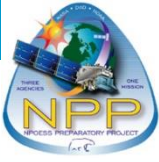# SNPP OMPS Stray Light Corrections

NASA's OMPS Ozone Science Team

NASA Ozone Product Evaluation and Algorithm Test Element (PEATE)

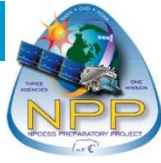**JPSS OMPS Science Operations Center (SOC)**

Presented by Glen Jaross

Conclusion:

Task is complete and is candidate for incremental improvement

Sensor vendor measured point spread functions (PSFs) to demonstrate compliance with stray light requirements

SS3.2.1.21.1 The ratio of the combined out-of-band + out-of-field signal to the expected signal in a channel shall be less than or equal to 2% for all channels specified in SS3.2.1.7.1.

With this allocation, ozone requirements should be met WITHOUT ground correction

BATC (sensor vendor) used the measured PSFs as input to stray light calculation based on modeled TOA radiances
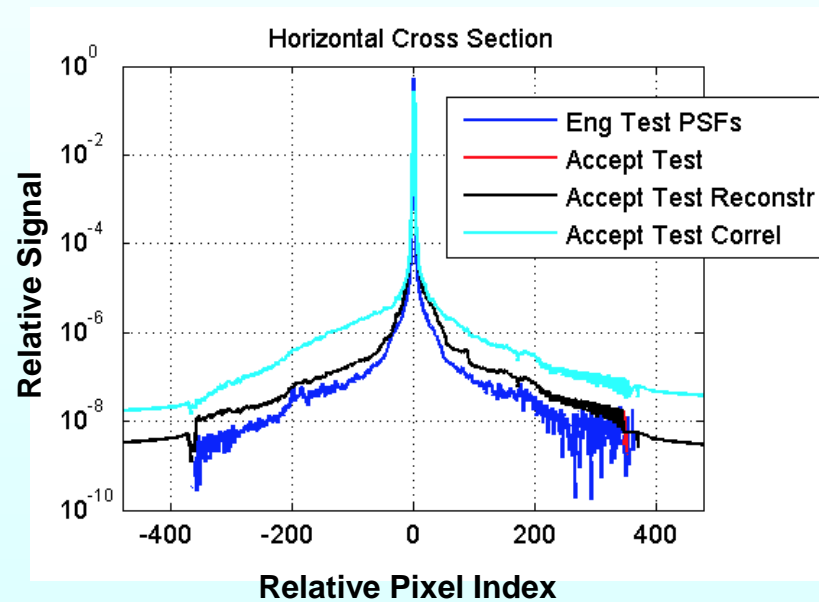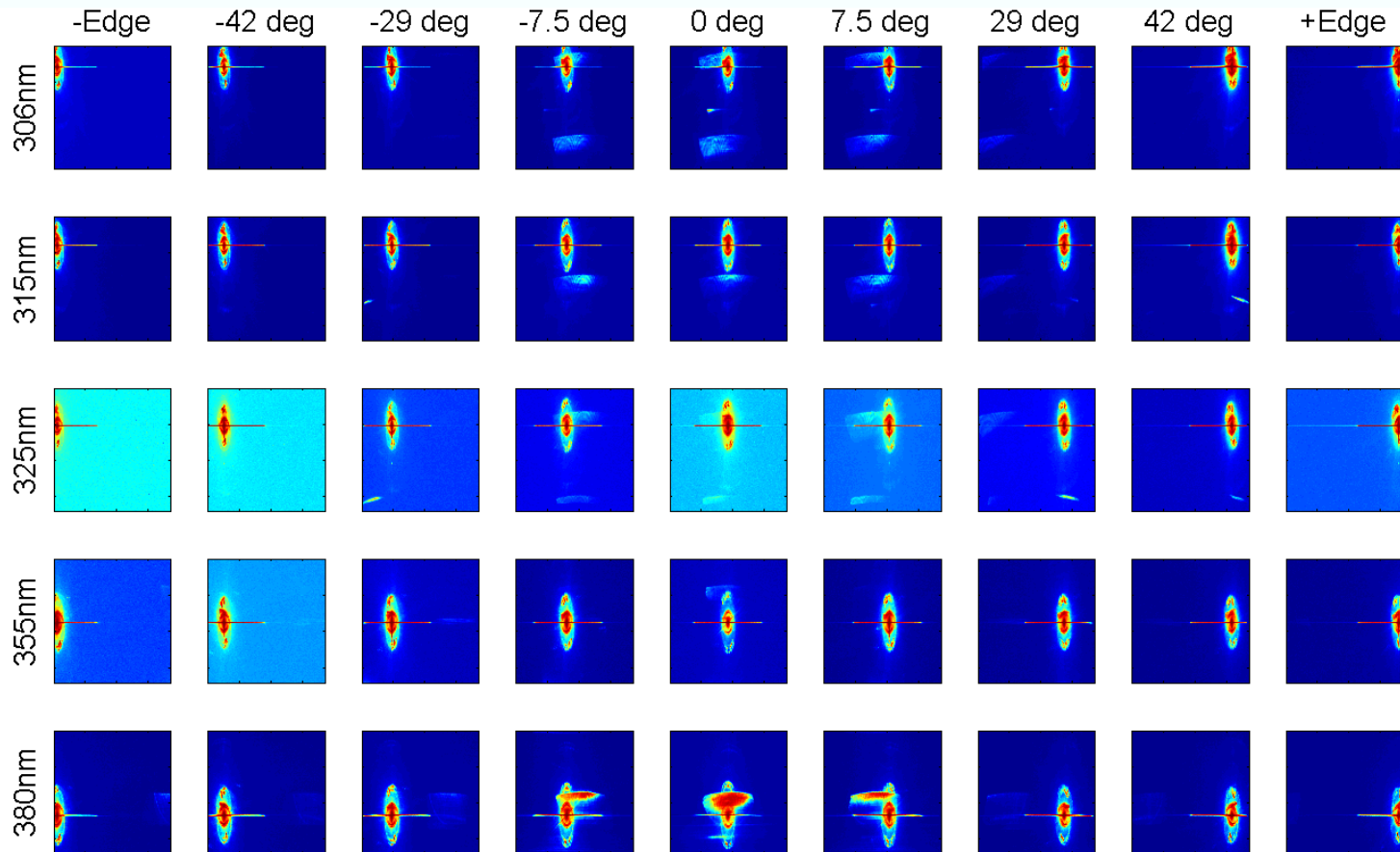

Image courtesy of BATC

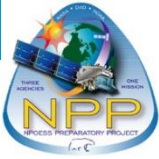# Matrix of measured PSFs allows us to model (and correct) any measured scene

- Vendor asked to deliver PSFs
- S.L. correction built into NM SDR code in anticipation of correction
- S.L. correction added in NP code in Mx8.3

Image courtesy of BATC

- Photons scatter internally due to imperfections in optical surfaces (primarily the grating)
- Stray light that affects ozone is primarily out-of-band
- Most important effect is stronger signals scattering into weaker signals
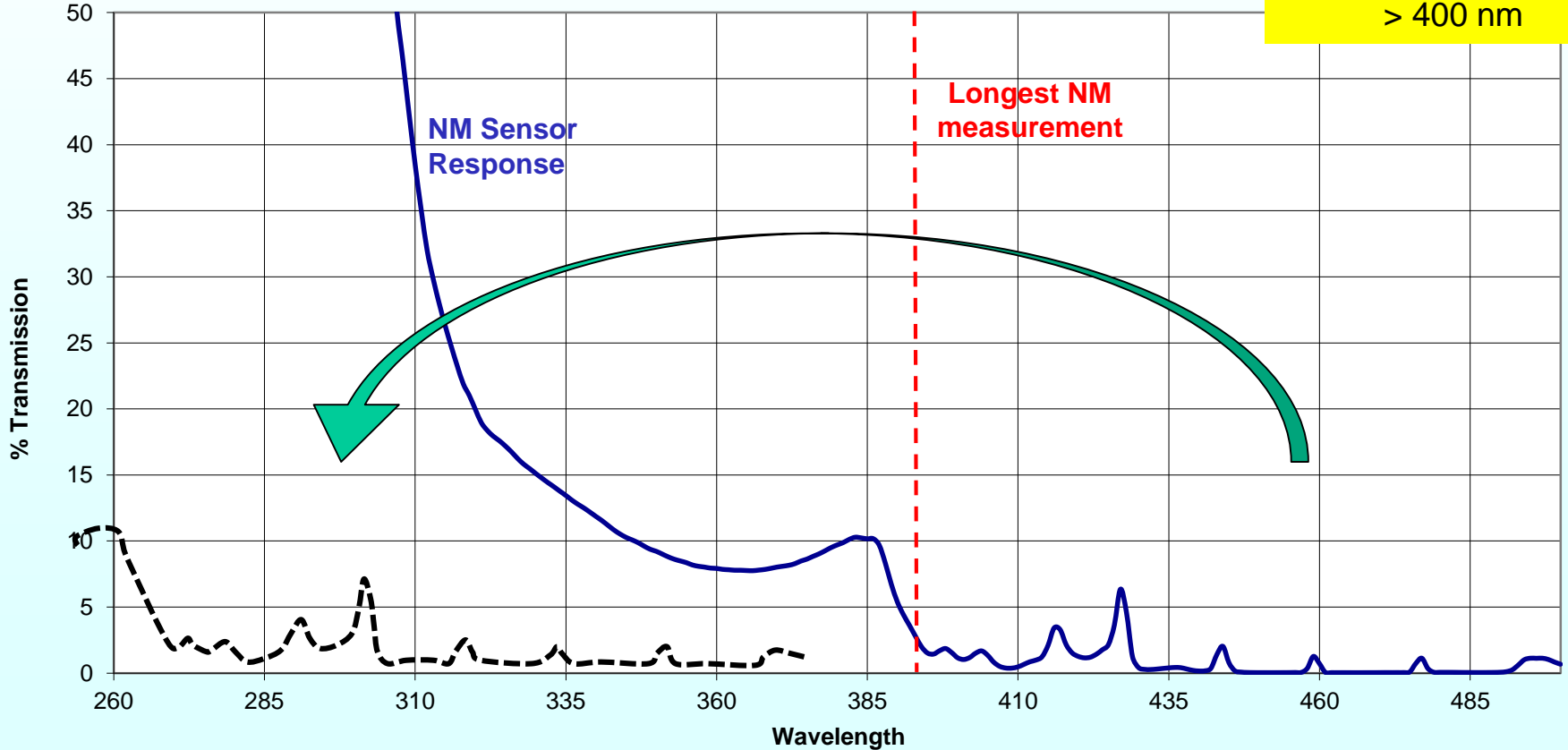- Signal differential is largest for NP, so it has greatest percent stray light
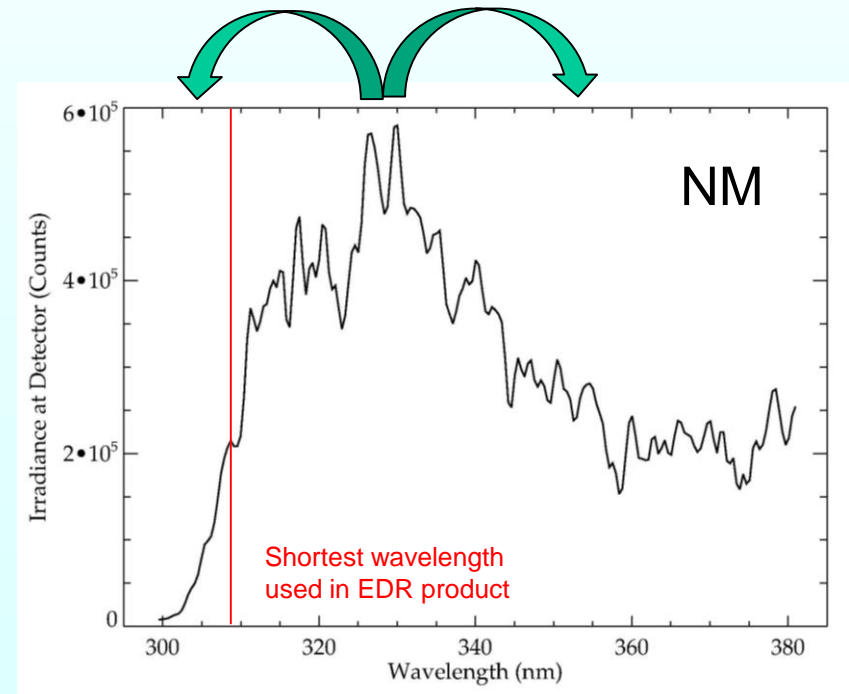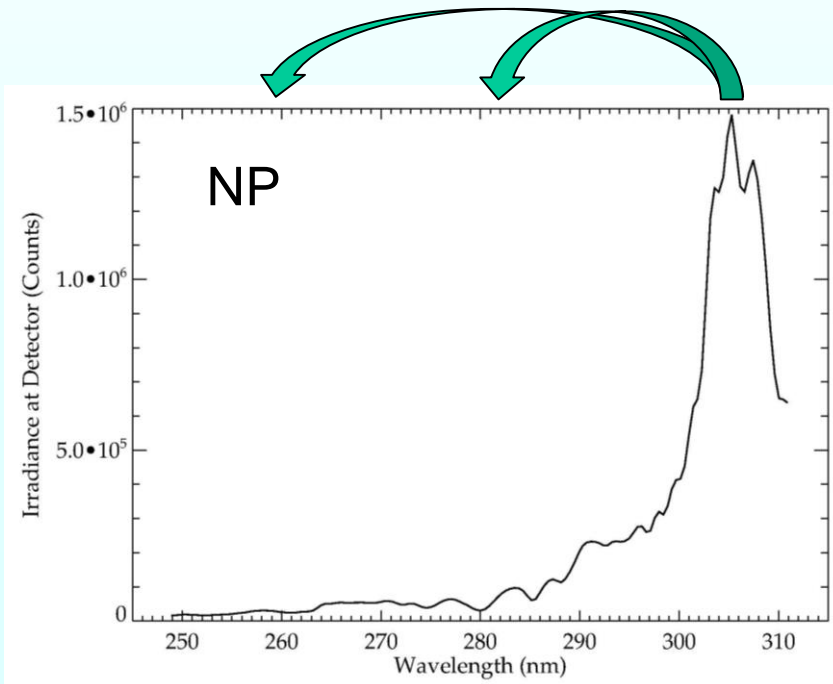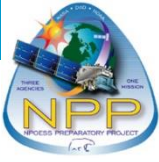
Reflection within NM spectrometer creates "ghost" spectrum at shorter wavelengths

Correction requires an estimate of radiances > 400 nm

NM Sensor Response

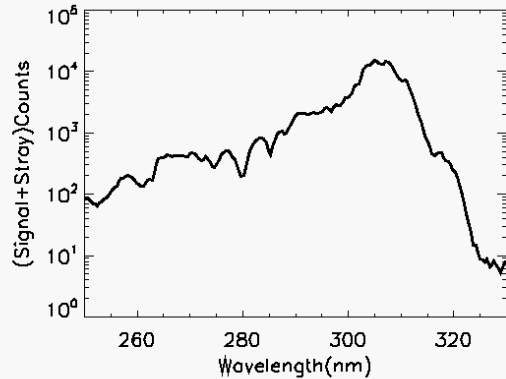Longest NM measurement

% Transmission

Wavelength

**Stray light Jacobian used to model and correct each image
Used for both NASA and NOAA codes**
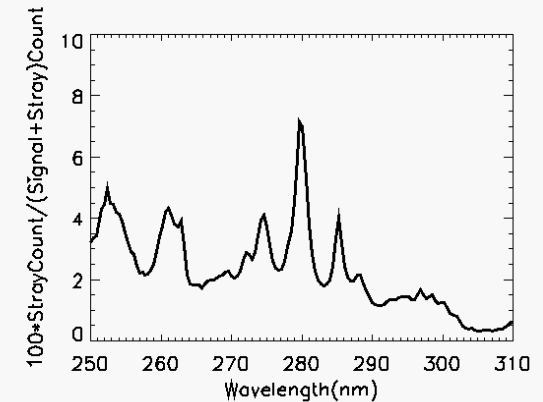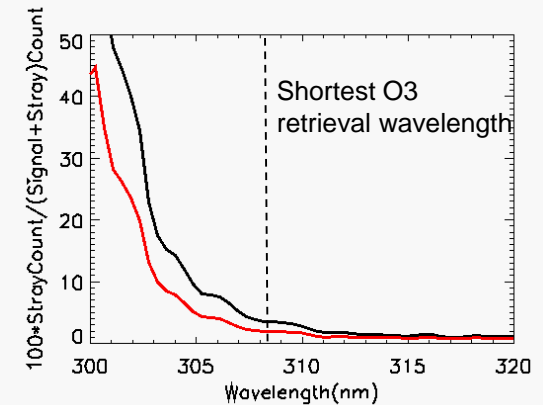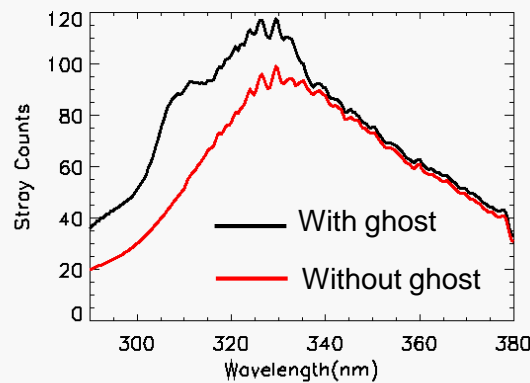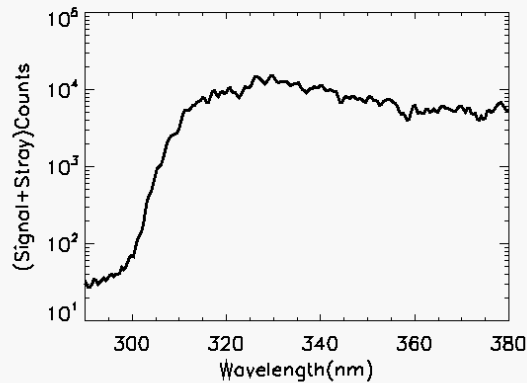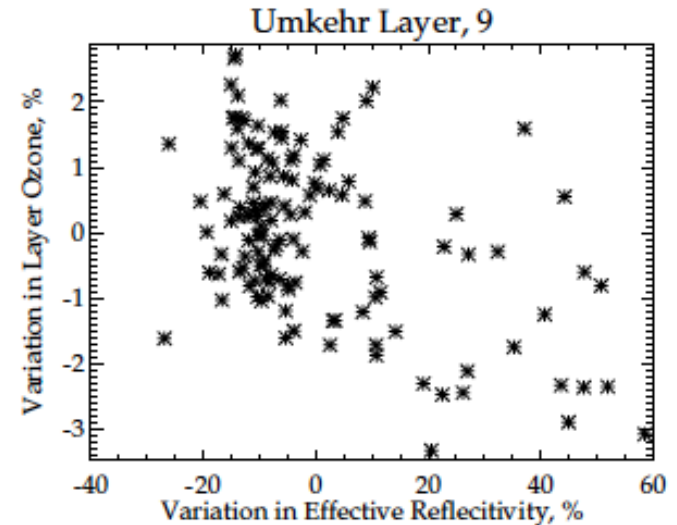
Full Signal

Modeled S.L. Signal

Stray Light Percentage
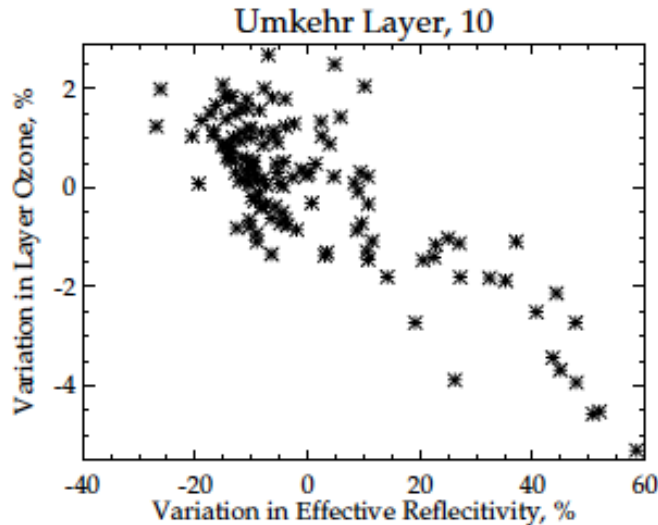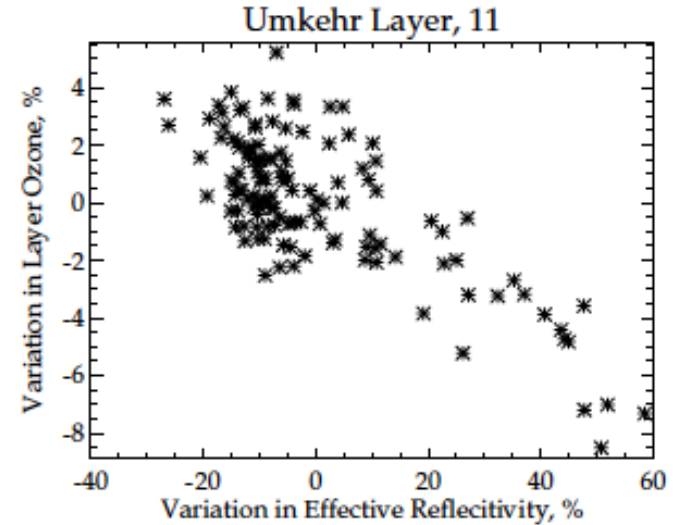
NP
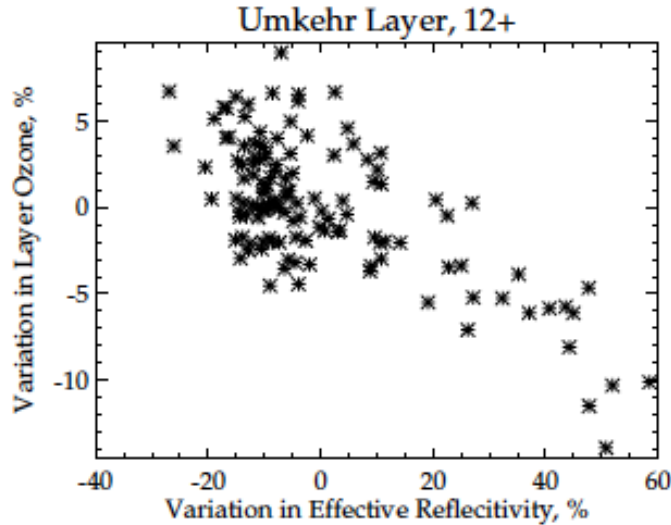
NM

With ghost

Without ghost

Shortest O3
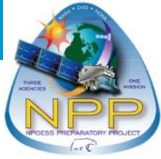retrieval wavelength
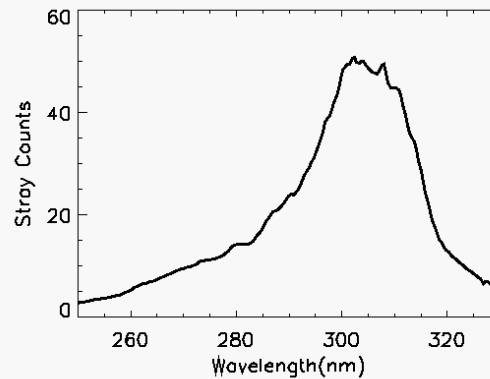
Errors could exceed 2% at
308 nm if the ghost is
ignored
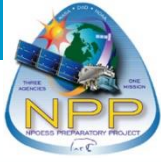
This accepted measure of stray light contamination suggests a correction is needed

Uncorrected

Corrected

52 matchups -
20° < Lat < 20°

This comparison
includes all other
OMPS and MLS errors
as well

Predicted Stray Light
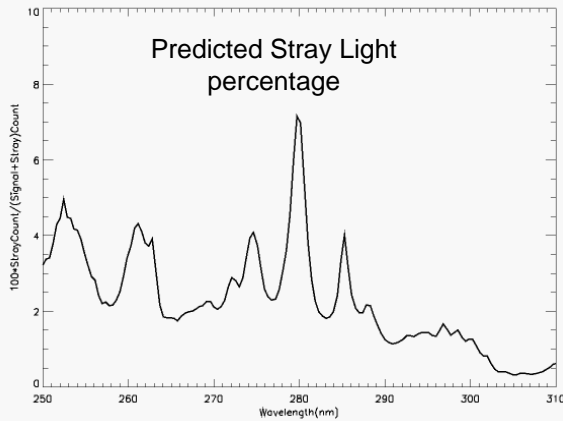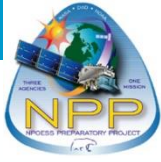percentage
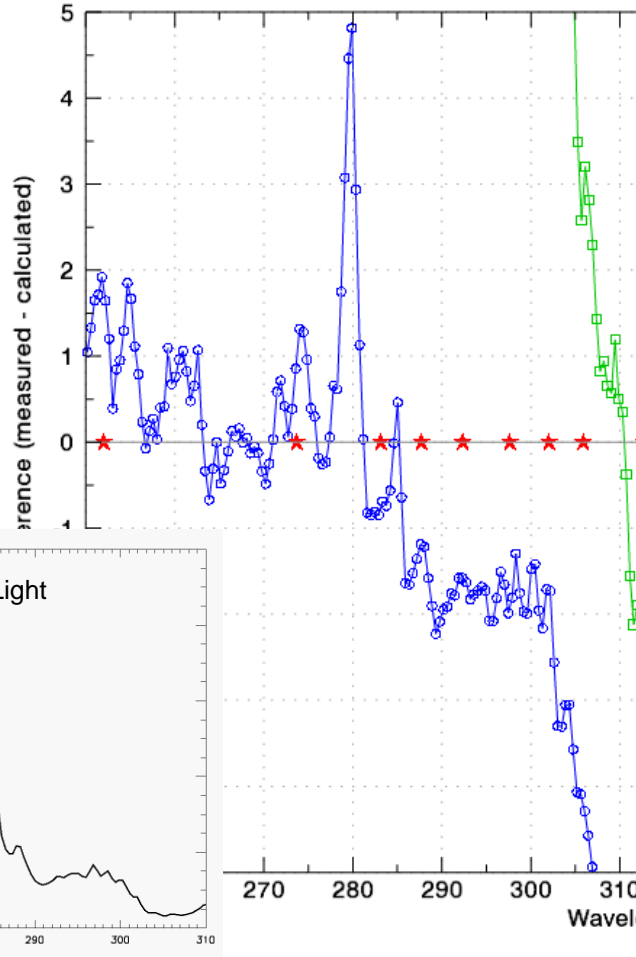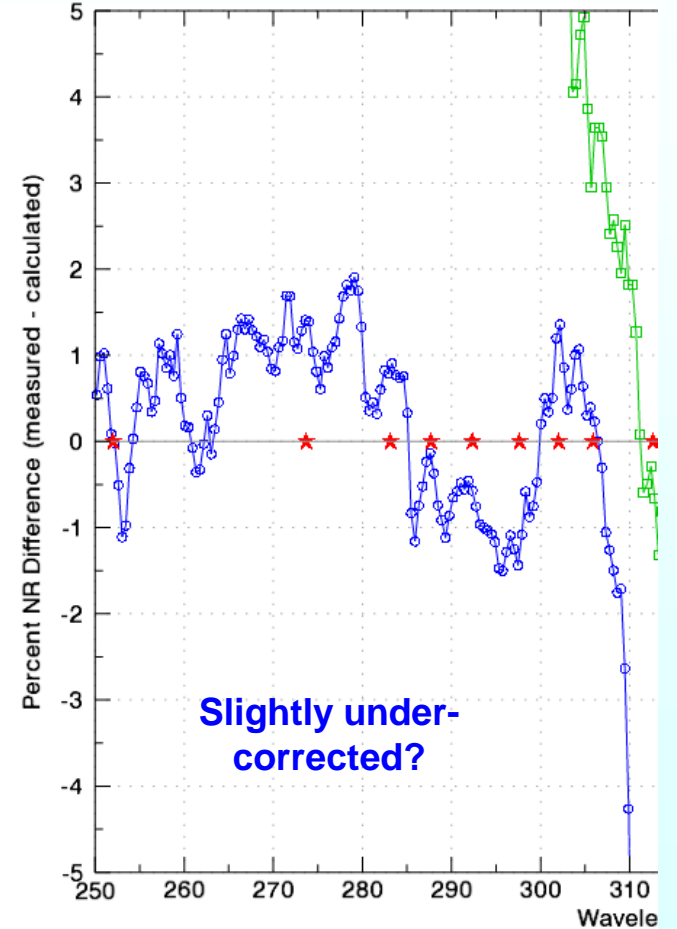
**Slightly under-
corrected?**

NM radiance comparison with model (based on Aura/MLS)

22 matchups
60° < Lat < 80°

Percent Difference:
measured minus calculated
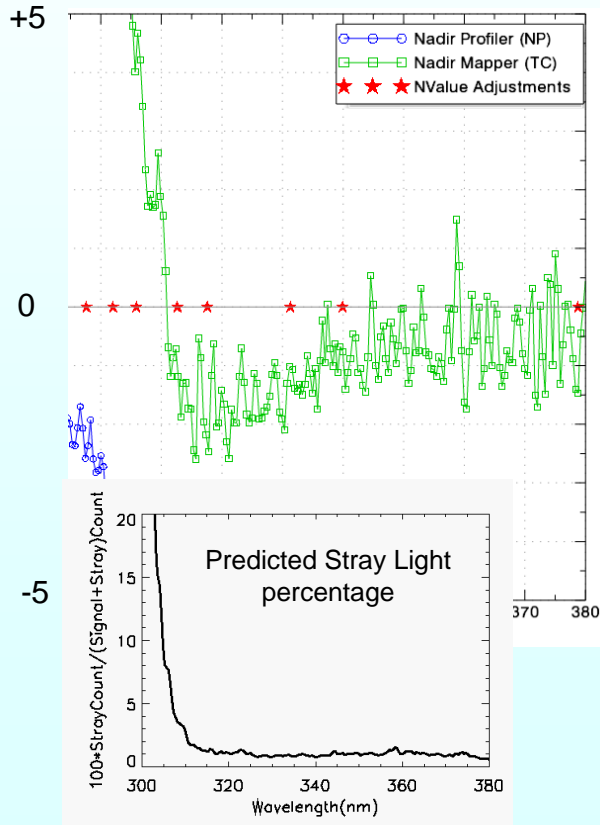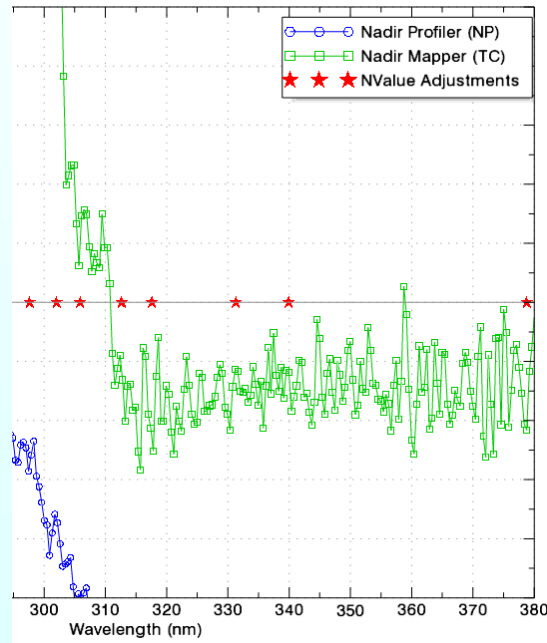
OMPS stray light issue has been addressed since Provisional Review

- PSF correction applied to NM data (has little effect on O3 retrievals) starting Mx7.0
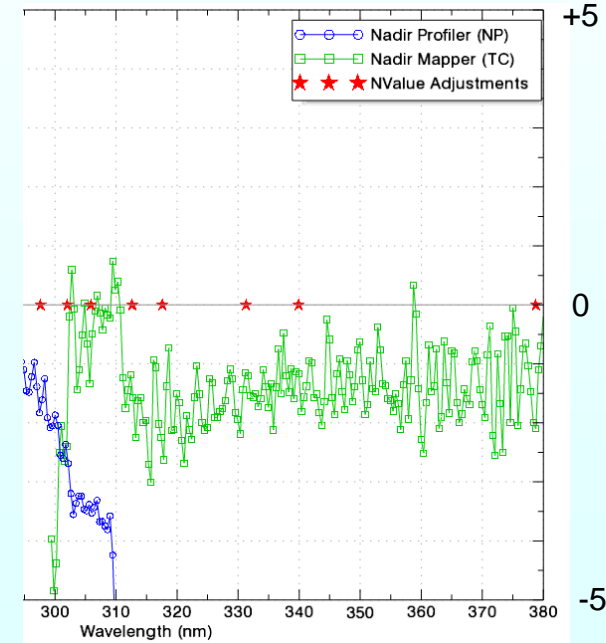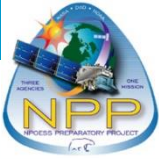- NP correction will be introduced in Mx8.3
- NM & NP codes contain needed functionality for continued improvement in coefficients

Future work

- Refine NM ghost correction factors; test and deliver (after Mx8.3)
- Decide on need for further NP improvement

Differences for J1 OMPS

- NM ghost better characterized in ground tests
- New 417 nm radiance measurement will provide direct input for ground correction