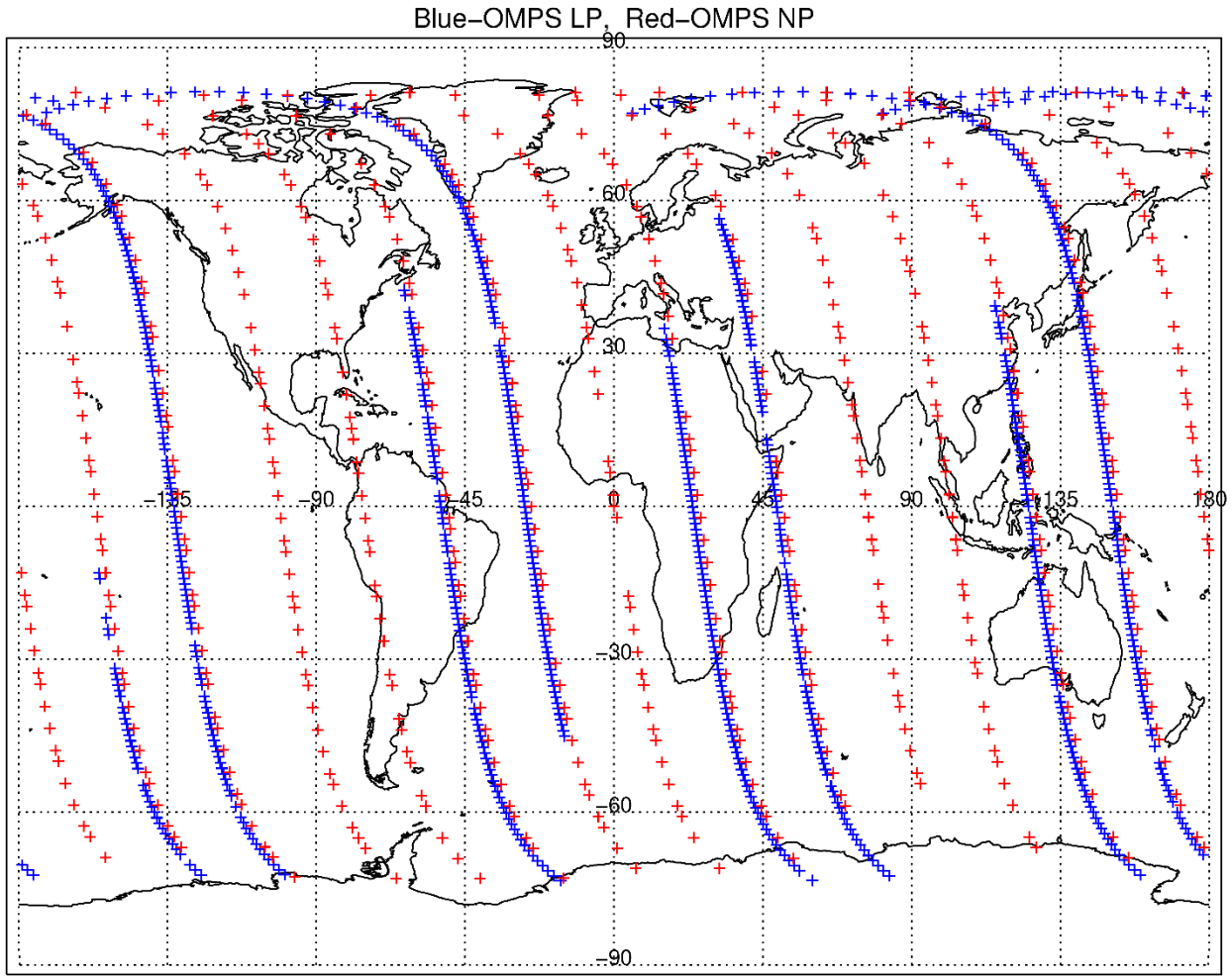
total column O3 data coverage



OmF from OMPS nadir mapper



- OMPS nadir mapper has better coverage than OMI_AURA.

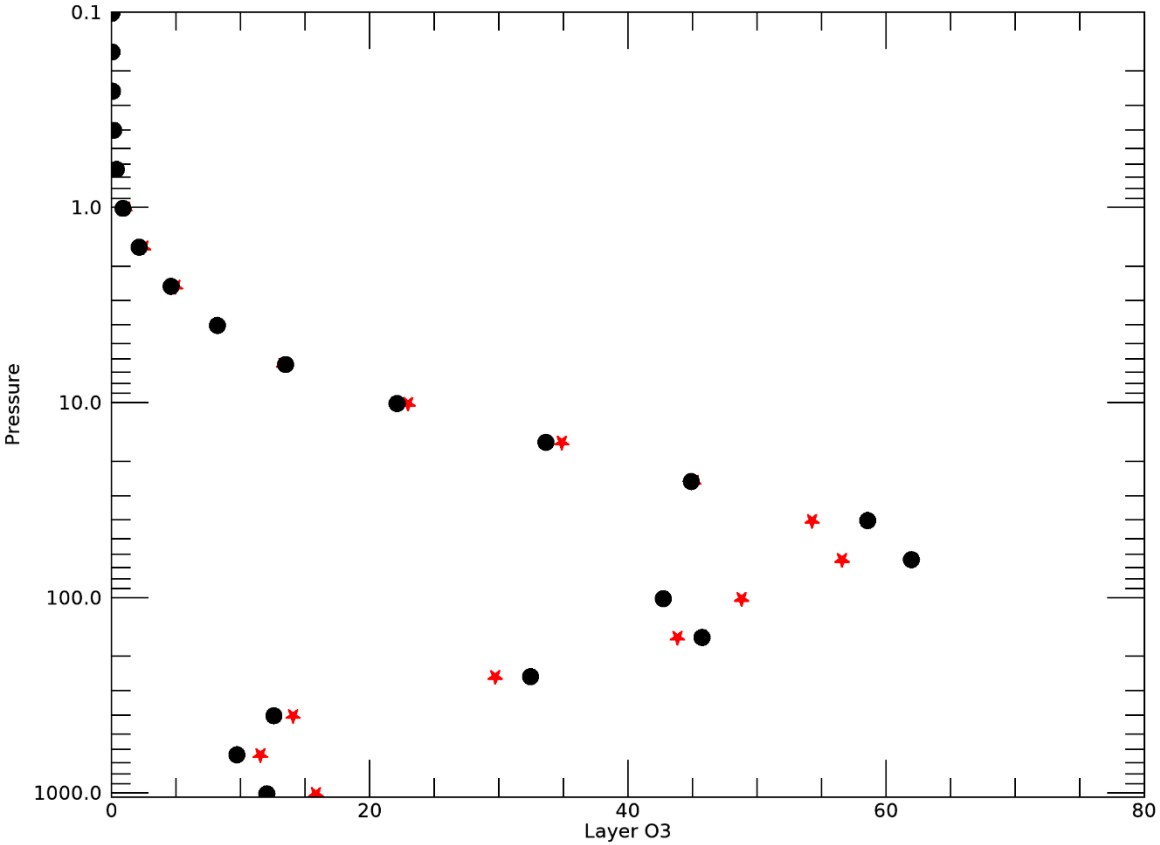


OMPS profiler daily data coverage

blue: limb profiler

red: nadir profiler

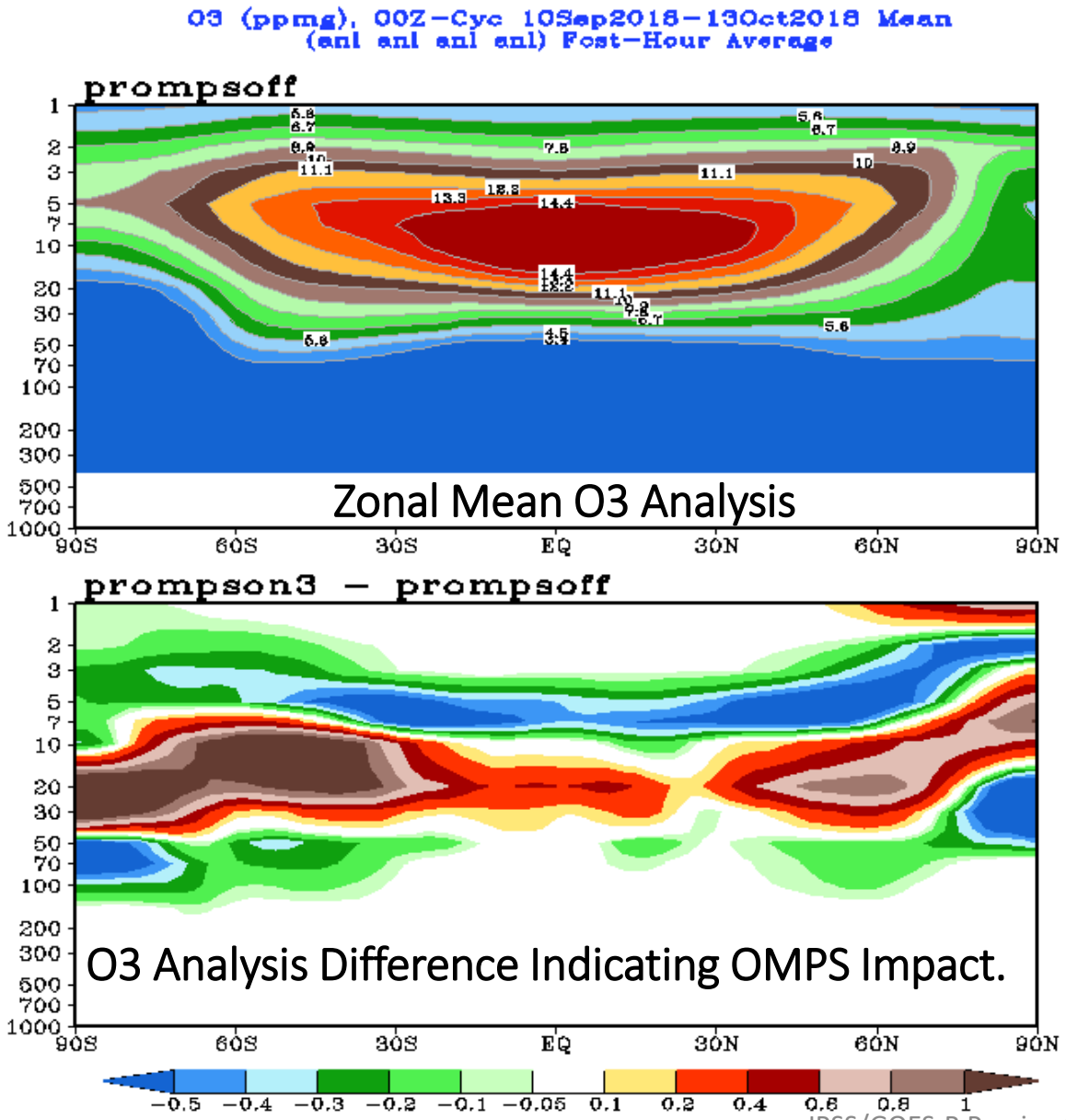
Obs from OMPS nadir profiler VS **FCST**



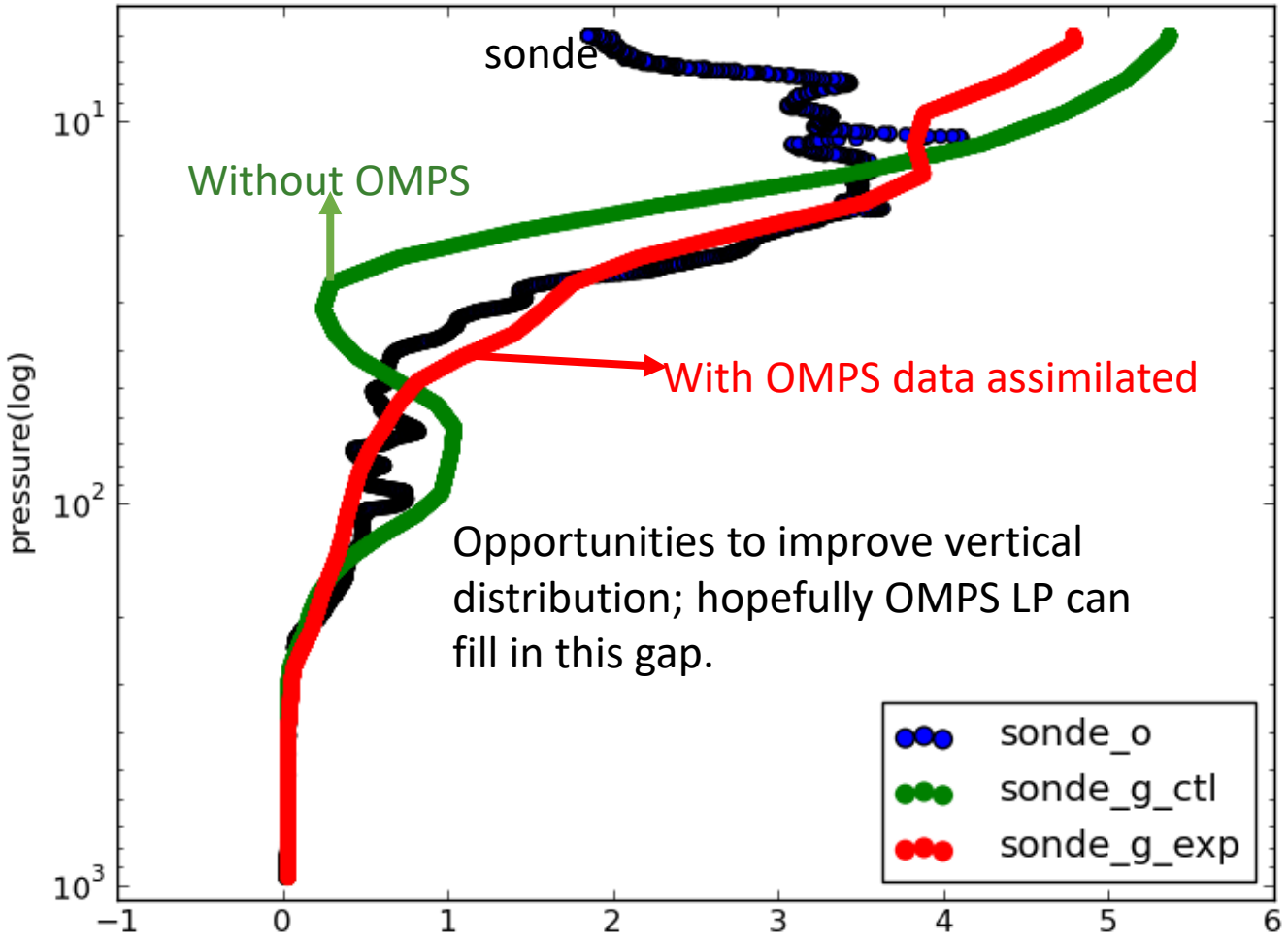
OMPS_NPP Assimilation

- 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

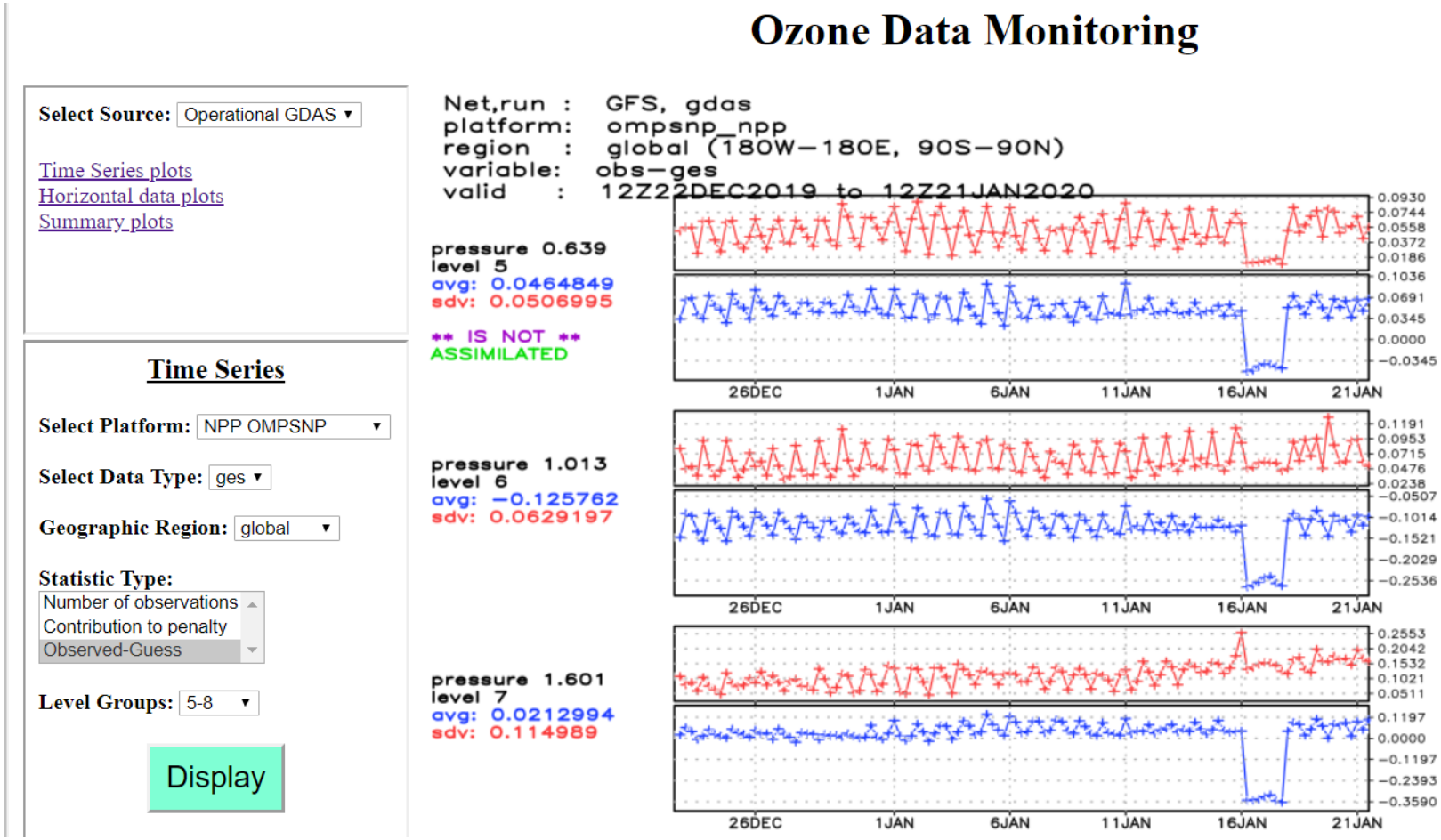
Impact of OMPS_NPP Assimilation



Comparison with independent O3 sounding



Ozone Data Assimilation Monitoring



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?