NOAA User Update

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NOAA/NWS/NCEP
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NOAA Users of NPP OMPS Observations

• Operational Assimilation
  – Ozone product assimilation
    • Already assimilating SBUV/2 profile and OMI TO$_3$
    • Conducting tests using MLS NRT v3 to simulate the OMPS - LP
  – Aerosol product assimilation
    • NEMS GFS Aerosol Component – NGAC

• Climate Monitoring
  – Long term ozone dataset (SBUV/2 + OMPS)
    • Ozone depletion
    • Ozone recovery
    • Impacts due to climate change
  – Ozone “hole” monitoring/attribution
    • Antarctic
    • Arctic
NEMS GFS Aerosol Component (NGAC)
NCEP’s global interactive atmosphere-aerosol forecast system

Model Configuration:
- Forecast model: Global Forecast System (GFS) based on NOAA Environmental Modeling System (NEMS), NEMS-GFS
- Aerosol model: NASA Goddard Chemistry Aerosol Radiation and Transport Model, GOCART

Phased Implementation:
- Dust-only guidance is established in Q4FY12
- Full-package aerosol forecast after real-time global smoke emissions are available and tested (JSCDA project)

NRT Dust Forecasts
- 5-day dust forecast once per day (at 00Z), output every 3 hour, at T126 L64 resolution
- ICs: Aerosols from previous day forecast and meteorology from operational GDAS
- Operational since Sept 2012

Future operational Benefits
- Enables future operational global short-range (e.g., 5-day) aerosol prediction
- Allows aerosol impacts on medium range weather forecasts (GFS/GSI) to be considered
- Provides global aerosol information required for various applications (e.g., satellite radiance data assimilation, satellite retrievals, SST analysis, UV-index forecasts)
- Provides a first step toward an operational aerosol data assimilation capability at NCEP
- Allows NCEP to explore aerosol-chemistry-climate interaction in the operational Climate Forecast System (CFS)
- Provides lateral aerosol boundary conditions for regional aerosol forecast system

Acknowledge: Development and operational implementation of NGAC represents a successful “research to operations” project sponsored by NASA Applied Science Program, Joint Center for Satellite Data Assimilation and National Weather Services

Suomi NPP EDR Product Review  -  Jan 17-18, 2013
Aerosol-radiation feedback: Impact of aerosols on weather forecasts

Verification against analyses and observations indicates a neutral-to-positive impact in temperature forecasts due to realistic time-varying treatment of aerosols.

- T126 L64 GFS/GSI experiments for the 2006 summer period
- PRC uses the OPAC climatology (as in the operational applications)
- PRG uses the in-line GEOS4-GOCART dataset (updated every 6 hr)
NGAC Evaluation and Verification: ICAP inter comparison

- NCEP is a member of the International Cooperative for Aerosol Prediction (ICAP) model intercomparison – member since June 2011
- Participation in ICAP provides confidence that the quality of NGAC dust products is comparable to that produced by other international and domestic modelling centers

- NRL, ECMWF, GSFC, JMA provide forecasts for dust, sulfate, sea salt, and carbonaceous aerosols
- Future capability of NCEP system
Operational Assimilation of OMPS Ozone Products

• NCEP is currently assimilating:
  – SBUV/2 Profile
    • NOAA-16, NOAA-17, NOAA-18, NOAA-19
  – OMI total column ozone
  – Testing MLS NRT v3

• OMPS NP and NM must meet/exceed SBUV/2 and OMI quality
  – Intersatellite comparisons
    • OMPS NP vs SBUV/2
    • OMPS NM vs OMI
  – Comparisons with ground-based Dobson and Brewer measurements

• Expect OMPS-LP to provide similar vertical information as MLS
  – Greater resolution in vertical
  – Additional quality information below ozone peak down to cloud top
Comparisons of Profile Total Ozone

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Column and Profile Total Ozone Should be Similar
Profile Ozone Should be Similar to SBUV/2
Comparisons for Profiler and Mapper

- Comparison so SBUV/2 and OMPS NP overlapping orbits
  - Total profile ozone
  - Profile O3mr
- Comparison of NM TO$_3$ and NP TotPro with ground-based Brewer/Dobson
- Comparisons of NM with OMI
Slight Difference in Num of Obs per Orbit
Long Term Comparisons of SBUV/2 TotPro vs Brewer/Dobson
Comparison of NM Total Ozone Products

OMPS INCTO Total Ozone for 20130101

OMPS OOTCO Total Ozone for 20130101

OMPS V8 Total Ozone for 20130101

OMI Total Ozone for 20130101

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Current Comparisons of OMPS NM vs Dobson

SYOWA, JPN (69.01S, 39.58E, STN101) Dobson

OMPS_v8 and sonde TOZ

DU

October 2012

Suomi NPP EDR Product Review - Jan 17-18, 2013
Average total ozone difference and 1-standard deviation between OMPS and Dobson ozonesonde. OMPS data are interpolated to ozonesonde locations.
Average total ozone difference and 1-standard deviation between OMPS and Brewer. OMPS data are interpolated to Brewer locations.
Current Comparisons of OMPS NM vs Dobson

OMPS_v8 - sonde TOZ (Dobson)

Latitude

90S  60S  30S  EQ  30N  60N  90N

DU

-40  -20   0  20   40
Current Comparisons of OMPS NM vs Dobson

OMPS_v8 - sonde TOZ (Dobson)

The graph shows the comparison between OMPS_v8 and sonde TOZ measurements in Dobson units (DU). The x-axis represents the Total Ozone (TOZ) in DU, while the y-axis shows the difference (diff) in DU. The data points are plotted with error bars indicating the variability or uncertainty in the measurements. The trend suggests a generally consistent agreement between the two methods, with most points falling close to the zero difference line.
Long Term Ozone Monitoring

SBUV&SBUV/2 COHESIVE TOTAL OZONE ANOMALIES (PCT)

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Long Term Ozone Monitoring

Global Mean SBUV/2 v8 Total Ozone Percent Anomalies

Lat Extent = 60S - 60N, Cohesive: Total Profile

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Long Term Ozone Hole Monitoring

2012 Southern Hemisphere Ozone Hole Area
NOAA SBUV/2
Current Year Compared Against Past 10 Years

Million Sq Km
Updated through Dec 5, 2012

August September October November December

2012 2011 2004 02-11 Mean 02-11 Max 02-11 Min

ONPS/INTCO Initial total column O₃ at 09/25/2012

Dobson Unit
100.00 156.67 233.33 300.00 366.67 433.33 500.00

INCTO_npp_d20120925*
GOTCO_npp_d20120925*
generated by orthographic.pro
To be Continued...
There are 32 sites (17 Dobson and 15 Brewer) which have updated total ozone data to October 2012.
platform: sbuv2_n19
region: 70S-90S (180W-180E, 90S-70S)
variable: obs-ges
valid: 00Z15DEC2012 to 00Z14JAN2013

pressure 25.433
level 13
avg: -0.524255
sdv: 1.05421

pressure 40.327
level 14
avg: -0.9185
sdv: 1.01654

pressure 63.938
level 15
avg: -0.724361
sdv: 1.16191

pressure 101.325
level 16
avg: -0.27682
sdv: 1.34871