

Validation of the NPP-Suomi OMPS ozone products with NOAA ground-based Dobson network.

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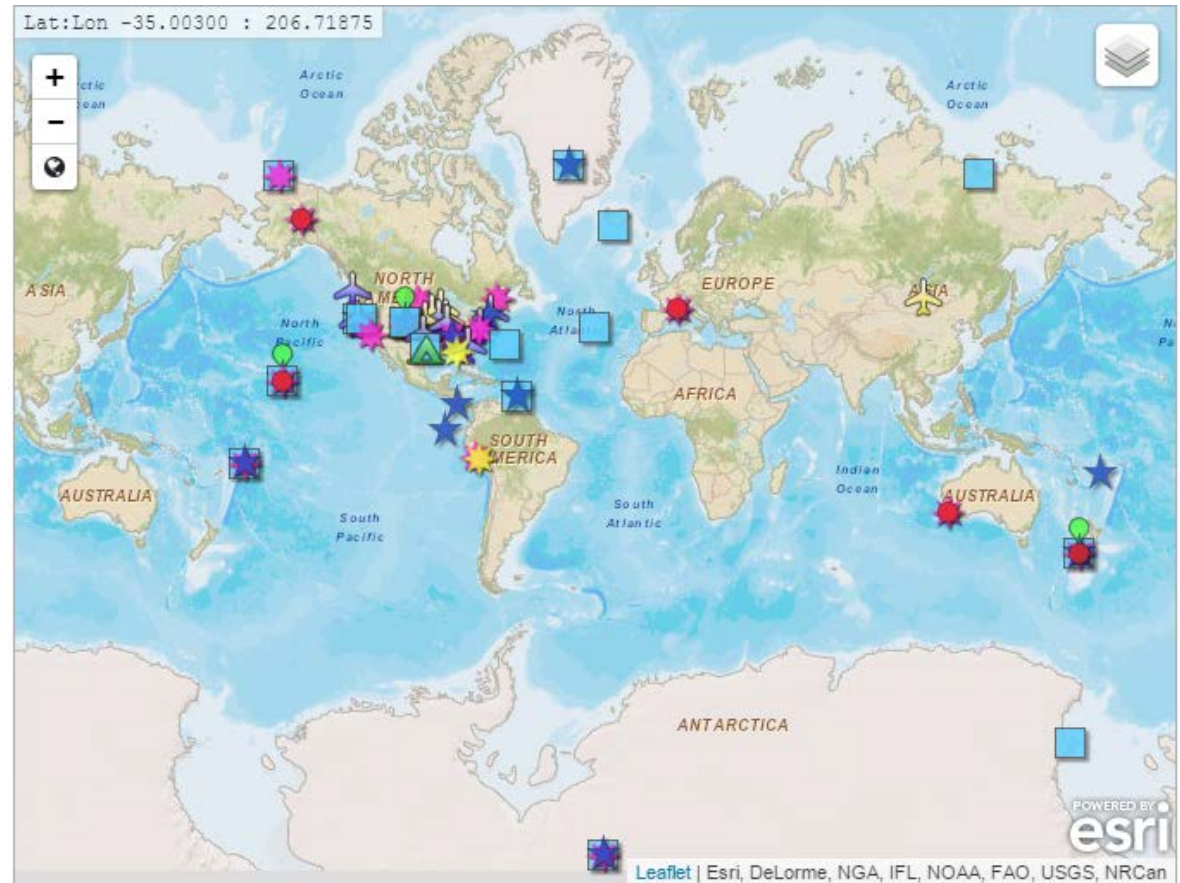
4 Center for Satellite Applications and Research, NOAA/NESDIS, College Park, MD



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Introduction to NOAA's Ozone Network



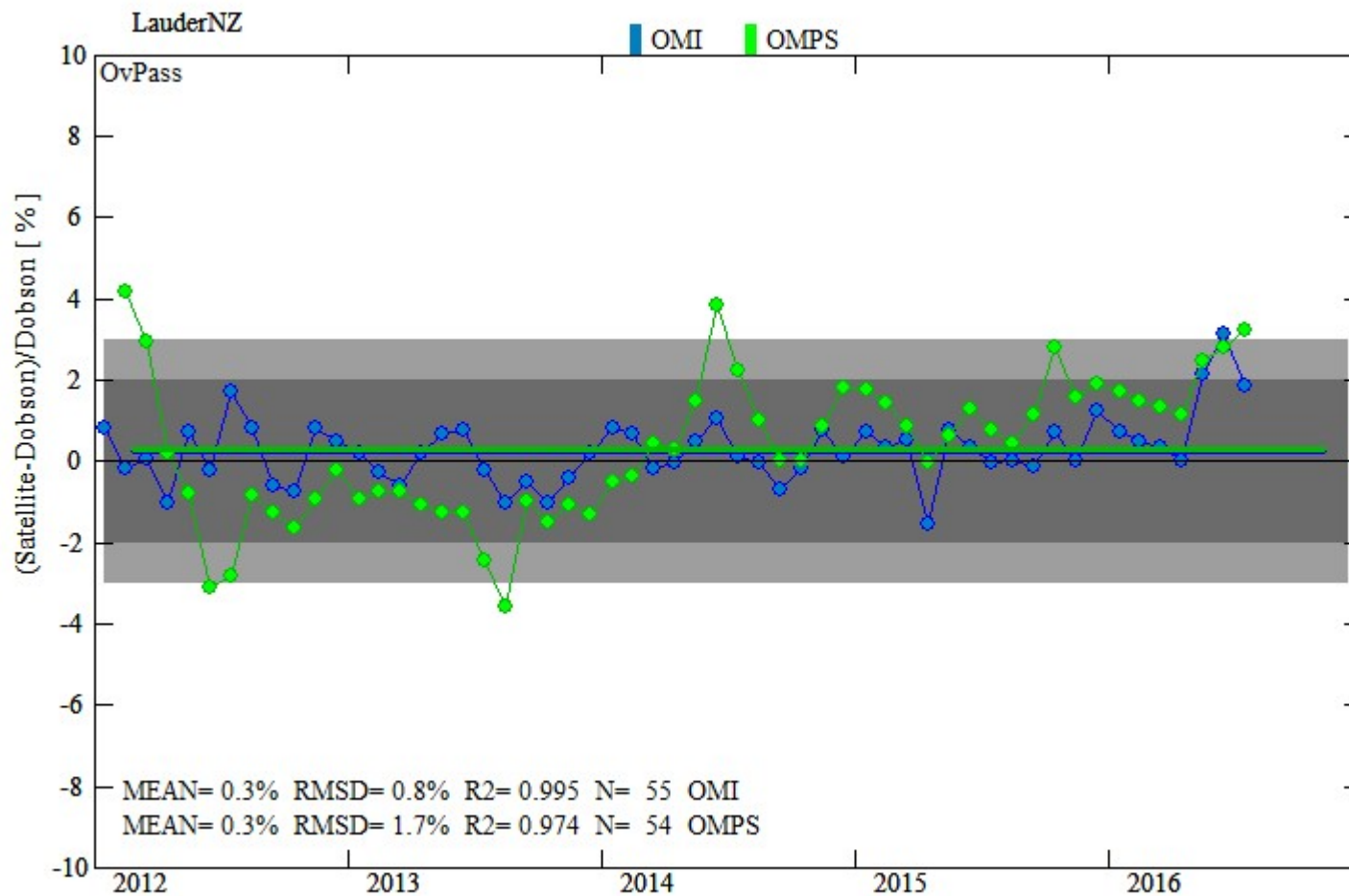
NOAA GMD ozone and water vapor group maintains long-term records of total column and ozone profiles at 20+ unique locations around the globe.

Spatial and temporal variability and its impact on Dobson comparisons

- Size of the footprint
OMI -13x24 , OMPS – 50x50 , SBUV -180x180 km²
- Separation in space
- Separation in time (jet stream meandering)
- Clouds – ozone amount below the cloud, averaging of ozone field with partial clouds
- Surface pressure
- Temperature sensitivity in ozone x-sections

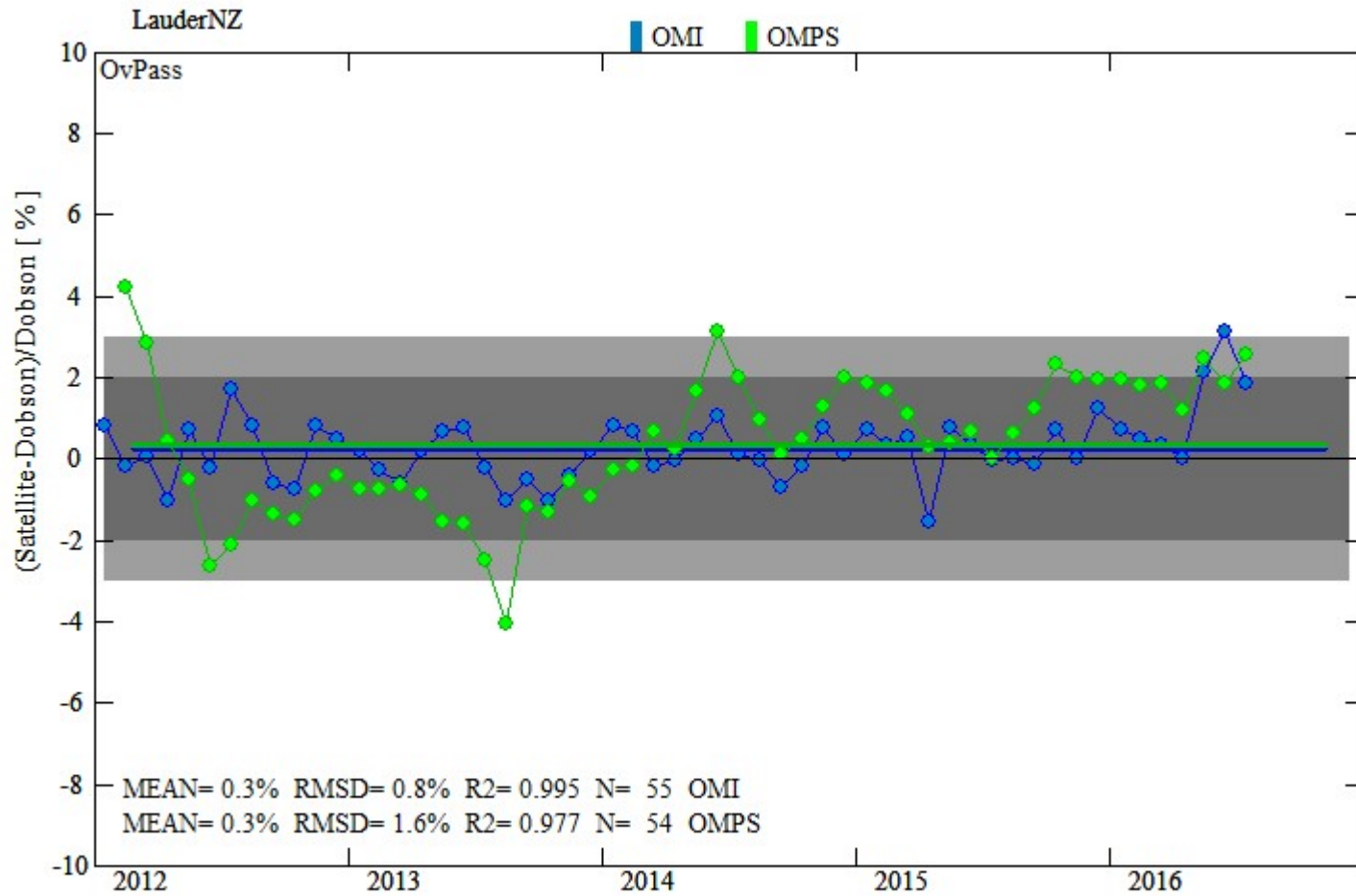
Match ADDS

OMPS_NOAA (TOZ; Closest_Dist)



Match ADDS

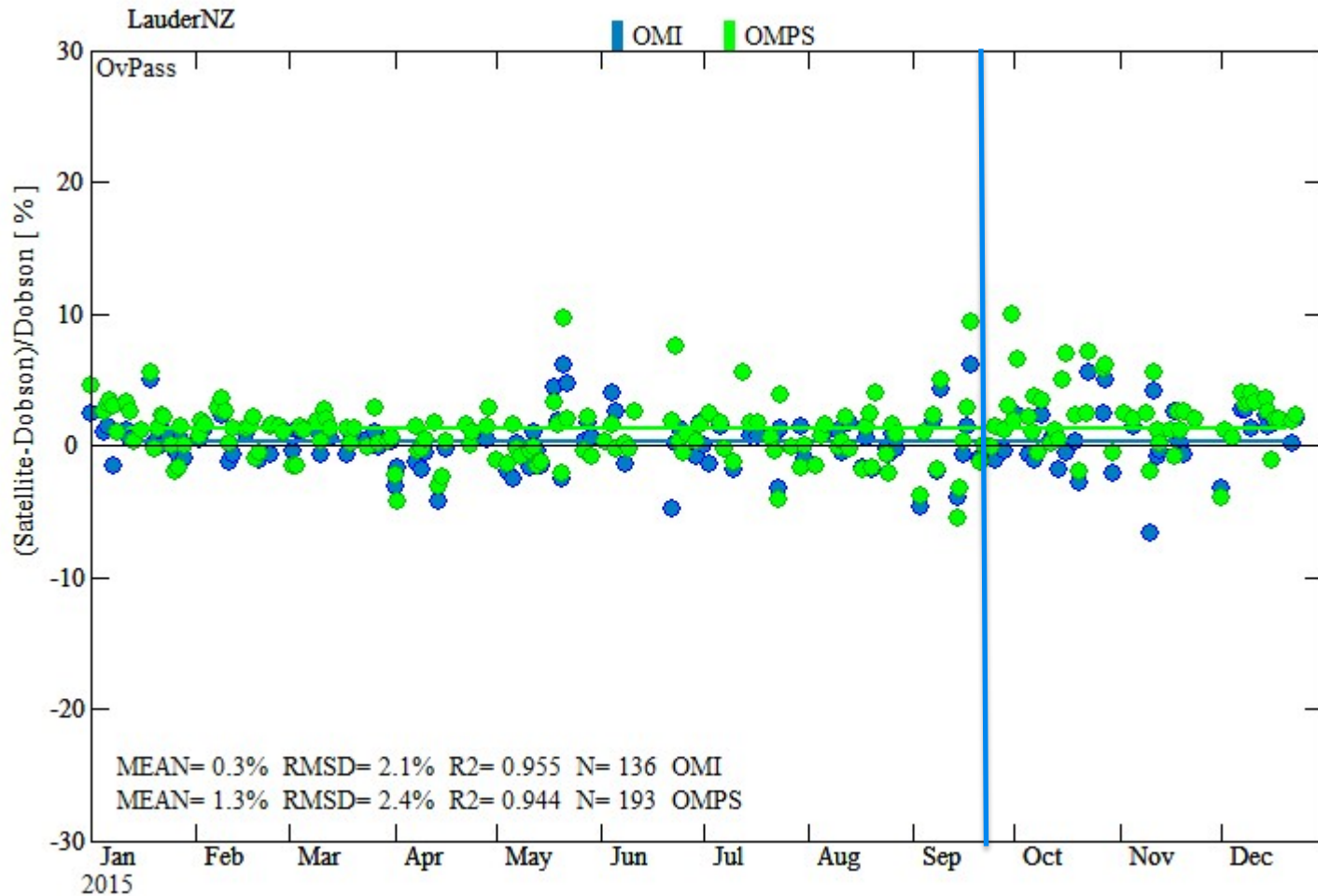
OMPS_NOAA (TOZavg)



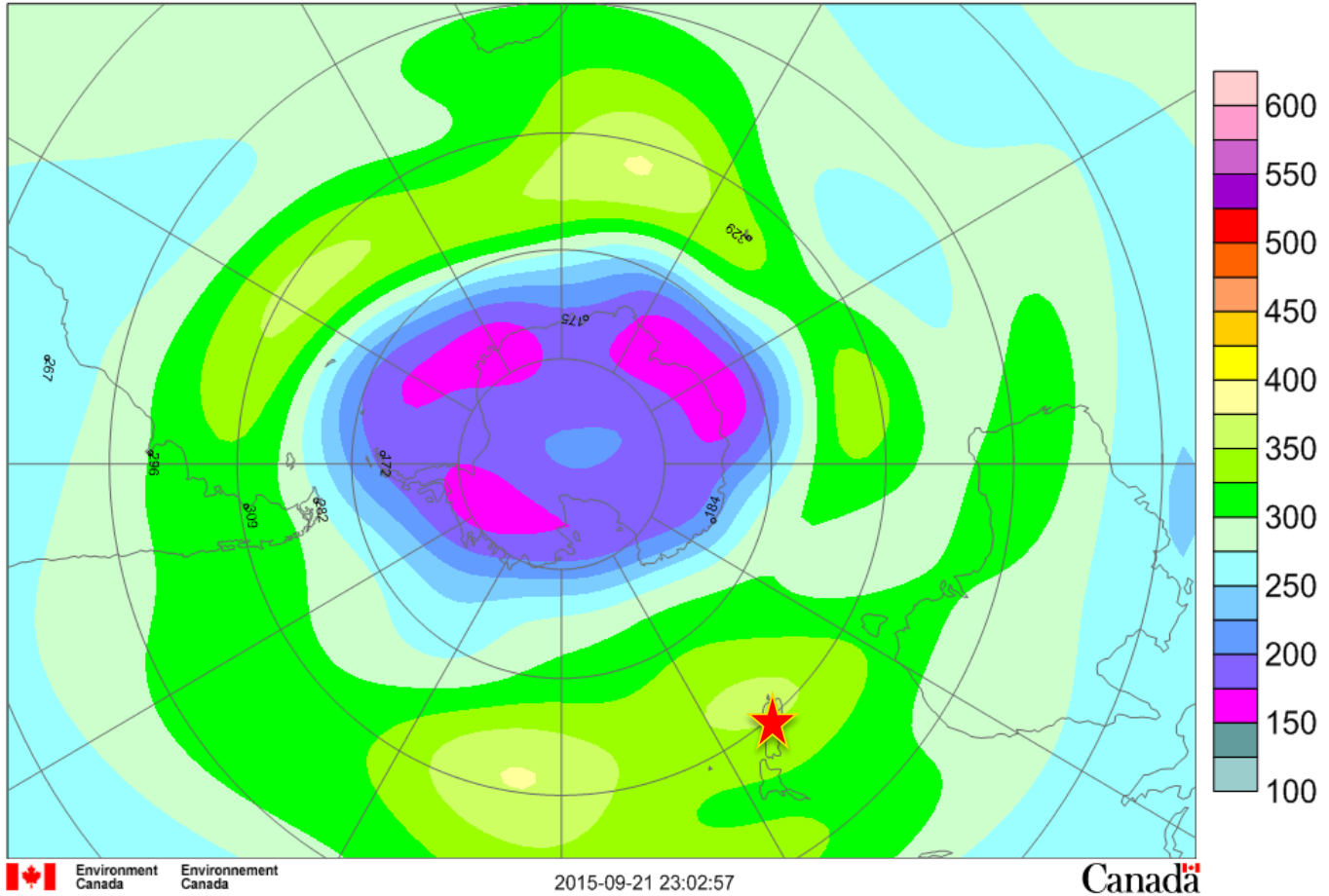
Match ADDS

OMPS_NOAA (TOZ; Closest_Dist)

September 19, 2015 Wavelength, Solar, Calibration NM NP CCR 15-2549 15-2548

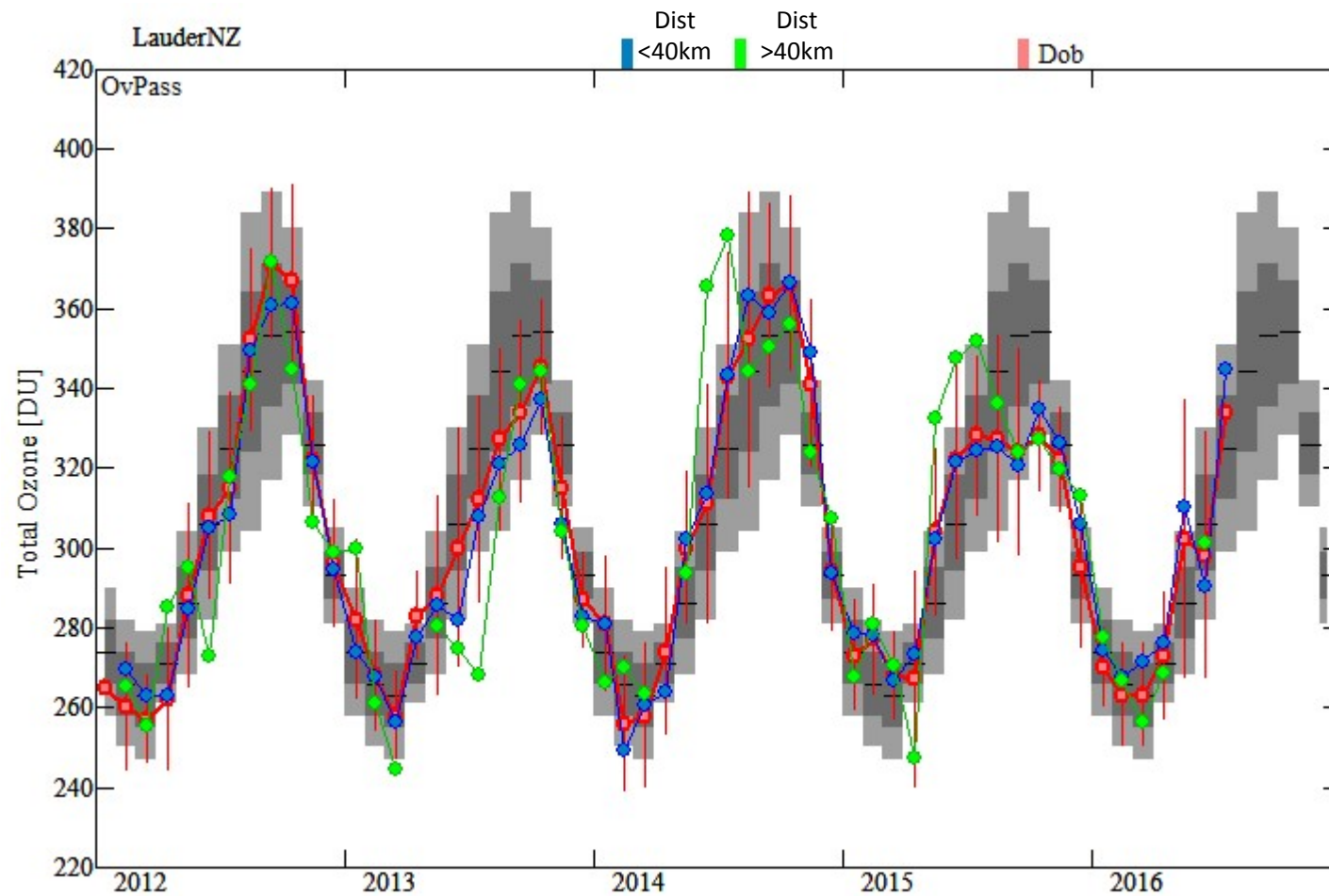


Total ozone (DU) / Ozone total (UD), 2015/09/18



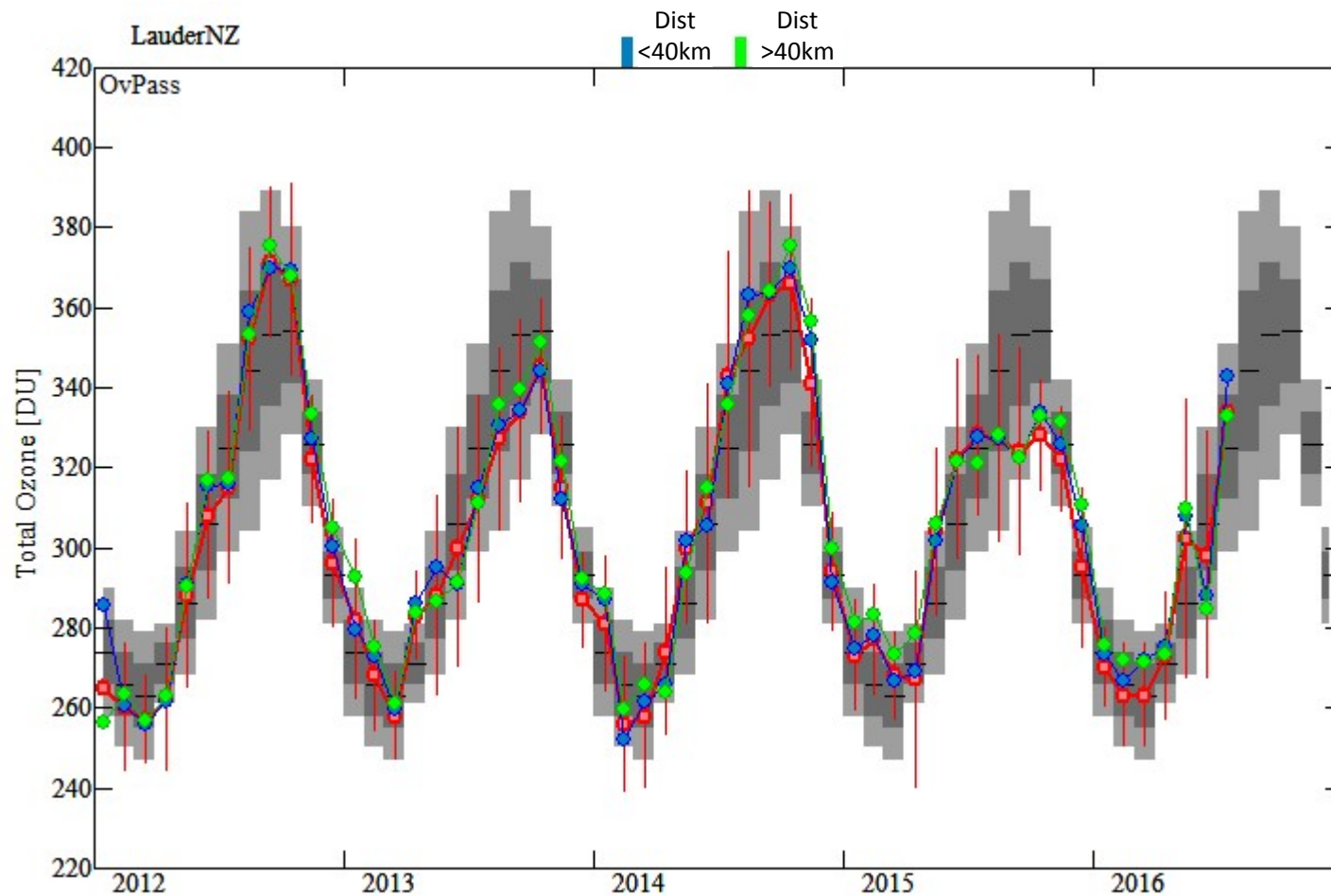
Matched ADDS

OMPS_NOAA

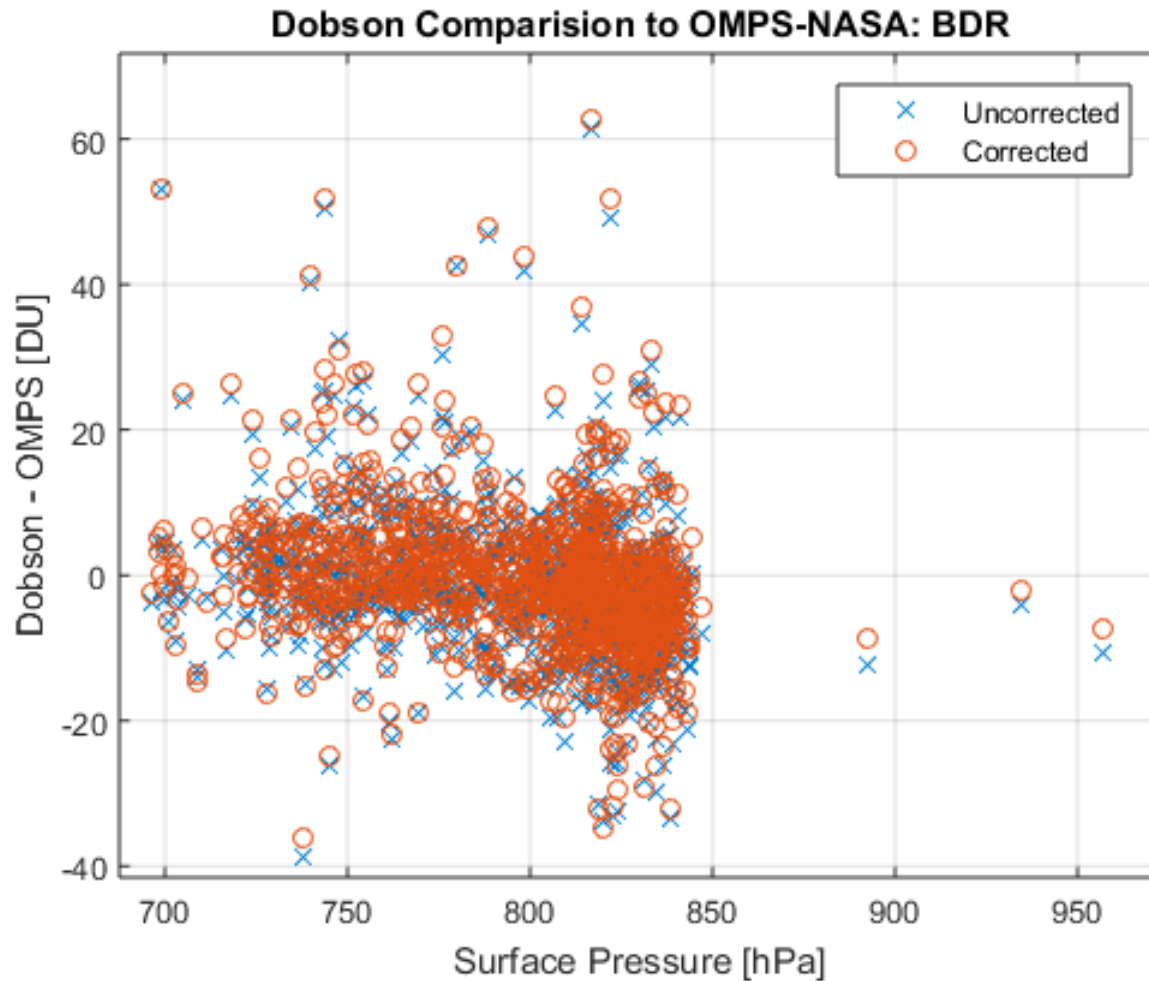


Matched ADDS

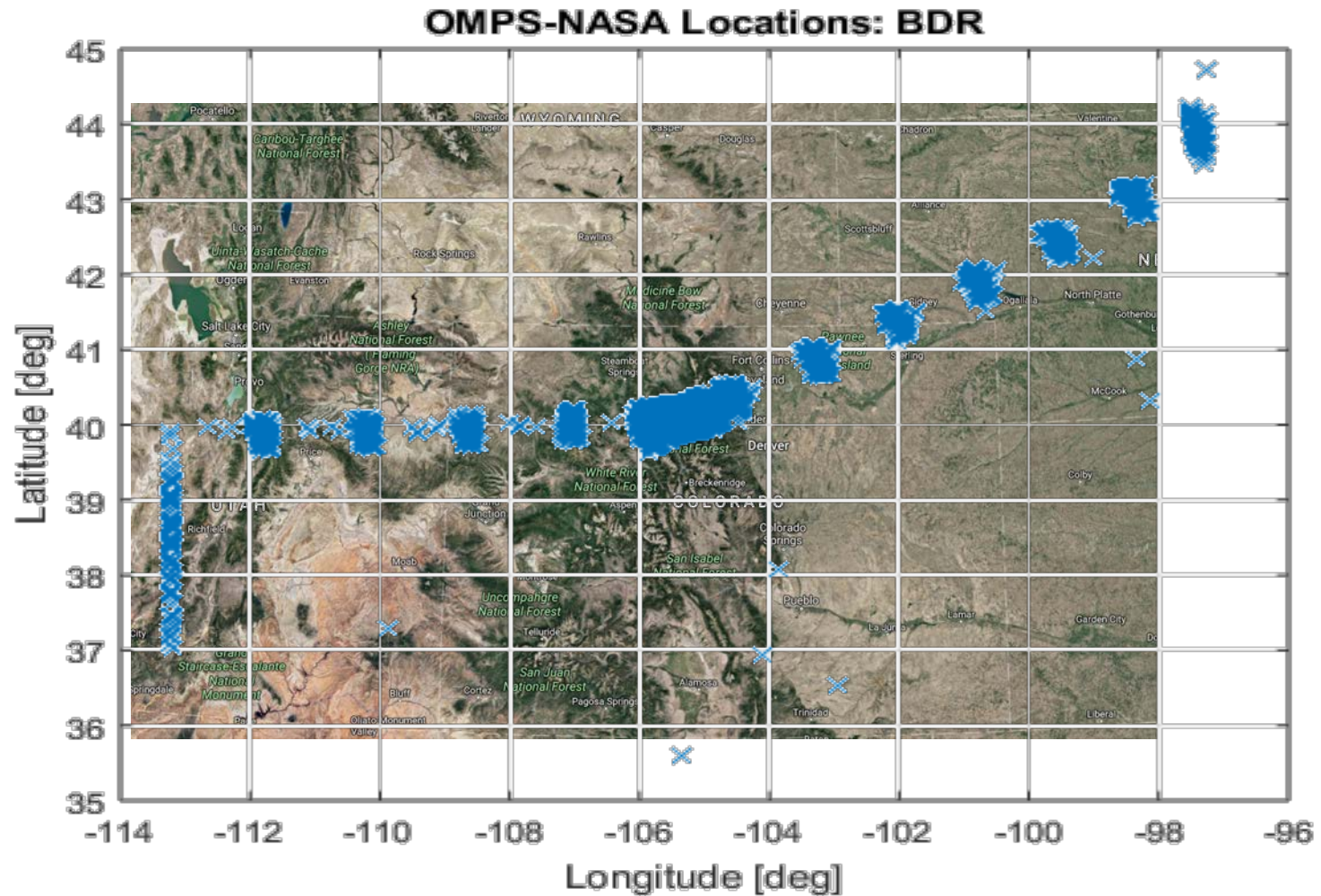
OMPS_NASA



Screening of the overpass data



Matching criteria for the “closest”



Tracking OMPS SDR changes

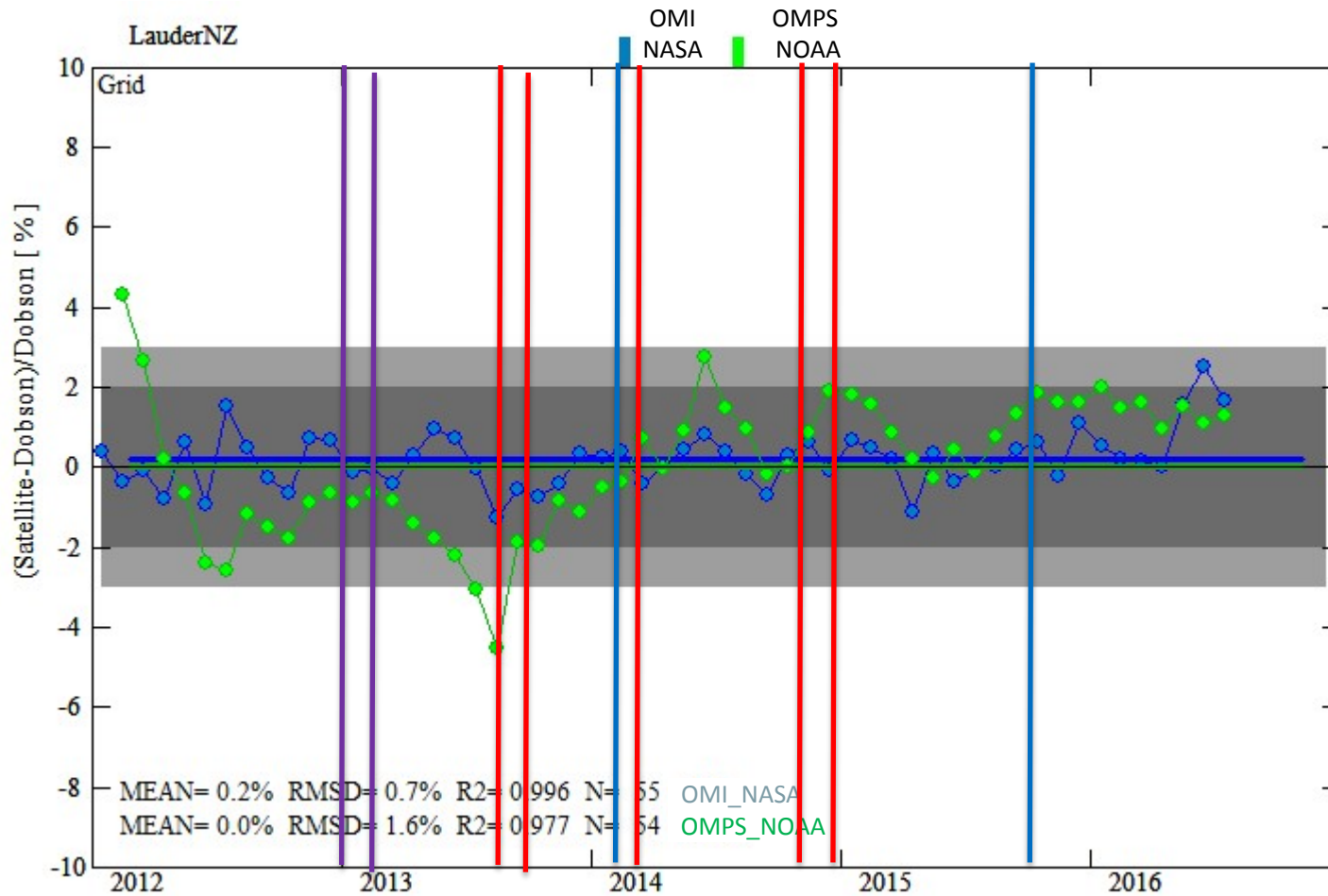
- 1. Wavelength scale changes.
- 2. Day 1 Solar changes
- 3. Changes in stray light corrections
- 4. Calibration constant changes.
- 5. Start of weekly dark update
- 6. Wavelength shift adjustment

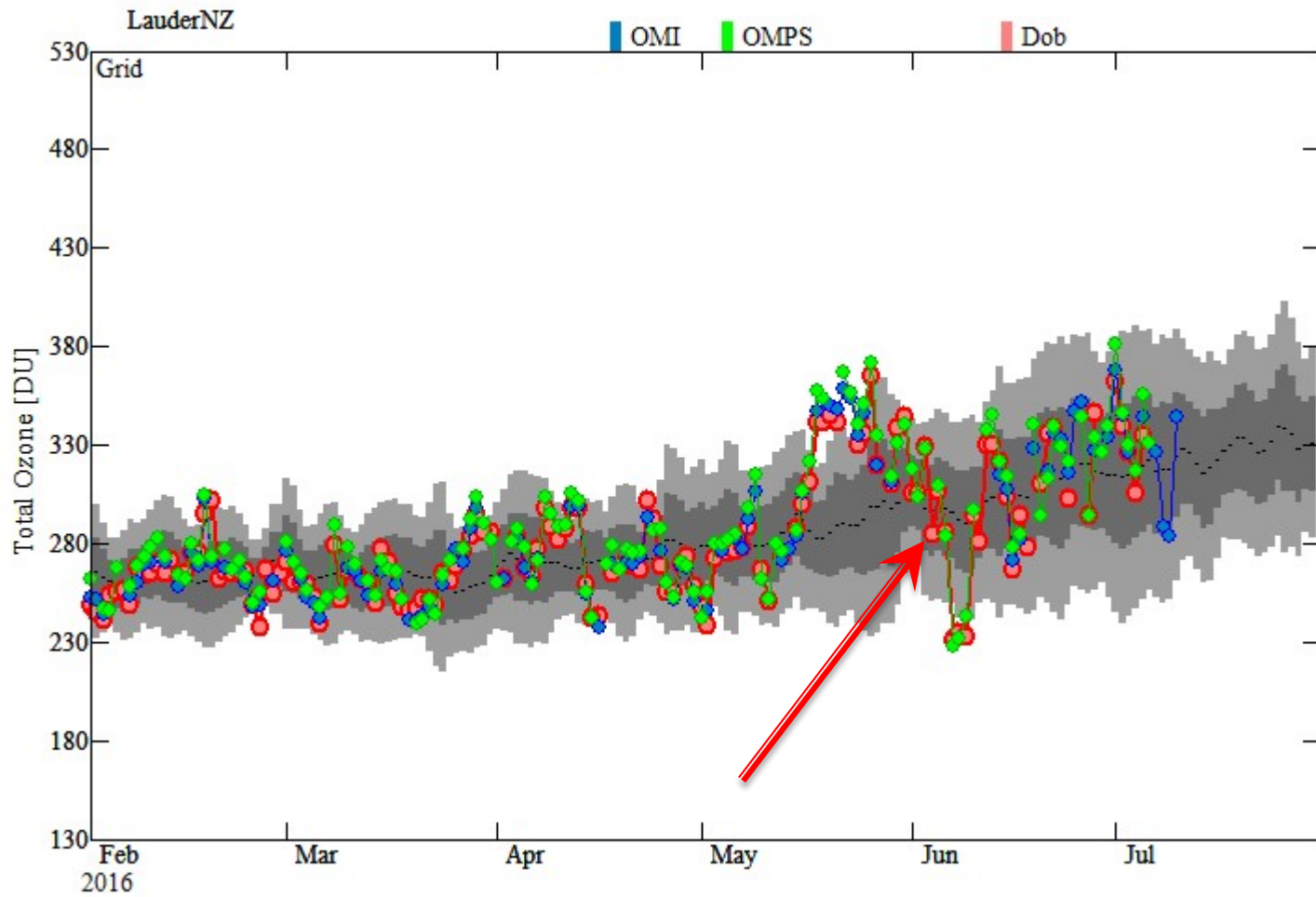
Timeline OMPS SDR changes

- February 2012 Problem with wavelength scales for both NM and NP - SDRs were reprocessed.
- May 7, 2012 Wavelength scales for NM and NP CCR 389
- June 11, 2012 Day 1 Solar for NM CCR 411
- July 17, 2012 Day 1 Solar for NP CCR 458
- **December 21, 2012 Dark Update NM CCR 12-776**
- **February 6, 2013 Dark Update NP CCR 13-801**
- **July 10, 2013 Stray Light Correction NM CCR 13-1115**
- **August 21 2013 Stray Light Correction NM CCR 13-0883**
- **February 20, 2014 Wavelength Shift Adjustment CCR 13-1192**
- **March 18, 2014 Stray Light Correction NP CCR 13-1249**
- October 23, 2014 Wavelength Scale NP CCR 14-2053
- November 13, 2014 Day 1 Solar and Wavelength Scale NM CCR 14-2052
- **November 21, 2014 Stray Light Correction NM CCR 14-1879**
- **December 18, 2014 Stray Light Correction NM CCR 14-2100**
- **September 19, 2015 Wavelength, Solar, Calibration NM NP CCR 15-2549 15-2548**

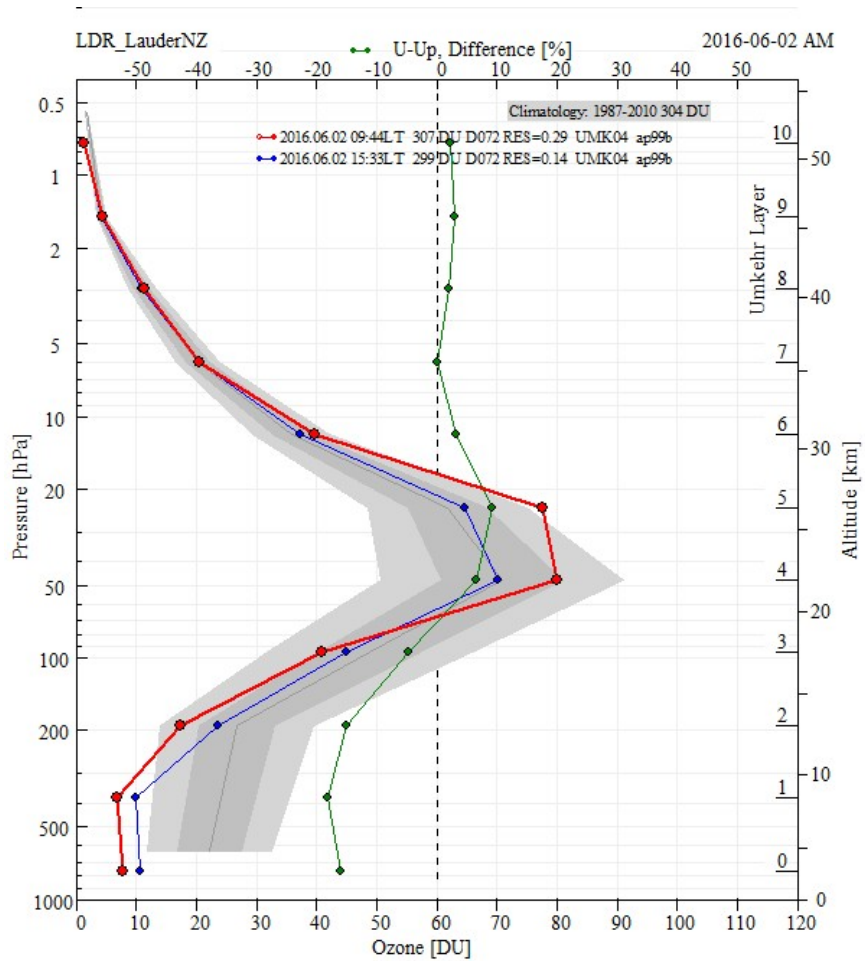
Matched ADDS

Gridded Data

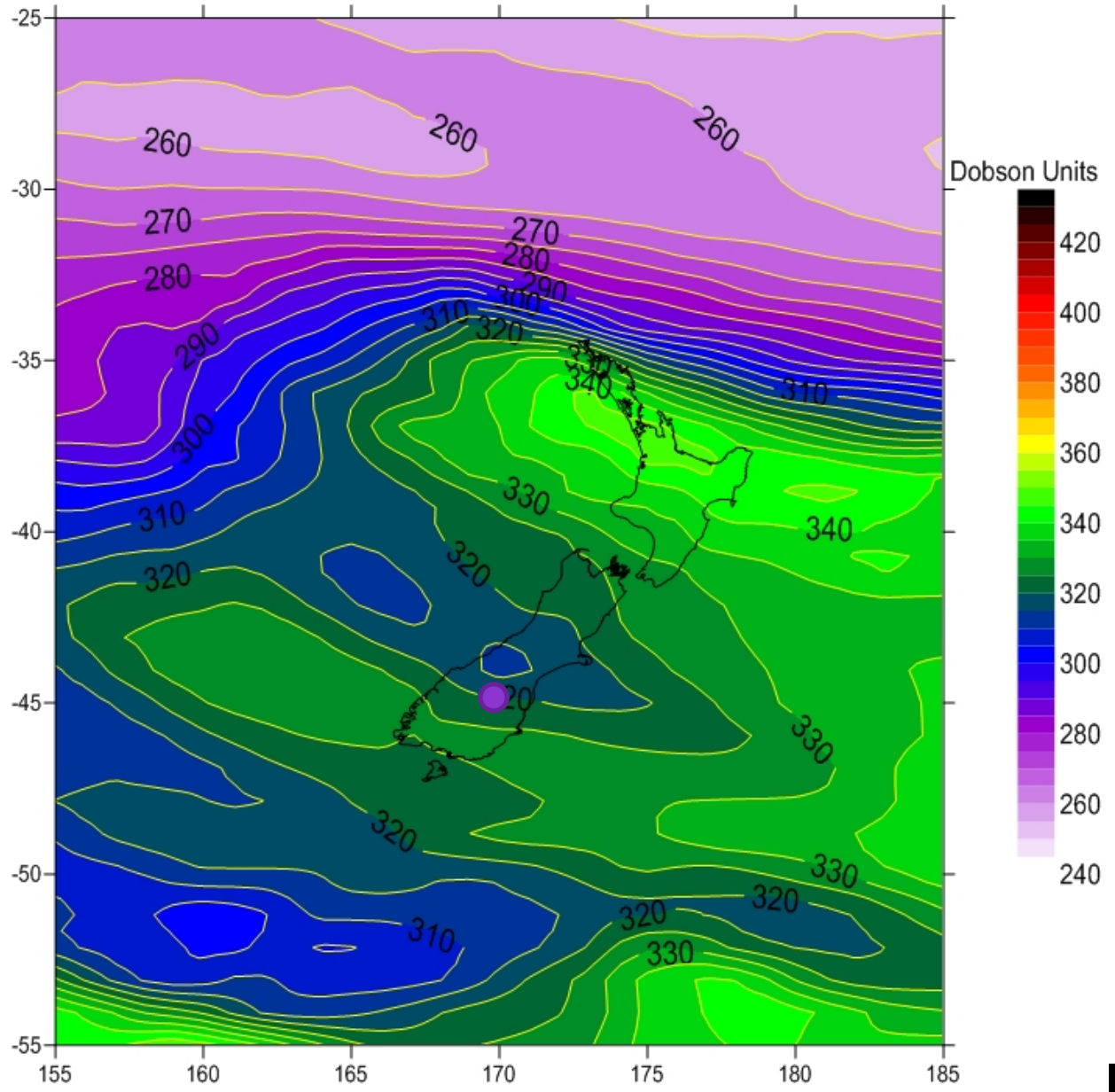




Umkehr AM and PM



FH+31 VT 1200 NZST 2 JUN 2016



Ozone Map For Today

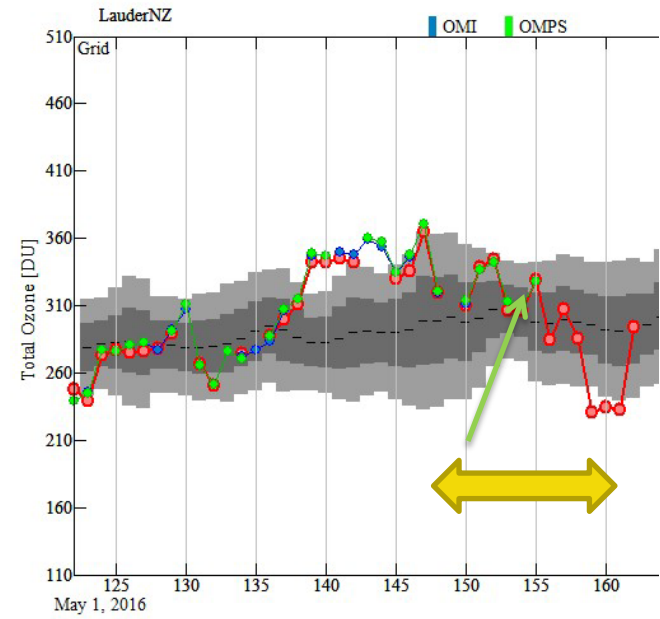
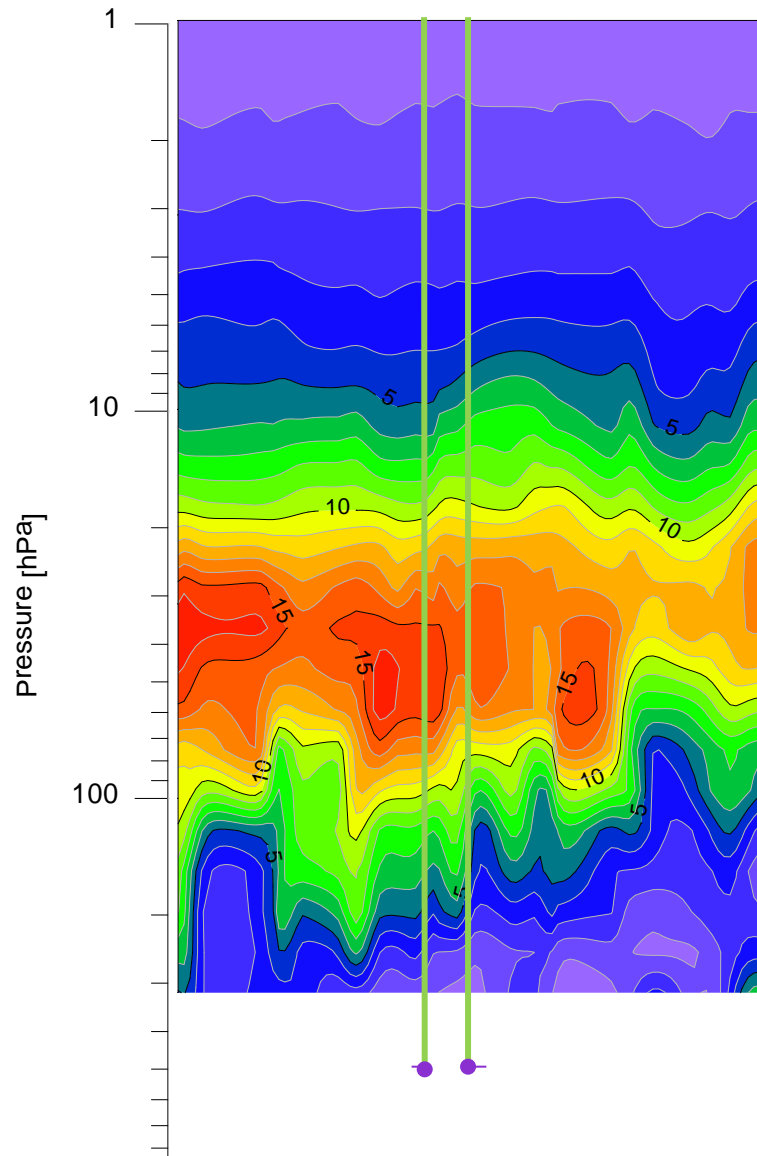
<https://www.niwa.co.nz/our-services/online-services/uv-ozone>

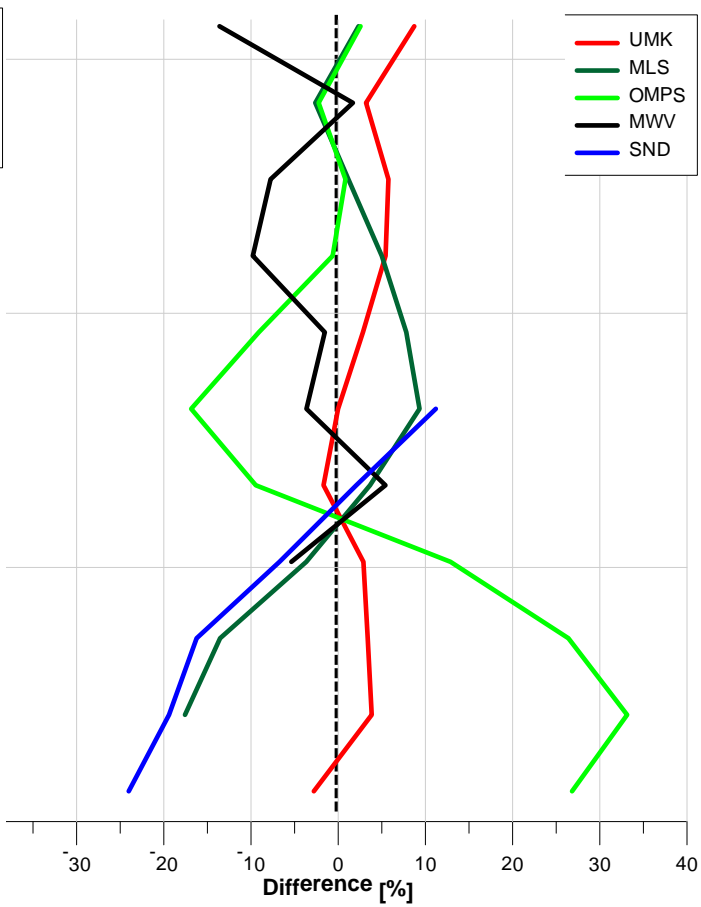
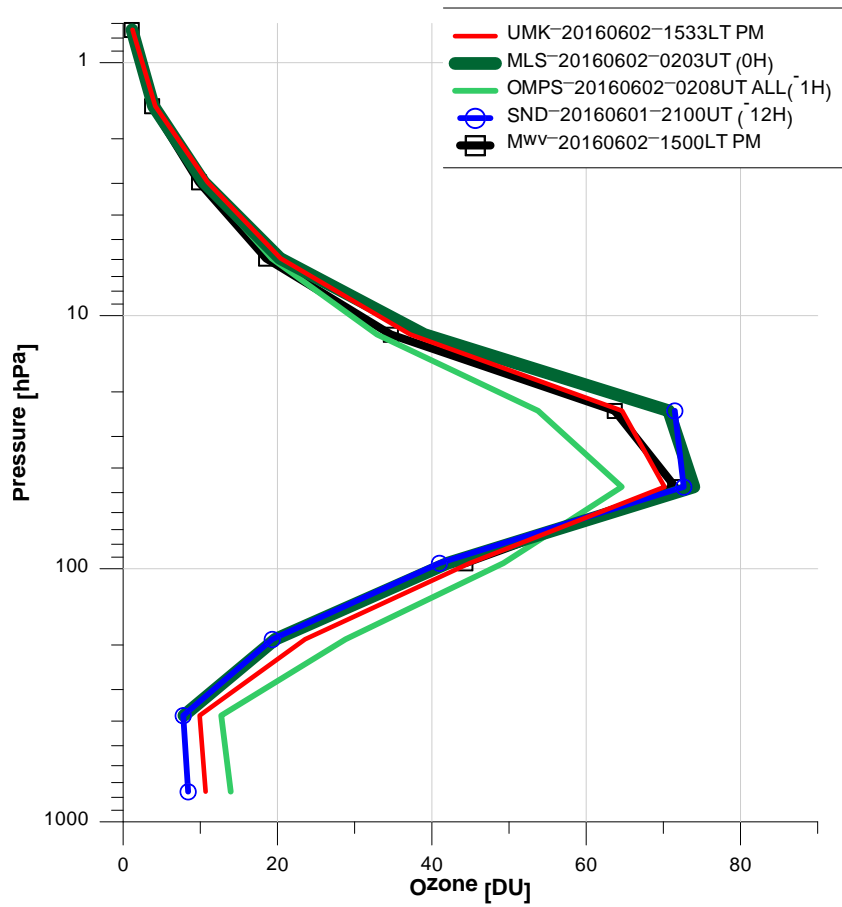
Environmental Sciences

**New Zealand ozone maps for noon
(12:00NZST, 0:00GMT)**



MLS





Boulder Dobson/SBUV Comparison (1992 – 2015)

Brandon Noirot, CIRES/NOAA



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Introduction

Problem:

Dobson Total Column Ozone exhibits seasonal error associated with current operational processing of the data using the constant stratospheric temperature. This creates the known bias from other Ozone-measuring methods.

Purpose:

To develop and validate the seasonal cycle correction method for Dobson Total Column Ozone record in Boulder (initially).

Ozone-Temperature Datasets Used to Test Correction:

~ Ozonesondes

~ Solar Backscatter UltraViolet (SBUV)

<http://www.star.nesdis.noaa.gov/smcd/spb/ozone/Version8AlgorithmDesc.php>

~ Ozone Mapping Profiler Suite (OMPS)

<http://npp.gsfc.nasa.gov/omps.html>

~ Global Modeling Initiative (GMI) (Susan Strahan, Goddard/USRA)

<http://gmi.gsfc.nasa.gov/index.php?section=7>

Equations: Effective Temperature

Generic Effective Temperature (Ozone-Weighted Temperature) [2]:

$$T_{effective} = \frac{\int_0^{top} (T(Z) * O_3(Z)) dZ}{\int_0^{top} O_3(Z) dZ} = \frac{\sum_{i=1}^{N_{top}} [T(i) * O_3(i)]}{\sum_{j=1}^{N_{top}} O_3(j)} \quad (1)$$

Effective Temperature for Ozonesonde (Ozone-Weighted Temperature) [4]:

$$T_{effective} = \frac{\sum_{i=1}^{N_{top}} [T(i) * O_3(i)]}{\sum_{j=1}^{N_{top}} O_3(j)} + \frac{O_{3,top} * \frac{(T_{top} + T_{ref})}{2}}{TOC} \quad (2)$$

T_{ref} is the reference temperature at a certain altitude using the 1976 Standard Atmosphere.

$T_{ref} = -2.5^\circ\text{C}$ for a Geopotential Height of 50km.

TOC is the Total Ozone Column (in DU).

T_{top} is the temperature at the burst.

Equations: TOC

Total Ozone Column Calculation (in DU):

$$O_{3,column} = \frac{1}{2} 0.7898 \ln\left(\frac{P_i}{P_{i+1}}\right) (VMR_i * P_i + VMR_{i+1} * P_{i+1}) \quad (3)$$

VMR is the Volumetric Mixing Ratio in ppmv.
 p is pressure in hPa.

$$10 * RT_0 / g_0 p_0 = 0.7898$$

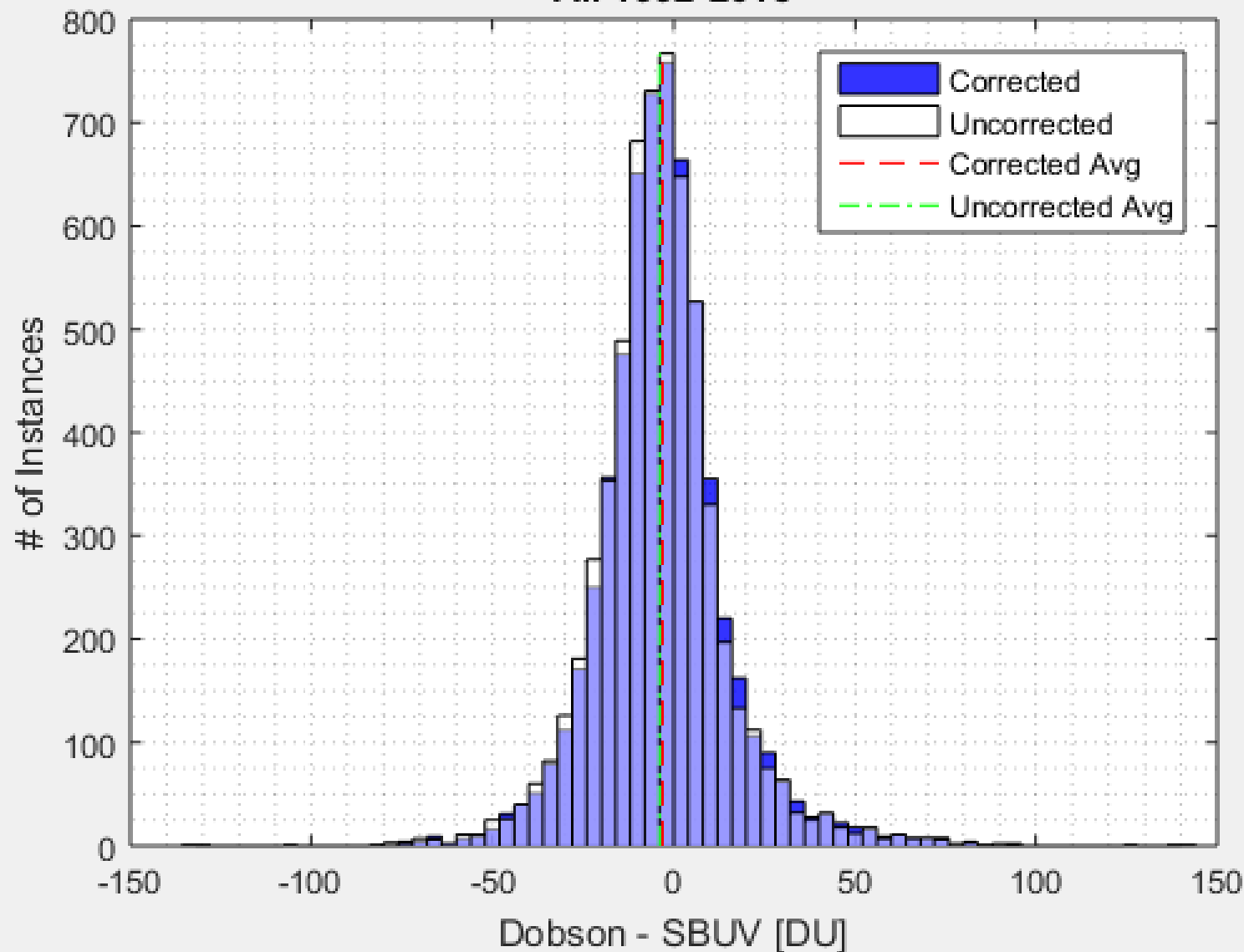
Effective Temperature Adjusted Total Ozone Column (in DU) [2]:

-46.5°C (Note: Dobson reference temperature is -46.3°C)

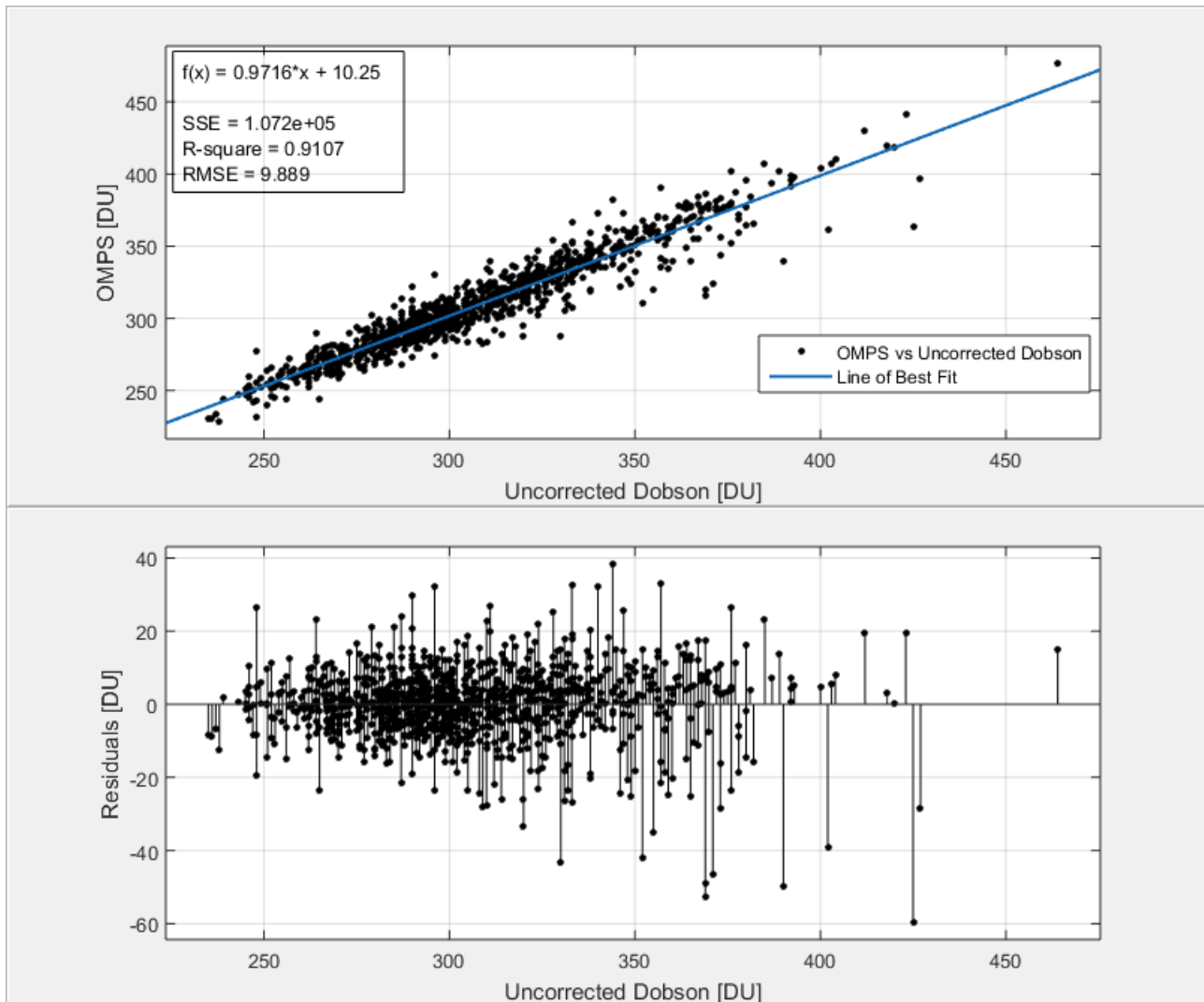
$$TOC_{new} = TOC_{old} * [1 - 0.0013 * (T_{effective} - 226.7)] \quad (4)$$

In Kelvin

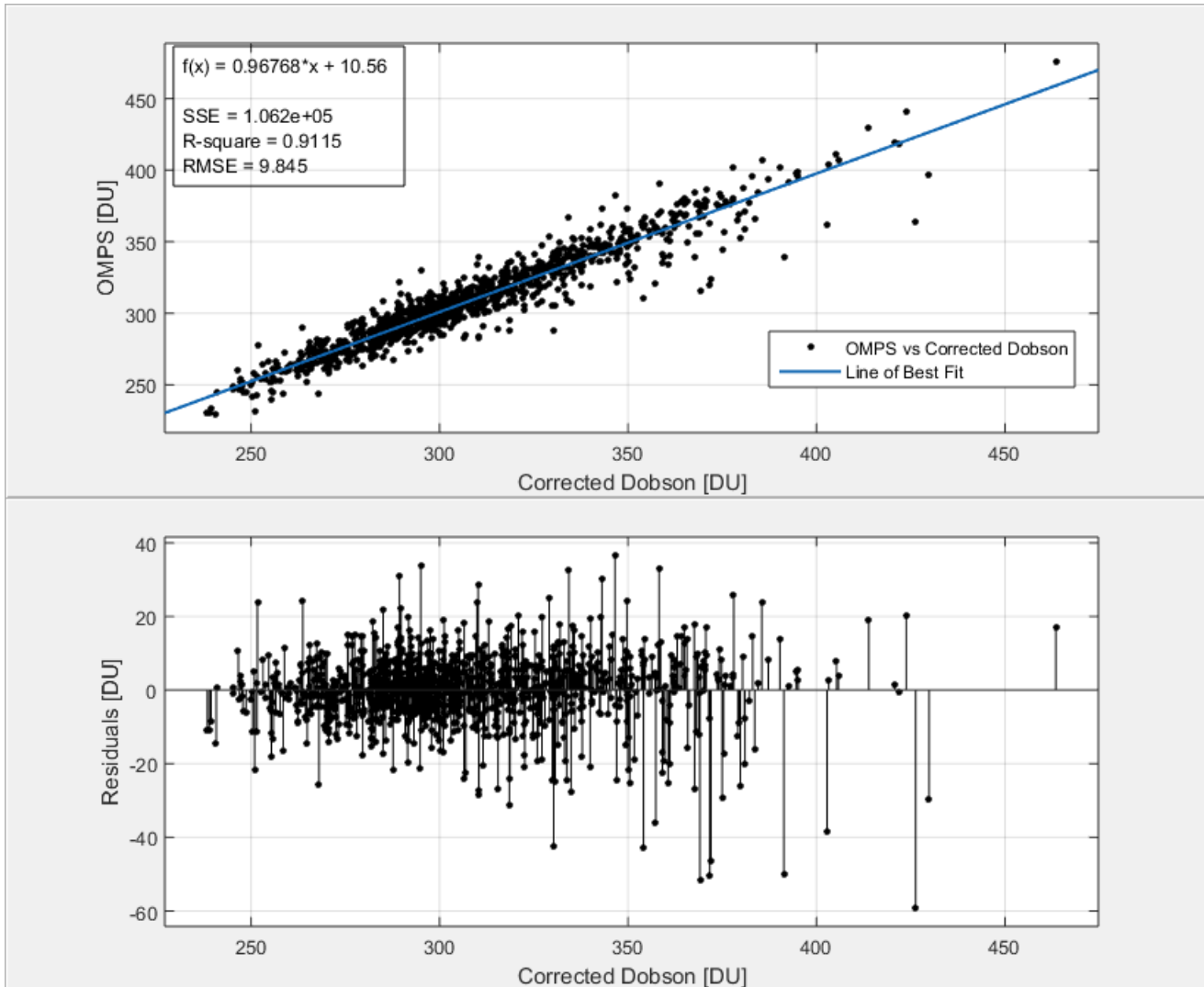
Differences in Corrected/Uncorrected Dobson w/ SBUV All 1992-2015



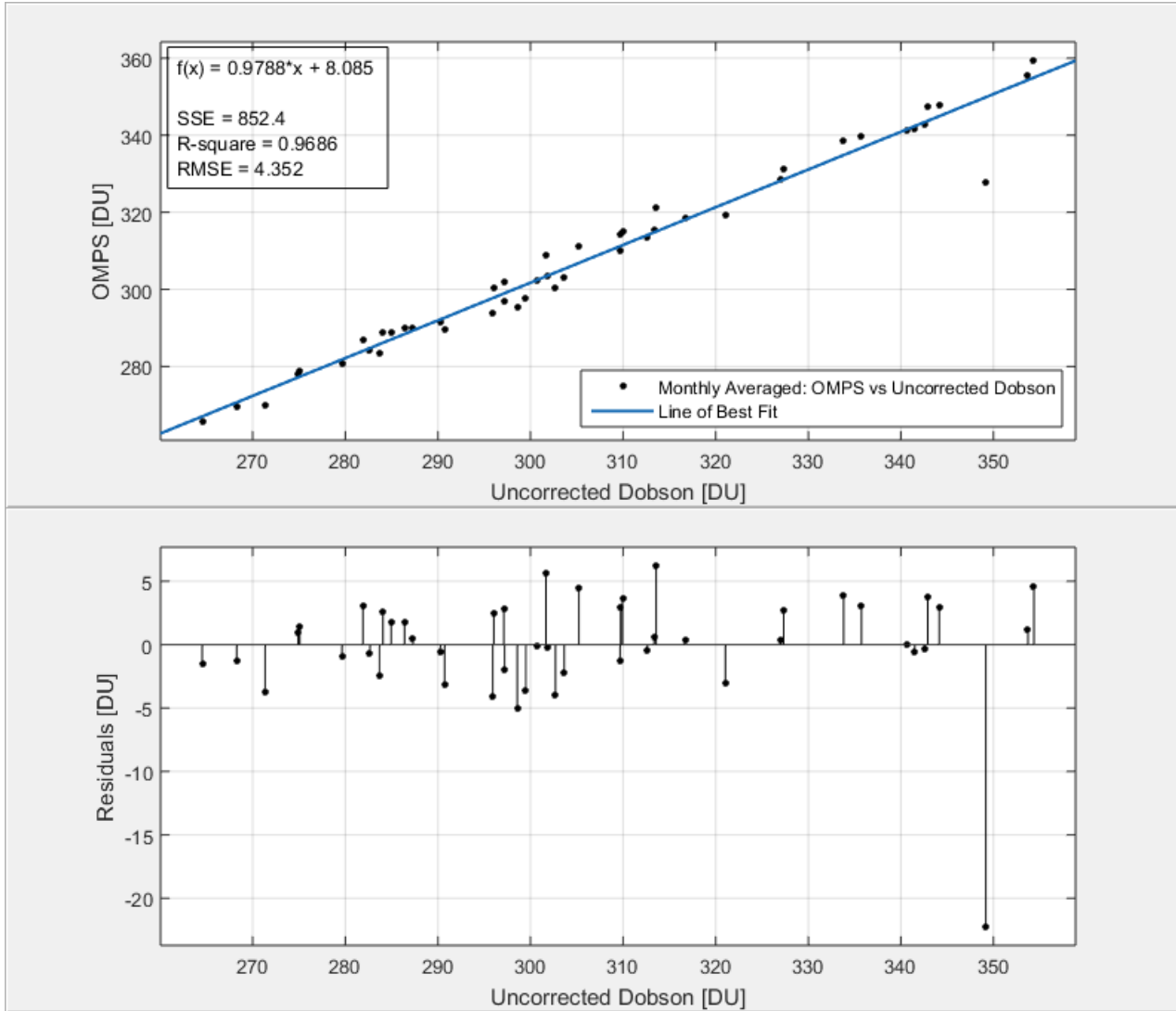
Daily: Uncorrected Dobson



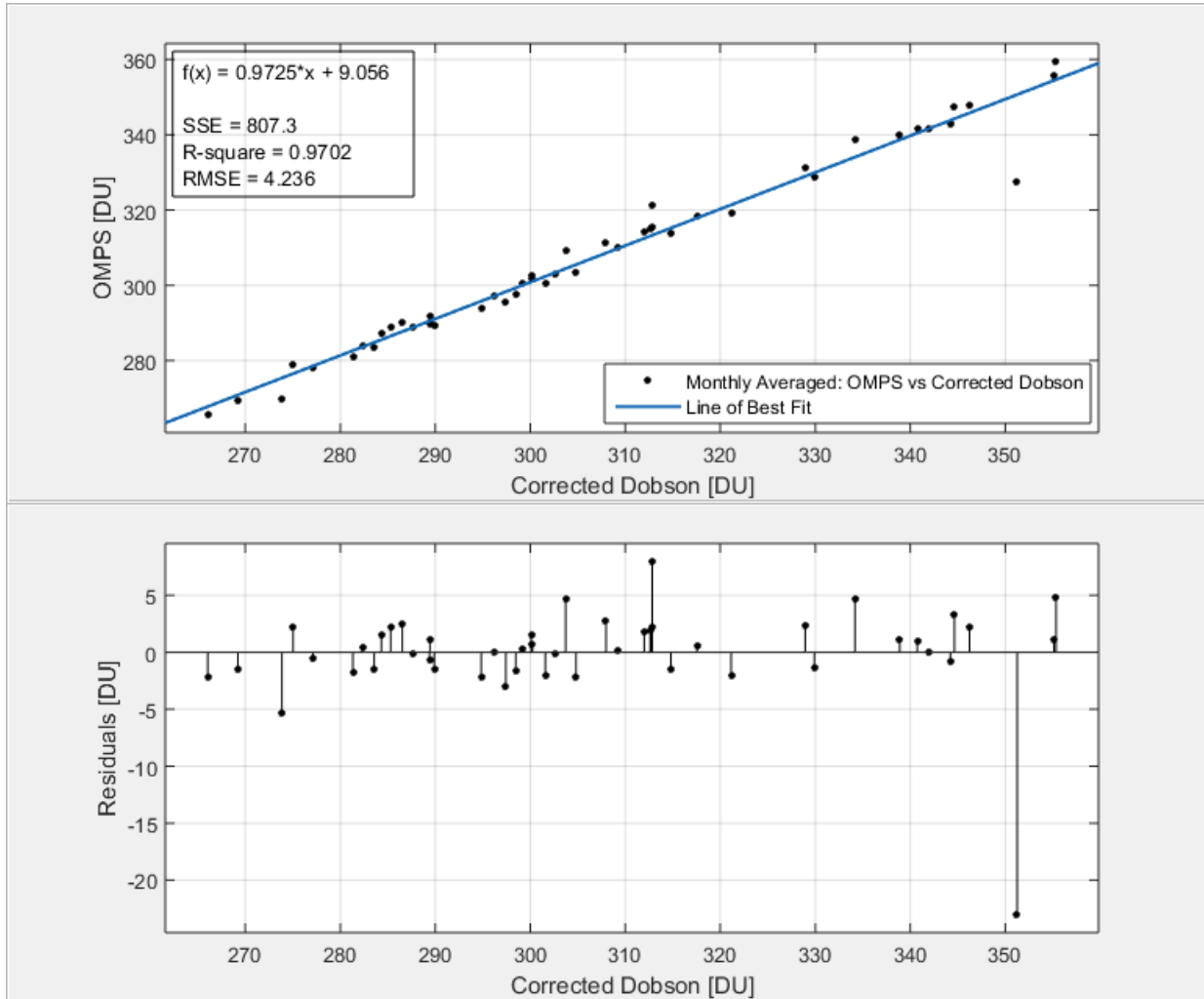
Daily Averages: Corrected Dobson



Monthly Averages: Uncorrected Dobson



Monthly Averages: Corrected Dobson



Correlation Matrix: R²

	Dobson	GMI	Sonde	SBUV	OMPS
Dobson	1.0000	0.9174	0.7575	0.9111	0.9313
GMI	0.9174	1.0000	0.6806	0.8366	0.8700
Sonde	0.7575	0.6806	1.0000	0.8550	0.7543
SBUV	0.9111	0.8366	0.8550	1.0000	0.8736
OMPS	0.9313	0.8700	0.7543	0.8736	1.0000