Overview of Suomi National Polar-orbiting Partnership (NPP) Instrument Calibration, SDR Product Validation and Applications

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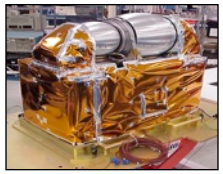
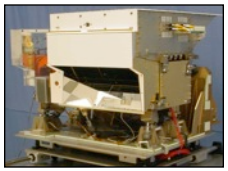
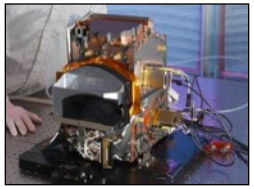
With SDR Science Team Leads and Members

2014 IGARSS, Quebec, Canada, July 13-18, 2014

Suomi NPP and JPSS-1 Instruments

Instrument Type		Measurement
	**ATMS** - Advanced Technology Microwave Sounder	ATMS and CrIS together provide high vertical resolution **temperature** and **water vapor information needed to maintain and improve forecast skill** out to 5 to 7 days in advance for extreme weather events, including hurricanes and severe weather outbreaks
	**CrIS** - Cross-track Infrared Sounder	
	VIIRS – Visible Infrared Imaging Radiometer Suite	VIIRS provides many **critical imagery products** including snow/ice cover, clouds, fog, aerosols, fire, smoke plumes, vegetation health, phytoplankton abundance/chlorophyll
	**OMPS** - Ozone Mapping and Profiler Suite	Ozone spectrometers for **monitoring ozone** hole and recovery of stratospheric ozone and for UV index forecasts
	CERES - Clouds and the Earth's Radiant Energy System	Scanning radiometer which supports studies of Earth Radiation Budget

SNPP SDR Products Review for Declaring the Validated Maturity

Attendees for SUOMI NPP SDR Product Review Meeting in NOAA Center for Weather and Climate Prediction Auditorium

Review Outcomes: SNPP SDR Products Review Meeting was held on Dec. 18-20, 2013. NESDIS Senior Management Leads: Ms. Mary Kicza and Dr. Al Powell attended the review. The Cal/Val team scientists presented the results on their specific calval tasks and NWP and other users NWS/NOS offered their independent assessments of data product quality based on their intensive cal/val analyses. The review panel recommended that the CrIS, ATMS and VIIRS SDR products be ready to be declared validated scientifically. And three remaining issues were recommended to resolve before OMPS EV SDR goes to the validated stage: cross-track effects in NM need to be addressed; Stray-light improvements still needed in NP SDR; Artificial separation between EV SDR and Cal SDR should be eliminated

Significance: Suomi NPP CrIS and ATMS SDR products are continuing NOAA afternoon orbits sounding data for NWS NWP radiance assimilation. It is shown from NCEP global forecast system (GFS) and ECMWF global models that uses of CrIS and ATMS data have similar or slightly better impacts on the global medium-range forecasts

Suomi NPP TDR/SDR Algorithm Schedule

Sensor	Beta	Provisional	Validated
CrIS	February 10, 2012	February 6, 2013	March 18, 2014
ATMS	May 2, 2012	February 12, 2013	March 18, 2014
OMPS	March 7, 2012	March 12, 2013	September , 2014
VIIRS	May 2, 2012	March 13, 2013	April 16, 2014

Beta

- Early release product.
- Initial calibration applied
- Minimally validated and may still contain significant errors (rapid changes can be expected. Version changes will not be identified as errors are corrected as on-orbit baseline is not established)
- Available to allow users to gain familiarity with data formats and parameters
- Product is not appropriate as the basis for quantitative scientific publications studies and applications

Provisional

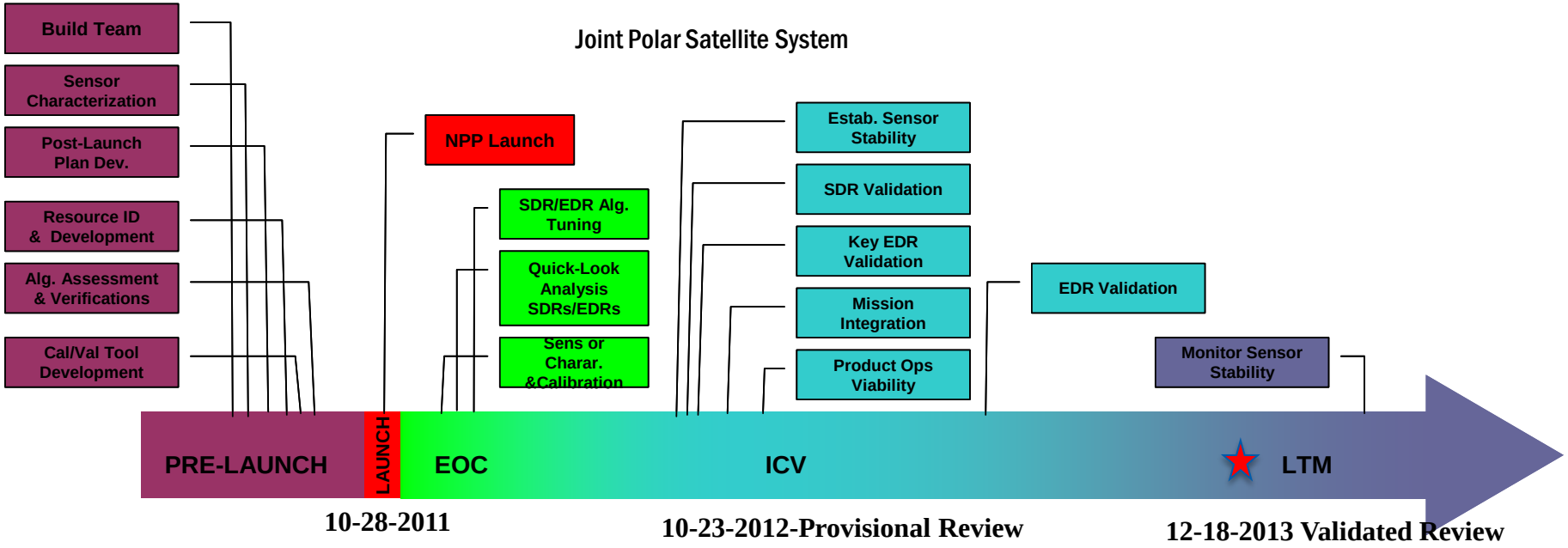
- Product quality may not be optimal
- Incremental product improvements are still occurring as calibration parameters are adjusted with sensor on-orbit characterization (versions will be tracked)
- General research community is encouraged to participate in the QA and validation of the product, but need to be aware that product validation and QA are ongoing
- Users are urged to consult the SDR product status document prior to use of the data in publications
- Ready for operational evaluation

Validated

- On-orbit sensor performance characterized and calibration parameters adjusted accordingly
- Ready for use in applications and scientific publications
- There may be later improved versions
- There will be strong versioning with documentation

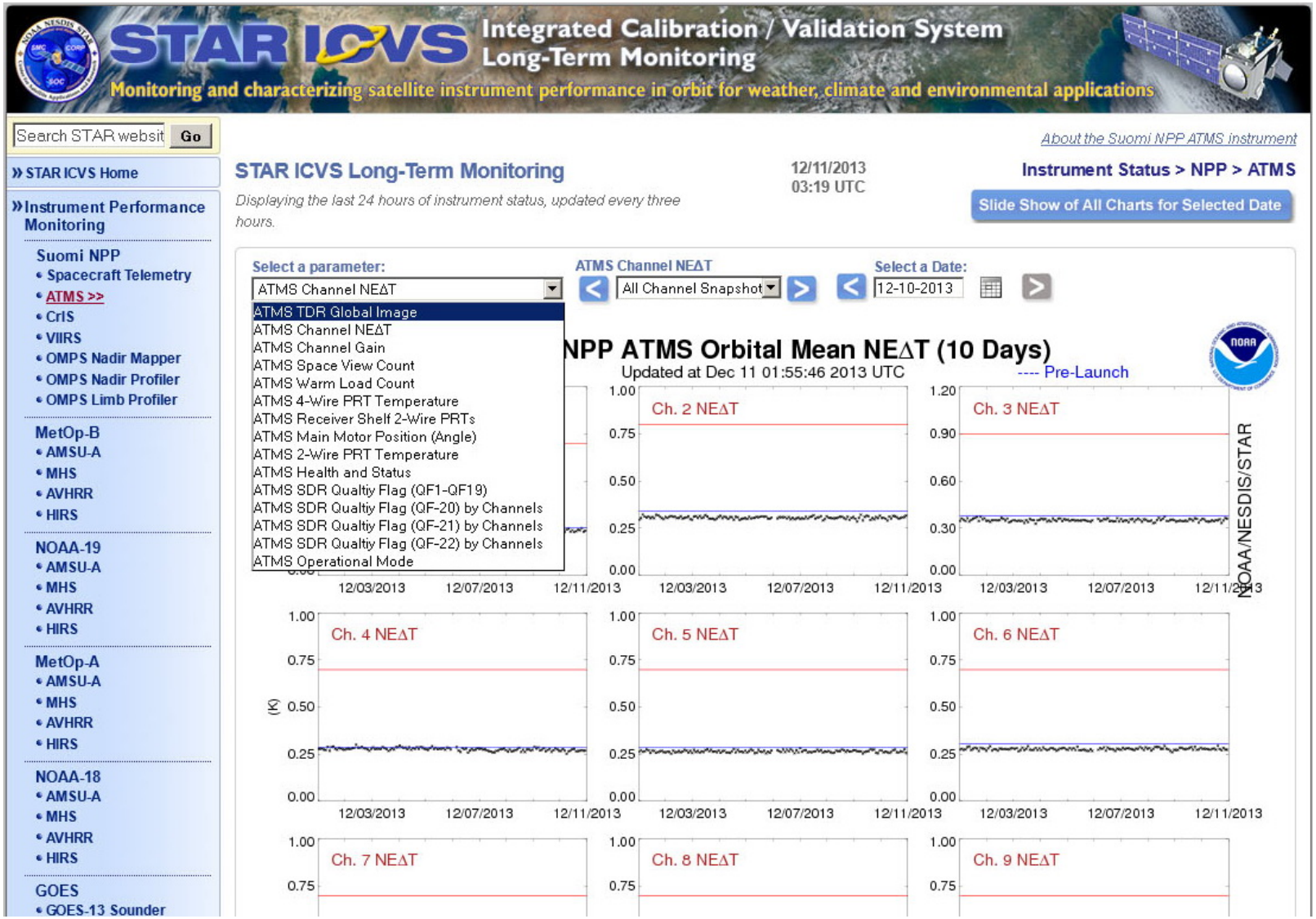
Suomi NPP Calibration/Validation Schedule

- Four Phases of Cal/Val:
  1. Pre-Launch; all time prior to launch – Algorithm verification, sensor testing, and validation preparation
  2. Early Orbit Check-out (first 30-90 days) – System Calibration & Characterization
  3. Intensive Cal/Val (ICV); extending to approximately 24 months post-launch – xDR Validation
  4. Long-Term Monitoring (LTM); through life of sensors after ICV
- For each phase:
  - Exit Criteria established
  - Activities summarized
  - Products mature through phases independently



STAR ICVS-LTM for SNPP/JPSS

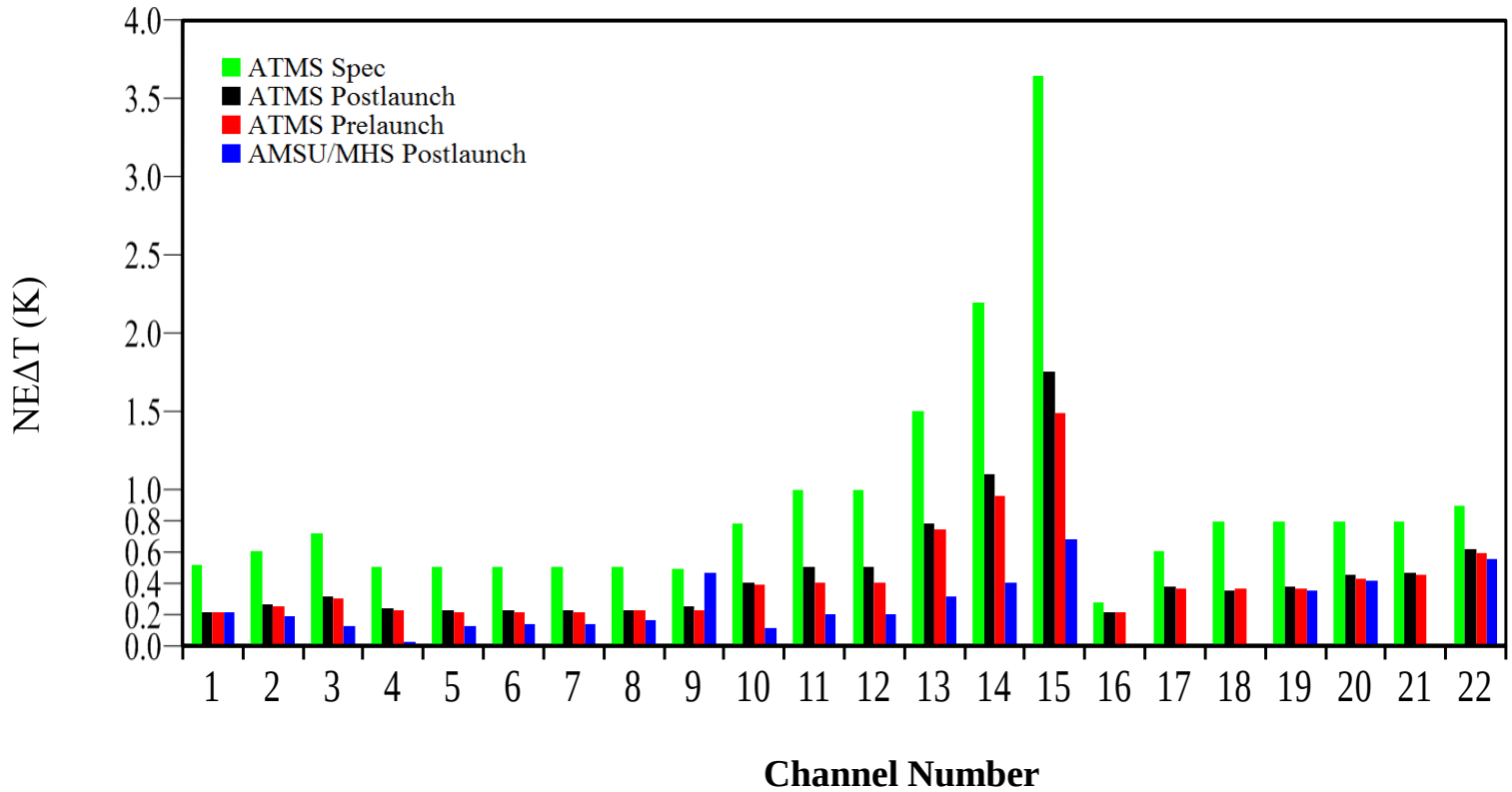
http://www.star.nesdis.noaa.gov/icvs/status_NPP_ATMS.php



Advanced Technology Microwave Sounder (ATMS) SDR Status

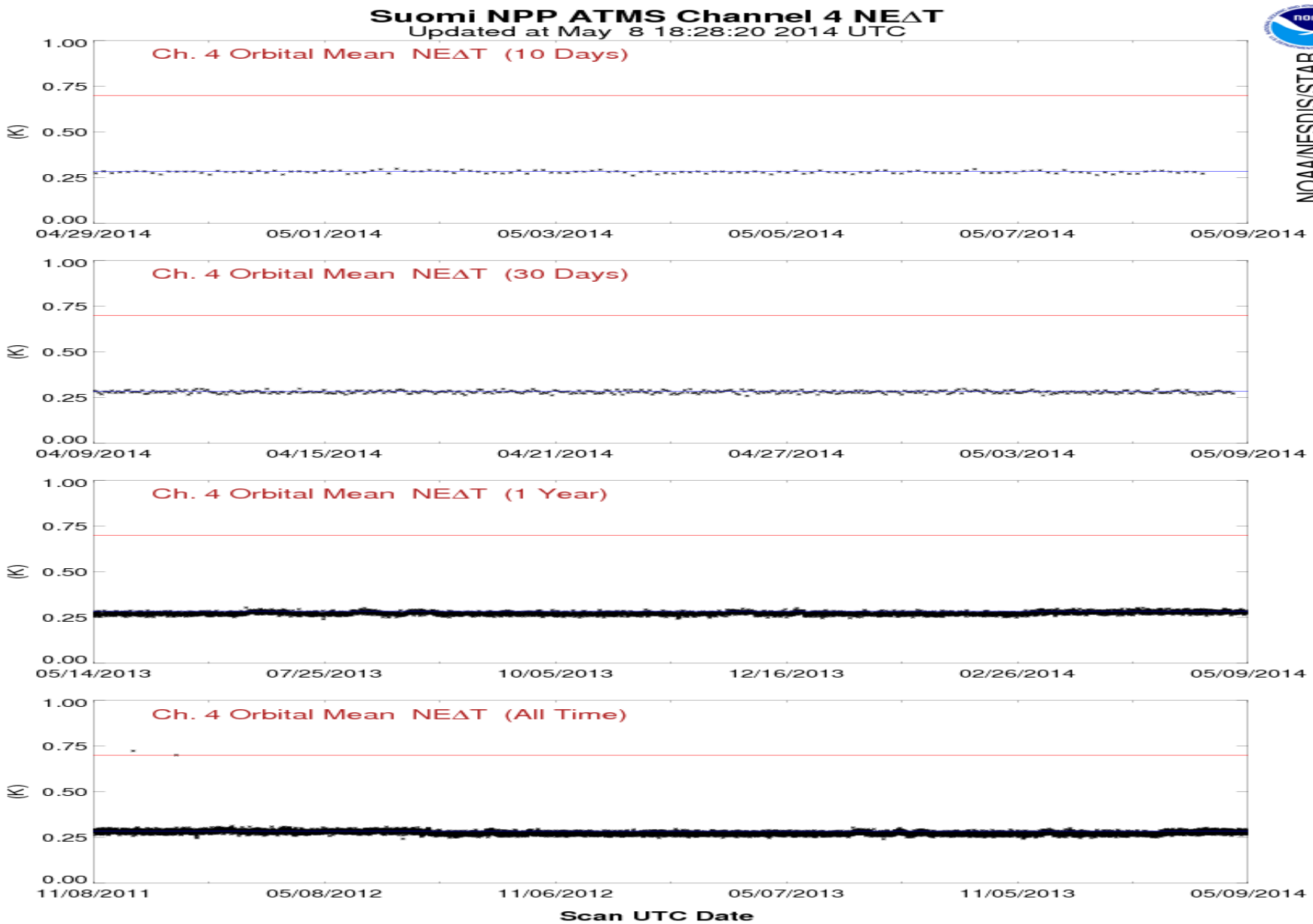
- SNPP SDR science and products review was held on December 18-20, 2013, and the ATMS SDR has reached a validated maturity level.
- ATMS SDR Product summary:
  - Stable instrument performance and calibration
  - ATMS instrument noises (NEDT) are characterized and all channels meet or exceed the requirements
  - All the ATMS channels have noises much lower than specification
  - ATMS processing coefficients table (PCT) are updated with nominal values
  - Quality flags (e.g. spacecraft maneuver and scanline, calibrations) are updated
  - Geolocation errors for all the channels are quantified and meet specification
  - Instrument performance and SDR uncertainties are well characterized and documented (e.g. ATBD, peer-reviewed publications, user's guide, error budget analysis)
  - Both TDR and SDR products are used in NOAA operations

ATMS Noise Equivalent Differential Temperature (NEDT)



On-orbit ATMS noise magnitudes are about twice as large as those AMSUMHS but much lower than specification. The re-sampled ATMS data within CrIS FOR or equivalent AMSU-A FOV would result in noise much lower than that of AMSU-A/MHS

SNPP ATMS Has Stable Noise



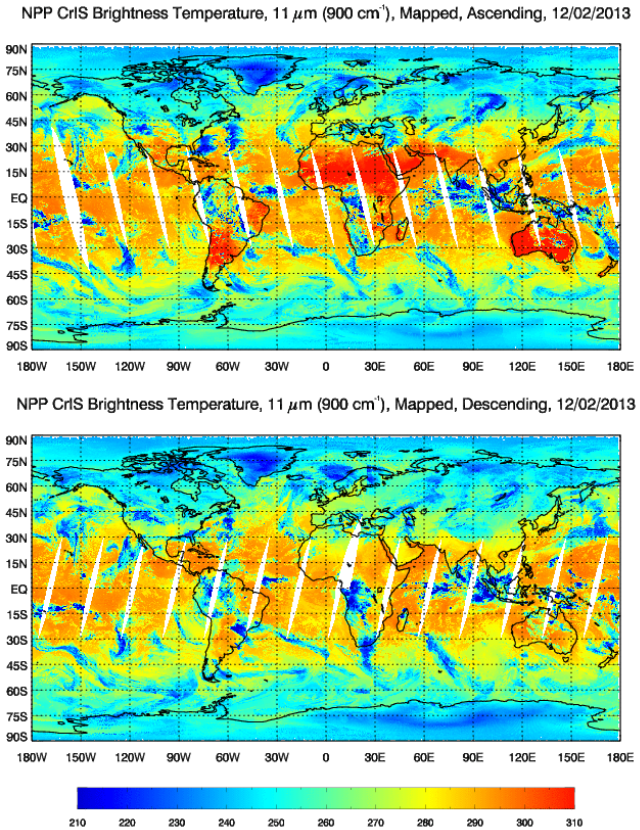
NOAA/NESDIS/STAR

Cross-Track Infrared Sounder (CRIS) SDR Status

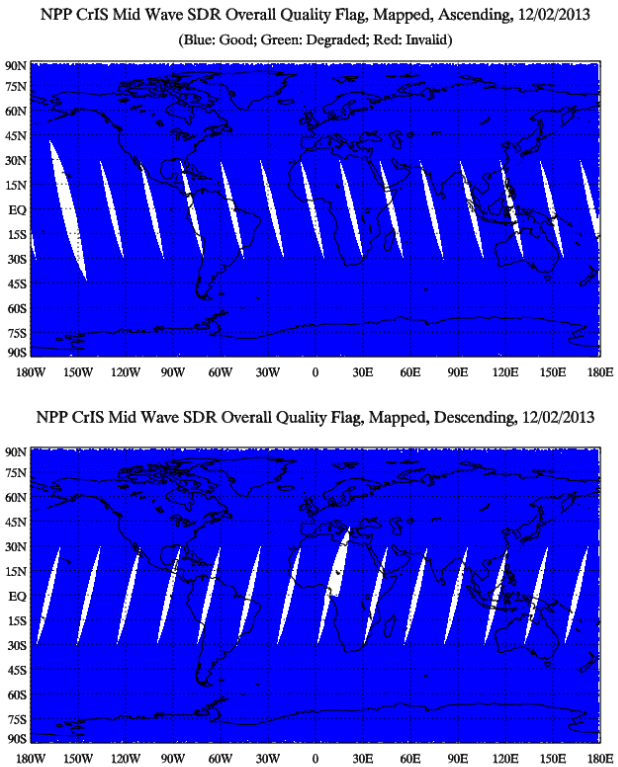
- SNPP SDR science and products review was held on December 18-20, 2013, and the CrIS SDR has reached a validated maturity level.
- CrIS SDR product summary:
  - On-orbit instrument performance is stable and well within specification
  - SDR uncertainties meet requirements,with NEdN and uncertainties of radiometric and spectral calibration well below specifications
  - Spectral uncertainty: < 2 ppm, well below specification
  - Radiometric uncertainty: ~0.1K, well below specification
  - Geolocation error: < 0.5 km below specification
  - ILS and NL correction algorithms/code and coefficients are improved and adjusted
  - All the important SDR quality flags are functioning as expected
  - 99.98% of the SDR data are in good quality
  - IDPS capability to process full resolution RDRs is implemented and tested
  - Instrument performance and SDR uncertainties are well characterized and documented (e.g. ATBD, peer-reviewed publications, user's guide, error budget analysis)
  - CrIS SDR data have been used in NOAA operations

Example of Data Quality after Mx8.0

Radiance (900 cm^{-1})



Overall SDR quality flag (Blue – good)



CrIS data monitoring website:

http://www.star.nesdis.noaa.gov/icvs/status_NPP_CrIS.php

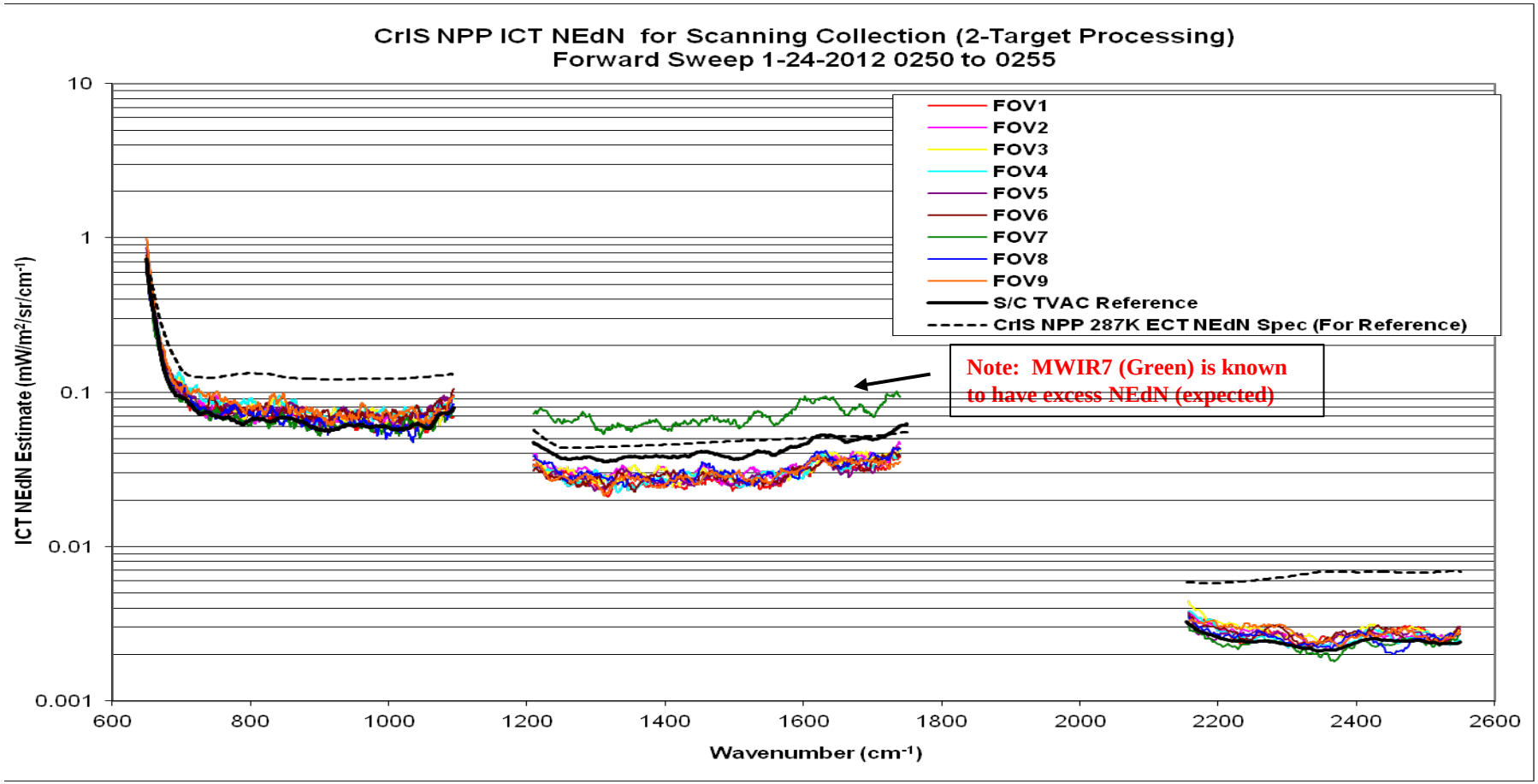
Validated CrIS SDR Product

CrIS SDR uncertainties (**blue**) vs. specifications (black)

Band	NEdN @287K BB $mW/m^2/sr/cm^{-1}$	Radiometric Uncertainty @287K BB (%)	Frequency Uncertainty (ppm)	Geolocation Uncertainty (km) *
LW	**0.098** (0.14)	**0.12** (0.45)	**3** (10)	**1.2** (1.5)
MW	**0.036** (0.06)	**0.15**(0.58)	**3** (10)	**1.2** (1.5)
SW	**0.003** (0.007)	**0.2** (0.77)	**3** (10)	**1.2** (1.5)

- Requirements
  - **Instrument & SDR performances exceed requirements by large margins**
- SDR software
  - **Stable & free of errors that could impact data quality since 11/14/2013 (Mx8.0)**
- Documentation
  - **SDR User's Guide (55 pages)**
  - **Revised ATBD**
  - **Peer-review Journal papers**

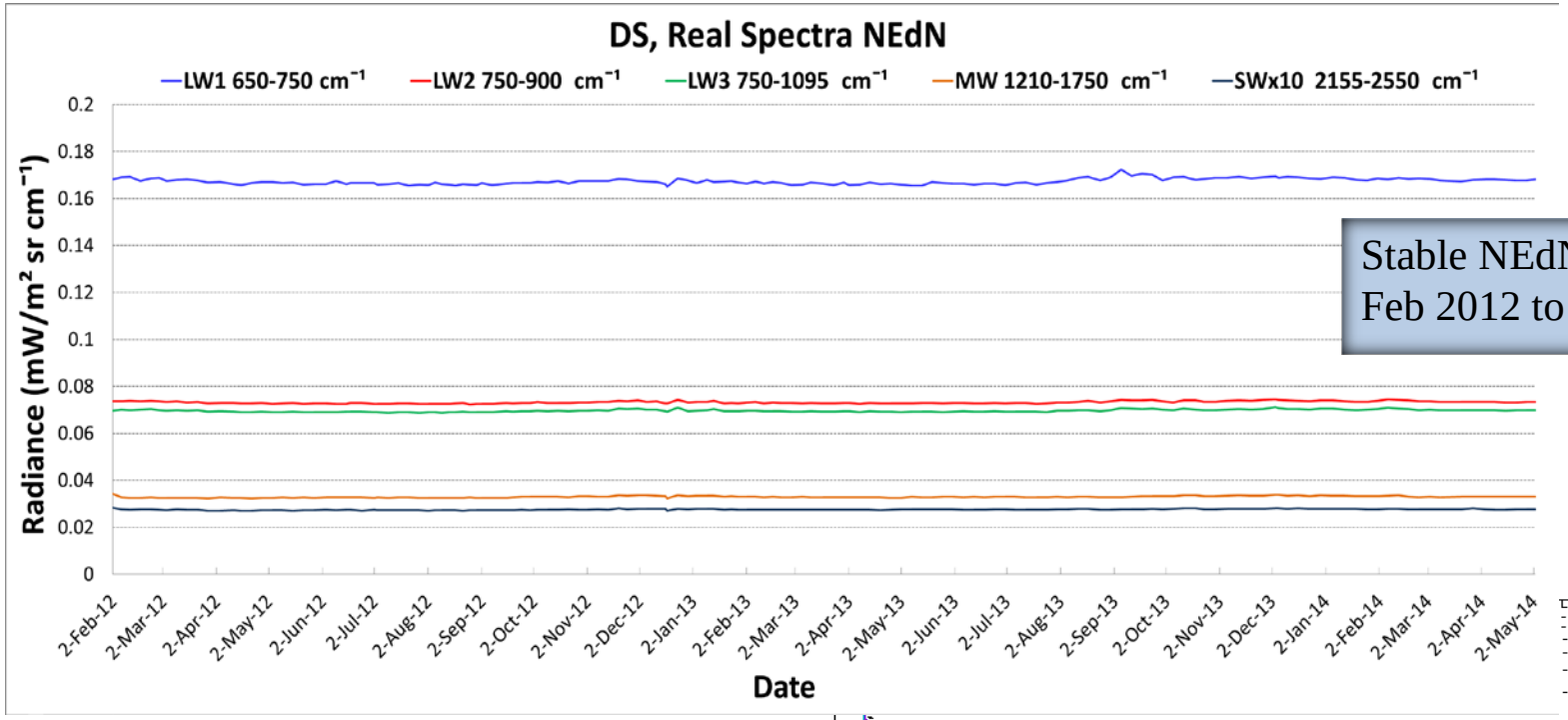
CrIS Noise Equivalent Differential Radiance (NEdN)



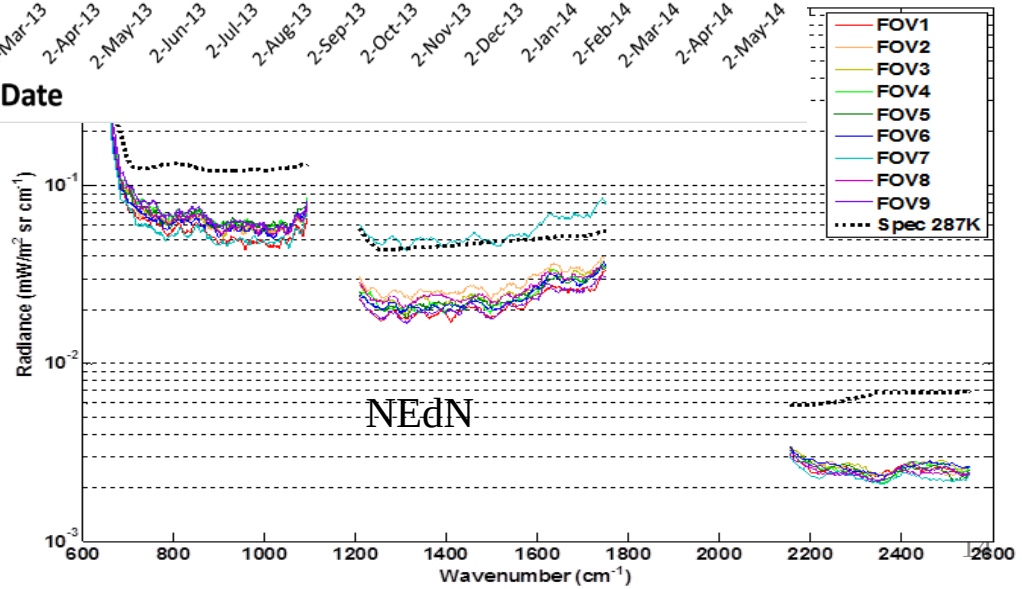
NEdN On-Orbit data is consistent with Ground Test Data (Black Lines); Much Better Than Spec Limits (Dashed Lines)……No Ice Contamination Signatures

Slide courtesy of Joe Predina, ITT EXELIS

Stable Instrument Performance



Stable NEdN
Feb 2012 to May 2014



The noise levels substantially better than specification

Visible Infrared Imaging Radiometer Suite (VIIRS) SDR Status

- SNPP SDR science and products review was held on December 18-20, 2013, and the VIIRS SDR has reached a validated maturity level
- VIIRS SDR product summary
  - Multiple code/LUT updates have been implemented or are being implemented into the SDR processing, including the scan-by-scan calibration, and have led to higher quality SDRs and EDRs.
  - VIIRS on-orbit performance is well characterized and meets specifications
  - Noise is small and stable, meet specification
  - Bias (accuracy) is well characterized for both reflective solar and thermal emissive bands. with the exception of M11 due to low signal (known prelaunch with waiver)
  - Calibration coefficients are automatically updated
  - RSB Autocal is implemented and reduce calibration latency and improve performance. DNB straylight correction works well.
  - Geo-location uncertainties for I-/M-bands are ~ 70 m at nadir, meeting specifications at nadir and edge-of-scan (DNB terrain corrected geo-location product was implemented in Mx8.3 in March 2014)
  - Instrument performance and SDR uncertainties are well characterized and documented (e.g. ATBD, peer-reviewed publications, user's guide, error budget analysis)
  - VIIRS SDR products are used in NOAA operations

VIIRS SDR Requirements and Performance

(all performance values are stable since provisional)

Band	Driving EDR(s)	Center Wavelength (µm)	Equiv. Width (µm)	Horizontal Sample Interval (km) (track × scan)		Band Gain	Ltyp or Ttyp (Spec)	Lmin or Tmin	Lmax or Tmax	Spec SNR or NEdT (K)	On Orbit SNR or NEdT (K)	MODIS equiv. band
				Nadir	End of Scan							
VisNIR												
M1	Ocean Color Aerosol	0.411	0.0198	0.75×0.75	1.60x1.58	H	44.9	30	135	352	588	B8
						L	155		615	316	1045	
M2	Ocean Color Aerosol	0.444	0.0143	0.75×0.75	1.60x1.58	H	40	26	127	380	572	B9
						L	146		687	409	1010	
M3	Ocean Color Aerosol	0.486	0.0190	0.75×0.75	1.60x1.58	H	32	22	107	416	628	B10
						L	123		702	414	988	
M4	Ocean Color Aerosol	0.551	0.0209	0.75×0.75	1.60x1.58	H	21	12	78	362	534	B4/B12
						L	90		667	315	856	
I1	Imagery EDR	0.639	0.0775	0.375x0.375	0.80x0.79	S	22	5	718	119	214	B1
M5	Ocean Color Aerosol	0.672	0.02	0.75×0.75	1.60x1.58	H	10	9	59	242	336	B13/B1
						L	68		651	360	631	
M6	Atmosph. Correct.	0.745	0.0146	0.75×0.75	1.60x1.58	S	9.6	5.3	41	199	368	B15
I2	NDVI	0.862	0.0394	0.375x0.375	0.80x0.79	S	25	10.3	349	150	264	B2
M7	Ocean Color Aerosol	0.862	0.0387	0.75×0.75	1.60x1.58	H	6.4	3.4	29	215	457	B16/B2
						L	33.4		349	340	631	
DNB	NCC Imagery	0.700	0.200	0.75×0.75	0.75×0.75	LG/MG/HG	3E-9	3E-9	0.02	6	>9	-
S/MWIR												
M8	Cloud Particle Size	1.238	0.0271	0.75×0.75	1.60x1.58	S	5.4	3.5	165	74	221	B5
M9	Cirrus/Cloud Cover	1.375	0.0150	0.75×0.75	1.60x1.58	S	6	0.6	77.1	83	227	B26
I3	Binary Snow Map	1.602	0.0572	0.375x0.375	0.80x0.79	S	7.3	1.2	72.5	6	149	B6
M10	Snow Fraction	1.602	0.0587	0.75×0.75	1.60x1.58	S	7.3	1.2	71.2	342	586	B6
M11	Clouds	2.257	0.0467	0.75×0.75	1.60x1.58	S	0.12	0.12	31.8	10	22	B7
I4	Imagery Clouds	3.753	0.360	0.375x0.375	0.80x0.79	S	270	210	353	2.5	0.4	B20
M12	SST	3.697	0.192	0.75×0.75	1.60x1.58	S	270	230	353	0.396	0.12	B20
M13	SST/Fires	4.067	0.165	0.75×0.75	1.60x1.58	H	300	230	343	0.107	0.04	B23
						L	380		634	0.423		
LWIR												
M14	Cloud Top Properties	8.578	0.324	0.75×0.75	1.60x1.58	S	270	190	336	0.091	0.06	B29
M15	SST	10.729	0.990	0.75×0.75	1.60x1.58	S	300	190	343	0.07	0.03	B31
I5	Cloud Imagery	11.469	1.75	0.375x0.375	0.80x0.79	S	210	190	340	1.5	0.4	B31
M16	SST	11.845	0.866	0.75×0.75	1.60x1.58	S	300	190	340	0.072	0.03	B32

VIIRS SDR Accuracy

	Requirement (absolute uncertainty for uniform scenes)	Prelaunch and onboard calibration	Validation: Relative to MODIS/CrIS/IASI/other thru Inter-comparisons	Note
VIIRS RSB	2% typical reflectance; 0.3% stability; 0.1% desirable for Ocean Color Applications	1.2% for M1-M7; 1.5% for M8&9 1.4% for M10 1.3% for I1&I2 1.6% for I3	2% (±1%) for matching bands	Except bands with very low signal (ex. M11); sub-percent accuracy for OC is very challenging. Geolocation error: expectation is half I-band pixel; achieved better than quarter I-band pixel (1-σ)
VIIRS TEB	M12/M13: 0.7%(0.13K) @270K M14: 0.6% (0.26K) @ 270K M15/M16: 0.4% (0.22K/0.24K) @270K I4: 5% (0.97K) @270K I5: 2.5% (1.5K) @270K	Better than 0.13K for all M bands except M13 (0.14); 0.47K for I4; 0.23K for I5	0.1K based on statistical comparison with MODIS and CrIS ER-2/SHIS Aircraft underflight shows excellent agreement M15 0.4 K bias relative to CrIS at 200K (in spec.)	M15 at 190K requirement is 2.1% radiance or 0.56K Geolocation uncertainty: expectation was half I-band pixel; achieved better than quarter I-band pixel (1-σ)
VIIRS DNB	5%, 10%,30% L_{min} (LGS,MGS,HGS)	3.5%, 7.8%, and 11% (LGS, MGS, HGS)	4%, 7.7%, 11.8% (LGS, MGS, HGS)	Geolocation error is a ~10th of a pixel (1-σ) on the ellipsoid earth but can exceed 1km (up to 24 km at the edges of scan) without terrain correction

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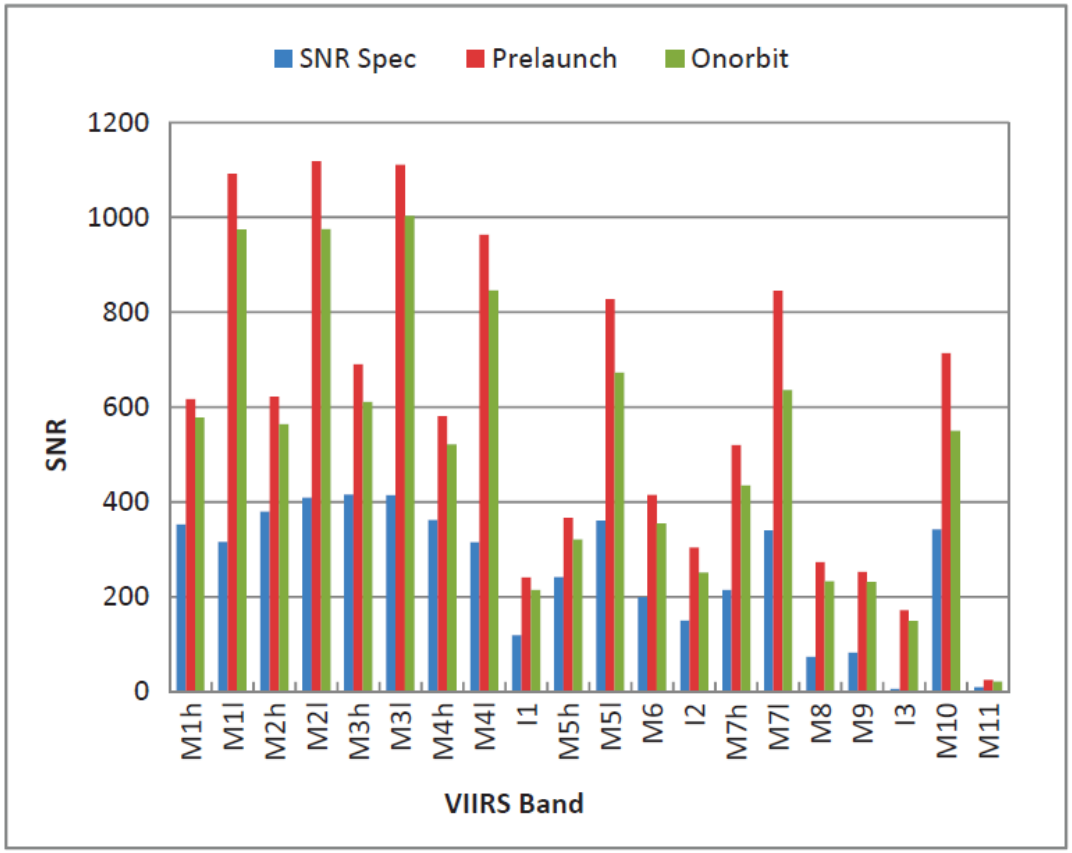
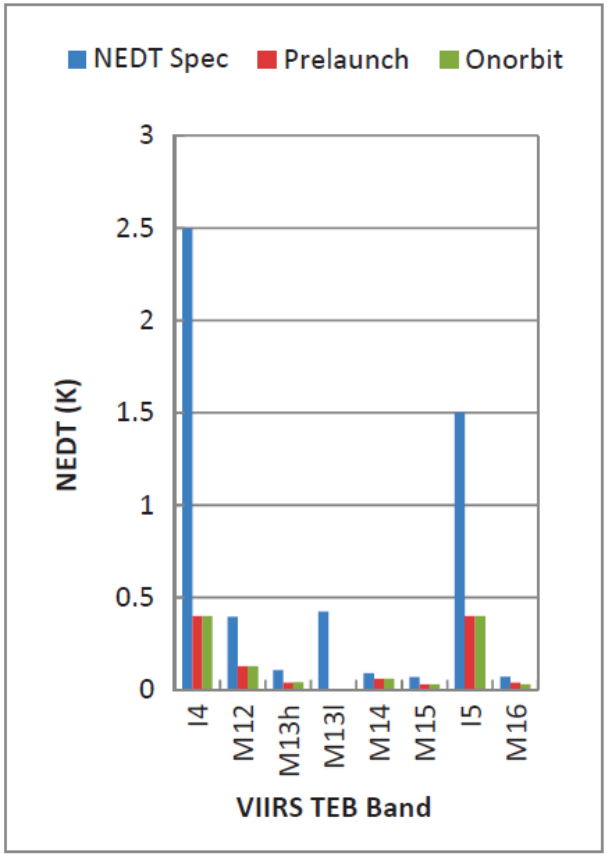
VIIRS On-orbit Performance

-SNR and NEDT (all values are stable since provisional)

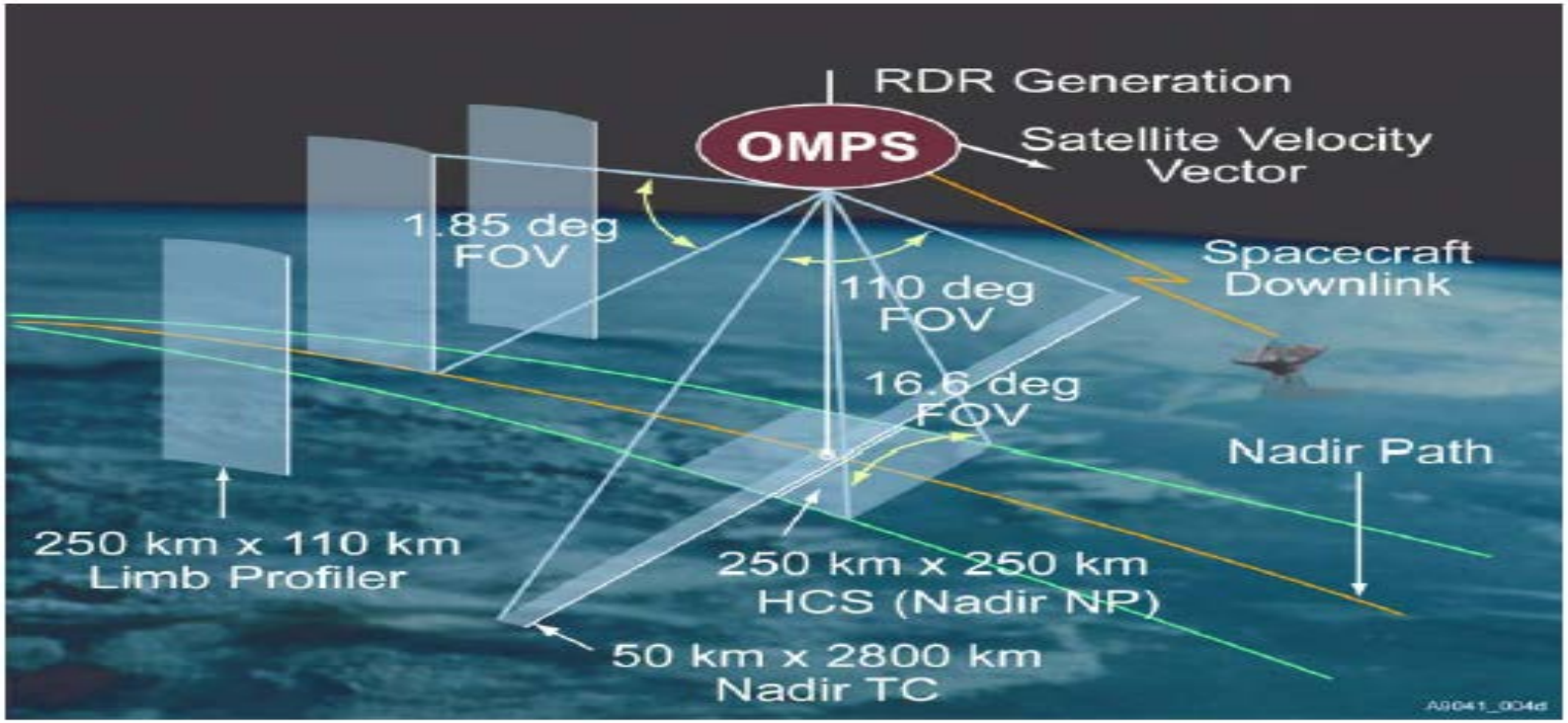




Ozone Mapping and Profiling Suite (OMPS) SDR Status

- SNPP SDR science and products review was held on December 18-20, 2013, and the OMPS EV SDR is approaching a validated maturity level
- OMPS SDR product summary
  - Excellent OMPS instrument performance, as validated by STAR ICVS monitoring.
  - Calibration coefficients have been adequately updates.
  - OMPS and GOME-2 inter-sensor biases are well characterized. Good agreements with existing knowledge of GOME-2 calibration.
  - Excellent outreach to and feedback from NOAA and NASA user community.
  - OMPS SDR on-orbit performance is well characterized. Exceptional performance in terms of noise, stability, and data completeness.
  - Further improvements in stray light correction is being implemented. Current performance meets requirements.
  - Initial wavelength correction is being implemented, after which performance will meet requirements.
  - Need a plan to correct for cross-track variation, e.g. by improved pixel-to-pixel cal or soft cal.
  - Good documentation in peer-reviewed papers and presentations for this review.

OMPS Scanning Characteristics



- OMPS consists of three spectrometers
  - Nadir Total Column Spectrometer covers a 50km x 2800km cross-track swath
  - Nadir Profile Spectrometer provides performance over $(250km)^2$ cell
  - Limb Sensor provides 1 km vertical sampling along three slits enabling ozone profile retrieval (Not on J1)
- PFM PSR completed Nov ’08
- Heritage: TOMS (Nadir Total Column) and
  SBUV/2 (Nadir Profiler)

OMPS SDR Calibration Table

Table Description	Table Type	Delivery Status
NM & NP Day 1 Solar	LUT	Once (will be repeat)
NM & NP Wavelength	GND-PI	Once (will be repeat)
NM & NP CF Earth	GND-PI	Monthly (ceased)
NM & NP Dark Tables	GND-PI	Weekly
Diagnostic Flight Sample Tables	SCT	When necessary
Earth-view Flight Sample Tables	SCT	Once
Earth-view Ground Sample Tables	GND-PI	Once
Calibration Flight Sample Tables	SCT	Once
NM & NP Radiometric Coefficients	LUT	TBD
NM Stray Light Coefficients	LUT	Once
NP Stray Light Coefficients	LUT	Not planned
NM & NP Linearity (Flight & Ground)	SCT/GND-PI	Not planned
NM & NP Flat Field	SCT	Not planned

Nadir Mapper Performance Summary

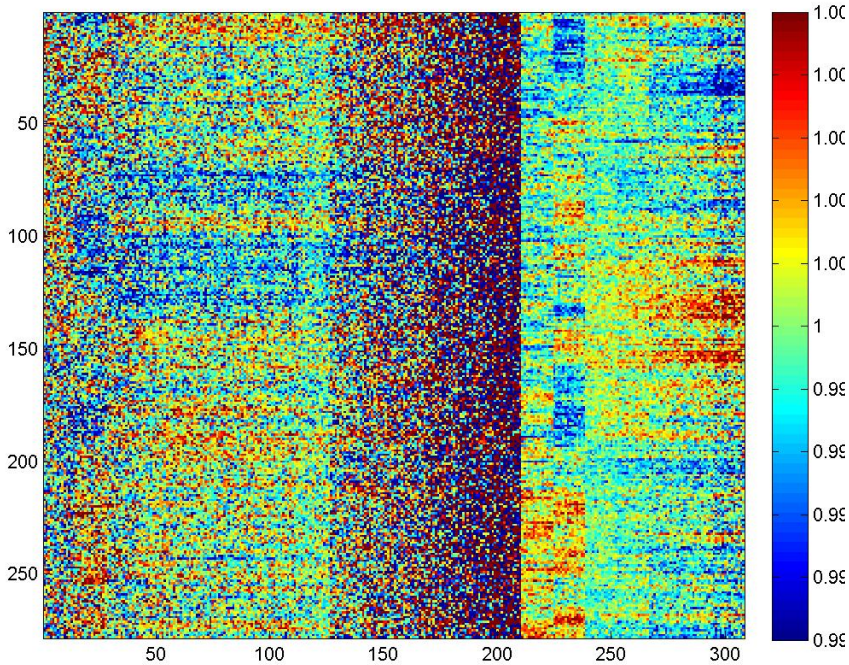
Parameters	Specification/Prediction Value	On-Orbit Performance
Non-linearity	< 2% full well	< 0.46%
Non-linearity Accuracy	< 0.2%	±0.2%
On-orbit Wavelength Calibration	< 0.01 nm	~ 0.02 nm
Stray Light NM Out-of-Band + Out-of-Field Response	For NM ≤ 2	average < 2%
Intra-Orbit Wavelength Stability	Allocation (flow down from EDR error budget) = 0.02 nm	~ 0.025 nm
SNR	1000	> 1000
Inter-Orbital Thermal Wavelength Shift	Allocation (flow down from EDR error budget) = 0.02 nm	~0.025 nm
CCD Read Noise	60 –e RMS	< 25 –e RMS
Detector Gain	43 (for NP) 46 (for NM)	47 (for NP) 51 (for NM)
Absolute Irradiance Calibration Accuracy	< 7%	< 7% in 300-310 nm: up to ~10 % for both NM and NP
Absolute Radiance Calibration Accuracy	< 8%	< 8%
Normalized radiance Calibration Accuracy	< 2%	< 1%

Further JPSS SDR Science Advancements

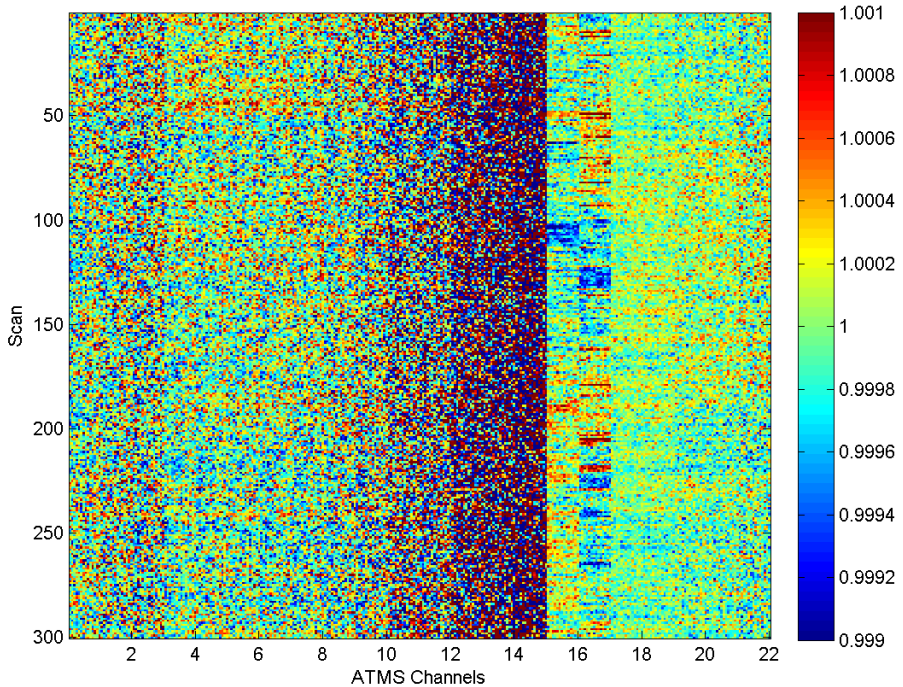
- ATMS maximum nonlinearity correction derived from TVAC is problematic since it is derived from medium theorem within the temperature range of 95 to 295K.
- Mitigation of ATMS TDR data striping requires various algorithm for either post processing or as part of TDR calibration algorithm\
- The current SNPP CrIS SDR calibration and processing system requires some optimization in order to reduce the ringing effects in full resolution processing
- VIIRS H-factor continues degrading and its impacts on EDR products (e.g. ocean color) requires further studies
- OMPS CalSDR is processed at NASA and requires transition to NOAA operation
- SDR teams will revisit noise quantification issues for all the thermal bands

Analysis of ATMS TVAC Test Data

SNPP TVAC Data (RC1 230K)

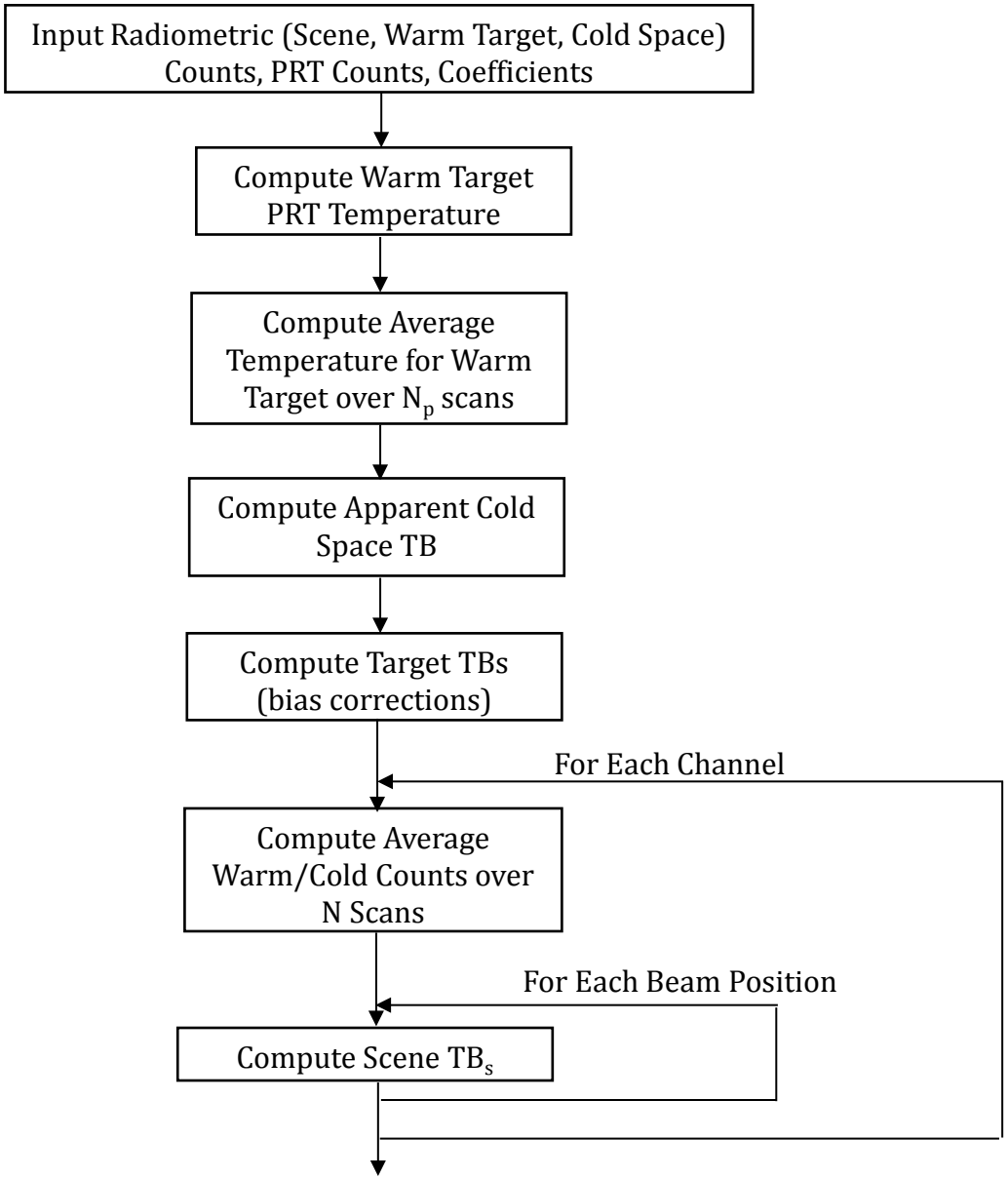


J-1 TVAC Data (RC4, 3/12/14)



Preliminary TVAC data analysis shows J1 ATMS is much cleaner than SNPP, except channel 16 and 17.

ATMS Radiometric Calibration Flow Chart



ATMS Two-Point Calibration with Non-linearity Correction in Brightness Temperature

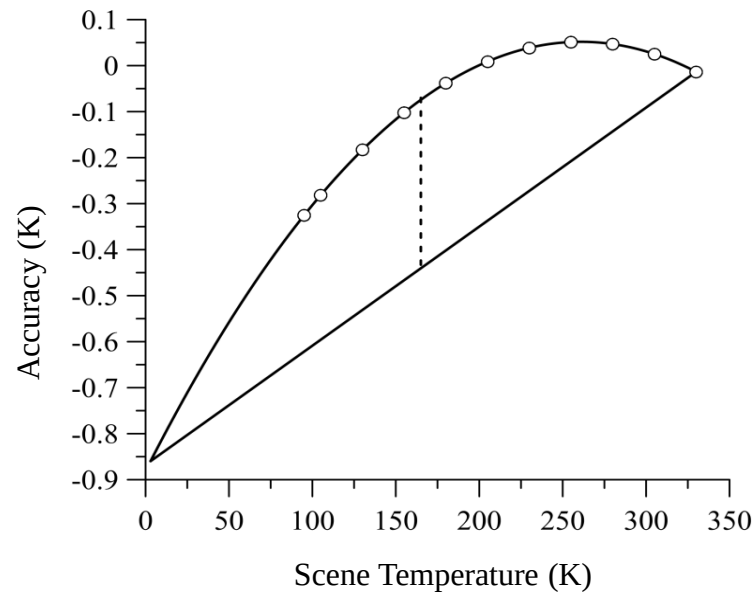
$$T_{b,ch} = T^{w}_{b,ch} + \frac{C^{s}_{ch} - \overline{C^{w}_{ch}}}{\overline{C^{w}_{ch}} - \overline{C^{c}_{ch}}}(T^{w}_{b,ch} - T^{c}_{b,ch}) + 4T_{NL}x(1-x)$$

$$\overline{C^{w}_{ch}}(i) = \sum_{k=i-N_s}^{i+N_s} \sum_{j=1}^{4} W_{k-i} C^{w}_{ch}(k,j)$$

$$\overline{C^{c}_{ch}}(i) = \sum_{k=i-N_s}^{i+N_s} \sum_{j=1}^{4} W_{k-i} C^{c}_{ch}(k,j)$$

$$\overline{G_{ch}}(i) = \frac{\overline{C^{w}_{ch}}(i) - \overline{C^{c}_{ch}}(i)}{\overline{T^{w}_{b,ch}}(i) - T^{c}_{b,ch}}$$

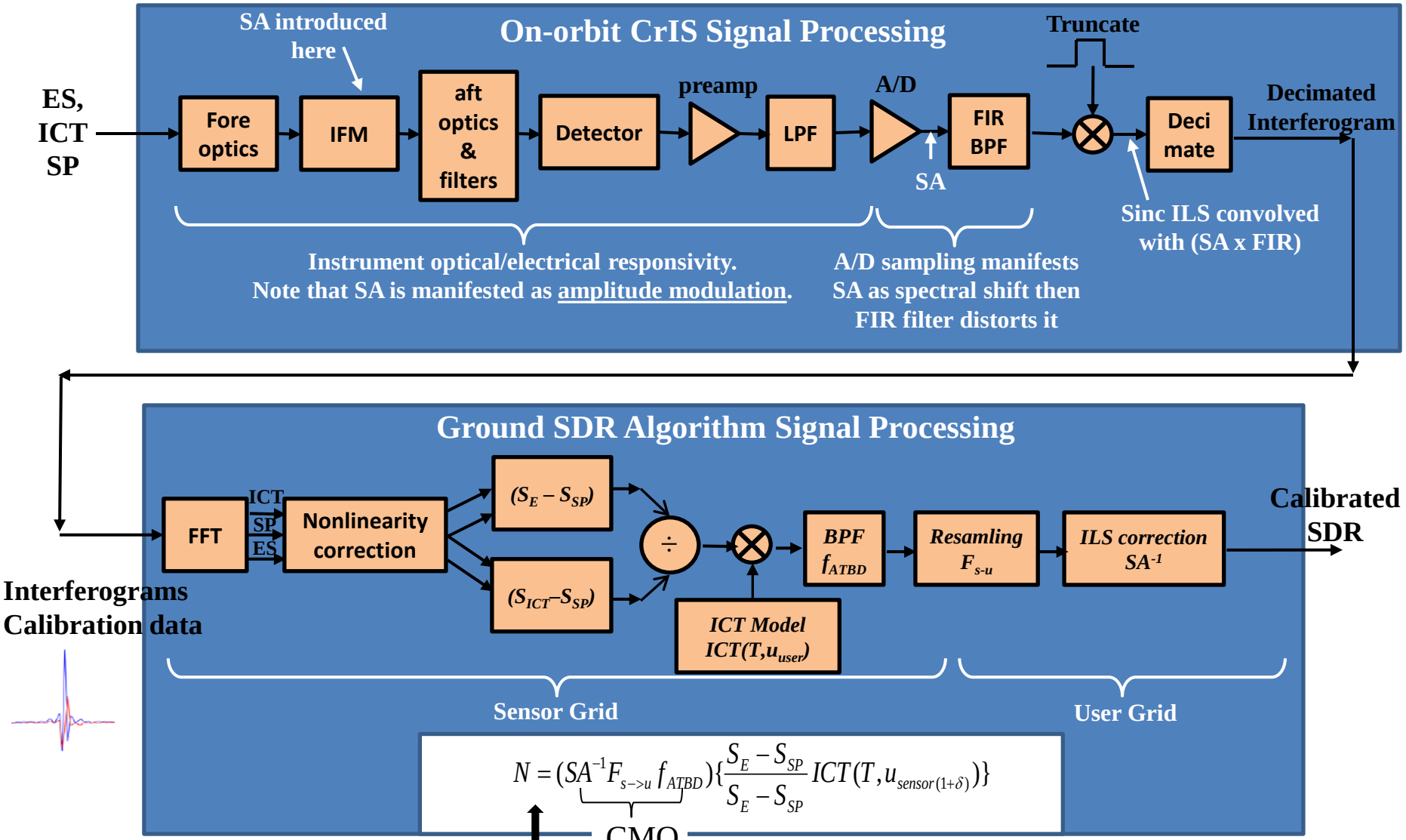
$$x = \frac{T_{b,l} - T_c}{T_w - T_c}$$



Nonlinearity of ATMS channel 1, calculated for cold plate (CP) at 5°C for redundancy configuration 1 (RC1). Blue dots represent the measured scene temperatures. Black solid curve represents the regression curve. Dashed line represents the peak nonlinearity.

A dramatic difference from AMSU calibration is the treatment of nonlinearity term which is derived from the medium theorem and x is a parameter derived from the linear term.

Current Ground SDR Algorithm



$$N = (\underbrace{SA^{-1} F_{s->u} f_{ATBD}}_{\text{CMO}})\{\frac{S_E - S_{SP}}{S_E - S_{SP}} ICT(T, u_{sensor(1+\delta)})\}$$

Not optimal for full spectral resolution mode processing

Example of Cal. Algorithm Difference

Algorithms are implemented in ADL and then compared

Proposed 2

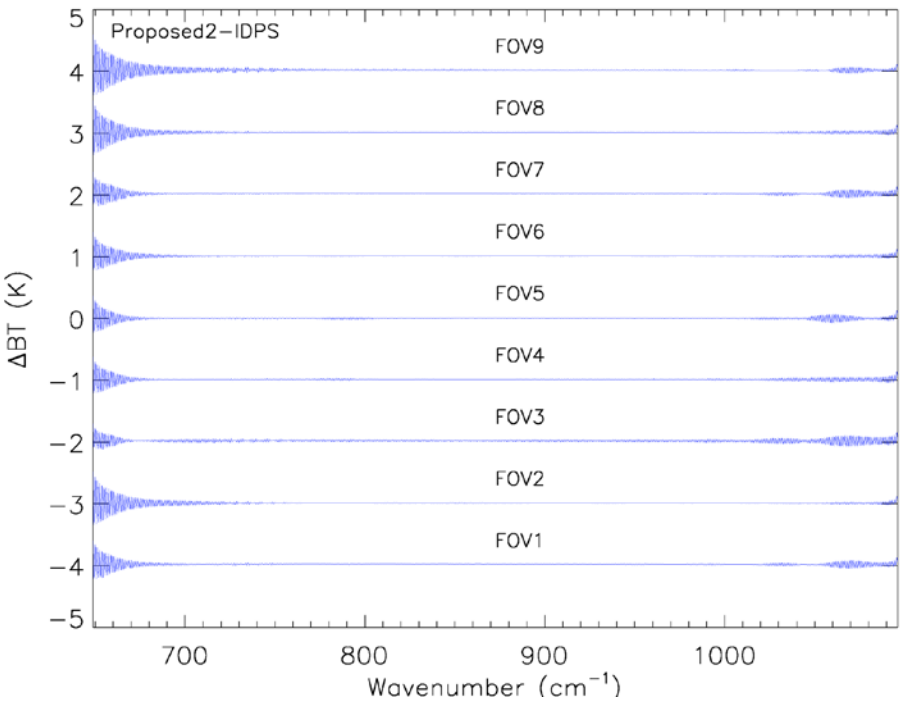
$$N = ICT(T, u_{user}) \cdot \left\{ \frac{F_{s\to u} \cdot SA_s^{-1} \cdot f_{ATBD} \cdot \left(FIR^{-1} \cdot (S_E - S_{SP})\right)}{F_{s\to u} \cdot SA_s^{-1} \cdot f_{ATBD} \cdot \left(FIR^{-1} \cdot (S_{ICT} - S_{SP})\right)} \right\}$$

minus

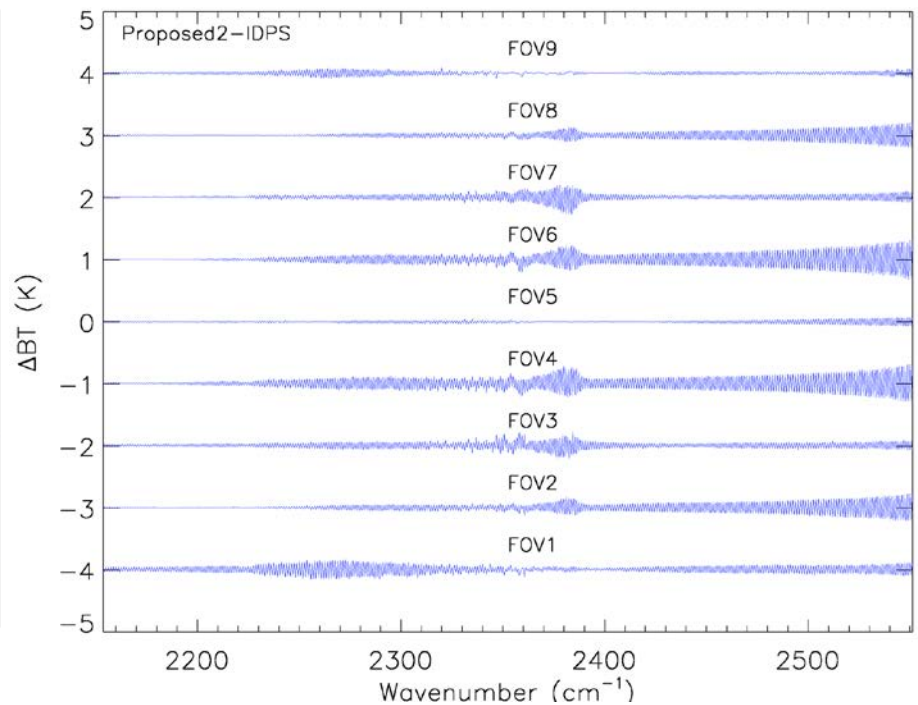
Current IDPS

$$N = (SA^{-1} F_{s->u} f_{ATBD}) \{ \frac{S_E - S_{SP}}{S_E - S_{SP}} ICT(T, u_{sensor(1+\delta)}) \}$$

LW Band (FOR 1)

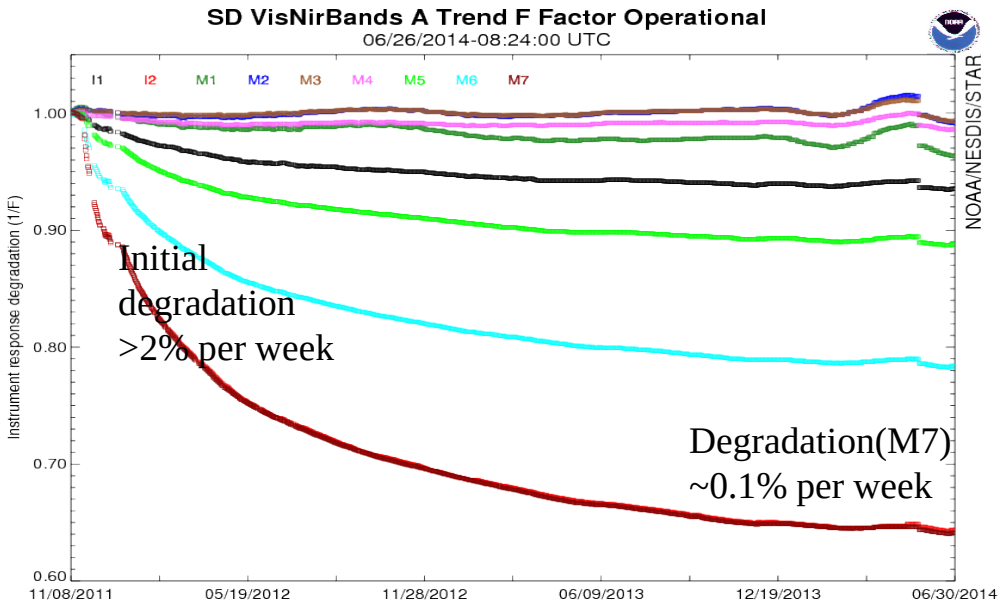


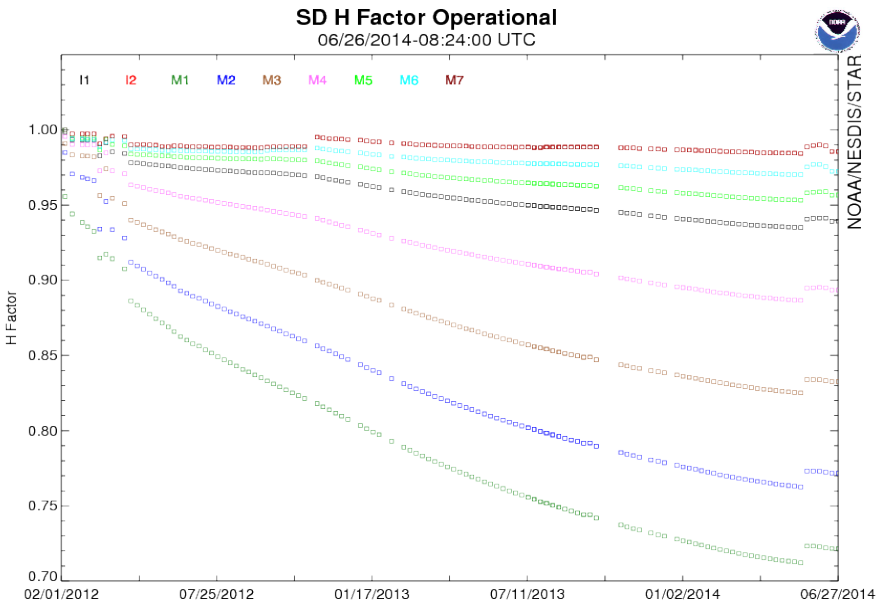
SW Band (FOR1, full resolution)



Significant difference (ringing) seen in all three bands (unapodized) 0.1 – 0.5 K

VIIRS Long-Term Trending





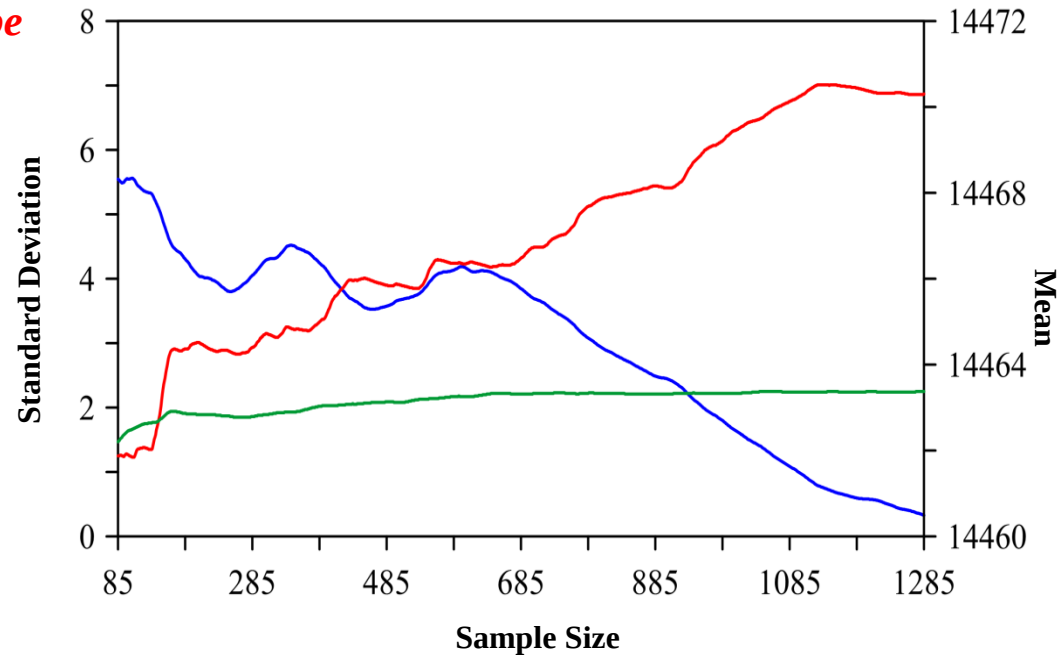
- RTA degradation leveling off
- For M7, initially > 2% per week; Currently ~0.1% per week
- H-factor degradation continues. Impact on OC requires additional studies

ATMS Noise Equivalent Temperature (NEDT)

For a time series with a stable mean, the standard deviation of the measurements can be used as NEDT:

$$\sigma_{ch} = \left[\frac{1}{4N} \sum_{i=1}^{N} \sum_{j=1}^{4} \left(\frac{C_{ch}^{w}(i,j) - \overline{C_{ch}^{w}}(i)}{\overline{G_{ch}}(i)} \right)^2 \right]^{1/2}$$

For a non-steady mean such as ATMS warm count from blackbody target, Allan deviation is recommended for NEDT:



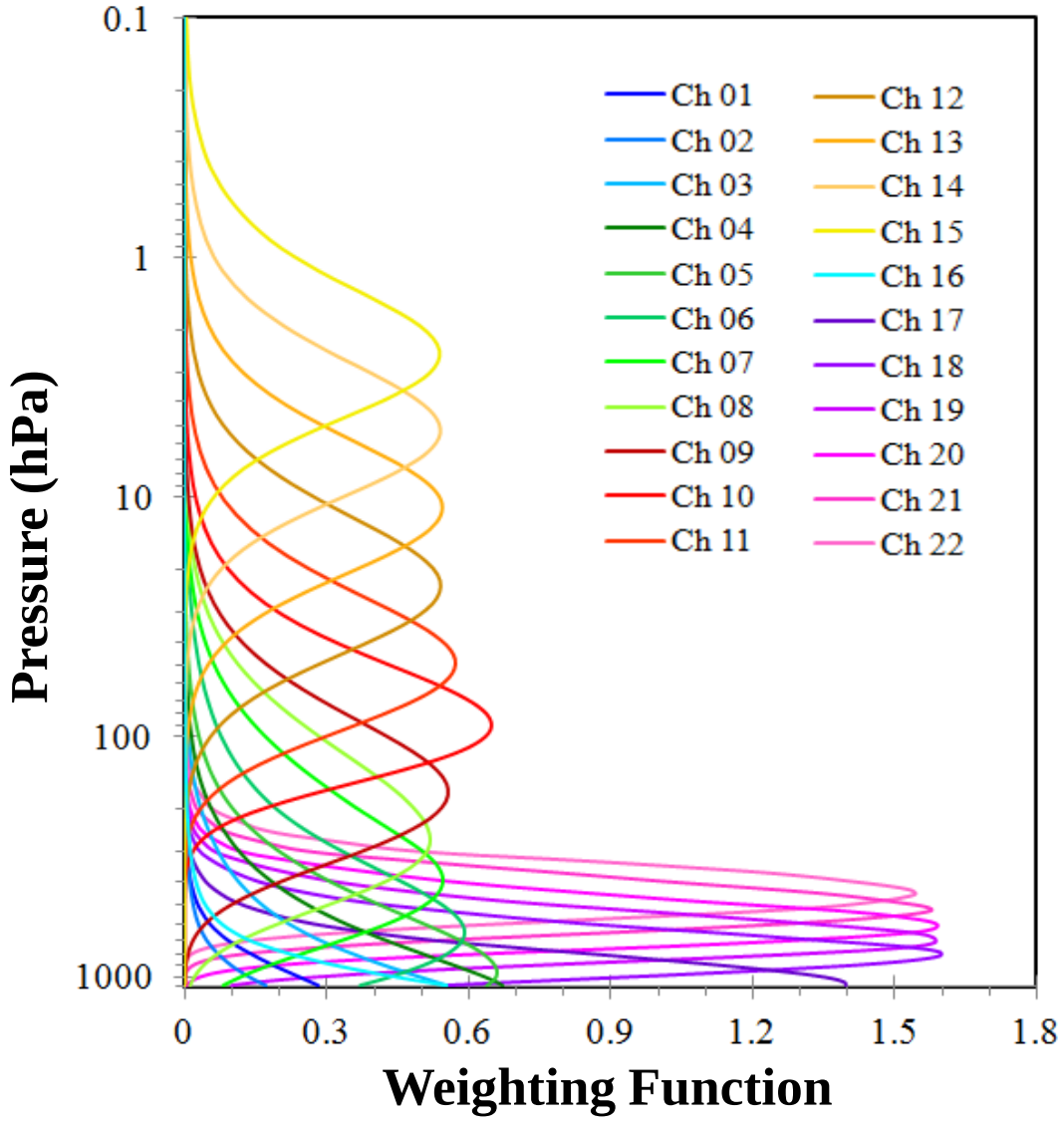
$$\sigma^{Allan}(m) = \sqrt{\frac{1}{2m^2(N-2m)} \sum_{j=1}^{N-2m} \left(\sum_{i=j}^{j+m-1} \left(C_{ch}^{w}(i+m) - C_{ch}^{w}(i) \right) \right)^2}$$

ATMS channel 1 warm count mean (blue, y-axis on the right), the standard deviation (red, y-axis on the left) and the overlapping Allan deviation (green, y-axis on the left) of the 17-scanline (m) average as a function of the total sample size (N).

MSU			AMSU/MHS			ATMS		
Ch	GHz	Pol	Ch	GHz	Pol	Ch	GHz	Pol
			1	23.8	QV	1	23.8	QV
			2	31.399	QV	2	31.4	QV
1	50.299	QV	3	50.299	QV	3	50.3	QH
						4	51.76	QH
			4	52.8	QV	5	52.8	QH
2	53.74	QH	5	53.595 ± 0.115	QH	6	53.596 ± 0.115	QH
			6	54.4	QH	7	54.4	QH
3	54.96	QH	7	54.94	QV	8	54.94	QH
			8	55.5	QH	9	55.5	QH
4	57.95	QH	9	fo = 57.29	QH	10	fo = 57.29	QH
			10	fo ± 0.217	QH	11	fo±0.3222±0.217	QH
			11	fo±0.3222±0.048	QH	12	fo± 0.3222±0.048	QH
			12	fo ±0.3222±0.022	QH	13	fo±0.3222±0.022	QH
			13	fo± 0.3222±0.010	QH	14	fo±0.3222 ±0.010	QH
			14	fo±0.3222±0.0045	QH	15	fo± 0.3222±0.0045	QH
			15	89.0	QV			
			16	89.0	QV	16	88.2	QV
			17	157.0	QV	17	165.5	QH
						18	183.31 ± 7	QH
						19	183.31 ± 4.5	QH
			19	183.31 ± 3	QH	20	183.31 ± 3	QH
			20	191.31	QV	21	183.31 ± 1.8	QH
			18	183.31 ± 1	QH	22	183.31 ± 1	QH

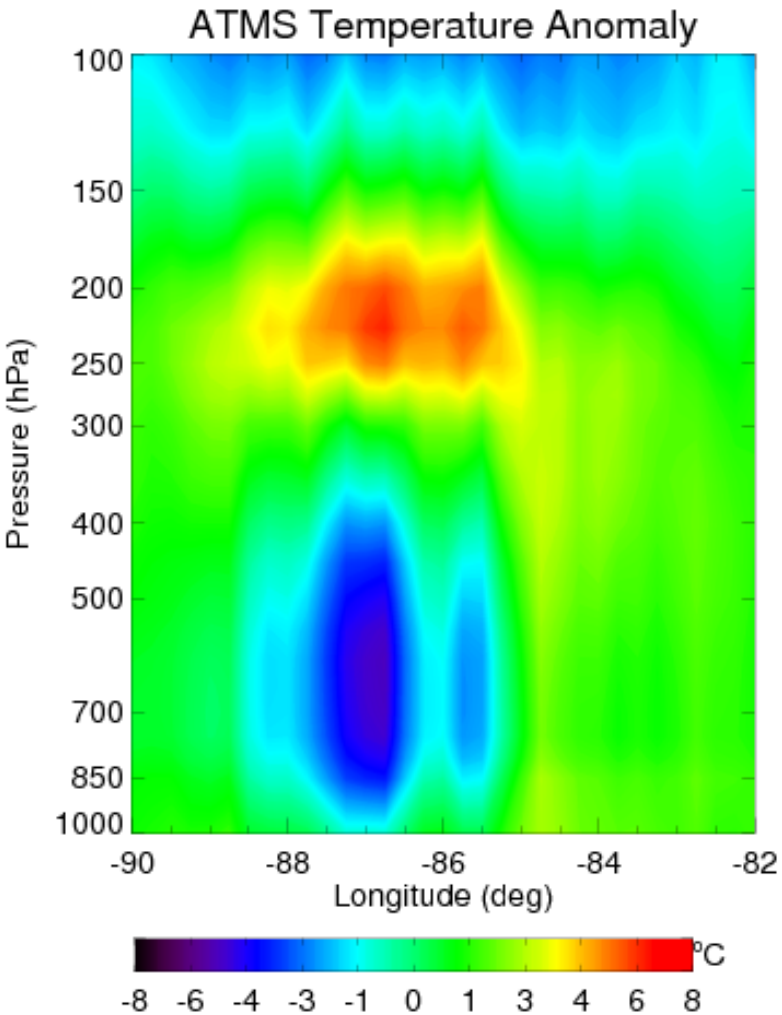
- Exact match to AMSU/MHS
- Only Polarization different
- Unique Passband
- Unique Passband, and Pol. different from closest AMSU/MHS channels

ATMS Channel Weighting Functions

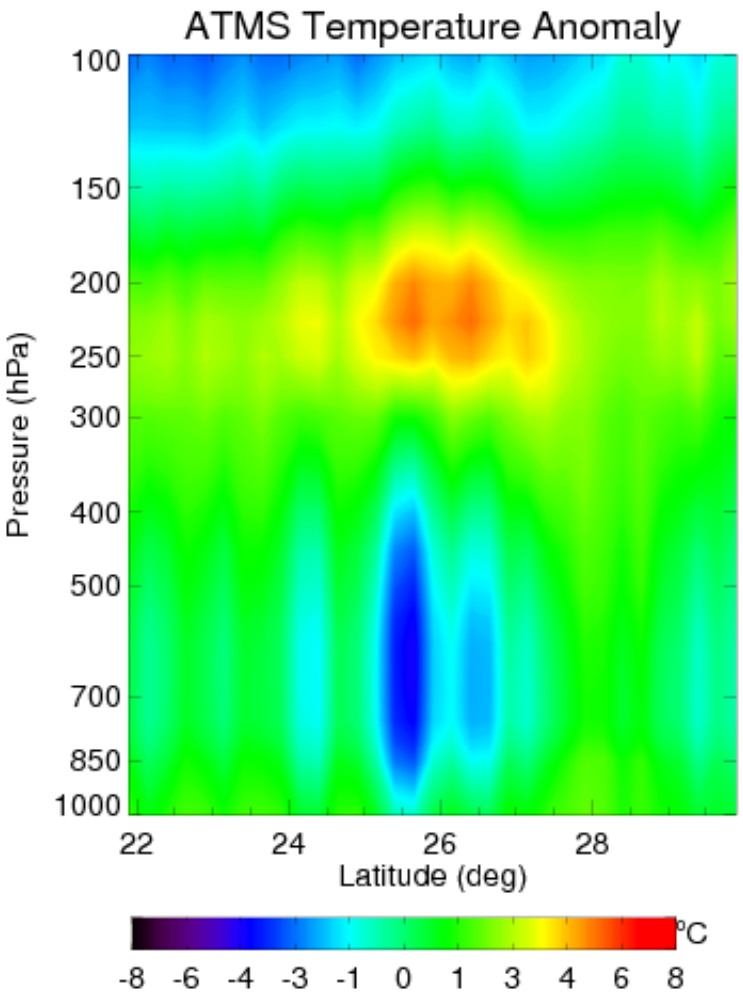


Warm Core - Temperature Anomaly
Hurricane Isaac 08/27/2012

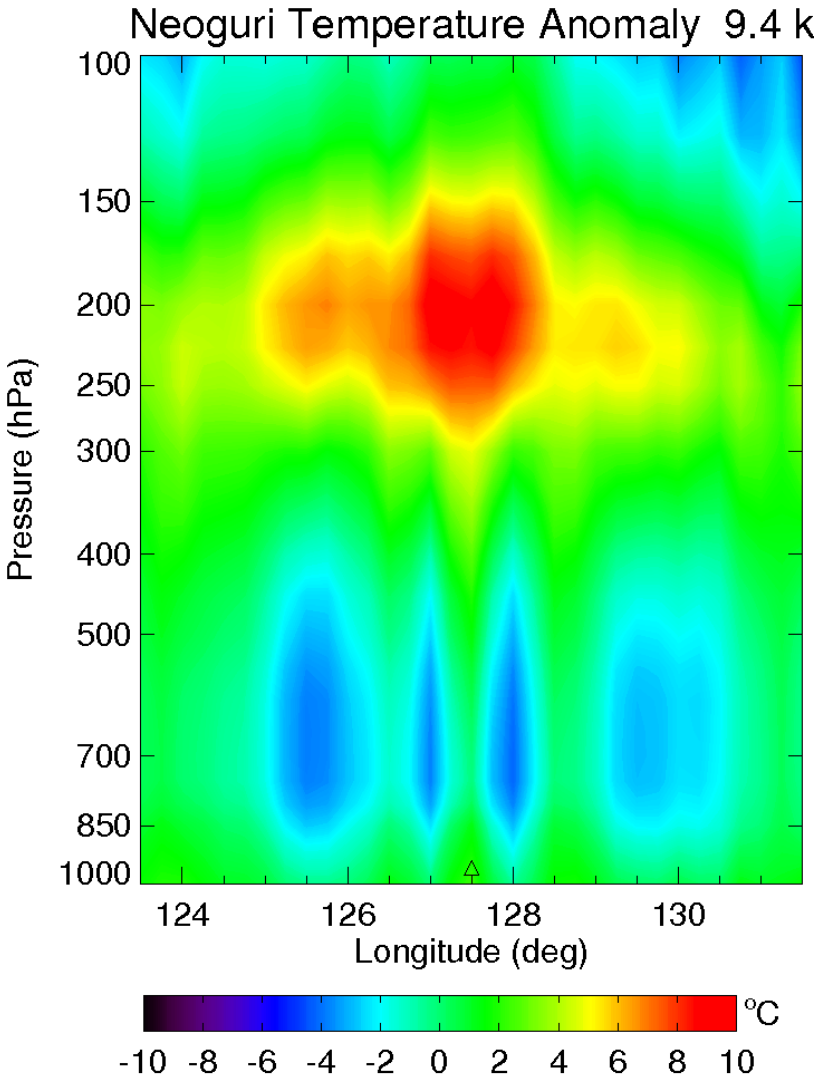
Cross section along 26.0 N

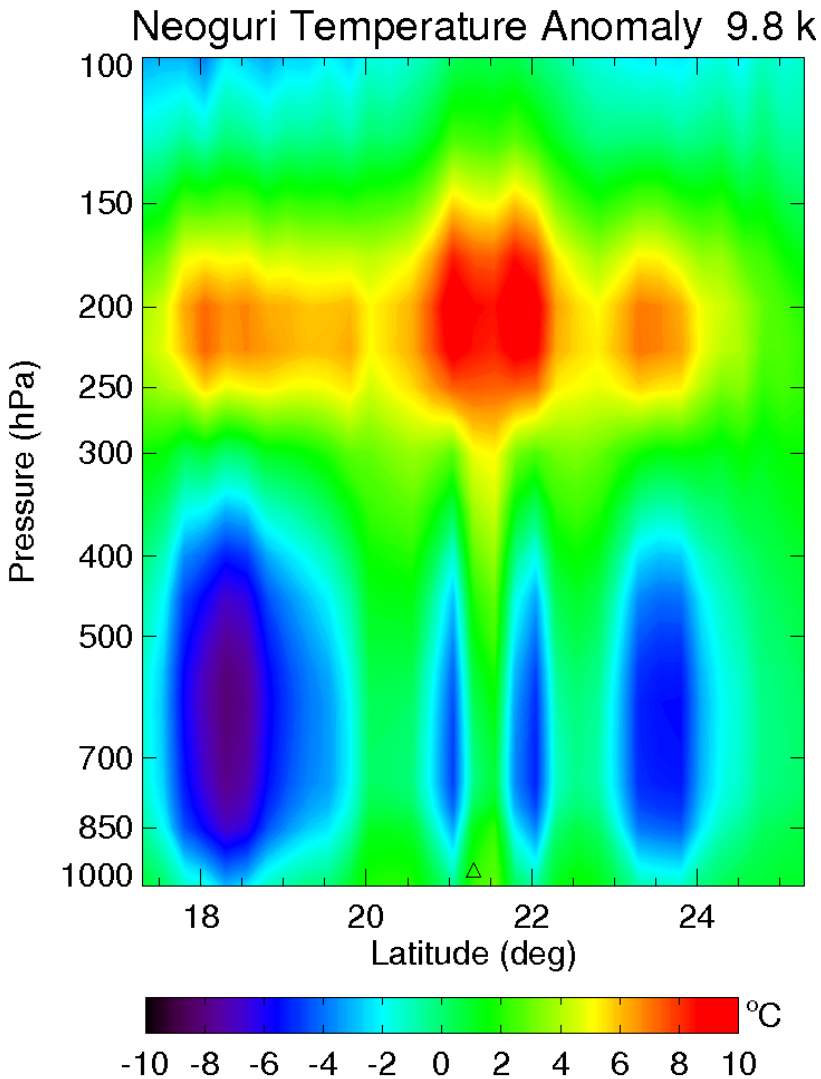


Cross section along 86.0 W



Warm Core - Temperature Anomaly
Typhoon Neoguri 07/07/2014

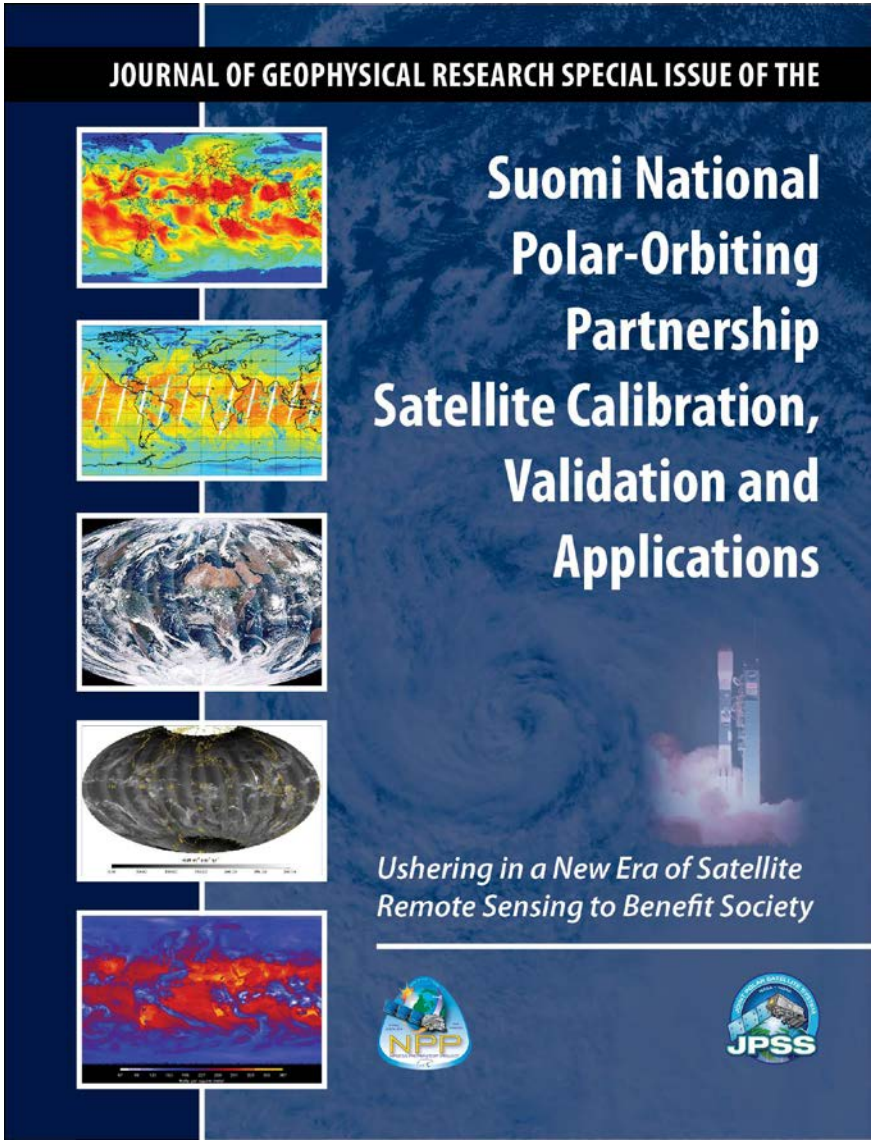




Summary

- SDR Teams are supporting all phases of the Suomi NPP instrument calibration and have completed all the critical tasks for beta version release
- Robust NOAA Integrated CalVal System (ICVS) for SNPP Long Term Monitoring (LTM)
- Stable ATMS SDR system updated with scan angle dependent bias corrections (full conversion from TDR to SDR for KAV bands in MX8.0), lunar correction and striping mitigation algorithms are ready for MX8.2 or higher version.
- Stable CrIS SDR processing system, on-orbit performance significantly exceeds spec., advanced capability for reprocessing full spectral resolution RDR.
- VIIRS instrument continues to perform well, meeting performance specifications. RSB automation was implemented in IDPS (MX8.0). DNB straylight correction was implemented and works well. H-factor discrepancies between the operational and other versions may cause problems in the F factor trends. Recent flattening in the F-factor trend requires further investigation
- Transition of NASA OMPS calibration SDR capability for NOAA operation was reviewed and approved. OMPS smear/dark/straylight corrections have been resolved. The OMPS EV SDR will be in a full validated maturity once the CalSDR is operational in GRAVITE.
- SDR teams start working on J1 prelaunch characterizations of all the instruments, preparing for J1 SDR algorithm upgrades.
- Documentation of all the SNPP SDR sciences and operational codes have been completed, including ATBD and user manuals, error budgets
- A lot of peer review papers have been published in JGR special issue and other high quality journals

JGR Special Issue on Suomi NPP CalVal

34 papers have been accepted in AGU Journal Geophysical Research Special Issue on Suomi NPP satellite calibration, validation and applications.

Guest Editor: Fuzhong Weng