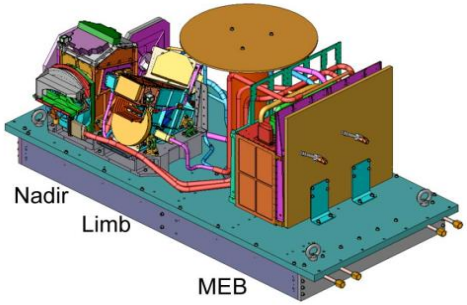
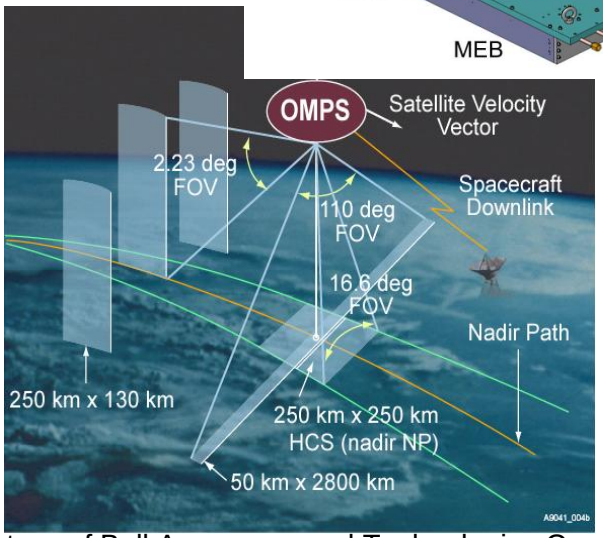




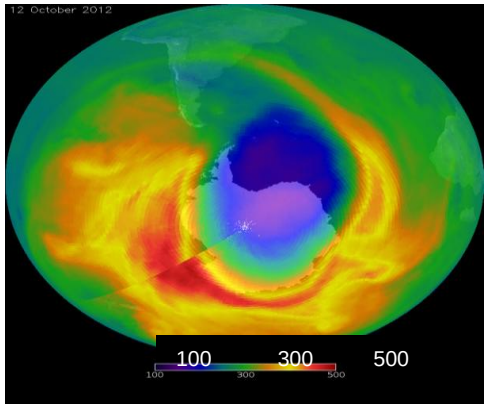
Curtsey of Ball Aerospace and Technologies Corp.

S-NPP OMPS On-orbit SDR Calibration and Validation

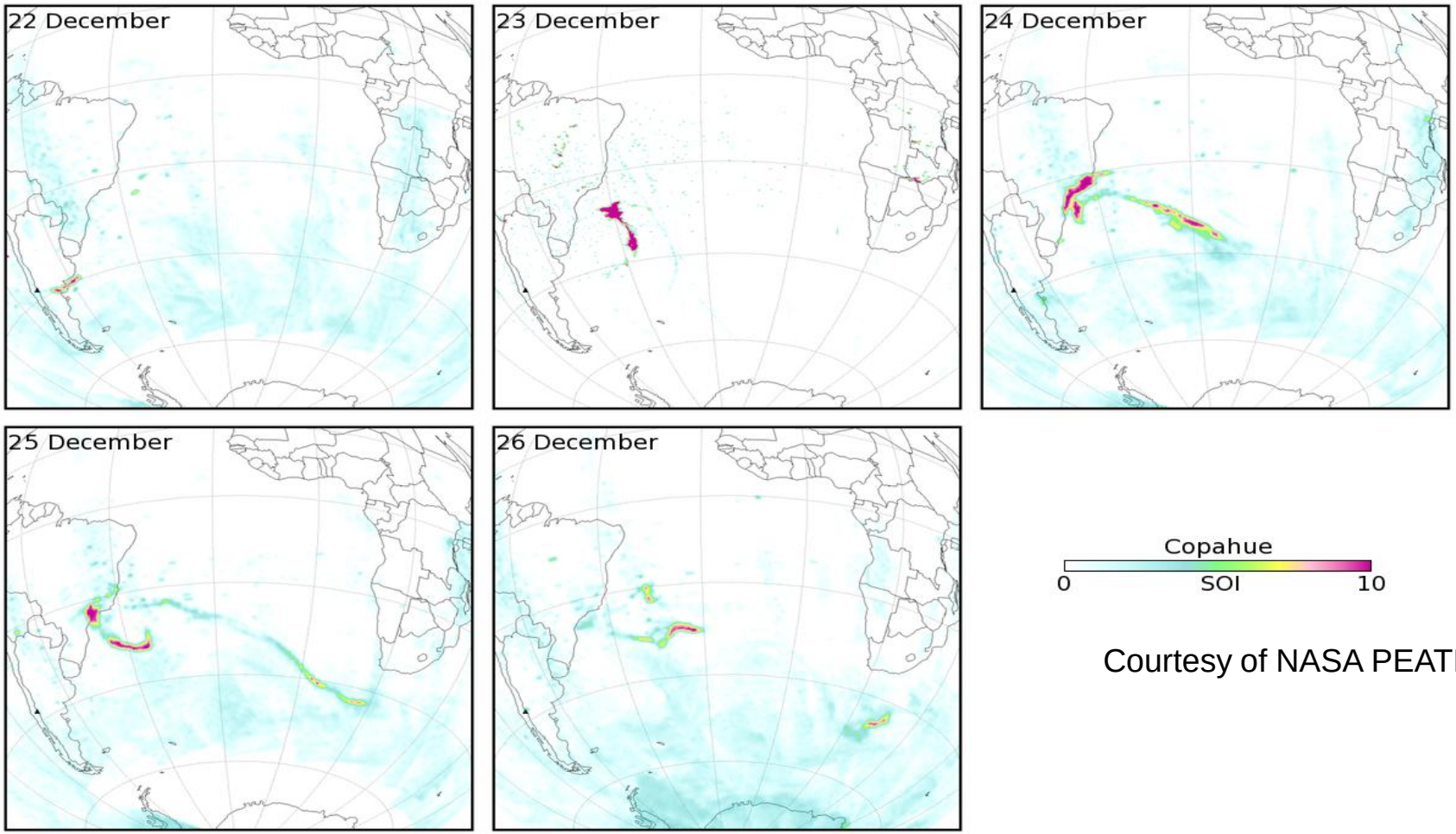
*C. Pan[1], F. Weng[2], X. Wu[2] and L. Flynn[2]

* 1 ESSIC, University of Maryland, College Park, MD 20740; 2 NOAA NESDIS/STAR, College Park, MD 20740

93rd AMS Annual Meeting
January 6 – 10, 2013
Austin, TX



SO2 Detection

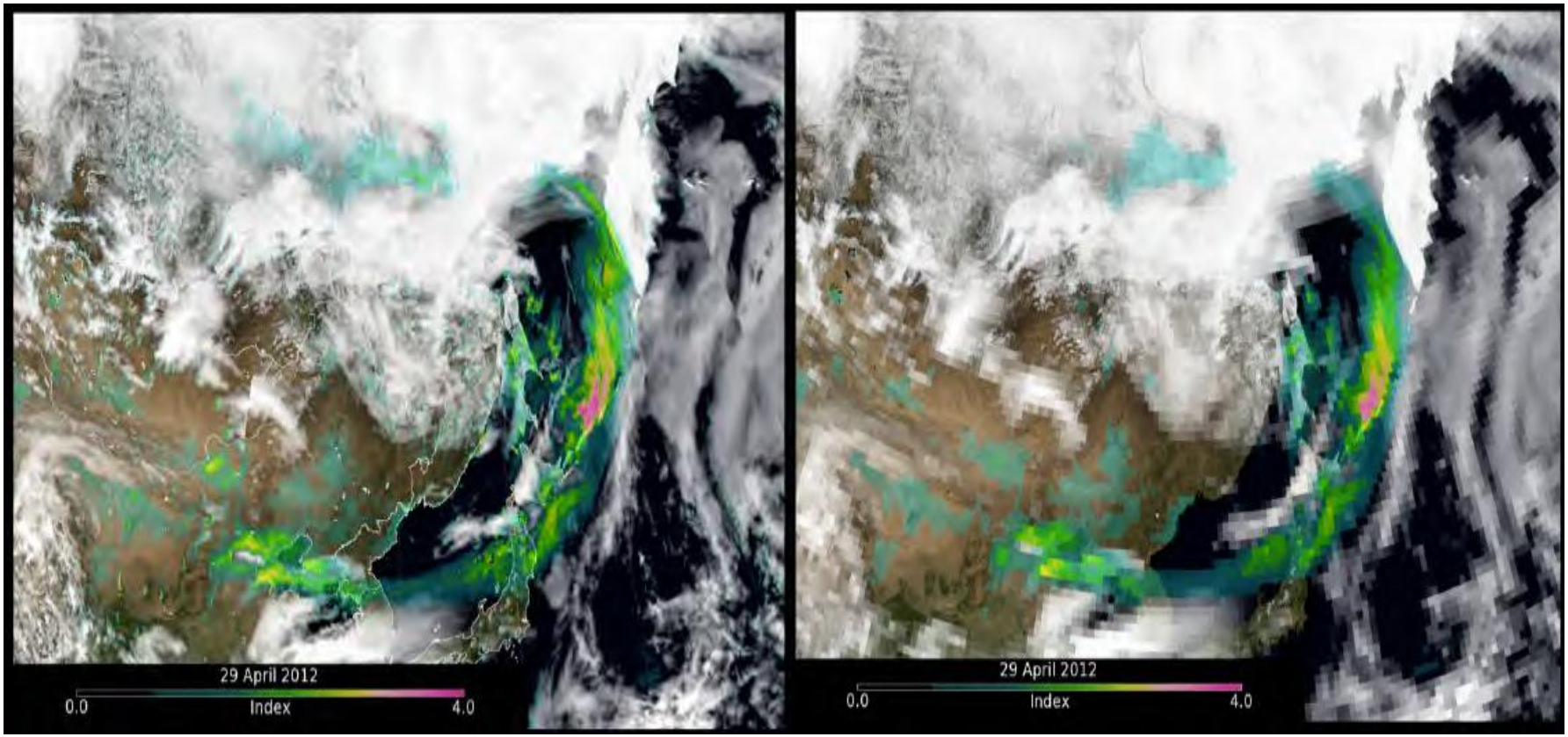


Courtesy of NASA PEATE

OMPS detects SO2 from the eruption of Copahue volcano on December 22 – 26, 2012.

.

OMPS aerosol index



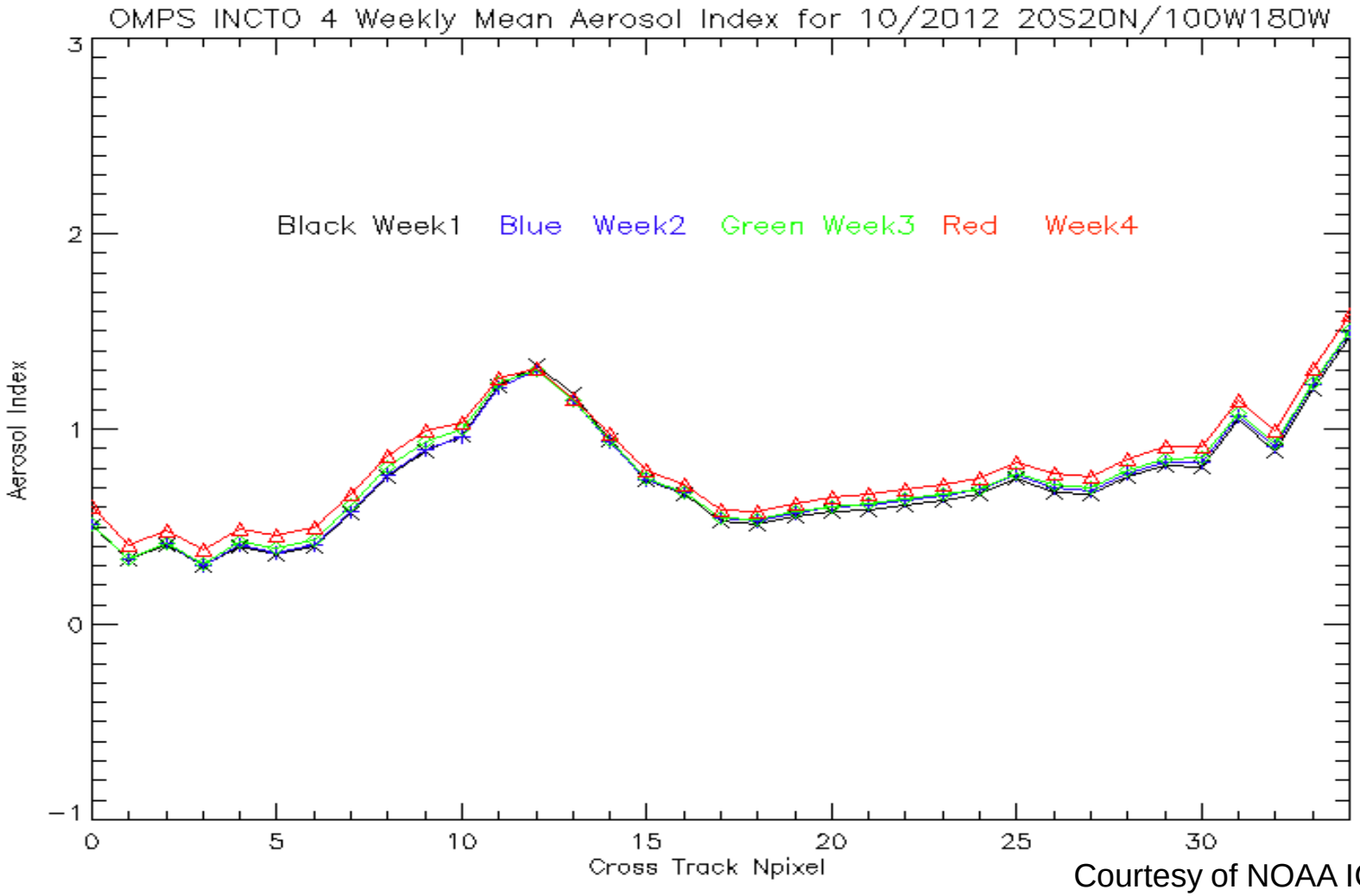
On 29 April 2012, a dust cloud from China's Taklamakan Desert was detected by OMPS.

Courtesy of NASA PEATE

Provisional SDR

- On-orbit calibration sequences have been modified to meet system requirement.
  - Newly established dark calibration captures and removes transients.
  - Multiple-orbit solar measurements are now used to provide higher SNRs.
- OMPS has been initially calibrated and the calibration has been evaluated
  - Dark calibration has been evaluated via. SAA and hot pixels impact
  - Hot pixels cause a constant increase in the dark signal, impacting SDRs and EDRs
    - NM: weekly on average 0.1% SDR error and 0.03% o3 error.
    - NP: weekly 0.2-2% SDR error is wavelength dependent, 0.1-0.5% O3 error (1-2% at high latitude)
- The associated algorithms and system integration necessary to produce science data has been intensively tested, evaluated and modified.
  - Numbers of DRs have been identified, opened and closed.
- Corrections of stray light, smear and dark are under going.
- The SDRs has reached the Beta level and its EV data will be at the Provisional maturity level on Jan. 13, 2013. We encourage OMPS users to participate in the QA as well as validation of the products.

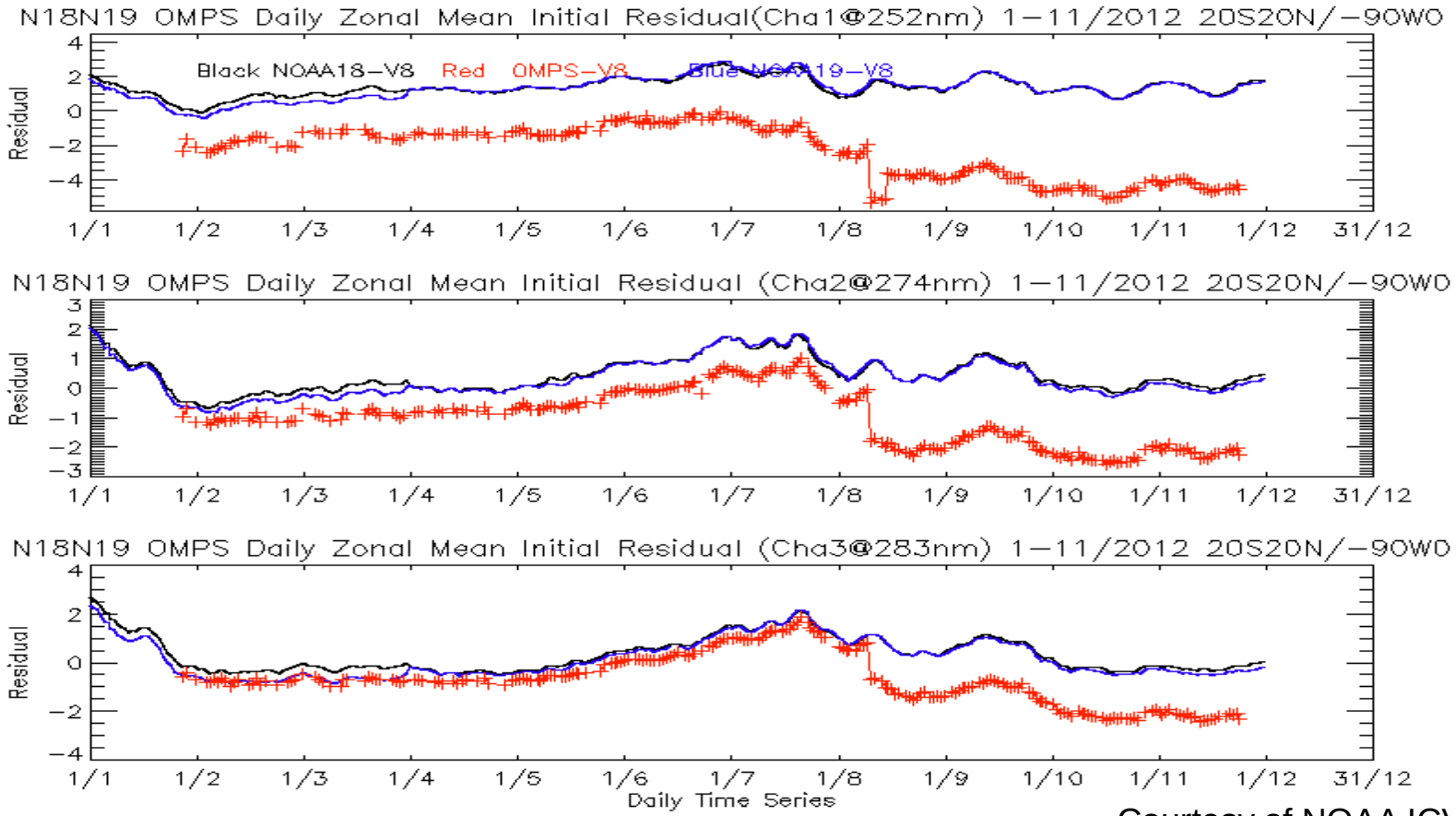
SDR provides stable EDR products



Courtesy of NOAA ICVS

Ozone products show consistency

Courtesy of NOAA ICVS



Courtesy of NOAA ICVS

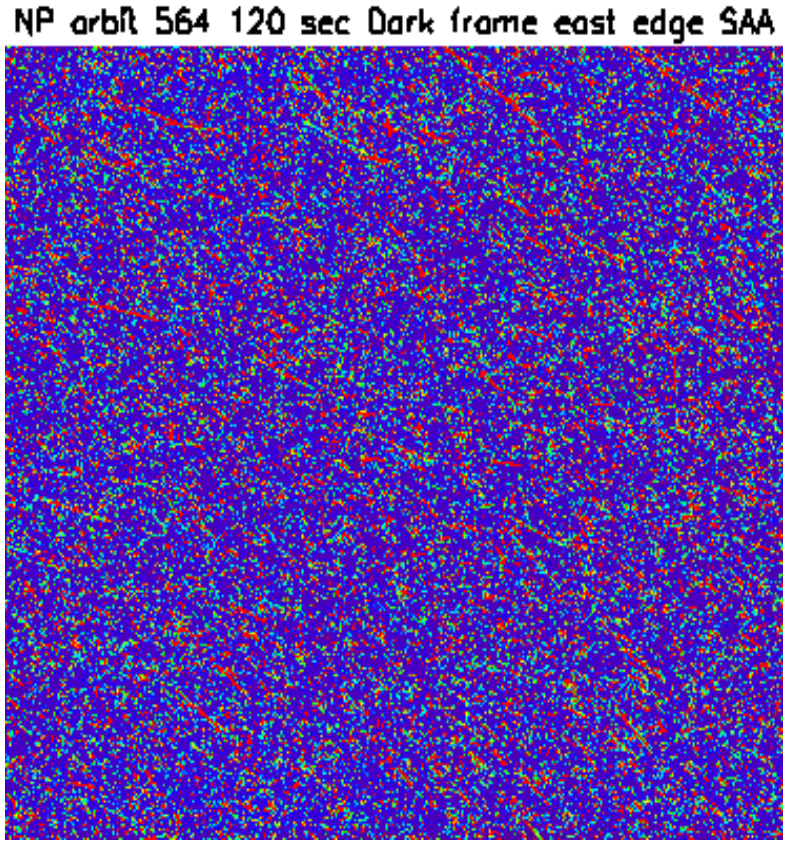
Incremental product improvement are still occurring as calibration parameters are adjusted with sensor on orbit characterization. Product quality is not optimal.

SDR performance evaluation

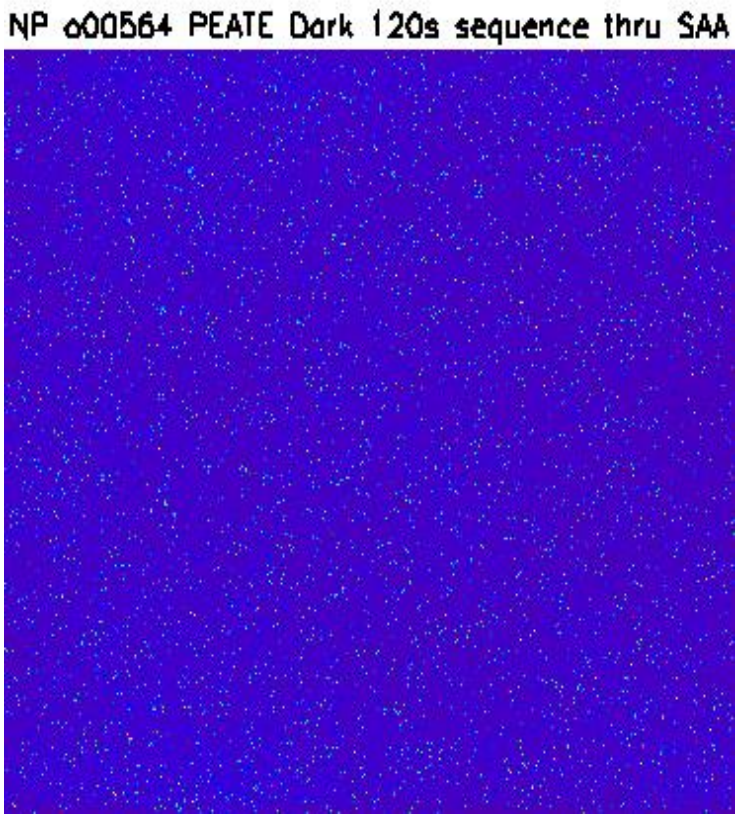
Requirement Summary	Specification/predicted Value	Orbit Performance
Non-linearity	< 2% full well	< 0.46%
Non-linearity Knowledge	< 0.5%	0.1%
On-orbit Wavelength Calibration	< 0.01 nm	NM: average ~ 0.01 nm RMS
Stray Light NM Out-of-Band + Out-of-Field Response	For NM ≤ 2	average ~ ± 2%
Intra-Orbit Wavelength Stability	Allocation (flow down from EDR error budget) = 0.02 nm	< 0.013 nm
SNR	1000	> 1000 from SV and EV
Inter-Orbital Thermal Wavelength Shift	Allocation (flow down from EDR error budget) = 0.02 nm	0.013 nm
Read Noise	60 –e RMS	< 25 –e RMS
Detector Gain	43 (for NP) 46 (for NM)	45 (for NP) 42 (for NM)
Absolute Irradiance Calibration Accuracy	< 7%	5% (for NM) 1-10% (for NP)
Absolute Radiance Calibration Accuracy	< 8%	< 5%

Modified dark calibration sequence

Before transient removal

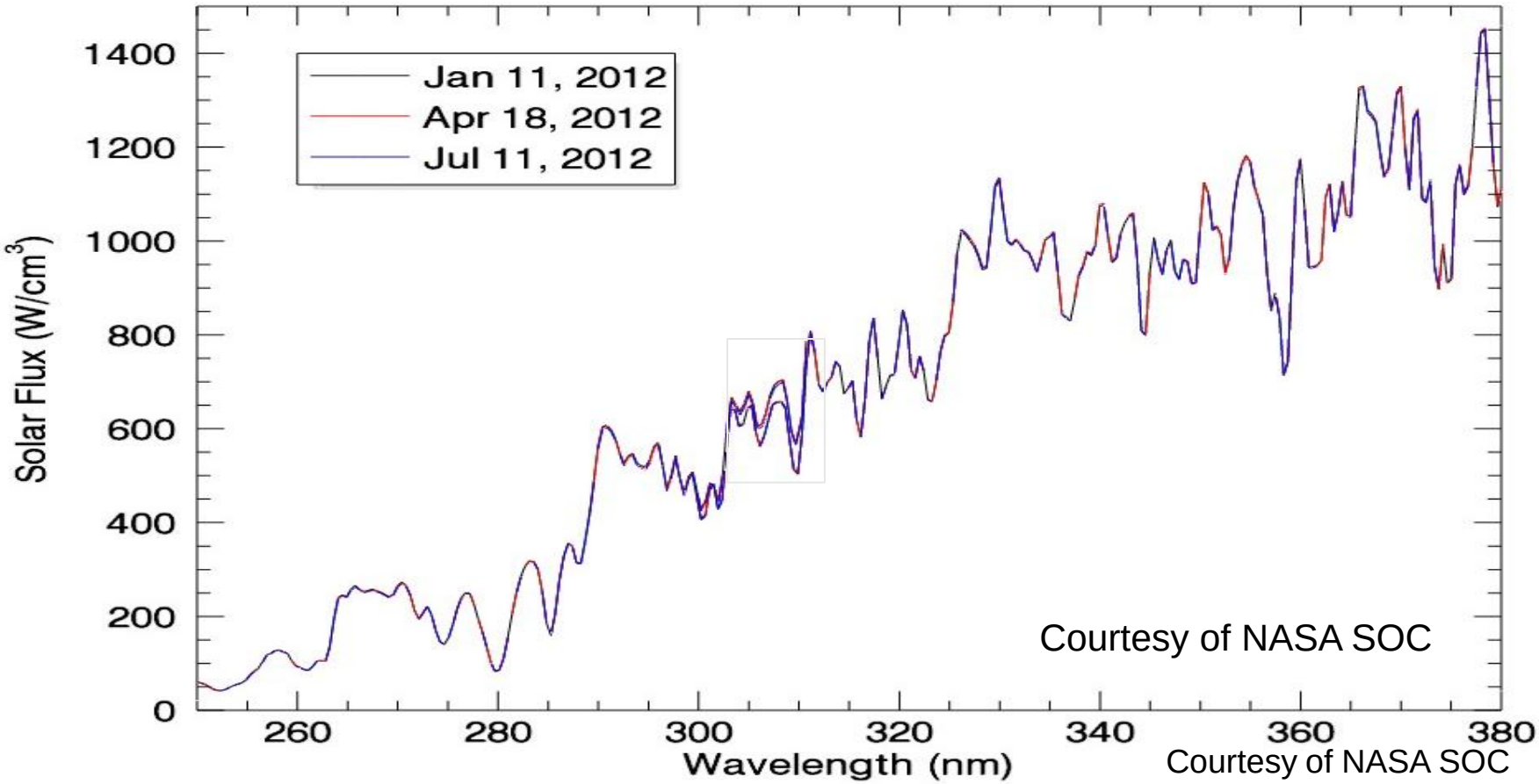


After transient removal



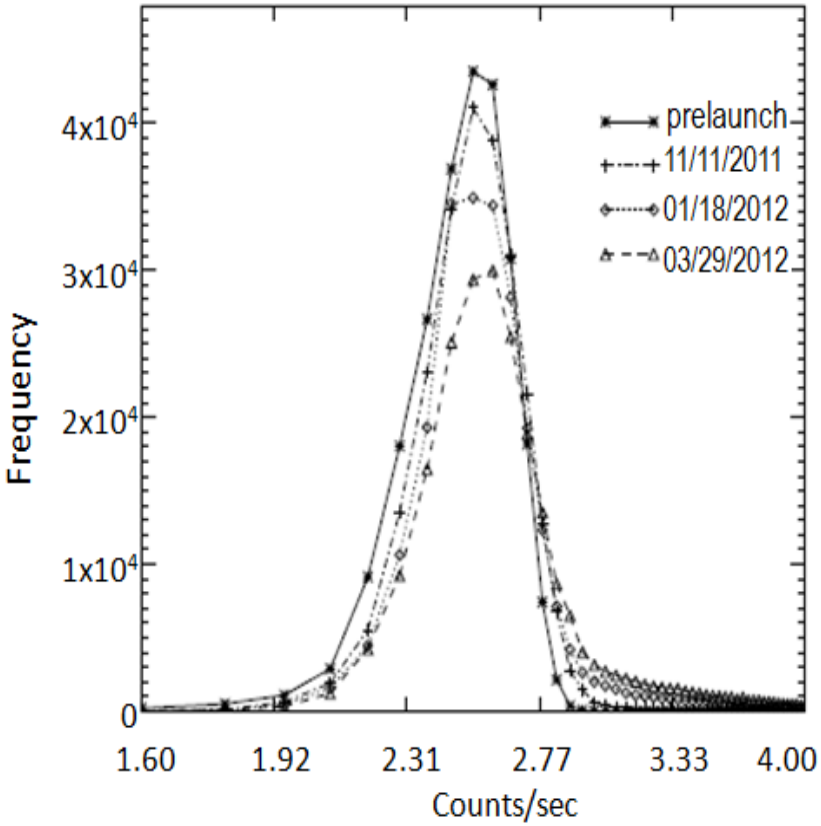
Courtesy of NASA SOC

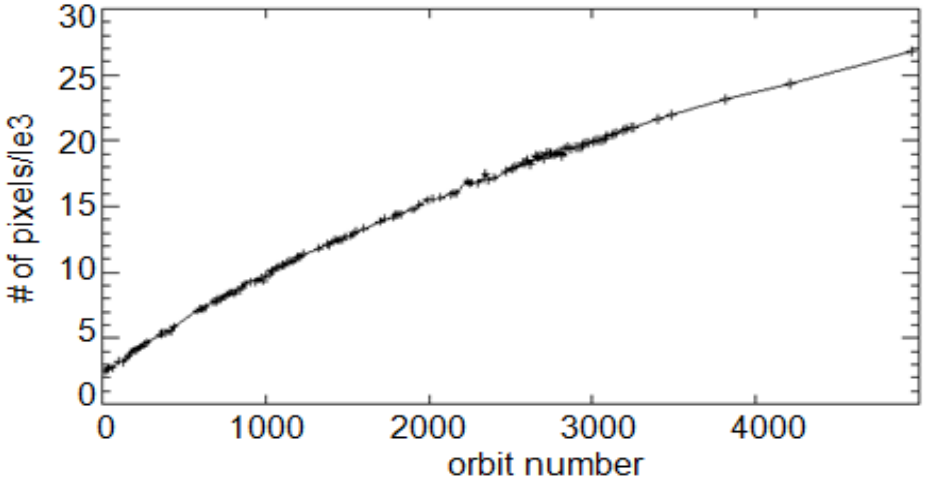
No signs of sensor degradation



Solar measurements show no evident of Nadir sensor degradation since first light measurements in January, 2012, indicating sensor response corrections are accurate.

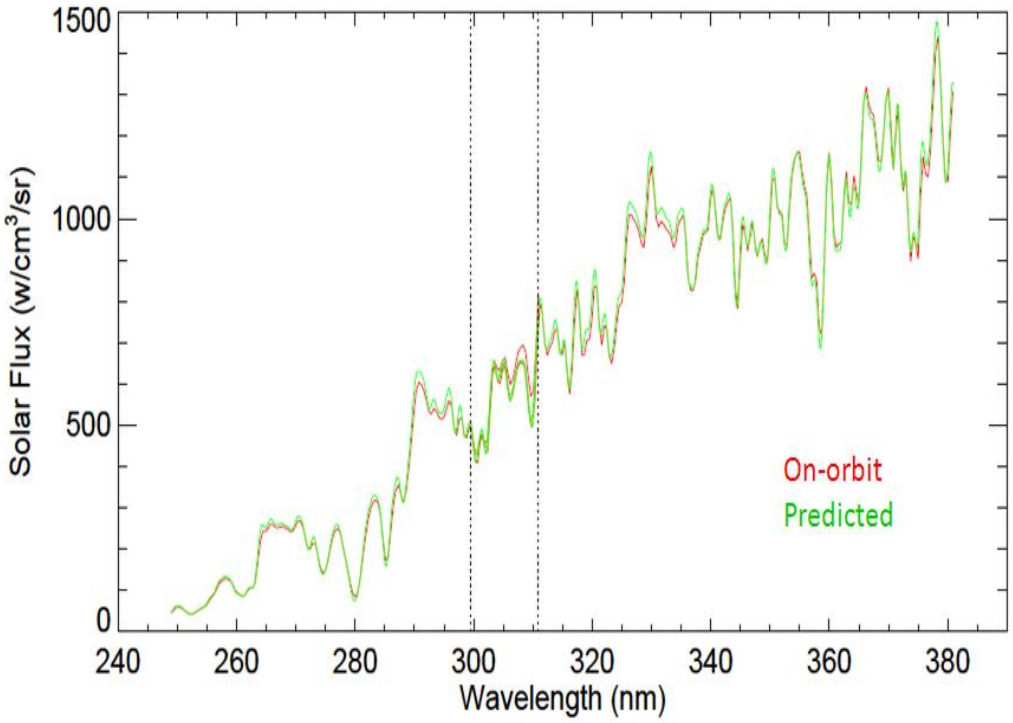
Increasing dark currents, as expected

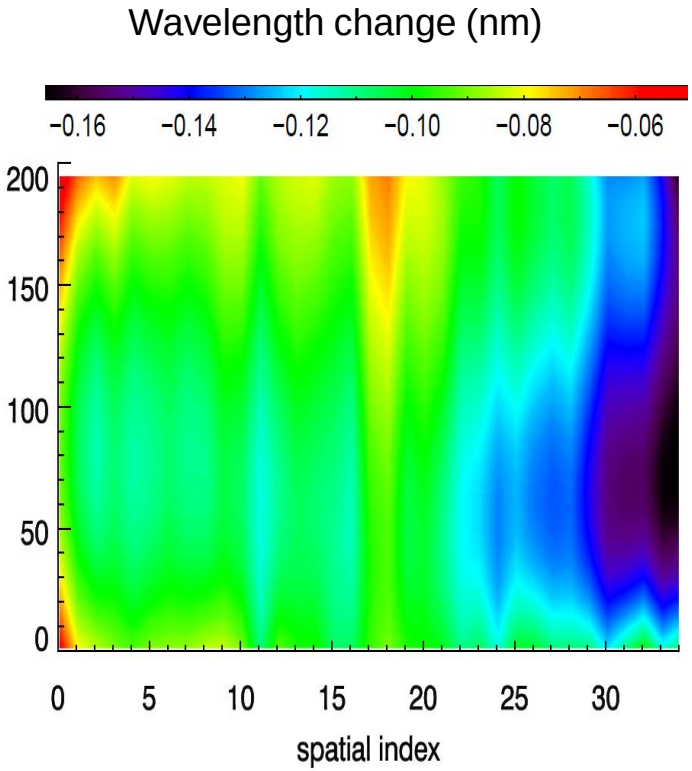




A “hot pixel” is any pixel with a statistically significant increase in dark current to the first image of launch.

Wavelength registration have been adjusted

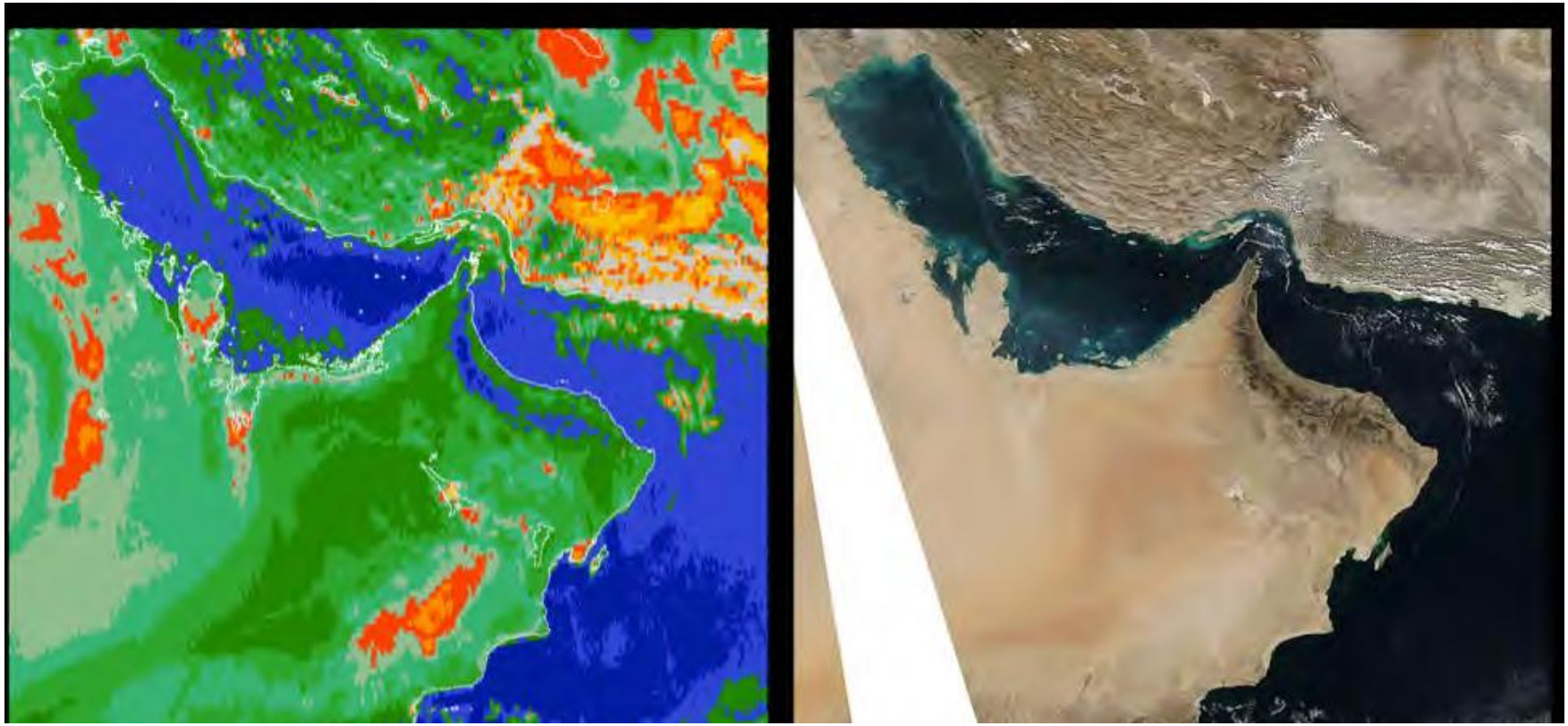




- The wavelength registration is derived by comparison with a synthetic solar spectrum
- Nadir wavelengths have been adjusted using on orbit measured solar spectra
- Observed solar flux from NM and NP shows up to 14% discrepancy in the overlap region – present a challenge.

Shift results suggest an accuracy of ~1/100 pixel.

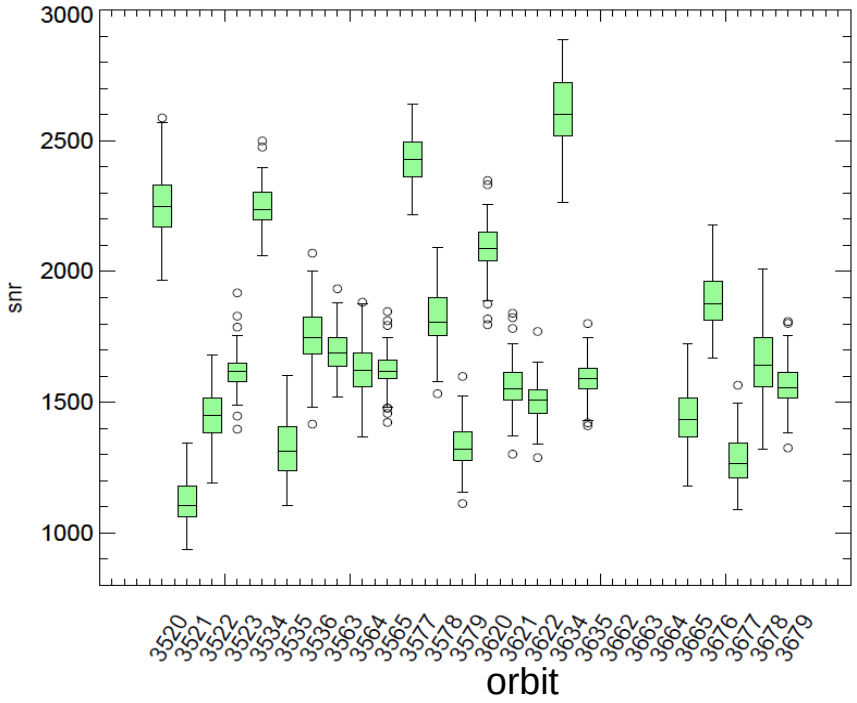
Geo-location accuracy is better than 5 km

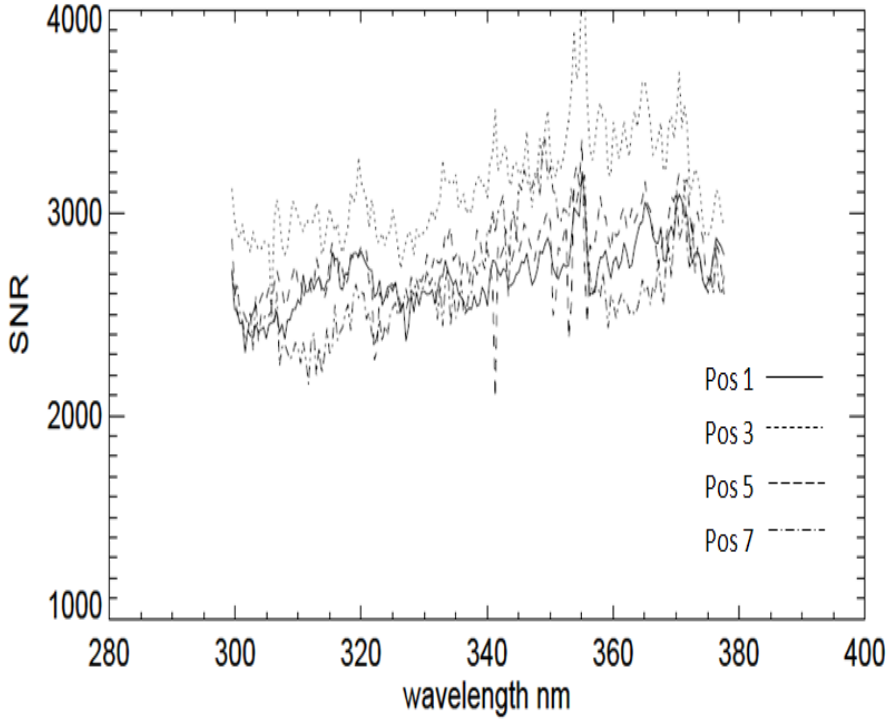


Courtesy of NASA SOC

OMPS NM effective reflectivity map for the 380-nm Channel with small Field-of-View (2.5 km X 10 km at Nadir) .

System noise meets requirement



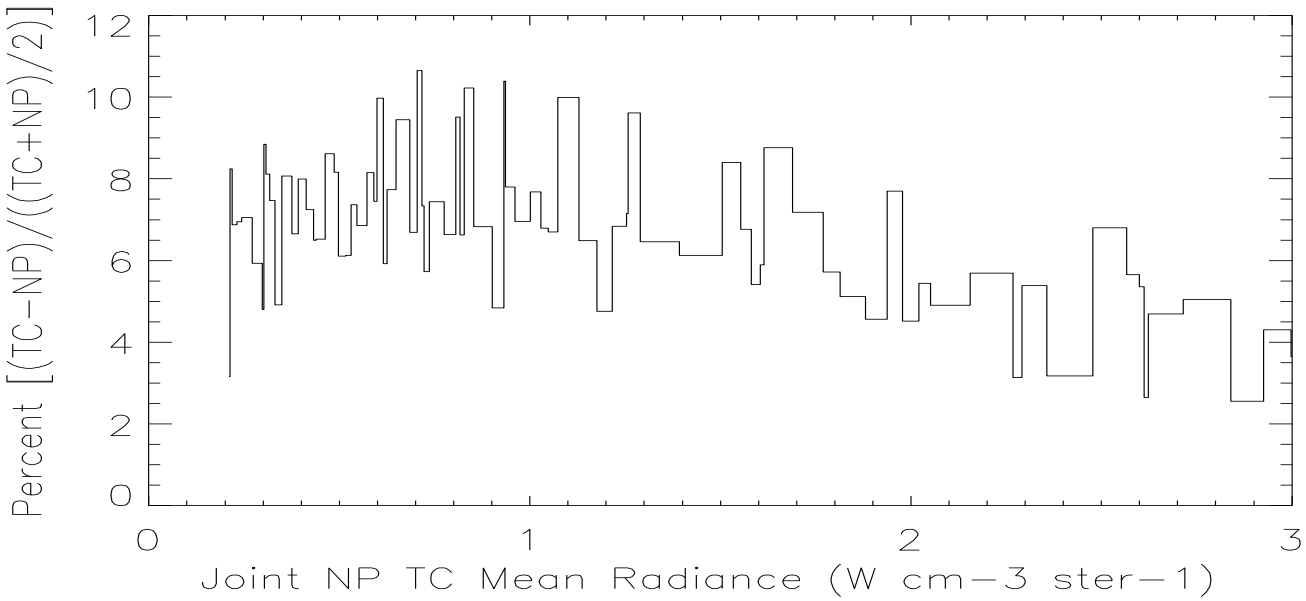


Data was collected from earth view Greenland region w/ PID 170, TPG 158.

Data was collected from June 27 from solar measurements.

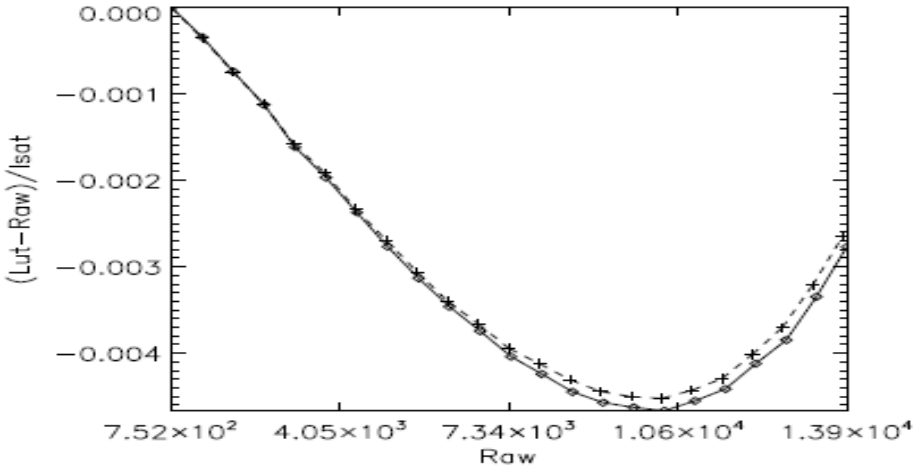
Stray light will be corrected

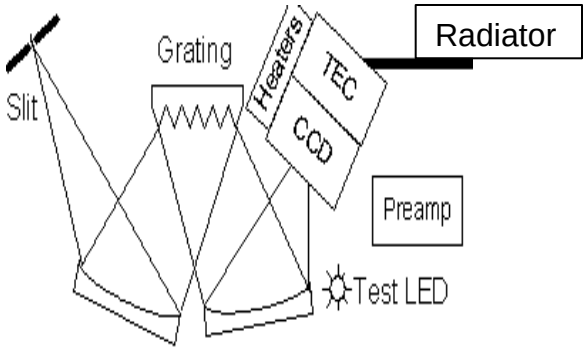
Orbit 4080-4086



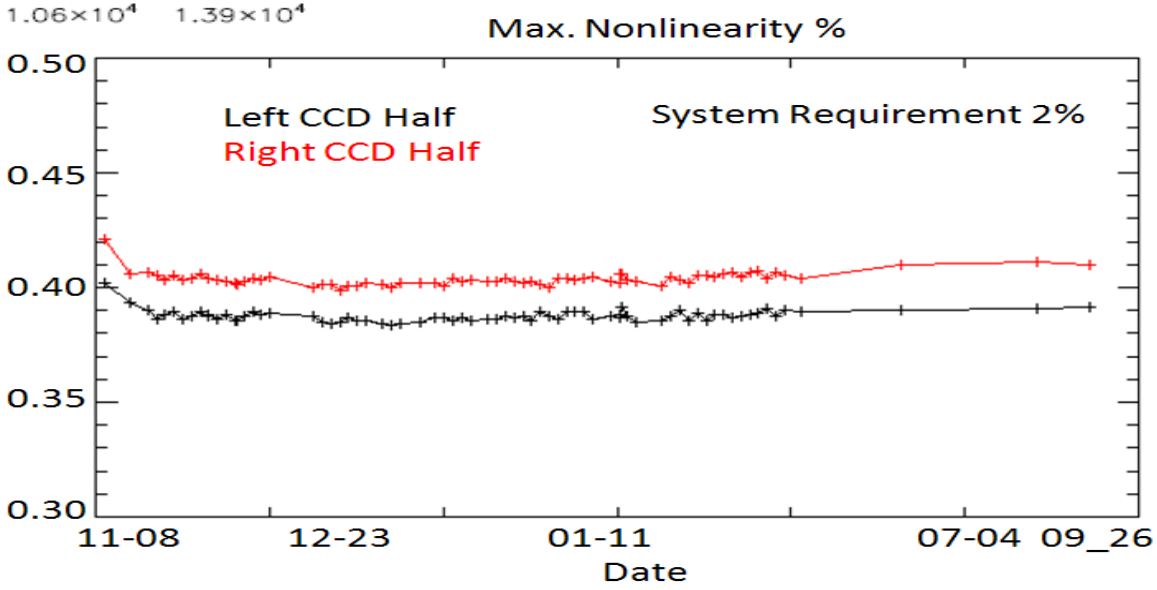
Large % differences occur both at low radiance levels and also at high solar zenith angles as might be expected from stray light (Co-location of TC & NP is reasonably good).

System linearity shows excellent stability





- The maxim non-linearity of the nadir sensor is no more than 0.42%, which meets the system requirement of 2% of full well



Sensor monitoring through ICVS

STAR Center for Satellite Applications and Research
formerly ORA — Office of Research and Applications

NOAA Satellite and Information Service
National Environmental Satellite, Data, and Information Service (NESDIS)

Skip navigation

STAR Home | Sitemap | Contact STAR | Careers | STA

Search STAR websites Go

- Integrated Cal/Val System
- NPP Instruments
- Instrument Performance Monitoring - Telemetry
  - NPP S/C Telemetry
  - NPP ATMS
  - NPP CrIS
  - NPP VIIRS
  - NPP OMPS >>
  - NOAA-19 AMSU-A
  - NOAA-19 MHS
  - NOAA-19 AVHRR
  - NOAA-19 HIRS
  - MetOP-B AMSU-A
  - MetOP-B MHS
  - MetOP-B AVHRR
  - MetOP-B HIRS
  - MetOP-A AMSU-A
  - MetOP-A MHS
  - MetOP-A AVHRR
  - MetOP-A HIRS
  - NOAA-18 AMSU-A
  - NOAA-18 MHS
  - NOAA-18 AVHRR

Satellite Integrated Calibration / Validation System (ICVS)

OMPS Sensors
Radiance Maps Display

OMPS Telemetry - General
Flight Software Version Number Display

OMPS Telemetry - Variables Total Column (TC)
TC Application ID Display

OMPS Telemetry - Variables Nadir Profiler (NP)
NP Application ID Display

OMPS Telemetry - Temperatures General
Temperature - Motor Driver Board Display

OMPS Telemetry - Temperatures Limb Profiler (LP)
LP Telescope Temperature Display

OMPS Telemetry - Temperatures Total Column (TC)
TC Charge Coupled Device Temperature Display

OMPS Telemetry - Temperatures Nadir Profiler (NP)
NP Charge Coupled Device Temperature Display

OMPS Telemetry - Currents/Voltages General
Current in the active Calibration LED Display

OMPS Telemetry - Currents/Voltages Nadir Profiler (NP)
Current - Nadir +28V Input Display

OMPS Telemetry - Currents/Voltages Total Column (TC)
Current - TC TEC Display

OMPS Telemetry - Currents/Voltages Limb Profiler (LP)
Current - Limb +28V Input Display

OMPS Radiance Maps at 331.28 nm for November 2012
(Click image to obtain larger one)

Courtesy of NOAA ICVS

Summary

- Instrument performance is stable and meet system requirement. No evidence of response degradation is observed.
- While the calibration is still being finalized, the data products are consistent with that from SBUV/2 instruments on NOAA18 and 19.
- IDPS SDR data processing and its algorithm discrepancies are the major challenge and MX7 will be in operations on April 2013 with significant improvement in data quality.
- Our near future goal is to finalize sensor orbital calibration and elevate SDRs from the provisional to the validate level.
- The successful demonstration of higher resolution data taken by S-NPP NM has prompted us to update the current FOV requirement for the J1-OMPS Nadir to obtain data at a new level of detail.