

Use of S-NPP OMPS Products at NOAA/NCEP

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NOAA/NWS/NCEP

1-Climate Prediction Center

2-Environmental Modeling Center



S-NPP SDR Science and Products Review – Dec 18-20, 2013

Utilizing OMPS NP and NM Products at CPC

- During the summer of 2013 CPC access OMPS ozone products via CLASS. (HDF5 format)
- Began using BUFR products delivered to NCEP October 29, 2013
- NDE is providing NCEP with
 - Version 6 profile product.
 - Multiple triplet total column product.
- NCEP/CPC is evaluating NDE products by comparing with
 - SBUV/2 ozone mixing ratios and layer ozone amounts
 - NASA has done comparisons with OMI total column

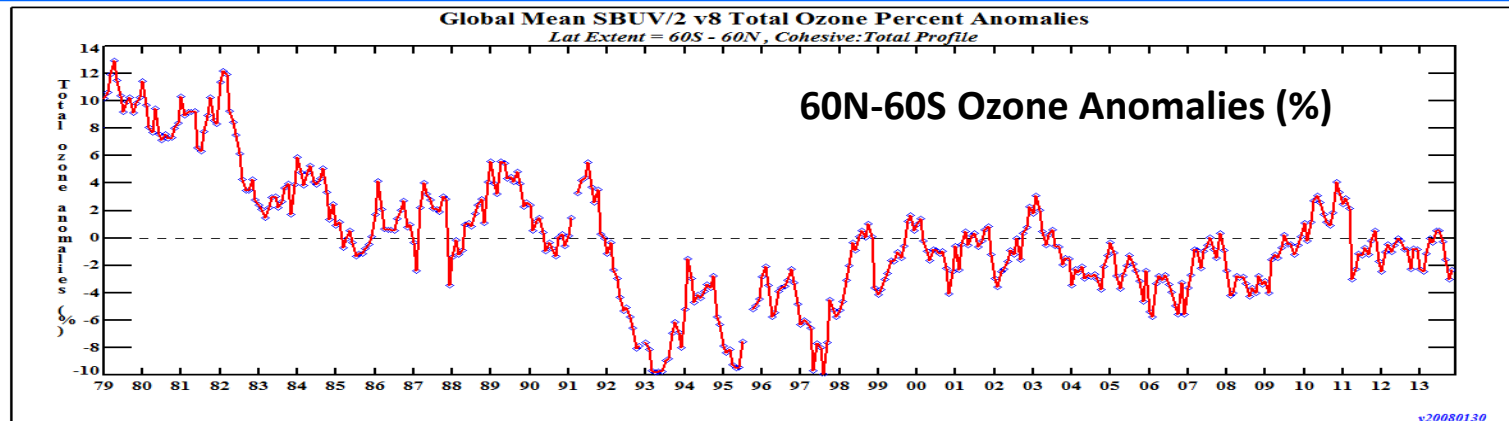
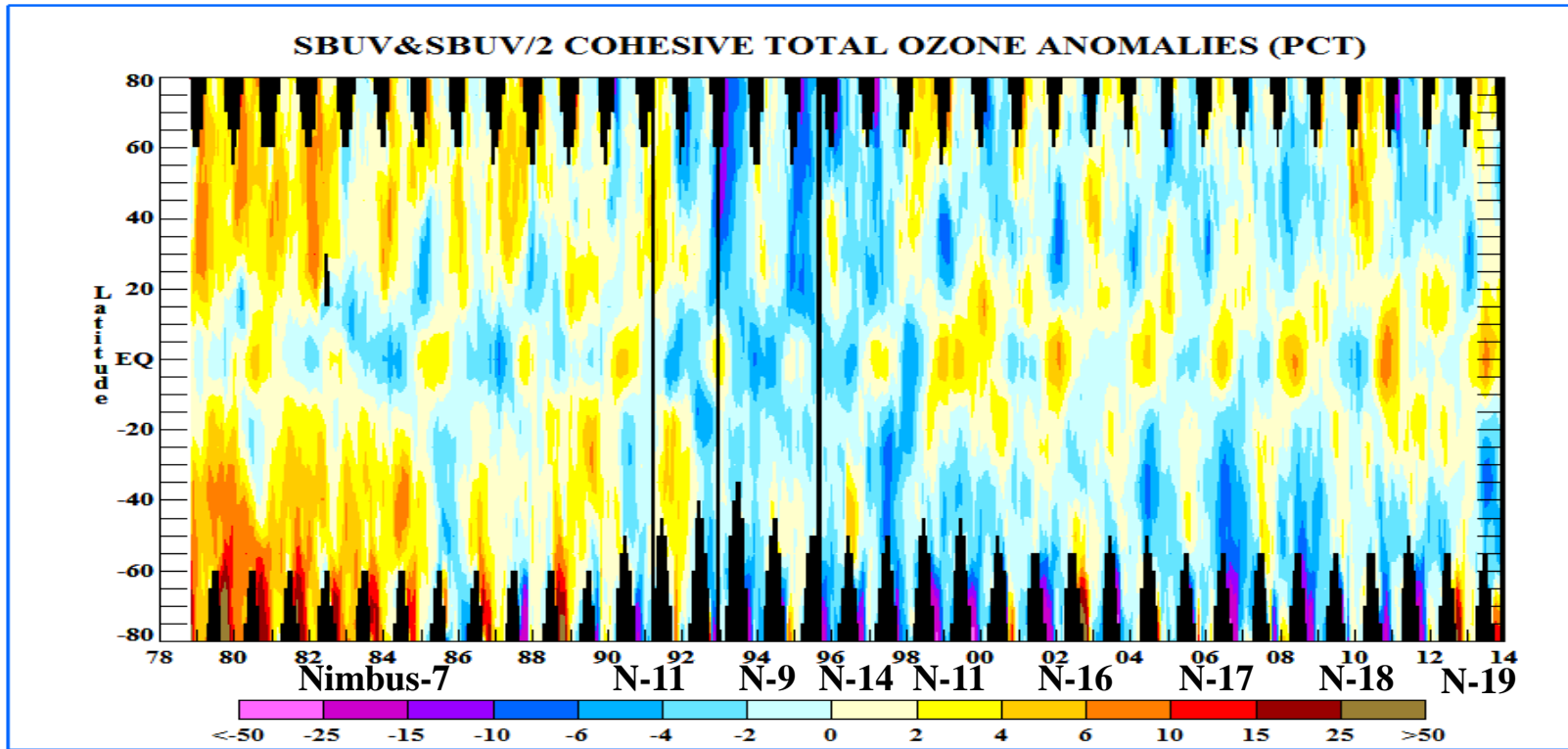
Continuation of Ozone Monitoring at CPC

- Short term
 - Ozone Hole
 - UV Index Forecasts
- Long term
 - Climate Data Records
 - Ozone Trends
 - Recovery from Ozone Depleting Chemicals
 - Impacts of climate change
- Importance of long term overlap with SBUV/2 to determine bias.
- OMPS ozone products are an **addition** to current SBUV/2 obs...not a replacement!

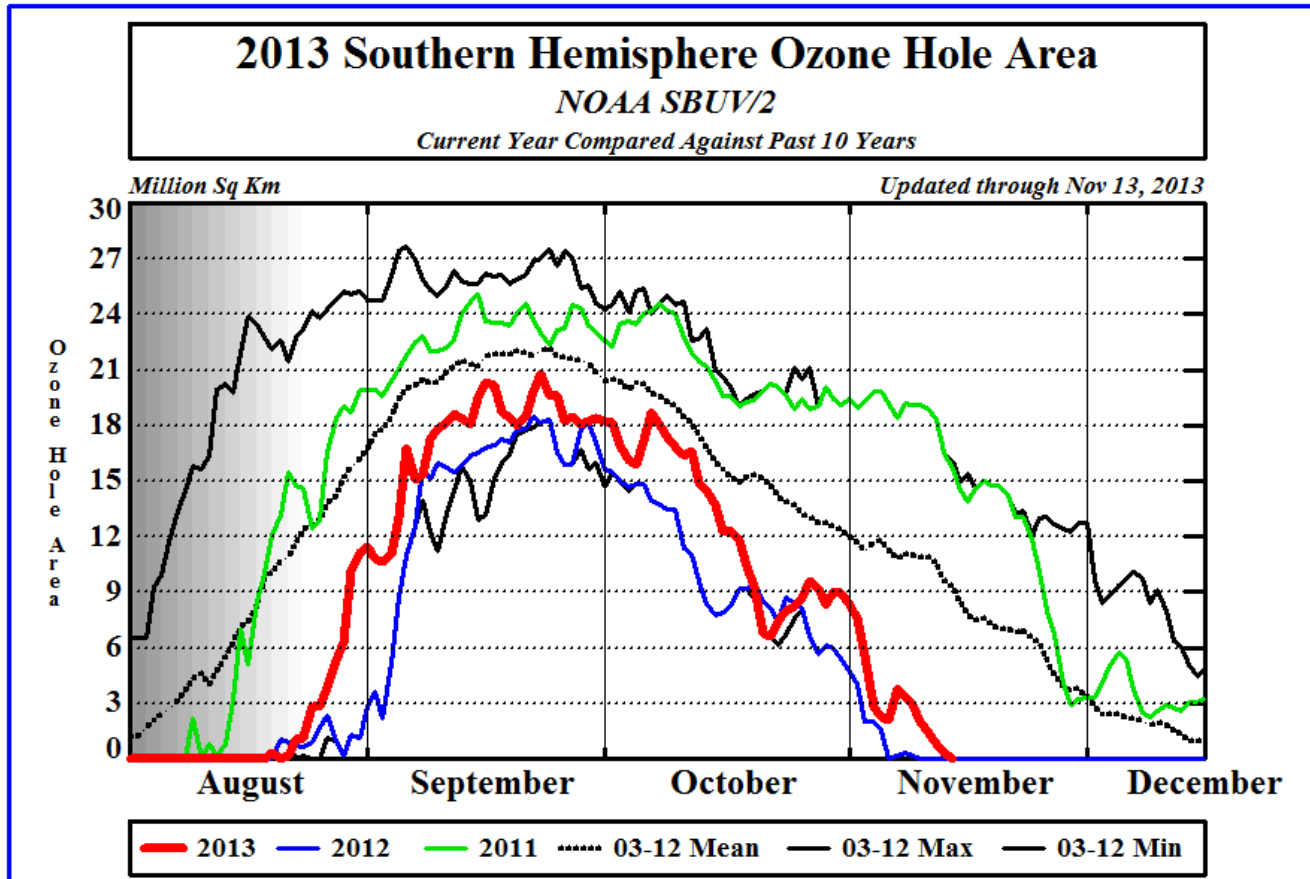
Assimilation into NCEP/GFS and Reanalyses

- Would not be used by NCEP models until 2015 at the earliest.
- Assimilate ozone mixing ratio and total column products not radiances.
- Addition to current SBUV/2(NP) and OMI(NM) ozone products being assimilated.
- Aura/OMI is ~10 years old (launched in July 2004).
 - Only about half of the cross track scan is usable.
- SBUV/2 available from NOAA-16 and 19.
 - Lost N17 and N18 in last year
 - MetOp-B GOME-2 ozone products are improving and could be used as well.
- Ozone in model is used in radiation heating/cooling calculations and to properly use ozone sensitive IR channel.
- Ozone forecasts are used to generate UV Index forecasts.

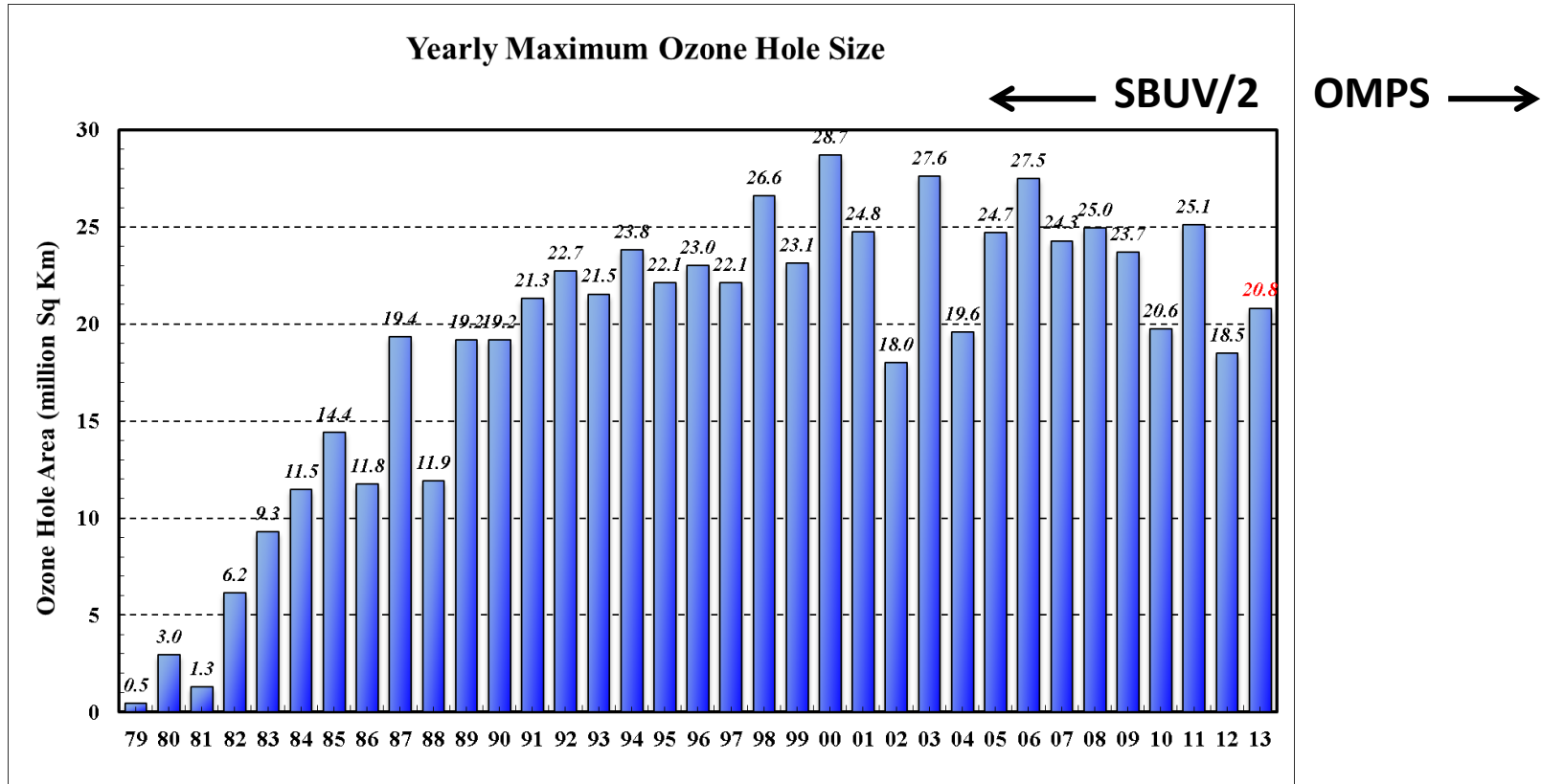
Continuing Long Term Monitoring



Continuing to Monitor the Ozone Hole

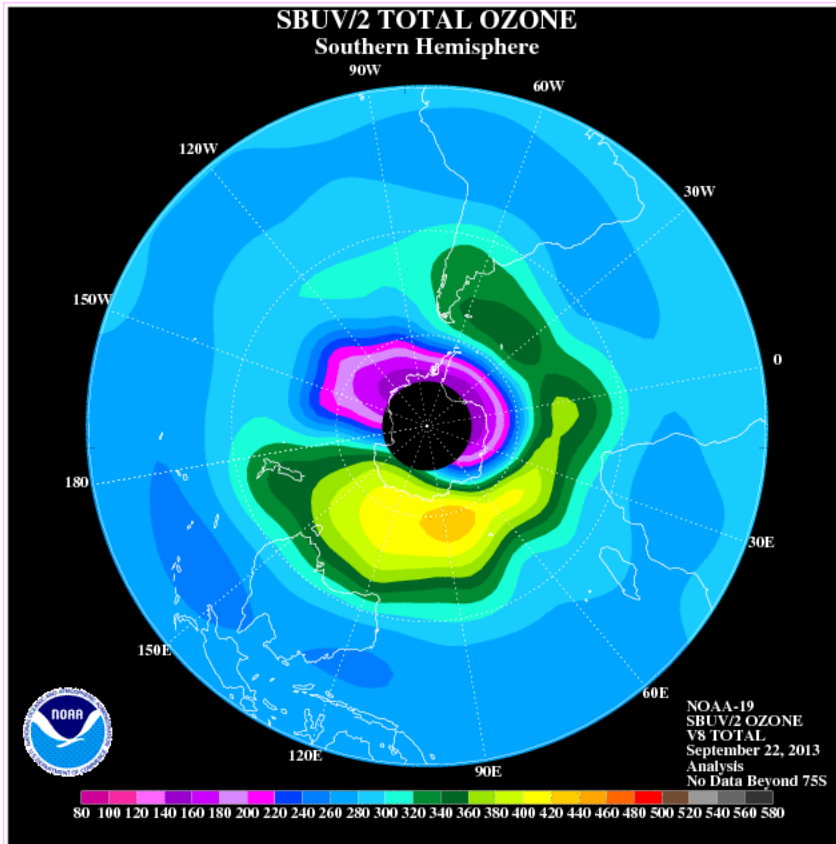


Monitor Inter-Annual Variability of Ozone Hole



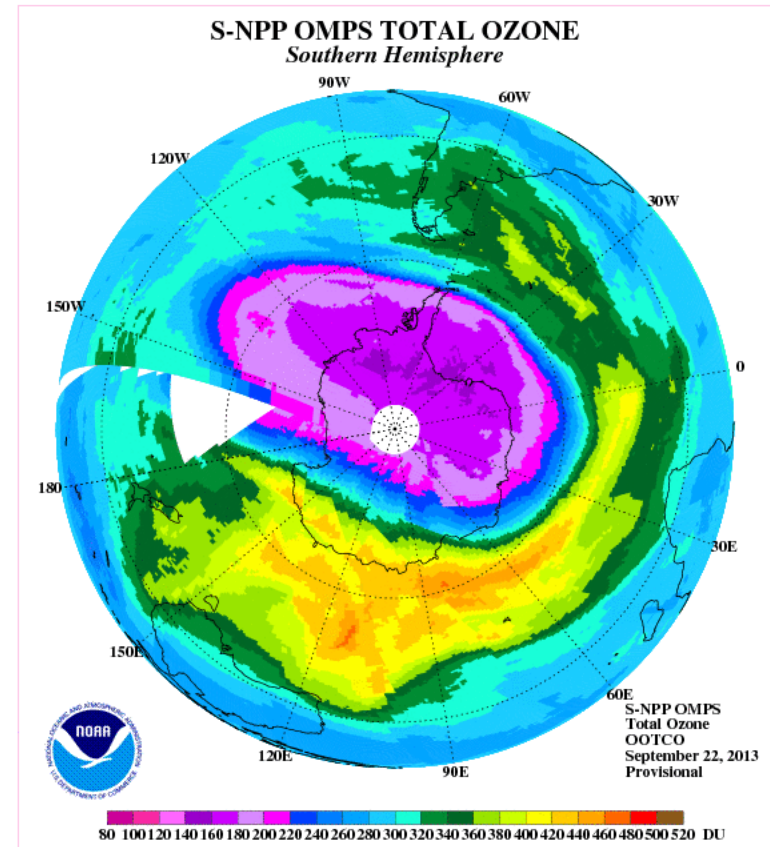
Monitoring Ozone Hole Peak Size

NOAA-19 Total Profile Analysis



*Analysis procedure smooths out features.
Reduces Min and Max values.*

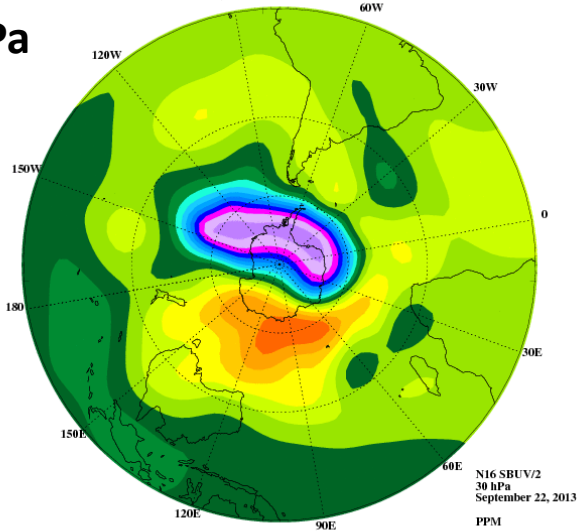
S-NPP OMPS NM



*NM provides greater fidelity of features
and maintains max and min values.*

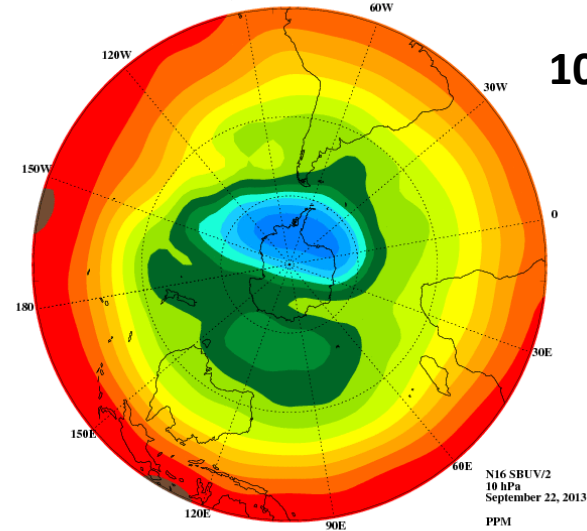
NP will continue to provide structure of ozone in vertical

30 hPa



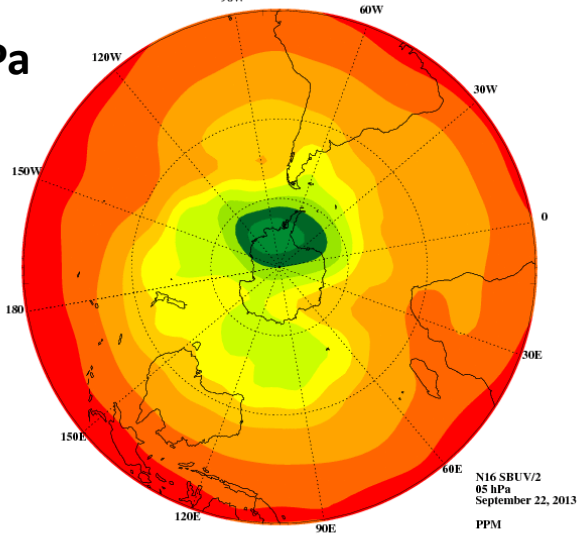
NOAA SBUV/2 OZONE MIXING RATIO
Southern Hemisphere

10 hPa



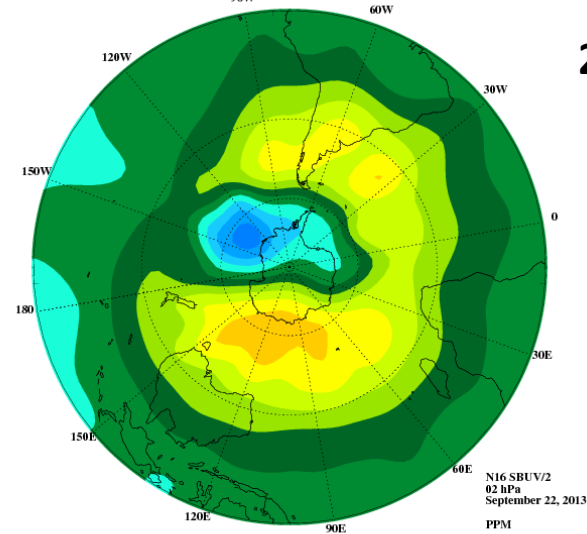
NOAA SBUV/2 OZONE MIXING RATIO
Southern Hemisphere

5 hPa



0.0 1.0 2.0 3.0 4.0 5.0 6.0 7.0 8.0 9.0 10.0 11.0 12.0 13.0 14.0 15.0 16.0 17.0 18.0

2 hPa



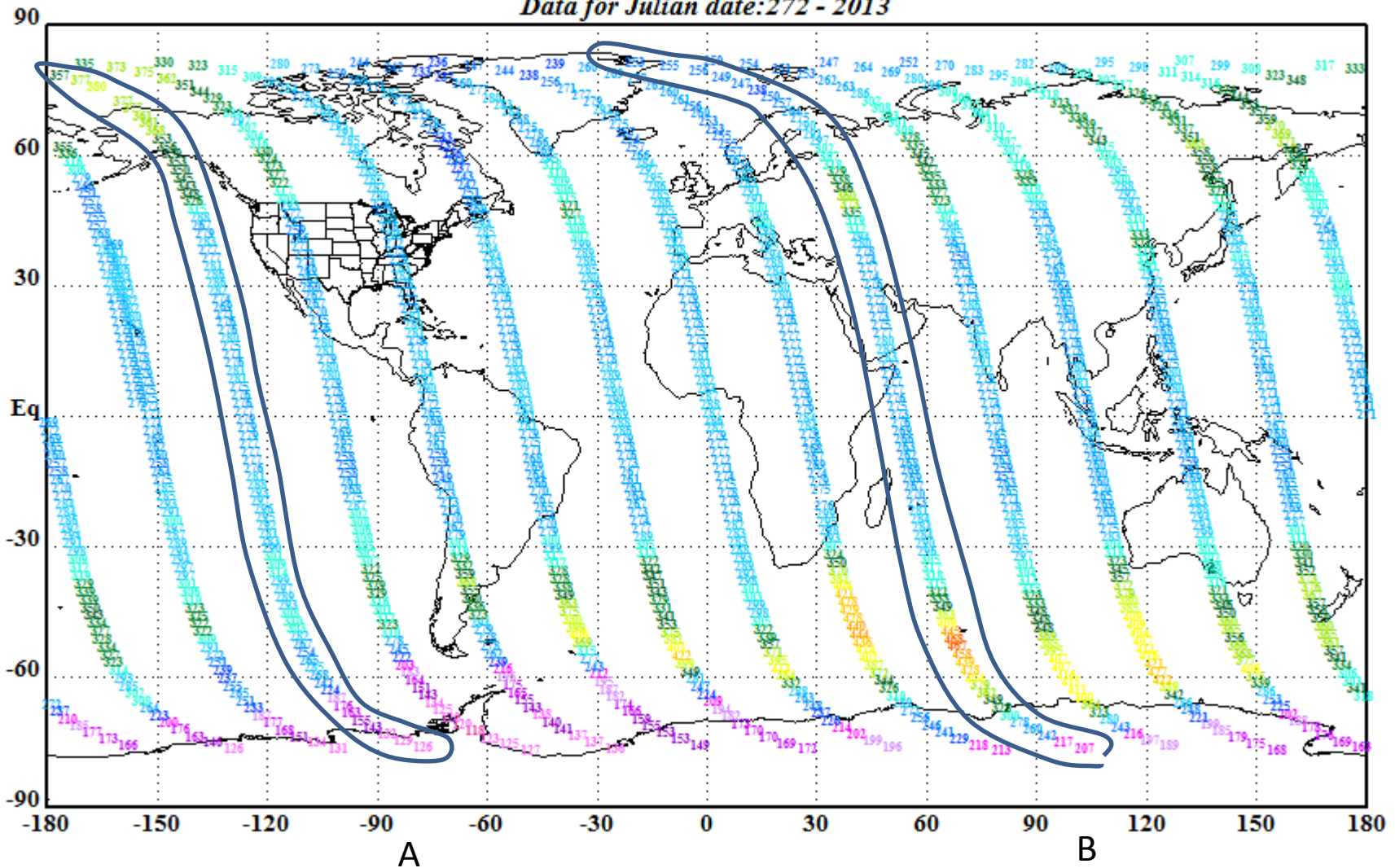
4.0 4.5 5.0 5.5 6.0 6.5 7.0 7.5 8.0 8.5 9.0 9.5 10.0 10.5 11.0 11.5 12.0 12.5 13.0

Peak ozone hole size day at 30, 10, 5, 2 hPa from N19 SBUV/2

Compare orbits of diff vertical structure

NOAA19 SBUV/2 PROFILE OZONE OBSERVATIONS

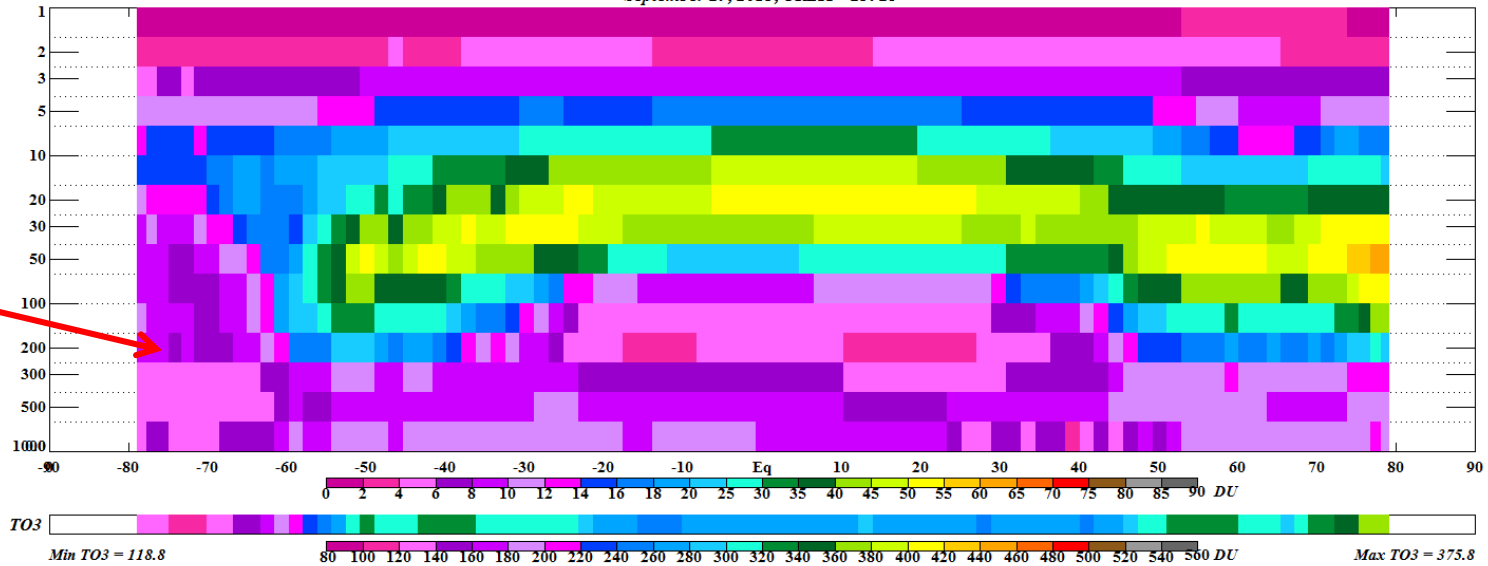
Data for Julian date: 272 - 2013



Compare orbits of diff vertical structure - NP

SBUV/2 PROFILE and TOTAL COLUMN OZONE(DU)

September 29, 2013, ORBIT =23925

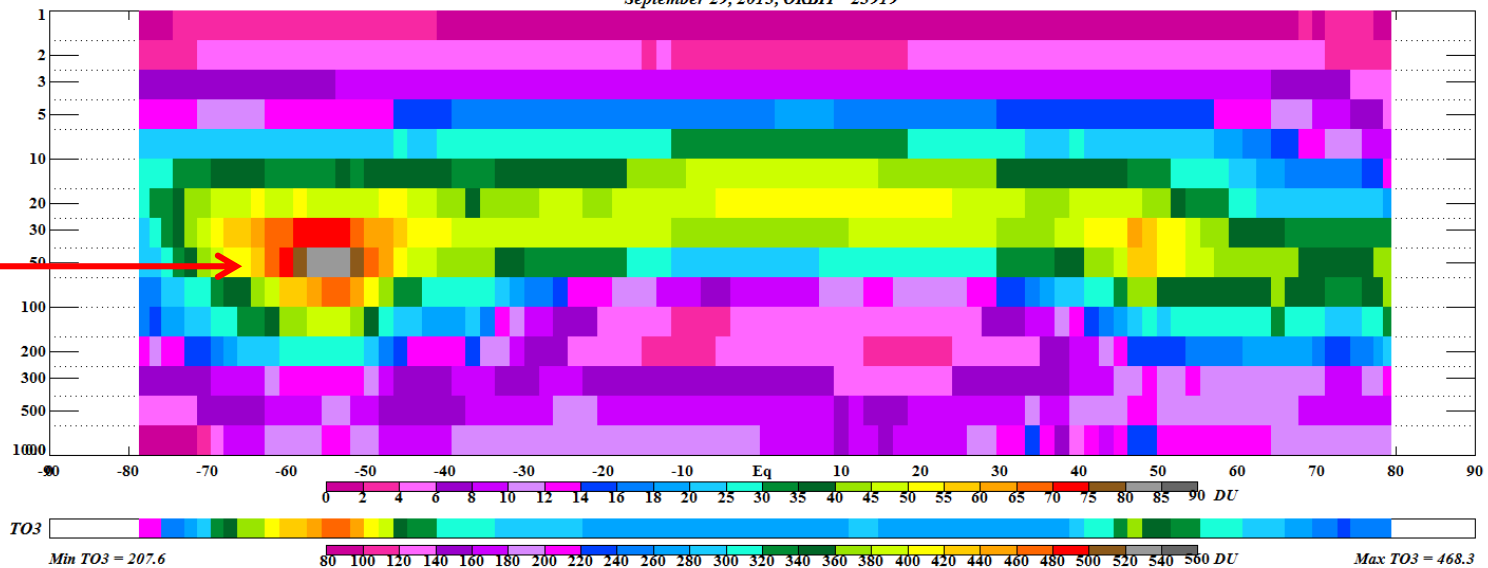


A
Depleted
Ozone

SBUV/2
layer DU
and TO3

SBUV/2 PROFILE and TOTAL COLUMN OZONE(DU)

September 29, 2013, ORBIT =23919

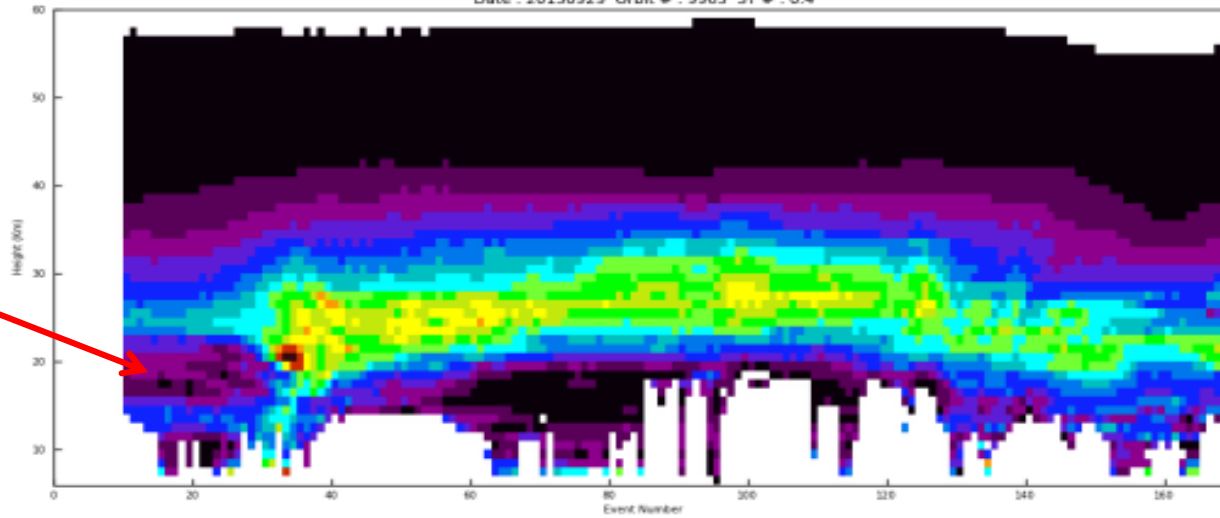


B
Ozone
Max

Compare orbits of diff vertical structure - LP

Ozone Orbital Curtain (Center Slit - Linear Scale)

Figure Generated 2013-10-22 12:18:58
Date : 20130929 Orbit # : 9963 ST # : 0.4

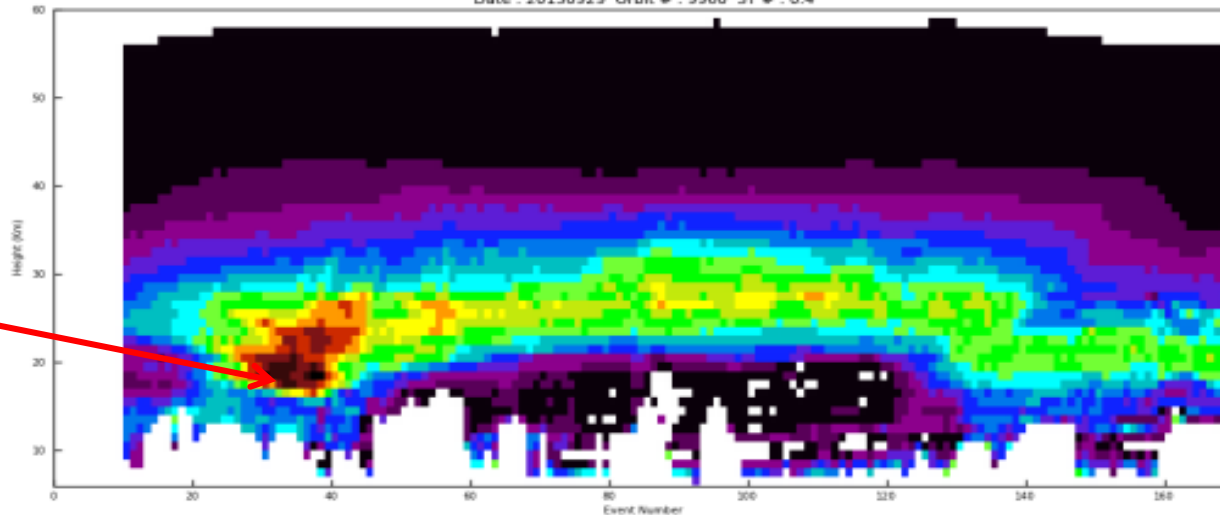


A
Depleted
Ozone

*Limb Profiles
from NASA
PEATE*

Ozone Orbital Curtain (Center Slit - Linear Scale)

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B
Ozone
Max

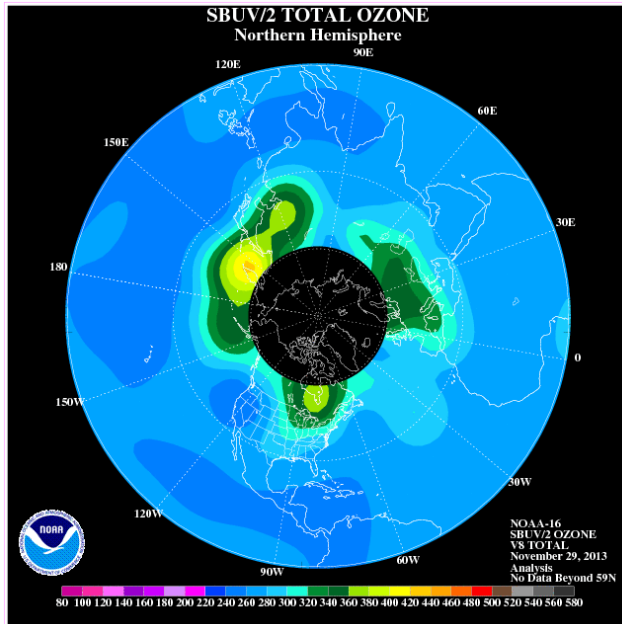


Evaluating OMPS NP and NM Products

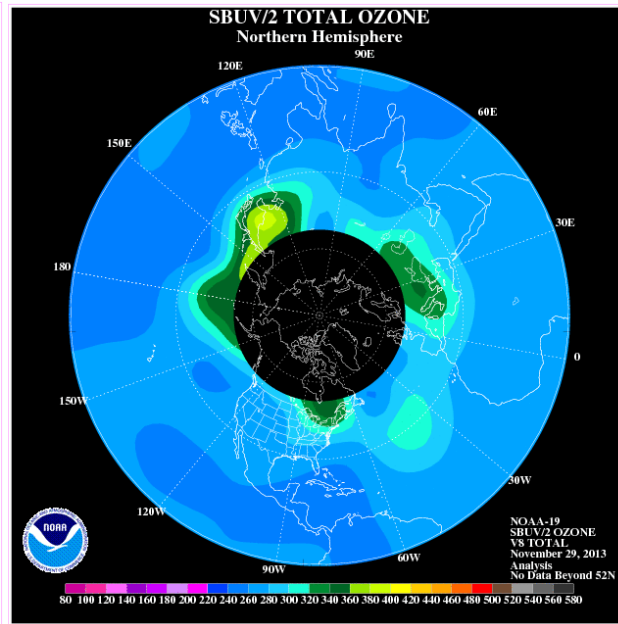
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Total Ozone – Integrated Profile

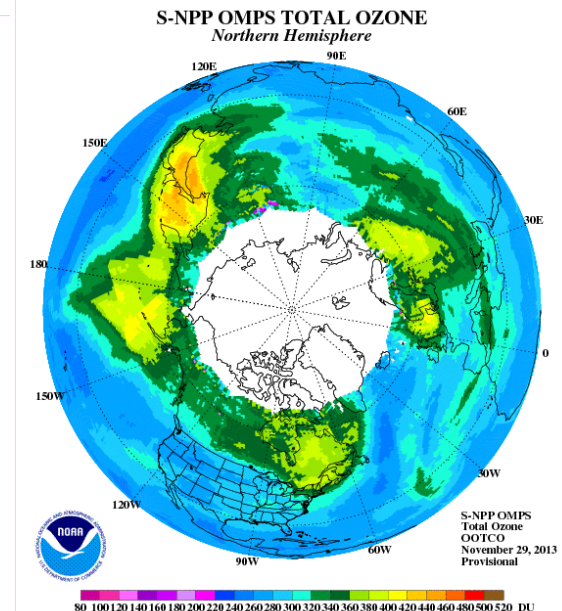
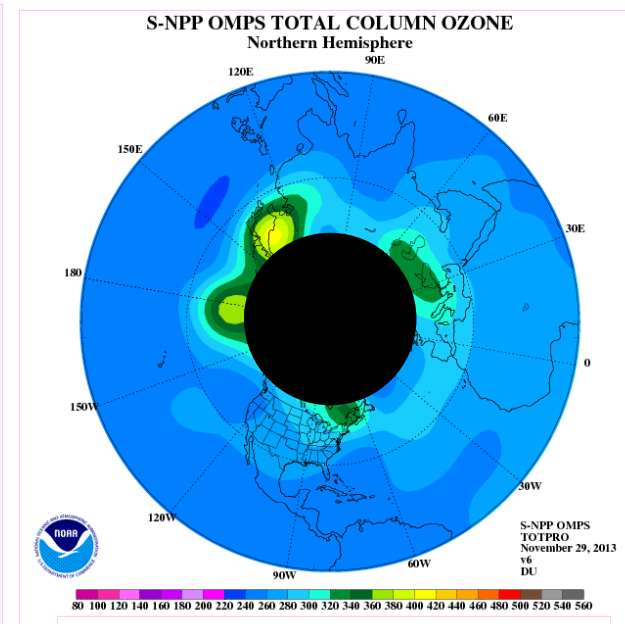
Nov 29, 2013



NOAA-16



NOAA-19



S-NPP Tot Profile ozone agrees with N16 and N19

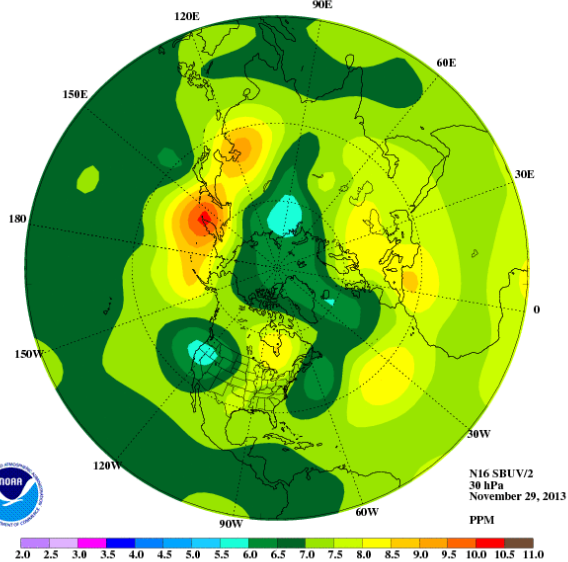
Max values too low compared with NM obs

Ozone Mixing Ratio - 30 hPa

Nov 29, 2013

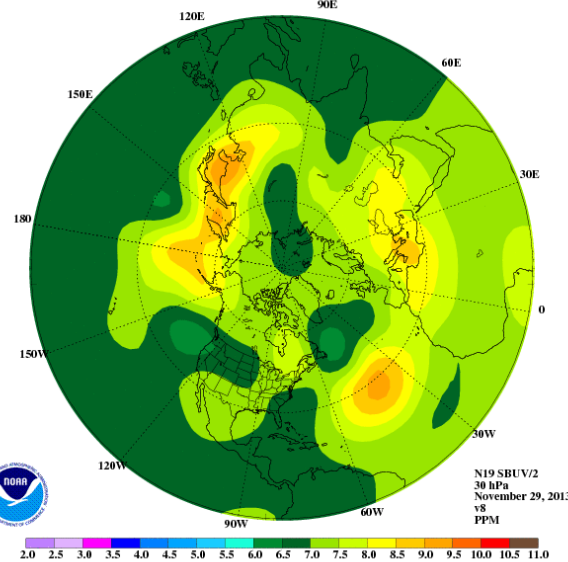
NOAA-16

NOAA SBUV/2 OZONE MIXING RATIO
Northern Hemisphere



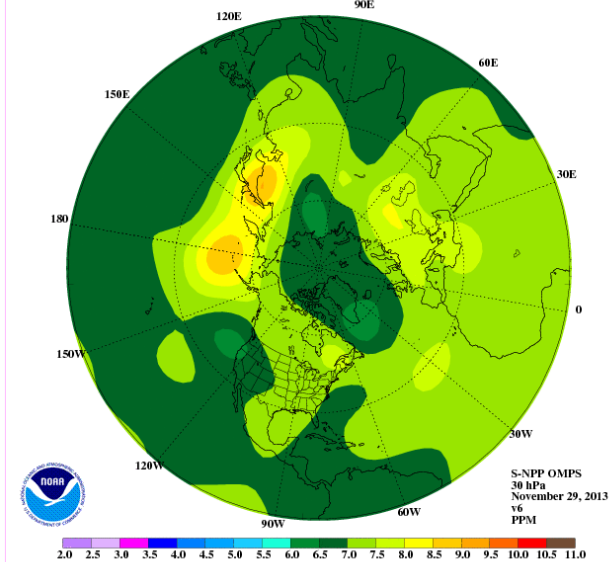
NOAA-19

NOAA SBUV/2 OZONE MIXING RATIO
Northern Hemisphere



S-NPP

S-NPP OMPS OZONE MIXING RATIO
Northern Hemisphere



Max values are smaller than N16 and N19

Ozone Mixing Ratio - 10 hPa

Nov 29, 2013

NOAA-16

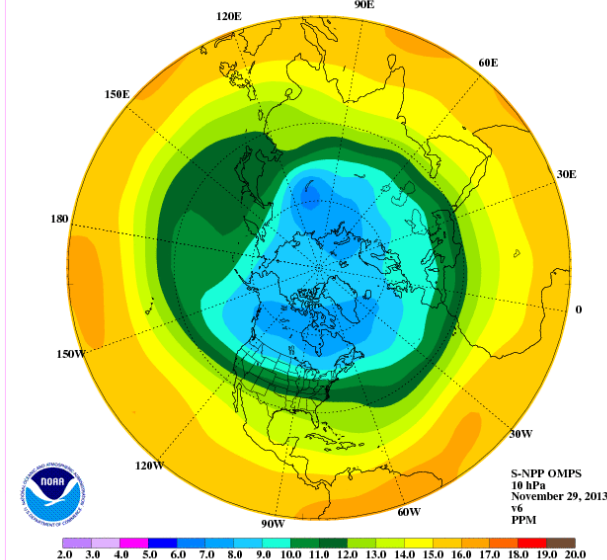
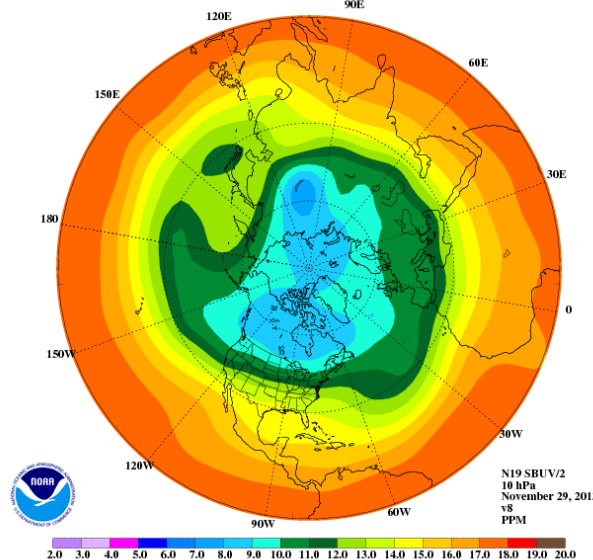
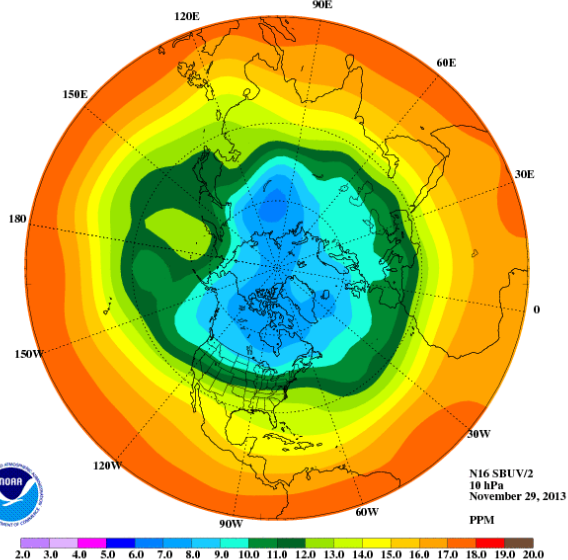
NOAA-19

S-NPP

NOAA SBUV/2 OZONE MIXING RATIO
Northern Hemisphere

NOAA SBUV/2 OZONE MIXING RATIO
Northern Hemisphere

S-NPP OMPS OZONE MIXING RATIO
Northern Hemisphere



*Min values agree in pole
Low lat high values too low*

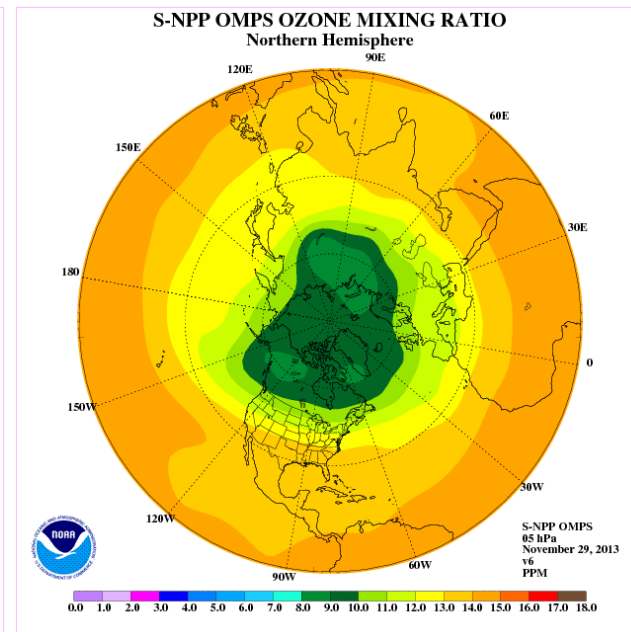
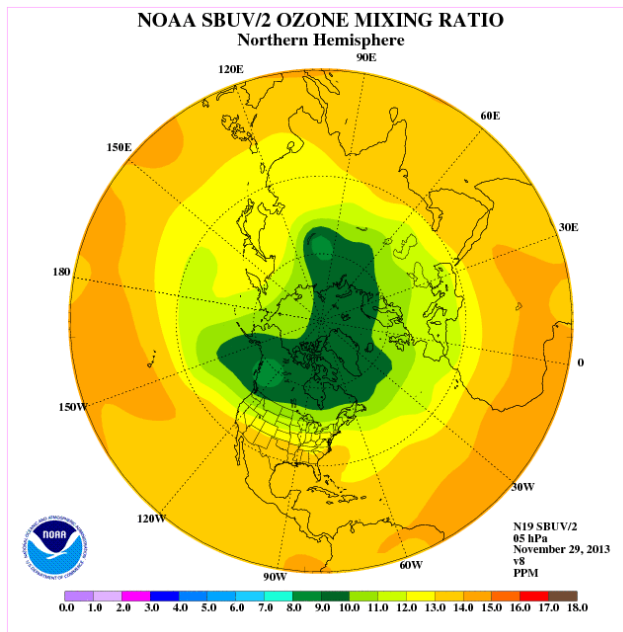
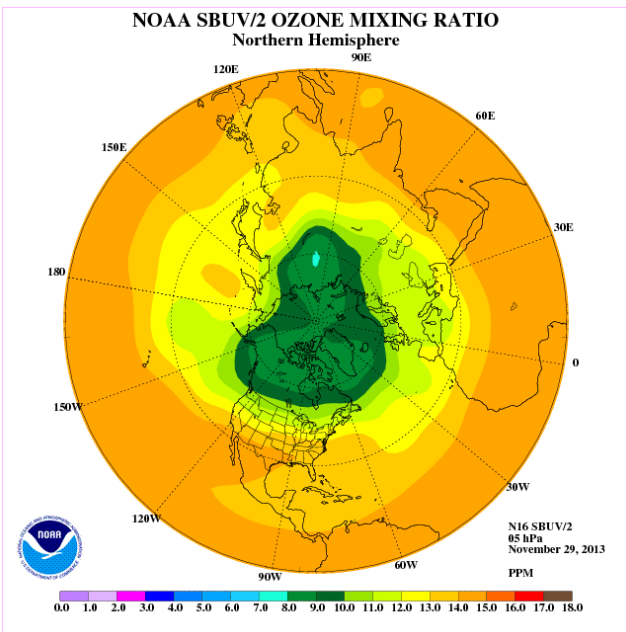
Ozone Mixing Ratio - 5 hPa

Nov 29, 2013

NOAA-16

NOAA-19

S-NPP



*Min values agree in pole
Low lat high values agree*

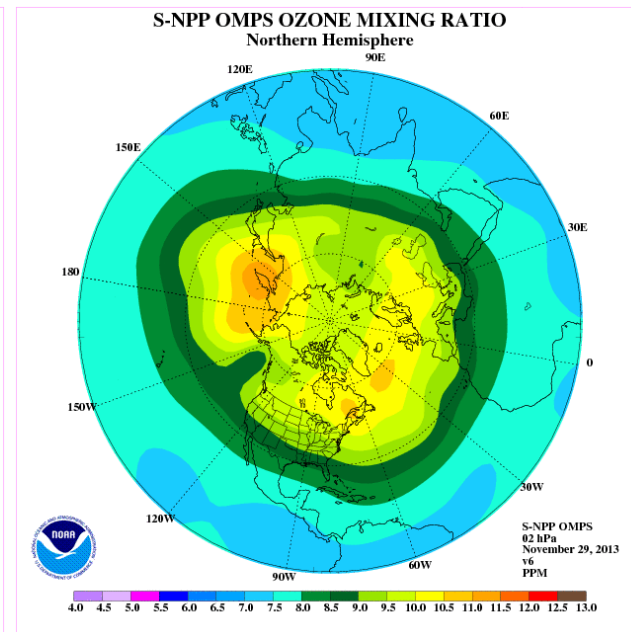
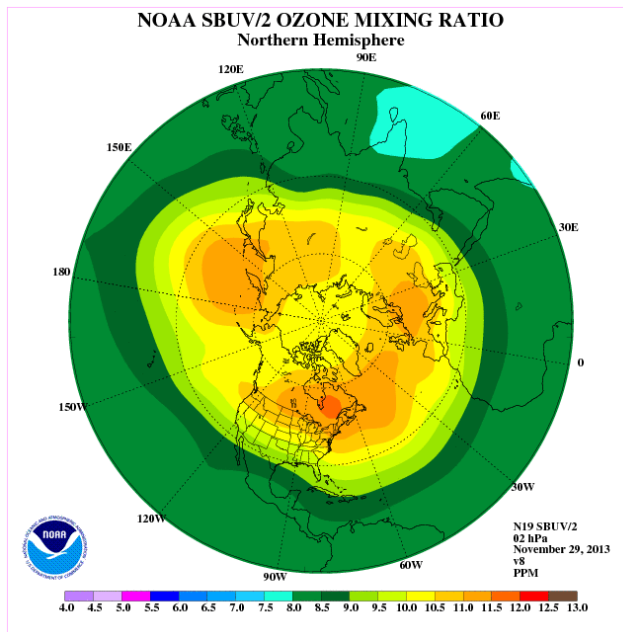
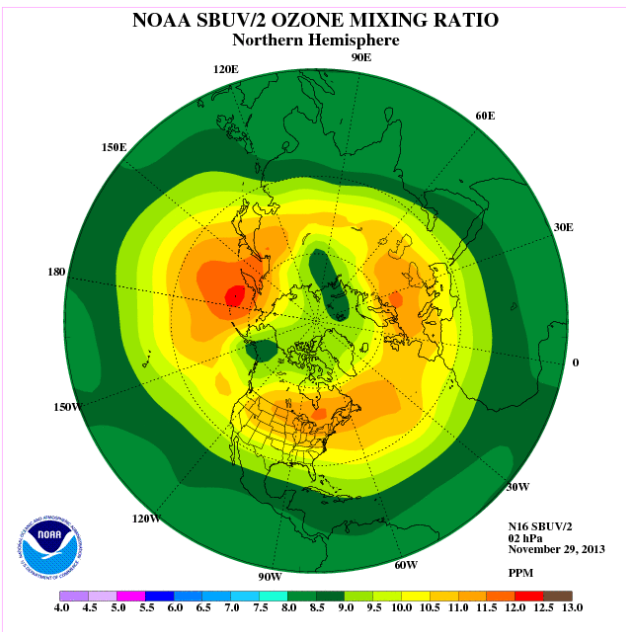
Ozone Mixing Ratio - 2 hPa

Nov 29, 2013

NOAA-16

NOAA-19

S-NPP



*Max values too low in pole
Low lat low values too small*

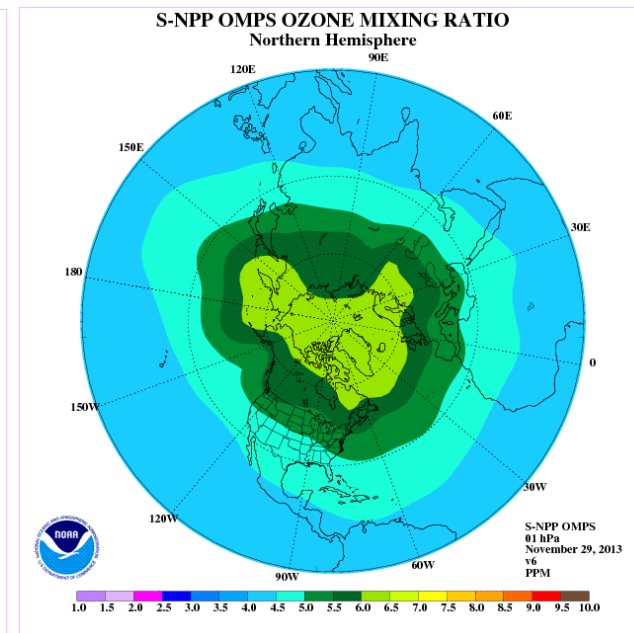
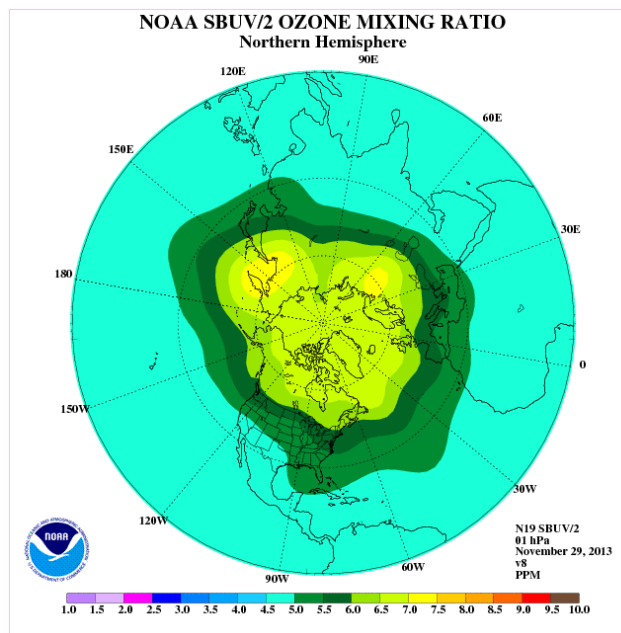
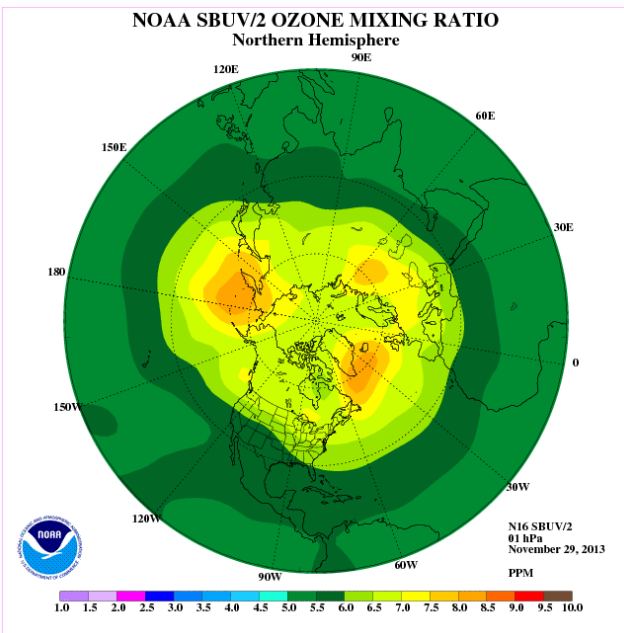
Ozone Mixing Ratio - 1 hPa

Nov 29, 2013

NOAA-16

NOAA-19

S-NPP



*N16 and N19 disagree
at 1 hPa and above*

*Max values too low in pole
Low lat low values too small*

Gridded Total Ozone

- Yet to come...
 - Level 3 Gridded product of Total Ozone from NM
 - 0.5x0.5 could be possible
 - need obs corners to fill in limb obs
 - Use this product to compute ozone hole area
 - Need to resolve cross track bias

NCEP's global interactive atmosphere-aerosol forecast system

Model Configuration:

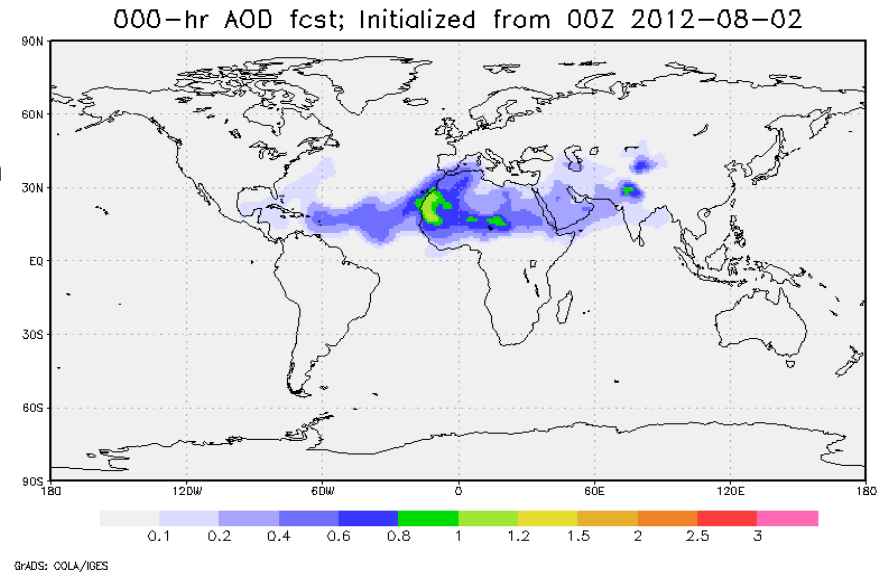
- Forecast model: Global Forecast System (GFS) based on NOAA Environmental Modeling System (NEMS), **NEMS-GFS**
- Aerosol model: NASA Goddard Chemistry Aerosol Radiation and Transport Model, **GOCART**

Near-real-time dust forecast

- Operational since Sept 2012
- 5-day dust forecast** once per day (at 00Z), output every 3 hour, at T126 L64 resolution

Ongoing Activities and Future Plans

- Use near-real-time smoke emissions from satellites (collaborating with NESDIS and GSFC)
- Full package implementation (dust, sea salt, sulfate, and carbonaceous aerosols), planned in FY15
- Refine the prototype volcanic ash capability (collaborating with ECMWF)
- Aerosol data assimilation using NGAC as first guess
- Provide aerosol information for potential downstream users (e.g., NESDIS's SST retrievals, CPC-EPA UV index forecasts; aerosol lateral boundary conditions for regional air quality models)



OMPS SO₂ and aerosol products can be used to advance NCEP's aerosol forecasting and assimilation capabilities, by:

- Providing aerosol products to validate NGAC forecasts and monitor model performance**
- Providing aerosol information to be assimilated**
- Providing real-time volcanic ash emission information**