SNPP OMPS Nadir Instruments Stray Light Corrections

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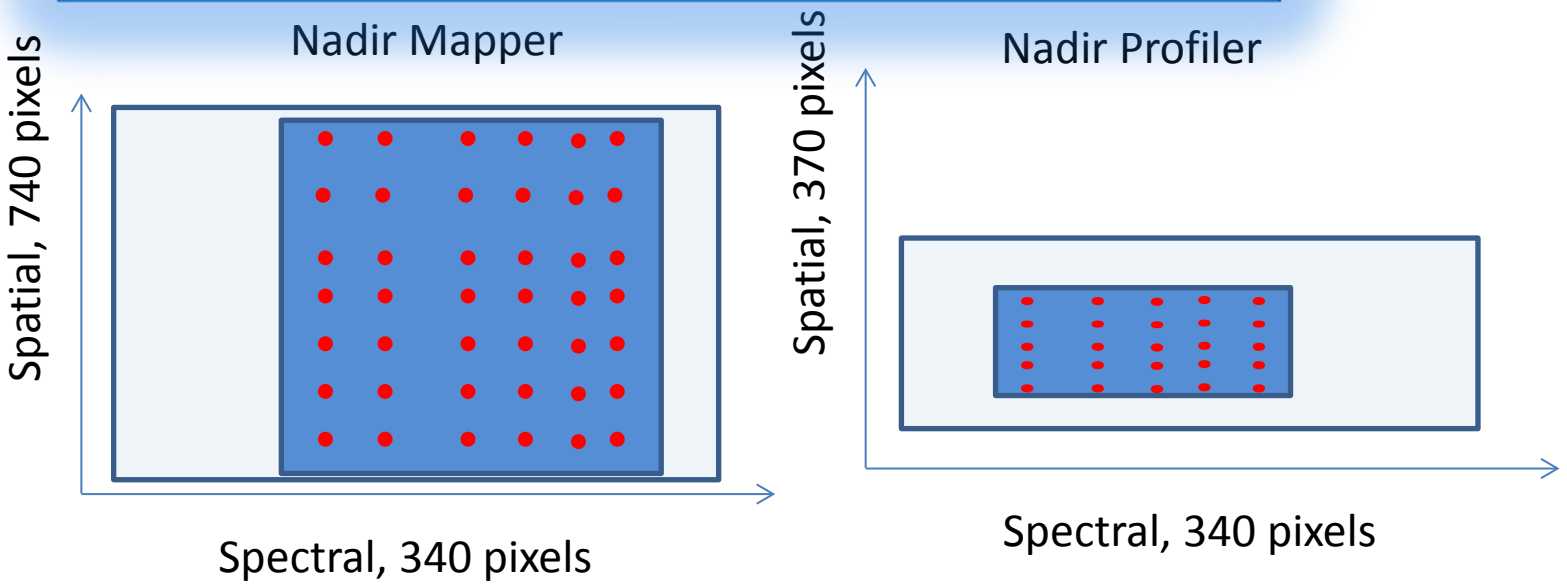
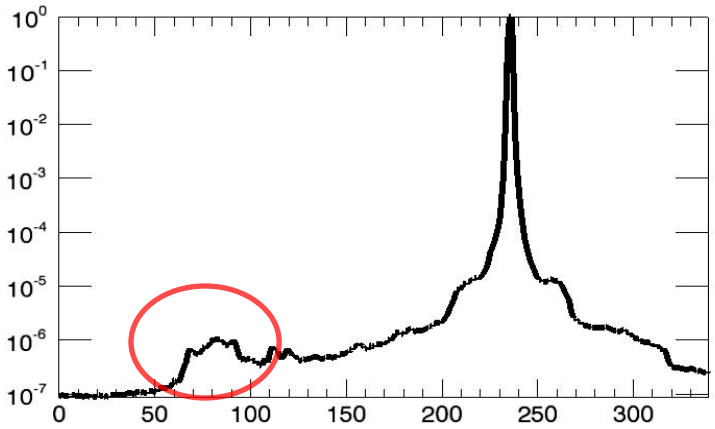
- **Stray Light Characterizations**
- **Stray Light Correction Approach in PEATE's APP**
- **Updates Have Been Done since Launch**
- **Validation Results and Future Plans for PEATE's Work**

Instrument Stray Light Characterization in Pre-Launch Tests





Stray Light Correction Approach in PEATE's APP

Simulation Method

Stray Light Accuracy

$$C_{stray}(i_t, j_t) = \sum_{i_s}\sum_{j_s} C_{in}(i_s, j_s) PSF(i_s, j_s, i_t, j_t) + \sum_{i_s}\sum_{j_s} C_{in}(i_s, j_s) GHOST(i_s, j_s, i_t, j_t)$$

1. Ground Test Measurements Accuracy

||

NM

$$C_{stray}(i_t, j_t) = \sum_{i_{s,spec}=1}^{500} \sum_{j_{s,spat}=1}^{740} C_{in}(i_{s,spec}, j_{s,spat}) Jacobian\_FullSize(i_{s,spec}, j_{s,spat}, i_t, j_t,)$$

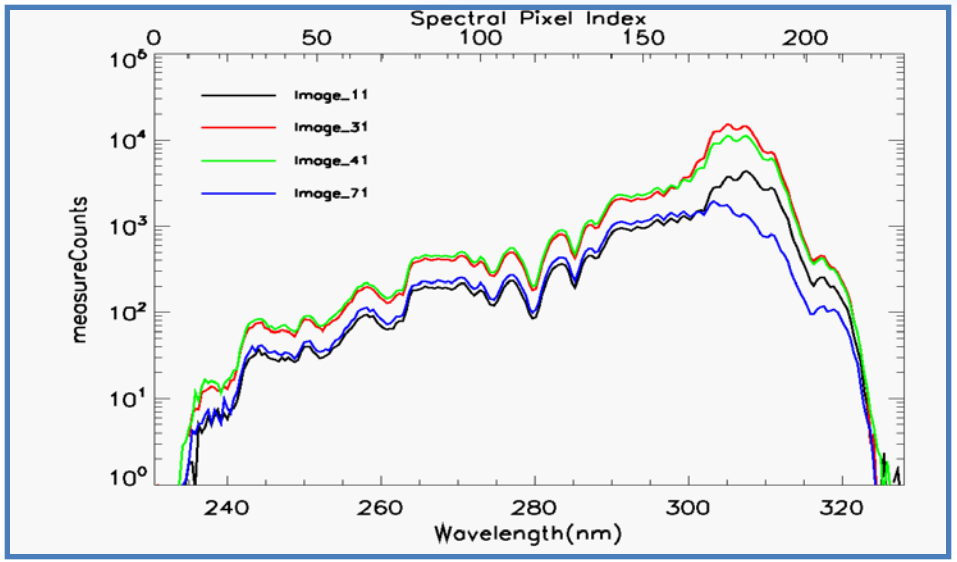
2. Source Binning Accuracy

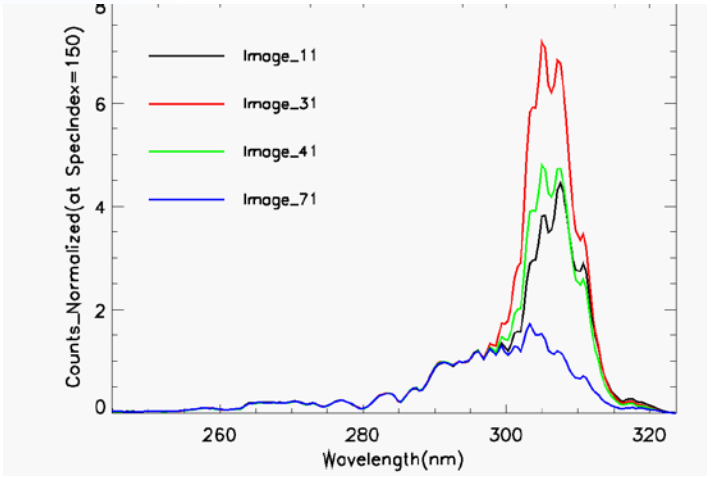
Applied in App for NM

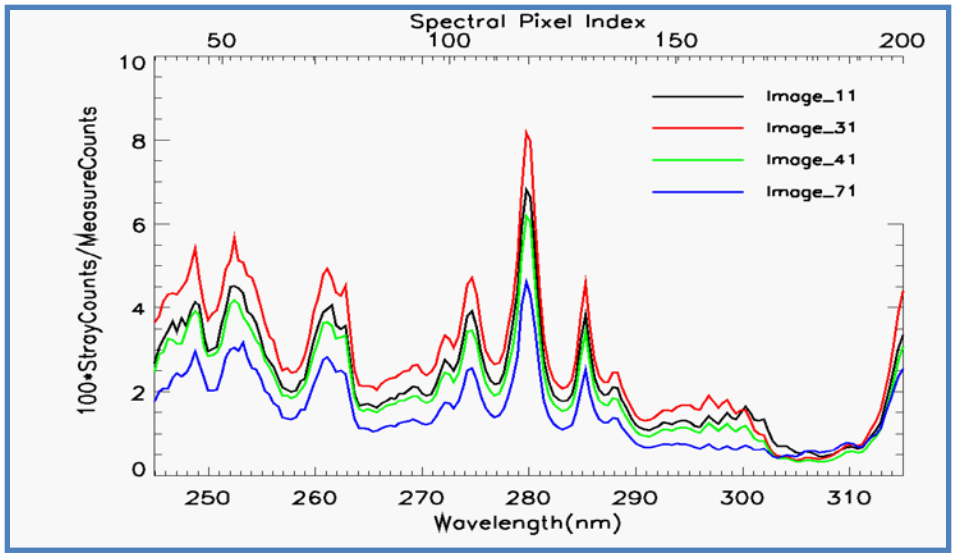
$$C_{stray}(i_t, j_t) = \sum_{kspec=1,lspat=1}^{21} \sum^{36} C_{in}(k,l) Jacobian(kspec, lspat, i_t, j_t,)$$

$$C_{in}(k,l) = \sum_{m\in(k),n\in(l)} \sum C_{in}(i_s, j_s)$$

Validation Results for Nadir Profiler





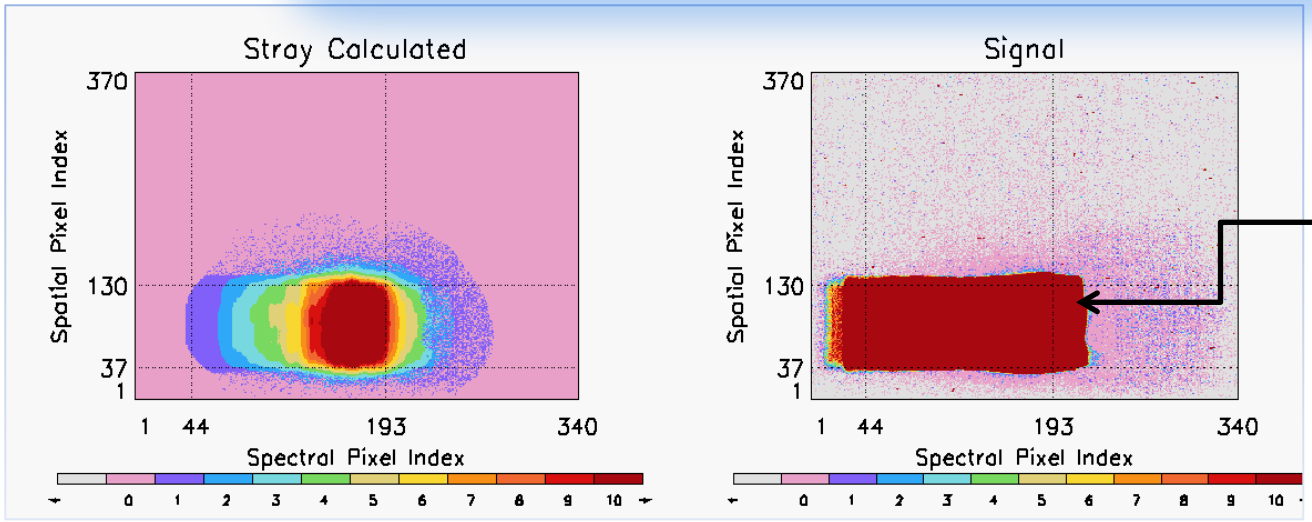


NP full-frame Earth View Measurement: there are total 80 frames in this orbit.

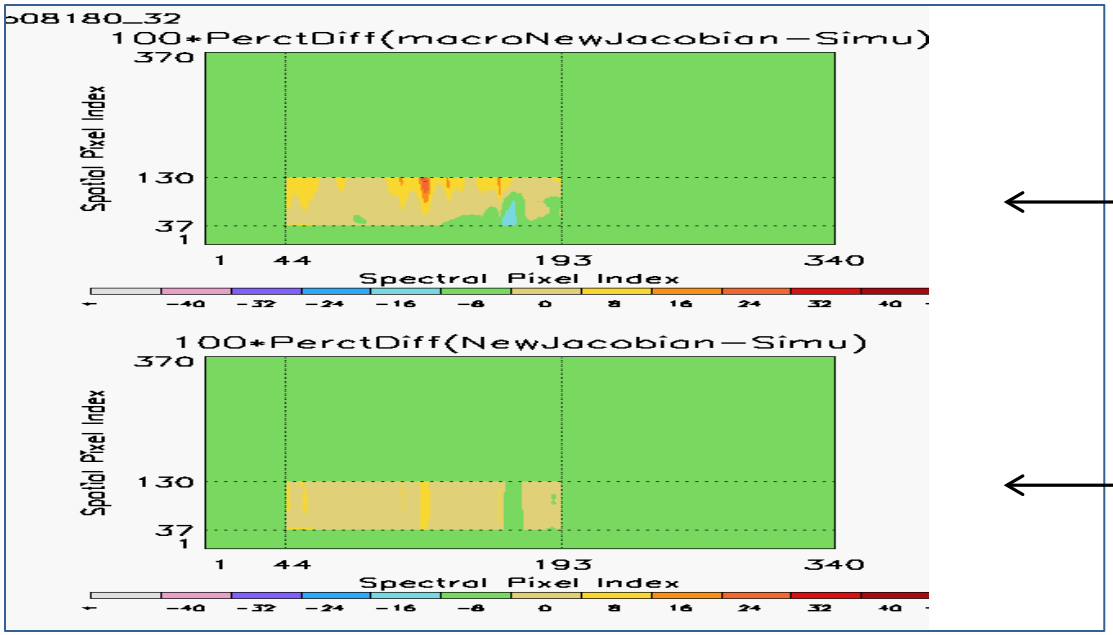
Top Left panel: Measured counts (with dark and smear cleaned)

Lower Panel: Stray light percentage vs wavelength.

Updates since Launch and Residual for Nadir Profiler



Updates at dichroic filter transition area



IDPS Jacobian
(SL_COR_COEFF (1,147,1,14))

PEATE Jacobian
(370,340,14,7)

Updates since Launch for Nadir Mapper(NM)

- **In-band, in-field PSF Stray Light**
- **In-band, in-field Ghosts**

----------First delivery to IDPS

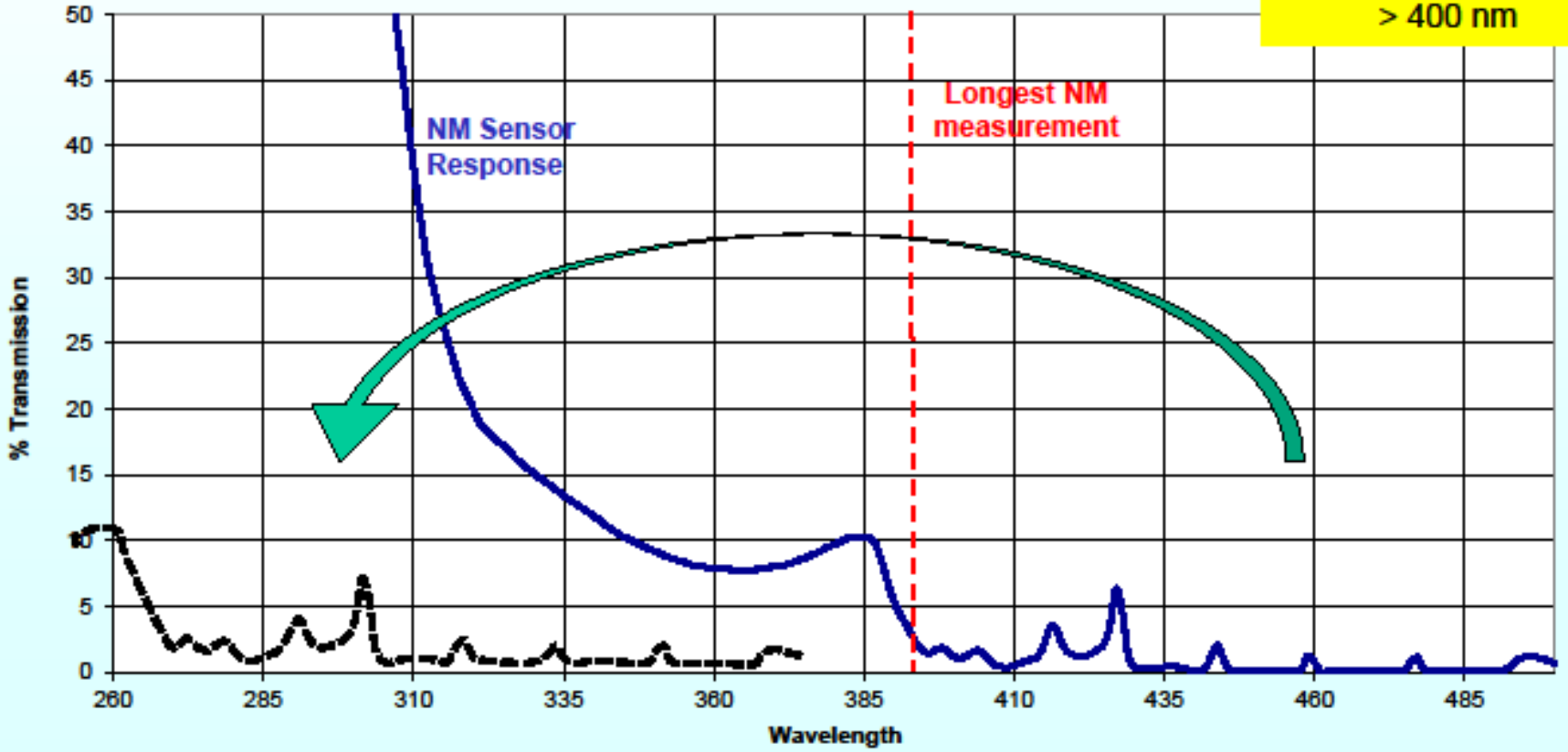
- **Out-of-band PSF Stray Light**
- **Out-of-band Ghost (was not fully characterized during pre-launch tests)**

-------Second delivery to IDPS

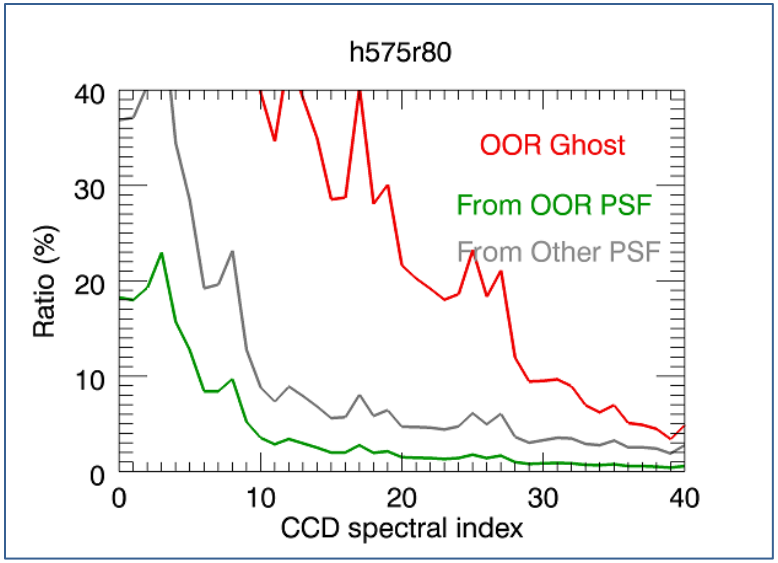
NM ghost is a significant error source at λ < 310 nm

Reflection within NM spectrometer creates "ghost" spectrum at shorter wavelengths

Correction requires an estimate of radiances > 400 nm

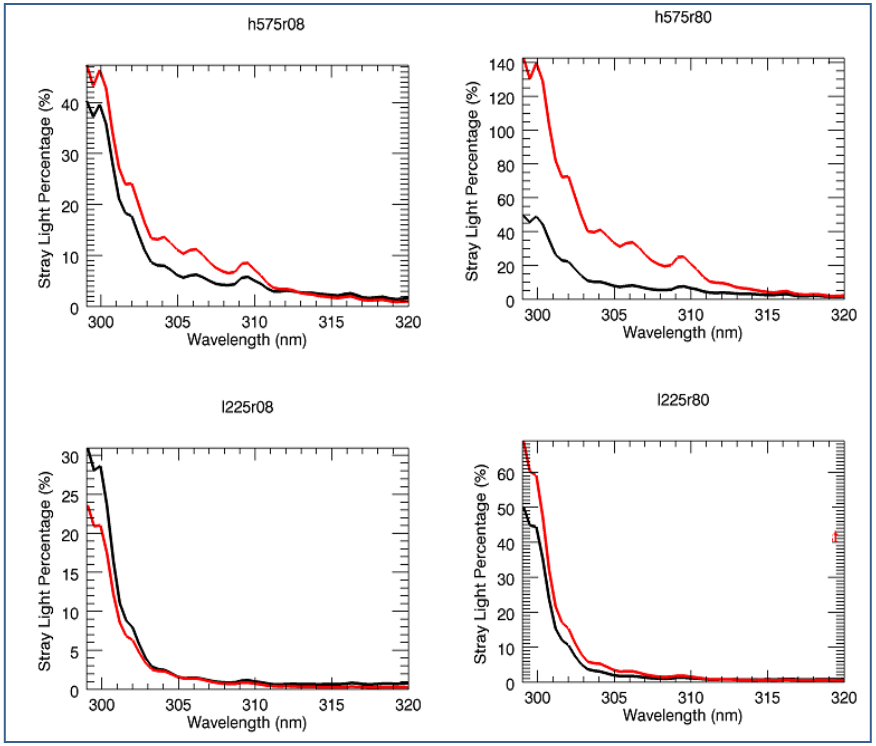


Before Launch Simulation for NM



Stray Light Percentage

Gray: All in-band contributions
Green: OOR PSF contribution
Red : OOR ghost contribution

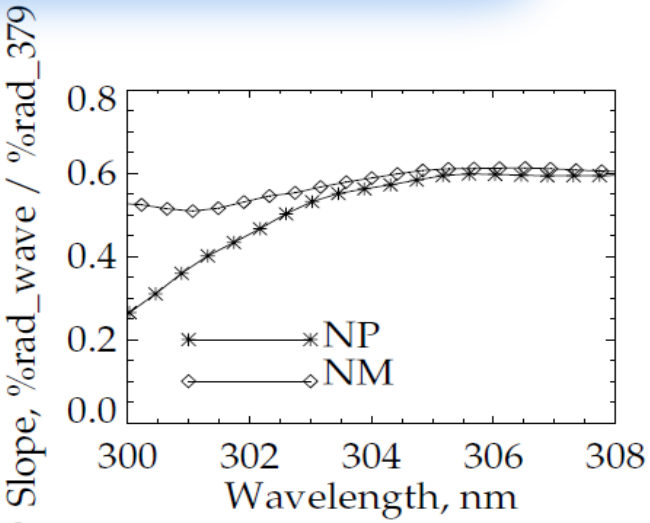


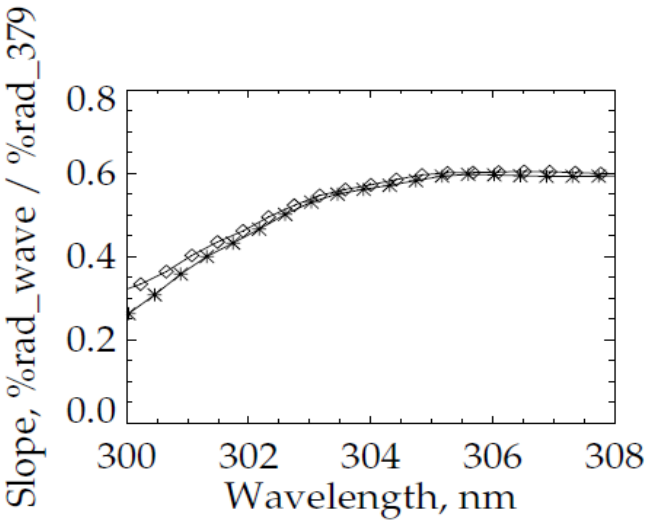
Stray light Percentage

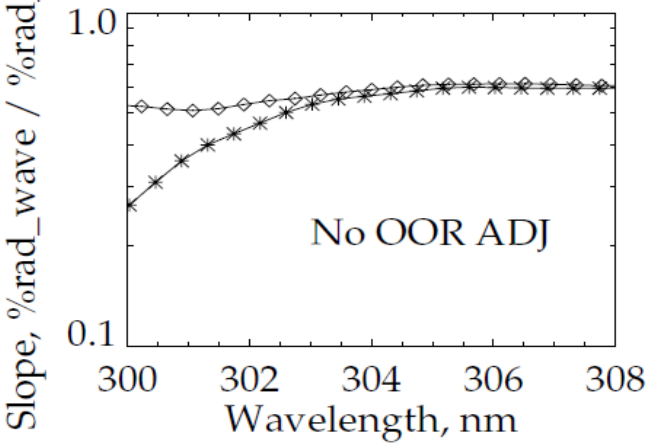
Black color: all in-band contributions
Red color : OOR contributions

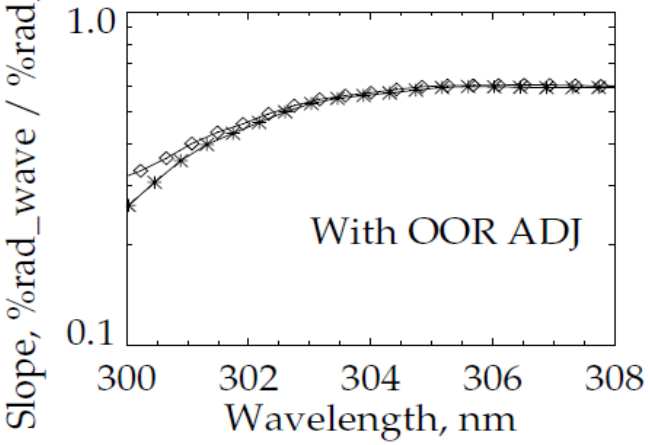
Validation Results for NM

Larry F., NOAA, DR7387…



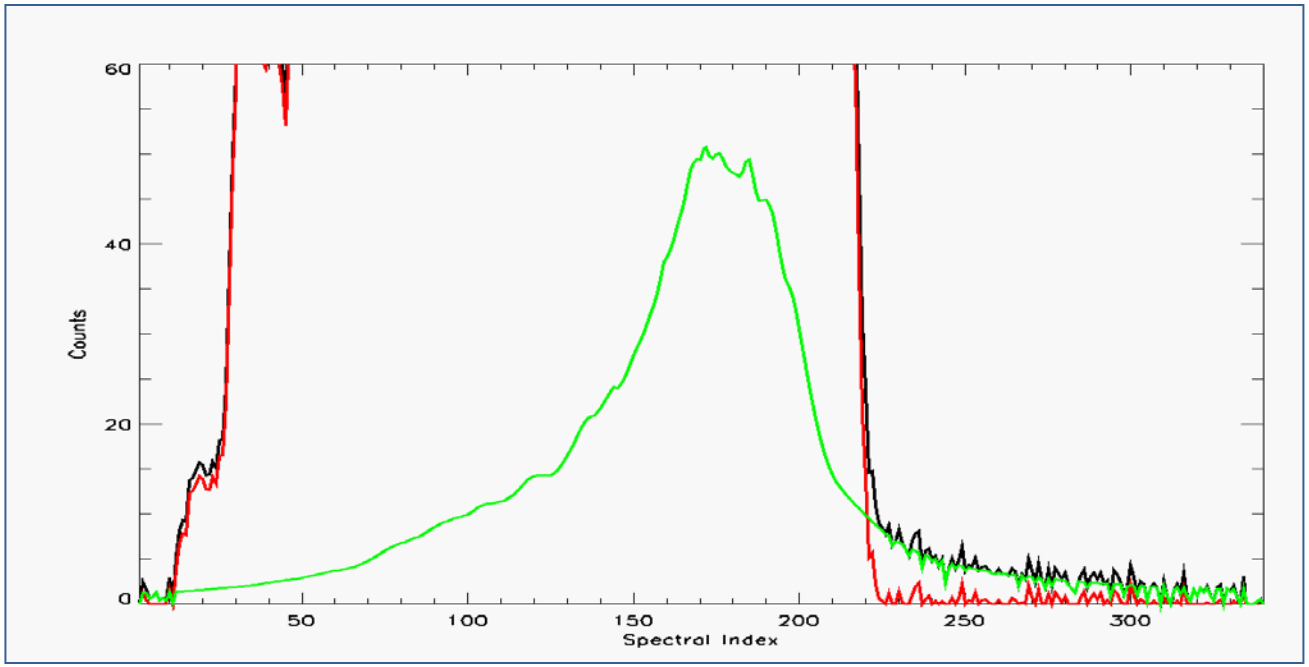






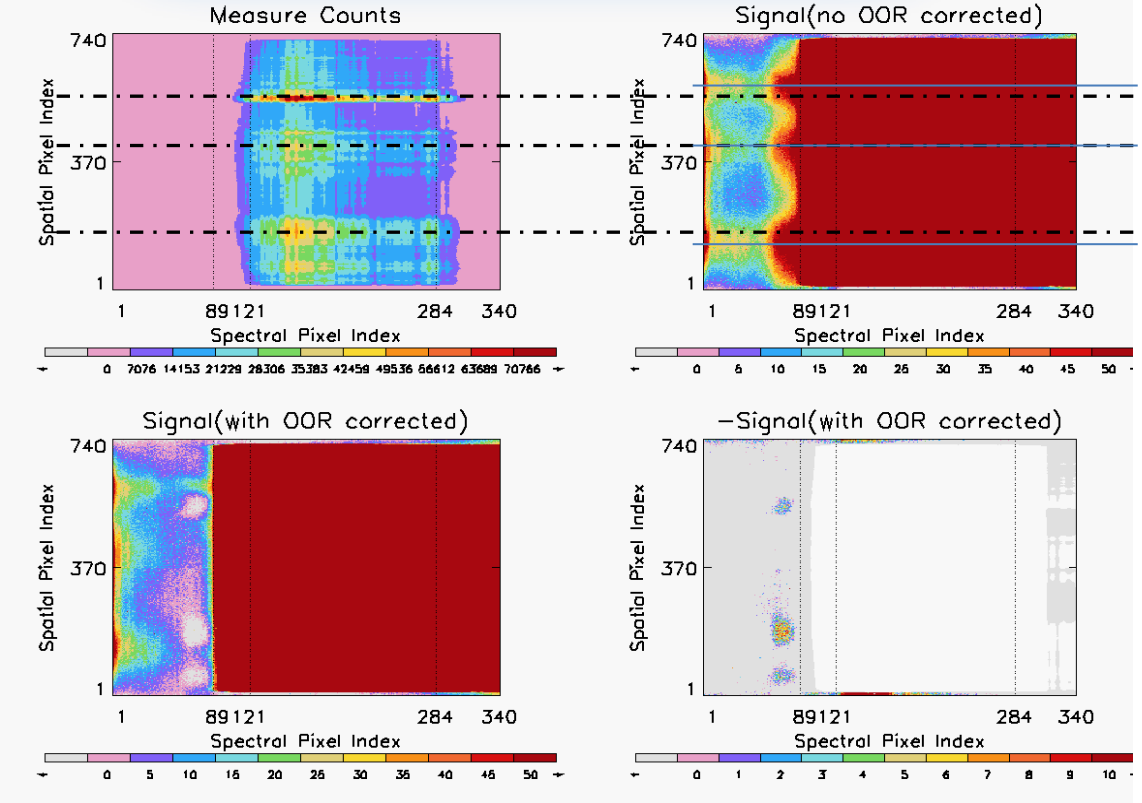
Residual analysis: Nadir Profiler

MeasuredCounts=SignalCounts +StrayCounts
? ?



The measured counts (Black), calculated stray light counts (Green) and the signal counts (Red) vs CCD spectral index. At the longer wavelength end, the remaining signal counts are near zero; this suggests no (very few) residual stray light.

Residual Analysis: Nadir Mapper



NM full frame measurement before and after stray light is removed

The black-dot lines show the OOR Ghost source spatial locations; the blue thin lines show the OOR Ghost spatial locations. Clearly there are offsets….

On-Going and Future Work for NM and NP

NM

Working on OOR ghost

*Spatial dependence

*OOR source signal estimation

NP

More Need your inputs!

Q: What the instrument imaging prosperities changes since launch?

Q: What pre-launch tests missed ?