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
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
Zonal Mean O3 Analysis

Comparison with independent O3 sounding

Oppportunities to improve vertical distribution; hopefully OMPS LP can fill in this gap.
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?