An Update: AC-VC Total Ozone Product, TOMS, OMI, OMPS and SAGE III

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AC-VC Objective:

Produce a 5x5 degree pole-to-pole monthly total ozone map

Solution:

Use MERRA-2 as a "Smart Interpolator"

Normalize to SBUV MOD to remove biases

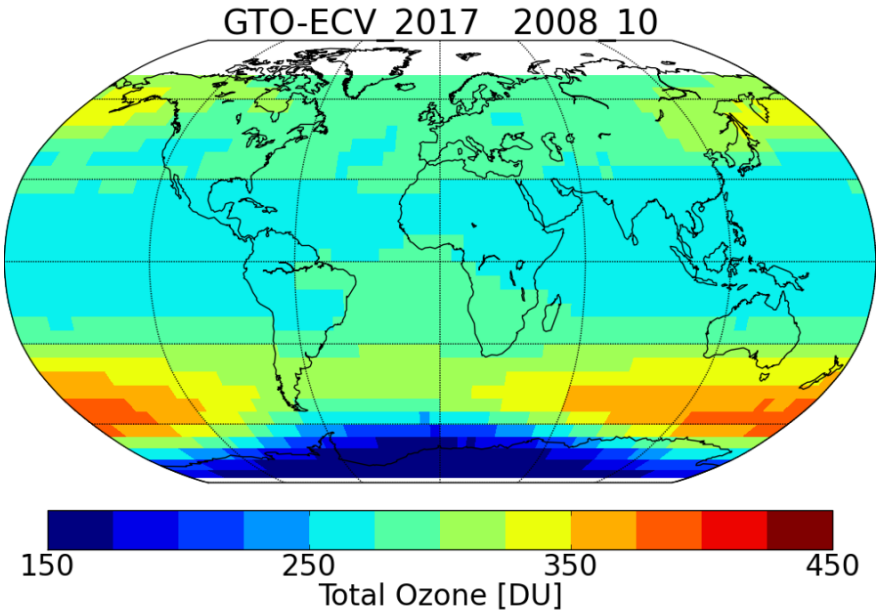
5 degree zonal means

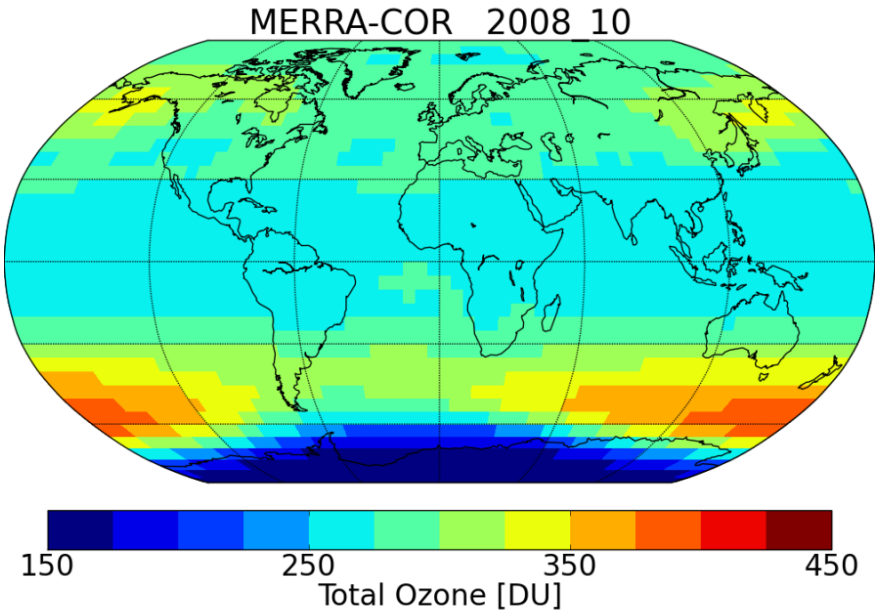
Validate product using total ozone products from V9 TOMS, OMI, NPP, GOME/GOME2, SCIA (ESA CCI Product) and a multitude of ground stations.

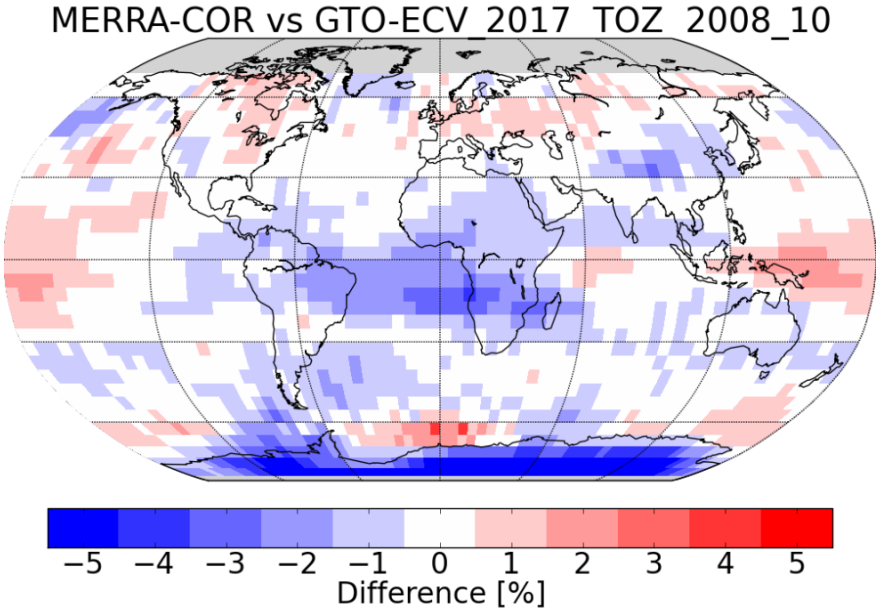
-Underway

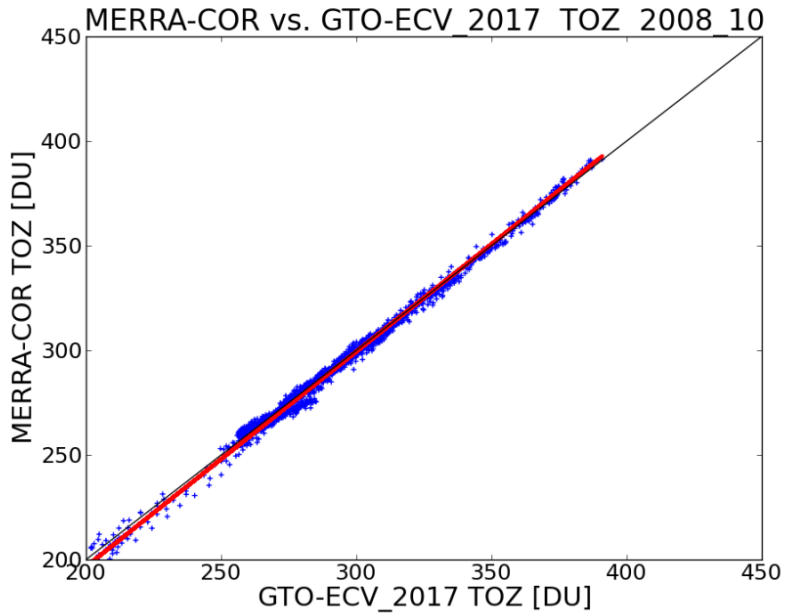
-Paper will be published by Fall of 2017

October 2008 – Total Ozone







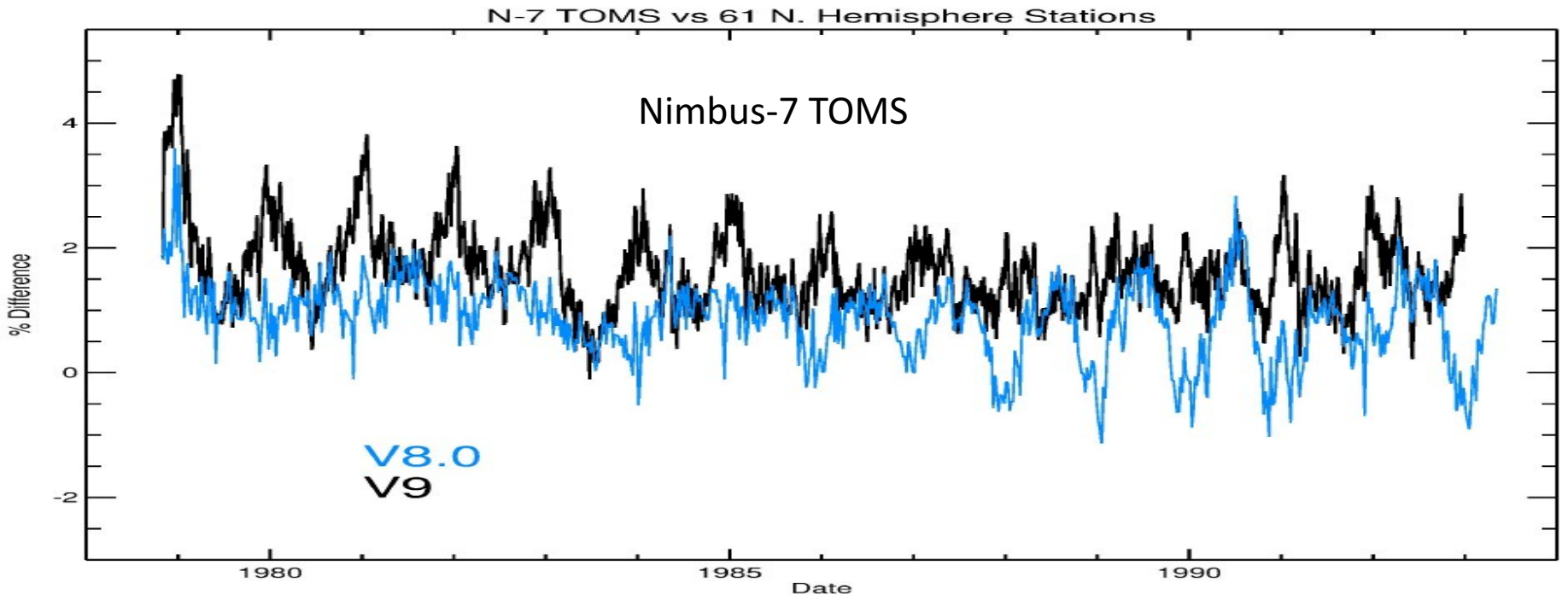


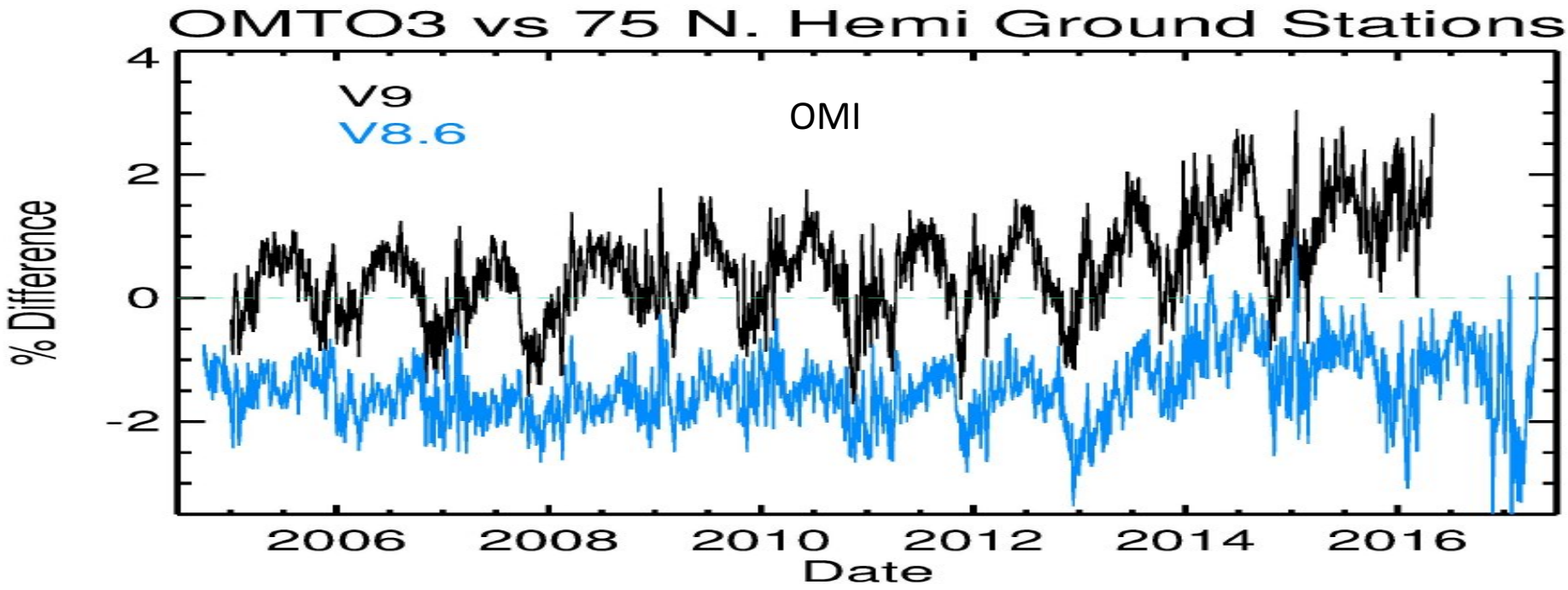
TOMS & OMI V9 Objectives

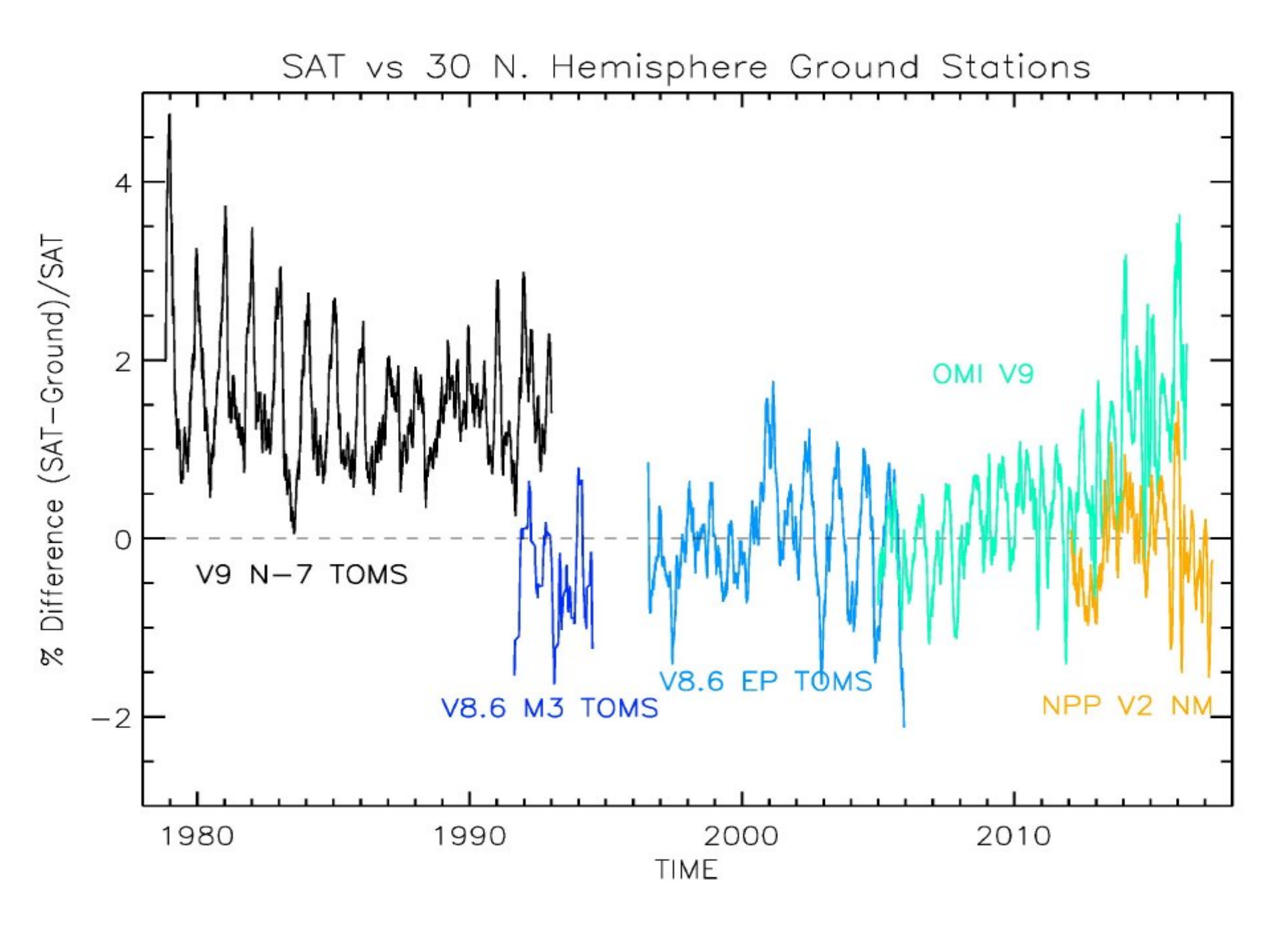
- Simplify the total ozone retrieval
- Exploit advantages of Rodgers' OE
  - Optimal estimation total ozone retrieval using 312.5, 317.5, 322 (OMI/OMPS), 331 nm
  - Provide error uncertainties (1-σ) for *each retrieval*
  - Extend retrievals to 88 deg. SZA
  - Supply retrieval operators (Averaging Kernels)
  - Total O_3 from sum of coarse (~5.5 km) retrieved profile (OMI only)
  - Additional Future Capabilities (add wavelengths, a priori easier to construct, Trop O_3, etc.)
  - Paper will be published by Fall, 2017

Version 9 Schedule for Release

- V9 OMI, TOMS/N7 to be released this summer.
- V9 algorithm paper submitted this summer.
- V9 OMPS reprocessing begins in fall, release next year (note: OMPS V2.1 total ozone product released last month, uses V8.6 algorithm)
- Meteor-3 and Earth Probe TOMS will be processed in the future (pending funding and time….)


N-7 TOMS vs 61 N. Hemisphere Stations
Nimbus-7 TOMS
% Difference
4
2
0
-2
V8.0
V9
1980
1985
1990
Date


OMTO3 vs 75 N. Hemi Ground Stations
V9
V8.6
OMI
% Difference
4
2
0
-2
2006
2008
2010
2012
2014
2016
Date


SAT vs 30 N. Hemisphere Ground Stations
% Difference (SAT−Ground)/SAT
4
2
0
−2
1980
1990
2000
2010
TIME
V9 N−7 TOMS
V8.6 M3 TOMS
V8.6 EP TOMS
OMI V9
NPP V2 NM

Key changes in OMPS Limb version 2.5

- **A stray light correction for the VIS wavelengths;**
- **Sensor pointing errors [L. Moy et al., AMT 2017];**
- **A new cloud height detection [Chen et al., AMT, 2016].**

OMPS-LP v2 algorithm

- 43 UV pairs and 17 VIS triplets;
- radiances are normalized at 65 km for UV and 45 km for VIS ranges;
- The aerosol correction module is turned off

OMPS-LP v2.5 algorithm

- 3 UV pairs and 1 VIS triplets;
- radiances are normalized at 55 km for UV and 40 km for VIS ranges;
- Include the explicit aerosol correction by using LP aerosol v1;
- The algorithm uses realistic a priori covariance matrices instead of Tikhanov regularization.

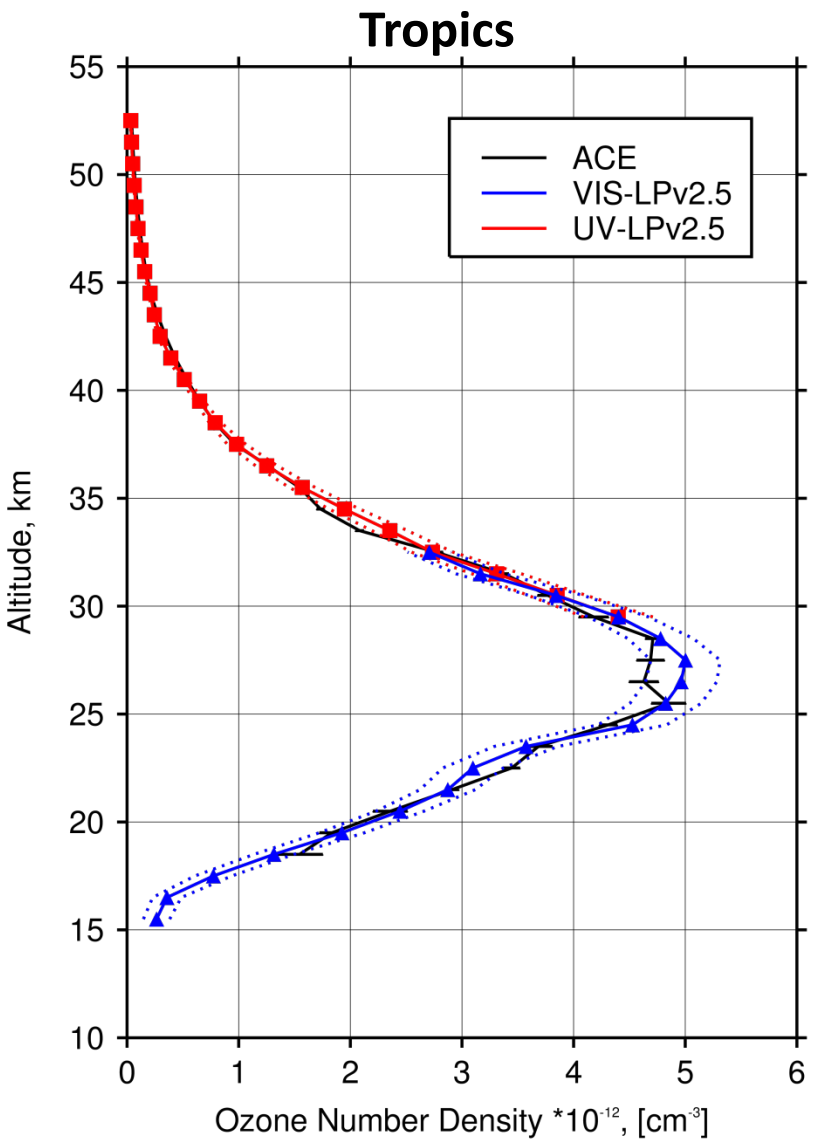
April-May 2017: Reprocessing LP data with the new 2.5 retrieval algorithm **DONE**

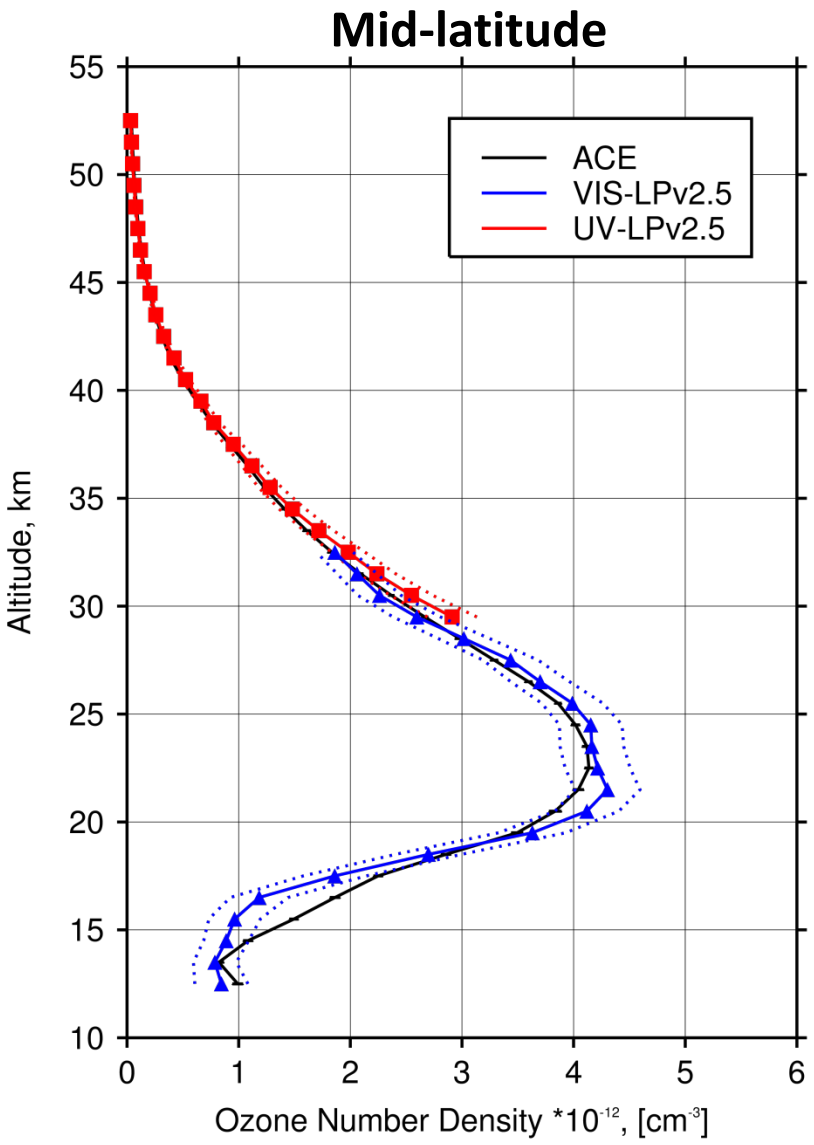
July-Aug 2017: Public release of the version 2.5 ozone profiles **TBD**

OMPS LP Ozone retrievals

Ozone 08/28/2014, Lat=5S

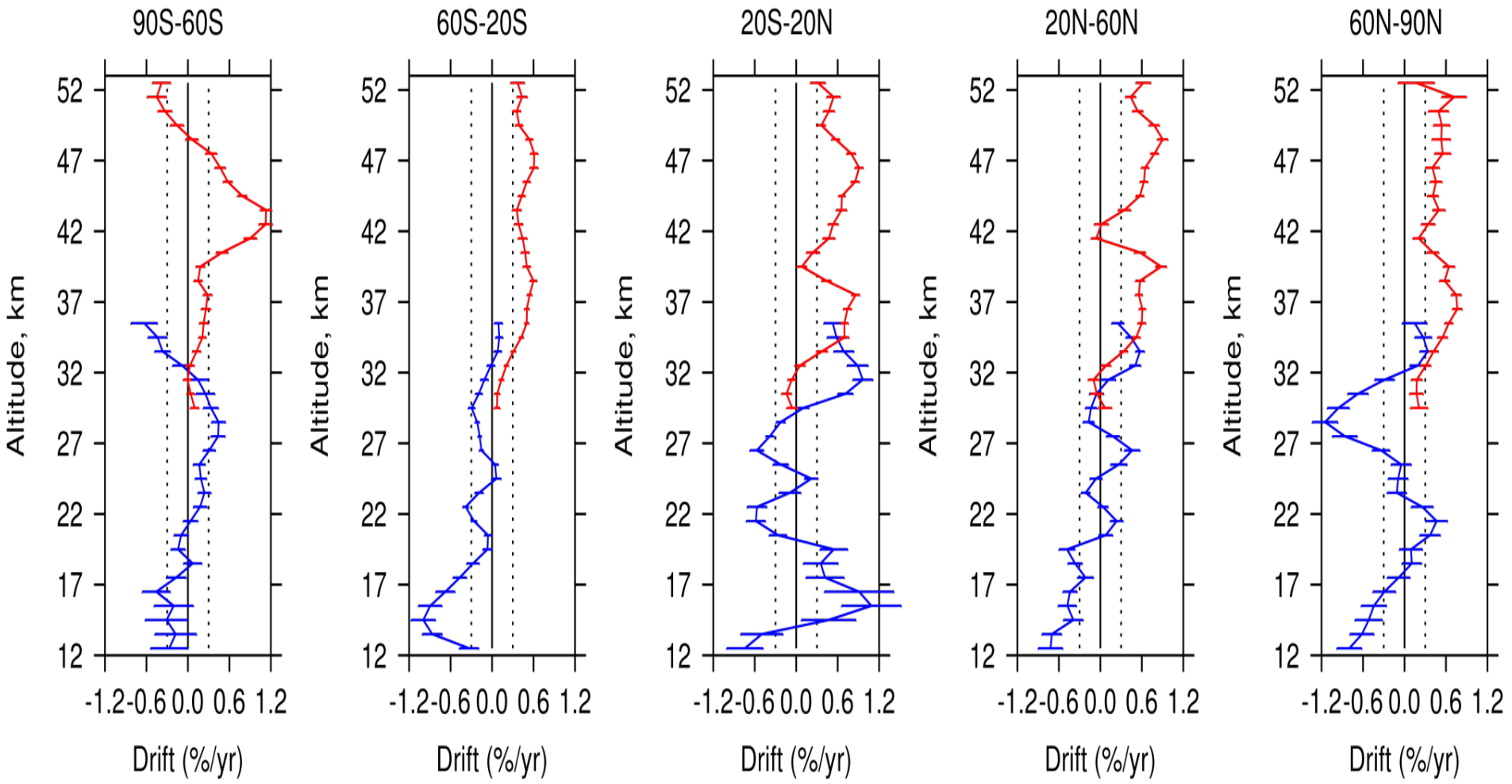
Ozone 03/09/2015, Lat=48S

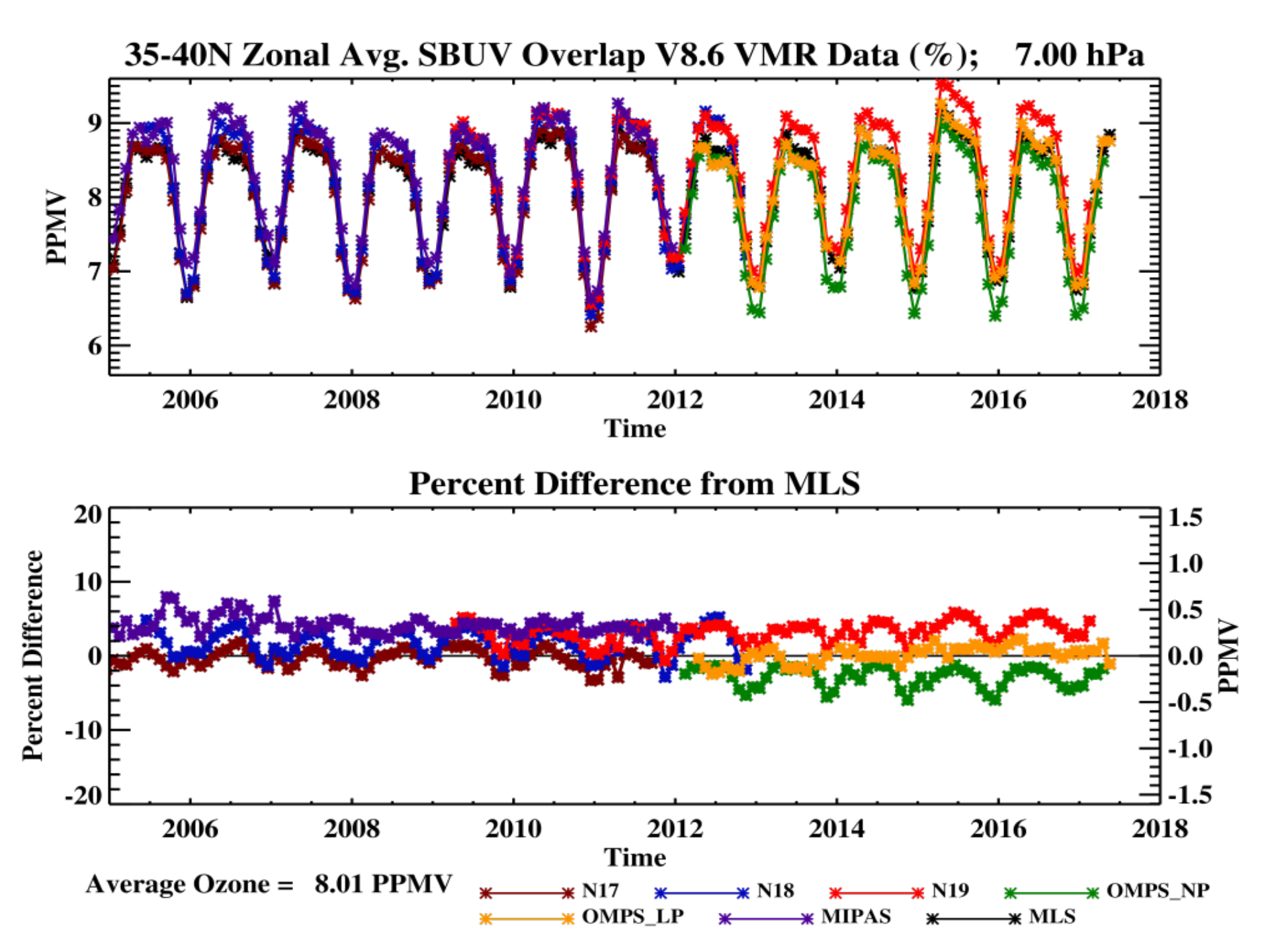


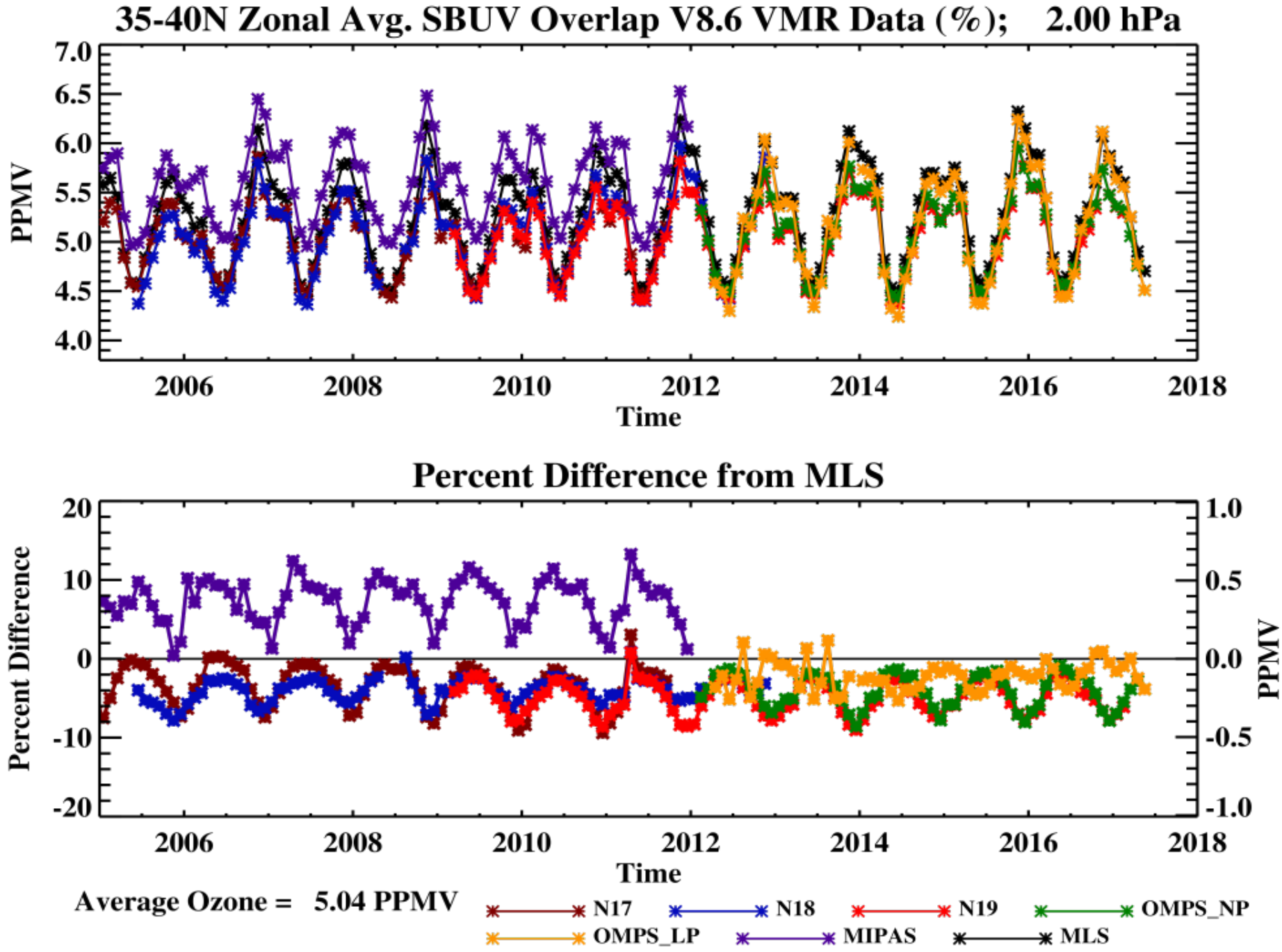


Relative drift against Aura MLS

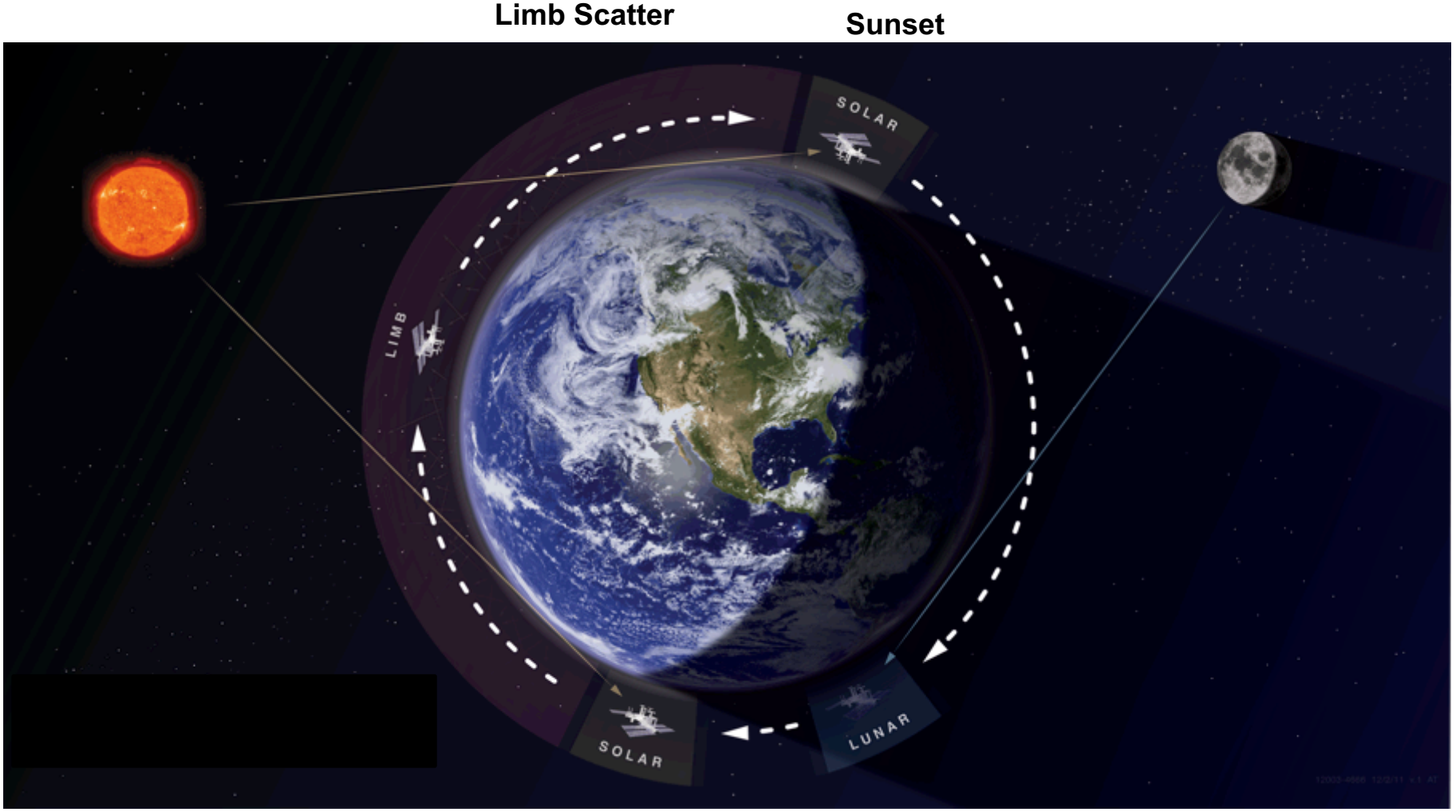
Feb 2012 - Present

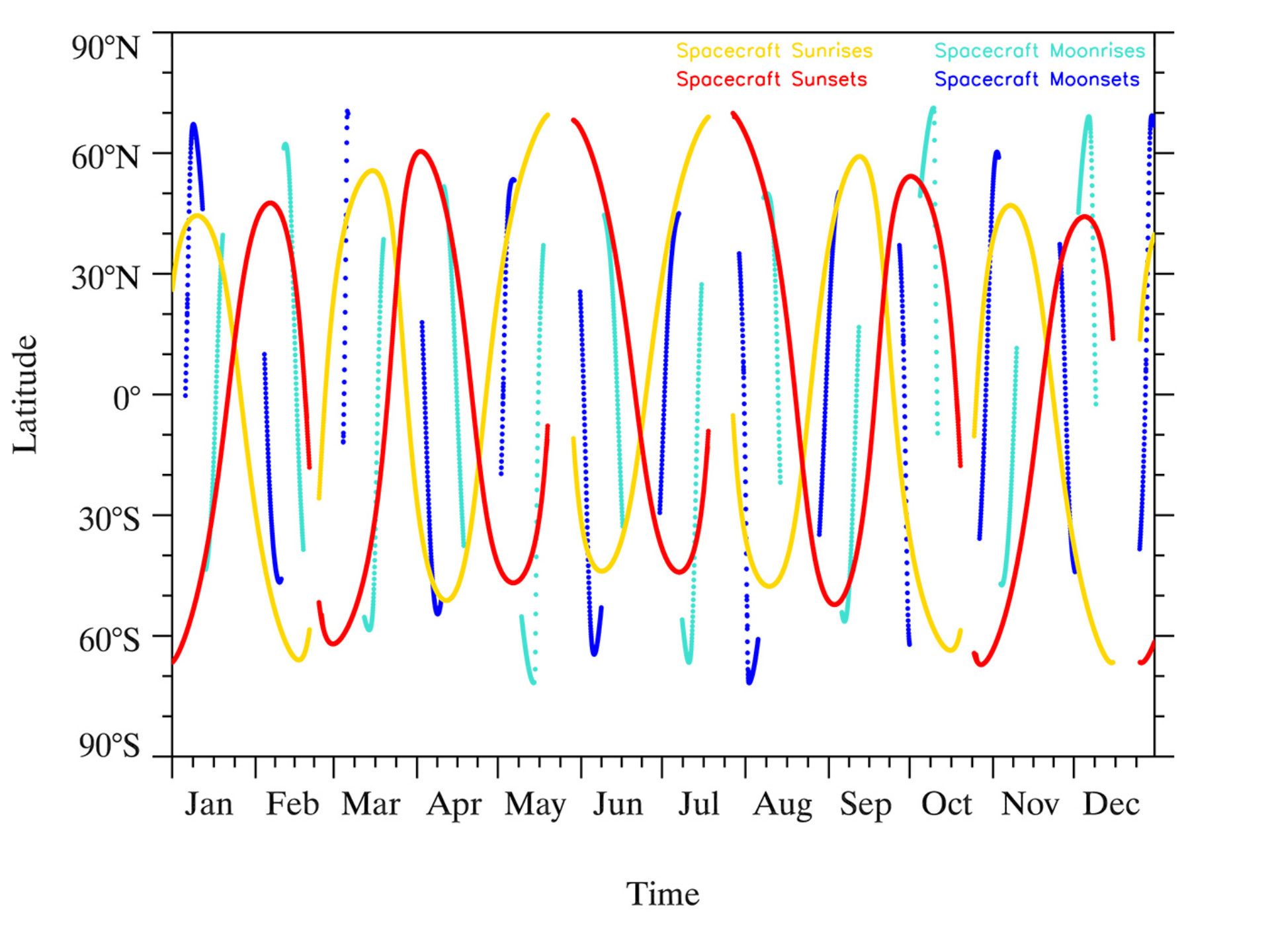



35-40N Zonal Avg. SBUV Overlap V8.6 VMR Data (%); 7.00 hPa
PPMV
9
8
7
6
2006
2008
2010
2012
2014
2016
2018
Time
Percent Difference from MLS
Percent Difference
20
10
0
-10
-20
1.5
1.0
0.5
0.0
-0.5
-1.0
-1.5
PPMV
2006
2008
2010
2012
2014
2016
2018
Time
Average Ozone = 8.01 PPMV
N17
N18
N19
OMPS_NP
OMPS_LP
MIPAS
MLS


35-40N Zonal Avg. SBUV Overlap V8.6 VMR Data (%); 2.00 hPa
PPMV
7.0
6.5
6.0
5.5
5.0
4.5
4.0
2006
2008
2010
2012
2014
2016
2018
Time
Percent Difference from MLS
Percent Difference
20
10
0
-10
-20
1.0
0.5
0.0
-0.5
-1.0
PPMV
Time
Average Ozone = 5.04 PPMV
N17
N18
N19
OMPS_NP
OMPS_LP
MIPAS
MLS

SAGE III Typical Orbit




Spacecraft Sunrises
Spacecraft Sunsets
Spacecraft Moonrises
Spacecraft Moonsets
90°N
60°N
30°N
0°
30°S
60°S
90°S
Latitude
Jan
Feb
Mar
Apr
May
Jun
Jul
Aug
Sep
Oct
Nov
Dec
Time

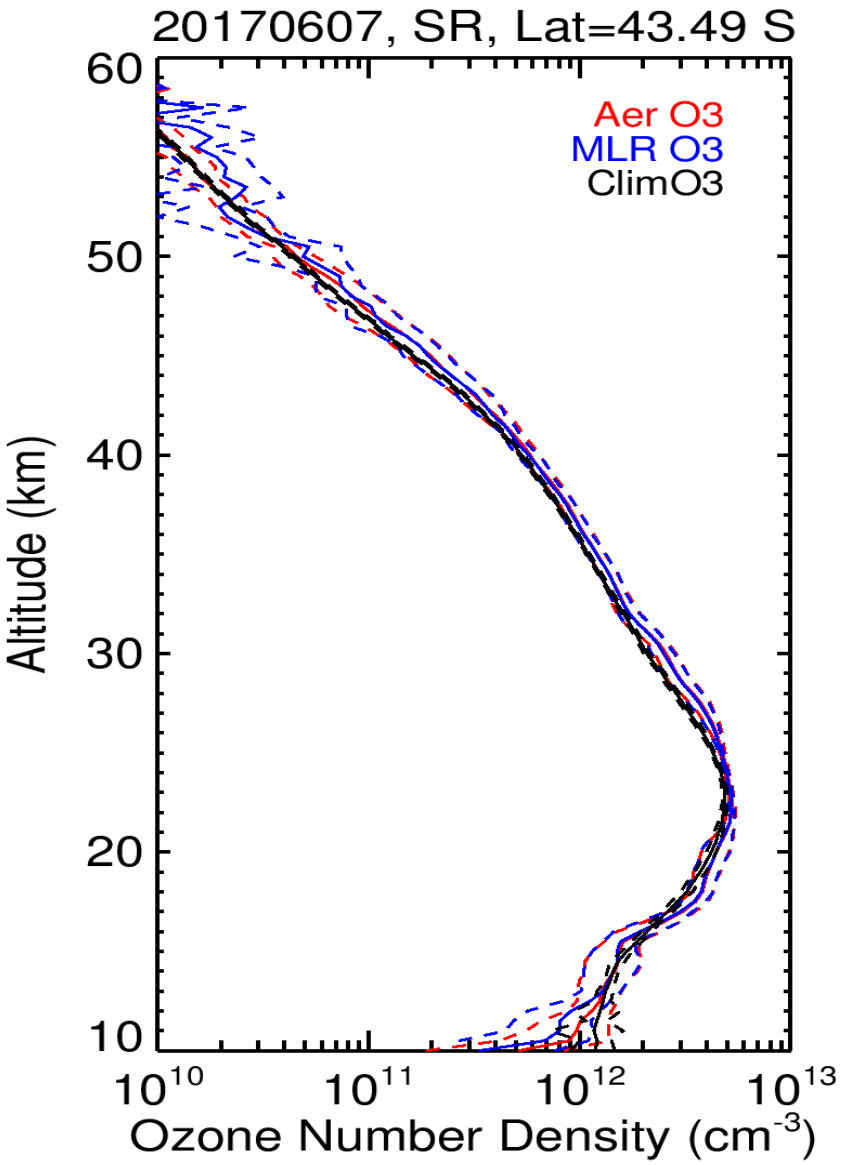
Data Availability Timeline

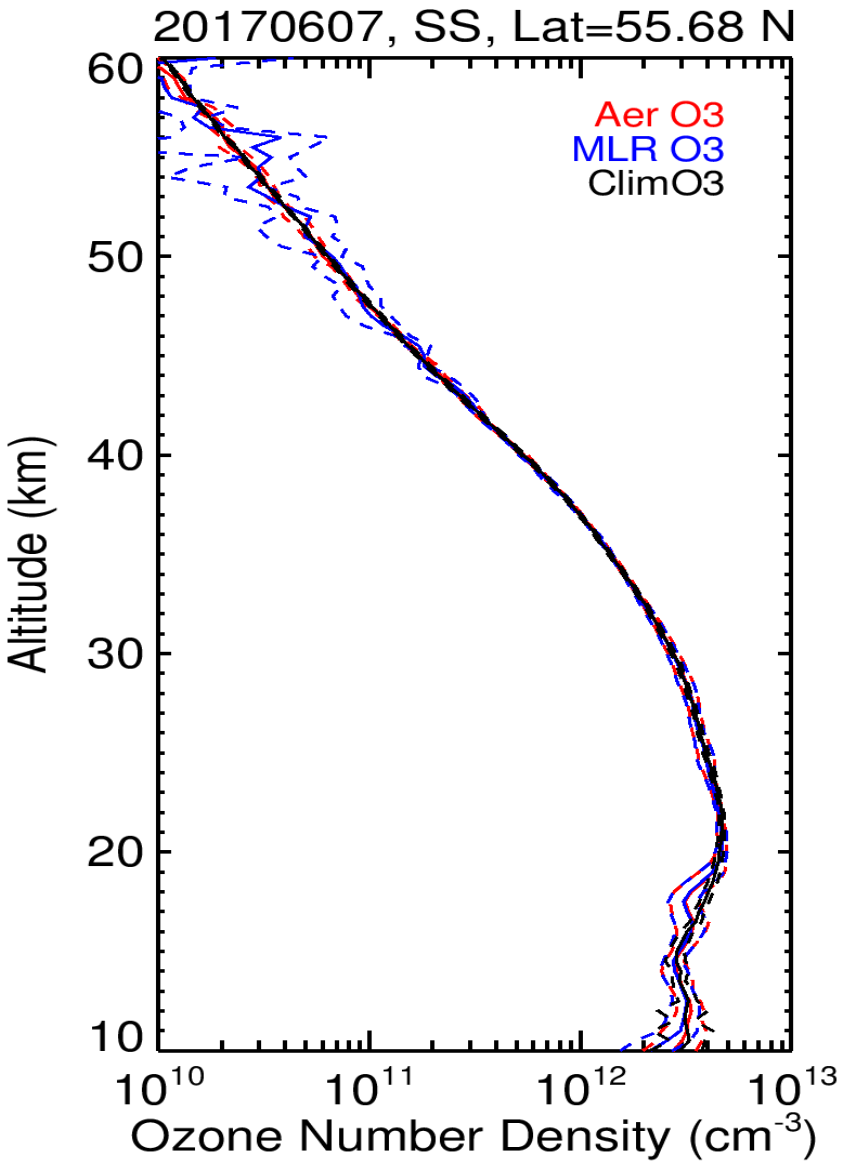
Data Processing Level	Description	First Data delivery after Commissioning*	Maximum data latency after first release**
Level 1	Solar Occultation Transmission	6 months	10 days
Level 2	Solar & Lunar Data Products	6 months	14 days

*Product quality shall be at least Beta quality with a goal of provisional quality.
**Latency is defined as the maximum time before release of higher order data products after receipt of all data required to produce the data product (e.g., MERRA).

- Events processed in a weekly batch
- Can be processed sooner with increased product uncertainty
- Utilizing heritage processing code from SAGE III/M3M, with updates appropriate for ISS
- Algorithm for Transmission identical to SAGE V7 Algorithm

First-Look O_3 Profiles





Summary:

AC-VC Total ozone product will be updated through 2016 and published by Fall 2017. This objective is now considered to be finished. Update every year??

V9 Total ozone algorithm for N7 TOMS, OMI and OMPS will be released shortly.

OMPS Limb V2.5 product will be released by the end of August.

SAGE III data will be available by the end of the year.