JPSS Sensor Data Record (SDR) Overview

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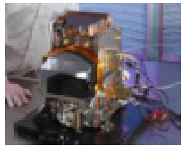
NOAA/NESDIS/Center for Satellite Applications and Research (STAR)

Outline

- Suomi NPP SDR Status and Reprocessing
- Applications of Suomi NPP SDR Data in NWP
- J1 SDR Algorithm Status and Schedule
- Summary and Conclusions

Suomi NPP Instruments and Their Applications

NPP/JPSS Instrument		NOAA Mission Benefits
	**Advanced Technology Microwave Sounder (ATMS)**	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
	**Cross-track Infrared Sounde (CrIS)**	
	**Visible Infrared Imaging Radiometer Suite (VIIRS)**	VIIRS provides many **critical imagery products** including snow/ice cover, clouds, fog, aerosols, fire, smoke plumes, vegetation health, phytoplankton abundance/chlorophyll. All are required for environmental hazard monitoring and are useful for crucial economic sectors (transportation, fishing, energy, agriculture), all of which impact human health
	**Ozone Mapping and Profiler Suite (OMPS)**	Total ozone for **monitoring ozone** hole and recovery of stratospheric ozone and for UV index forecasts
	**Clouds and the Earth's Radiant Energy System (CERES)**	Provide **climate quality measurements** of the Earth's outgoing radiation budget- longwave infrared, reflected solar flux, and incoming solar radiation, all of which are vital to climate monitoring

Suomi NPP TDR/SDR Algorithm Schedule

Sensor	Beta	Provisional	Validated
CrIS	February 10, 2012	February 6, 2013	March 17, 2014
ATMS	May 2, 2012	February 12, 2013	March 17, 2014
OMPS	March 7, 2012	March 12, 2013	September 17, 2015
VIIRS	May 2, 2012	March 13,, 2013	April 17, 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

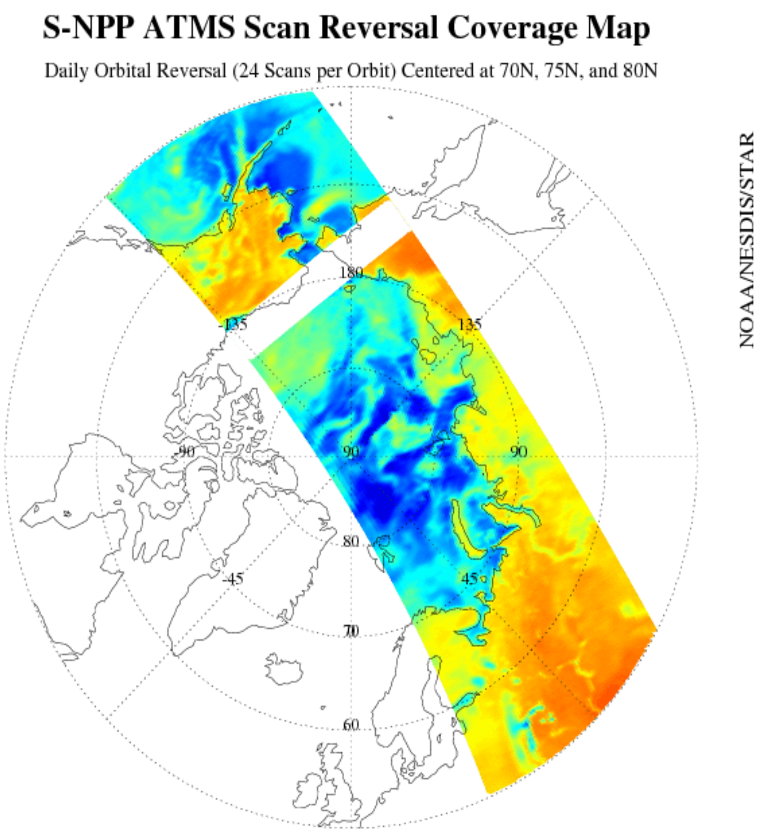
- Product quality may not be optimal
- Incremental product improvements are still occurring as calibration parameters are adjusted with sensor on-orbit characterization (versions will be tracked)
- General research community is encouraged to participate in the QA and validation of the product, but need 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

JPSS SDR 2016 Major Accomplishments

- CrIS full spectral resolution (FSR) SDR data are routinely produced at STAR processing system and the FSR data have been made available to the user community for various applications and research
- ATMS SDR team have completed the two-round J1 ATMS TVAC analysis, is timely supporting the anomaly investigations, and the team is prepared for the third round performance analysis after the ATMS channel 17 anomaly is fixed.
- VIIRS SDR team delivered J1 codes that accommodate 13 waivers (e.g. DNB aggregation). RSBautocal has been transitioned into IDPS operation. VIIRS SDR team, STAR OC team and NASA VCST are further working on uses of lunar observations to improve the RSB calibration
- J1 OMPS SDR algorithm was delivered with calibration tables and LUTs, after its end-to-end tests. The core dump issue in the OMPS 43 data sets was found and associated with the FSW compressor
- STAR Integrated CalVal System (ICVS) is monitoring the ATMS scan motor current excursion and the ICVS team has been supporting the NASA/NOAA decision makers for defining the Suomi NPP ATMS scan reversal scheme
- Suomi NPP SDR reprocessing project is initiated and a high quality of SDR data sets from ATMS and CrIS have been reprocessed and can be applied for climate applications



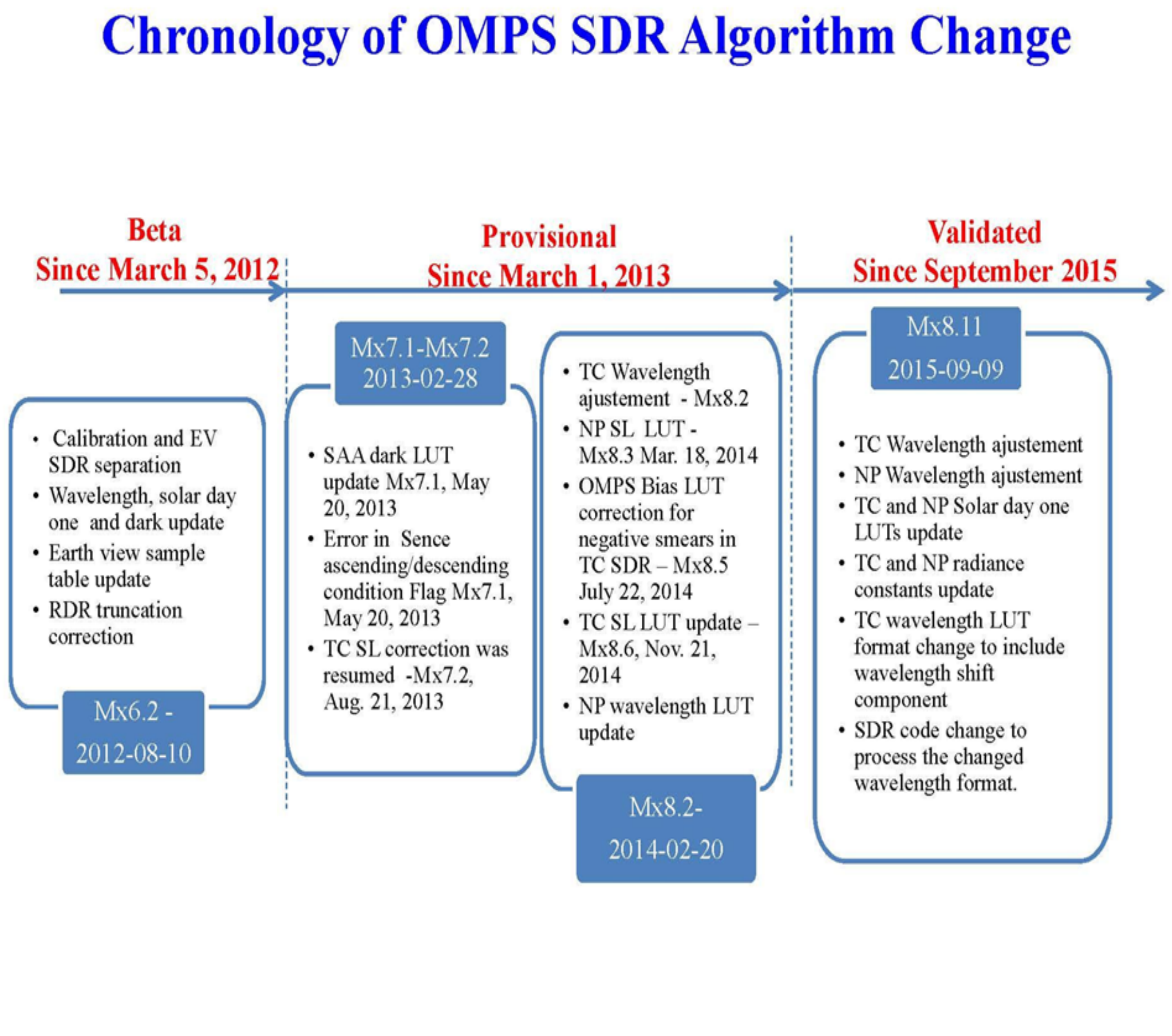
Objectives of JPSS Life-Cycle Data Reprocessing

- Optimize the algorithms and processing systems to achieve the lowest JPSS data uncertainties

- Implement the mission-life consistent sciences to achieve a long-term stability of JPSS data accuracy

- Reduce the processing anomalies to the lowest level for preserving the highest integrity of the JPSS data stream

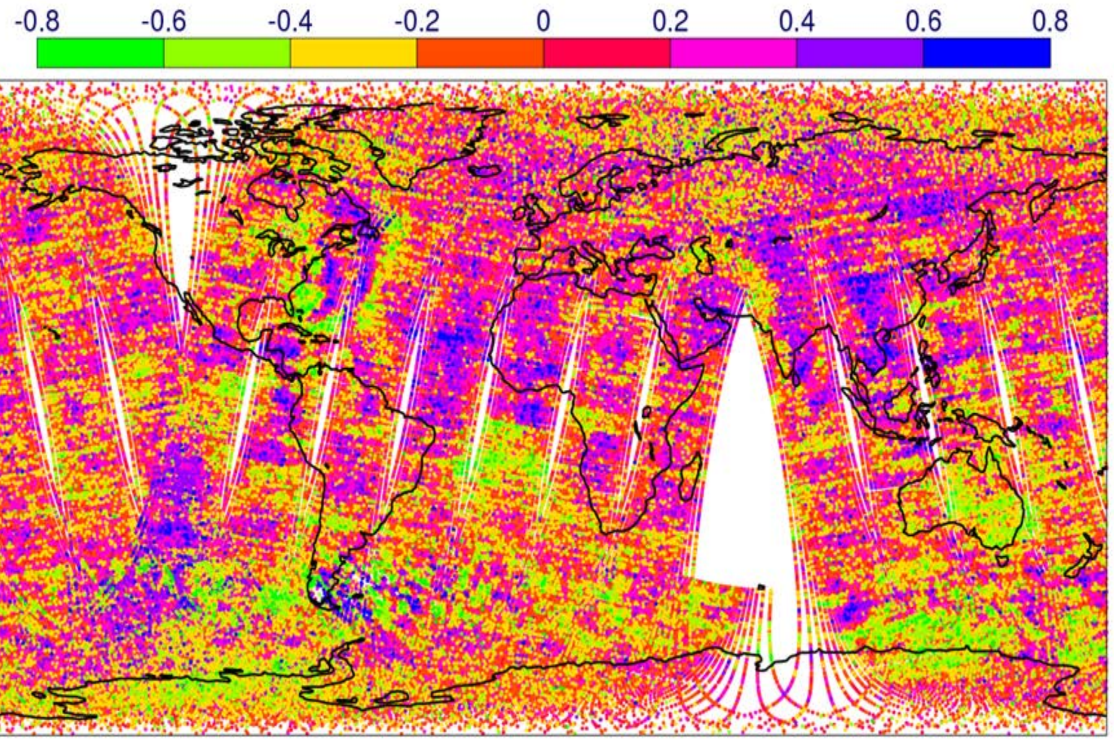
- Incorporate the user-oriented algorithm sciences into reprocessing to further augment the society impacts of JPSS datasets



Technical Approaches for JPSS Data Reprocessing

- Integrate the recommendations from user's community into the JPSS life-cycle data reprocessing plan
- Build a cost and effective HPC infrastructure for JPSS data reprocessing and accessing
- Utilize the latest version of algorithms with new sciences fully vetted by the calval teams
- Recover the missing/repaired granules from every possible archival and medium
- Update all the processing coefficient tables, look up tables and engineering package in reprocessing

ATMS NRT data:



Heather Laurence, ECMWF reported at 2016 NOAA JPSS Reprocessing Workshop

Example of NWP User Recommendations for ATMS/CrIS Reprocessing

- Lunar intrusions in cold calibration should be flagged for whole ATMS time series (ECMWF)
- Lunar intrusion correction should be applied for whole ATMS time series (ECMWF)
- ATMS striping correction algorithms need to be applied for reprocessed data (ECWMF)
- ATMS data stream at temperature sounding channels need to be remapped to AMSUA-like channels (NCEP)
- ATMS channel correlations should be well quantified through reprocessed data (NRL)
- CrIS data can be collocated with VIIRS imager data to assist in cloud-detection (ECMWF)
- CrIS data stream should be generated at both normal and full spectral resolution (NCEP)

Examples of VIIRS User Recommendations

- A “hybrid methodology” by combining SD and lunar calibrations is necessary for VIIRS calibration due to the RTA uniformity degradation (OC team)

- SD/SDSM calibration provide stable and clean calibration coefficients but each component must be robustly characterized – VF, BRF, H-factor, F-factor, Hybrid coefficients (OC team)

- VIIRS RSB channels requires the calibration stability of 0.1 – 0.2% level for the ocean color products (OC team)

- Warm up and cool down (WUCD) in thermal calibration results in spikes in VIIRS derived SST. Thermal channel calibrations should be compared w/o (WUCD) in VIIRS SDR reprocessing and be assessed on SST impacts (SST Team)

- VIIRS EDR repressing should be implemented with the enterprise algorithms (Land Team)

- VIIRS EDR reprocessing should be based on a holistic approach and should estimate impact of SDR and upstream product changes on downstream product such AOT (Aerosol Team)

OMPS User Recommendations

- Improved characterization of darks, radiance and irradiance calibration constants, non-linearity, stray light and intra-orbit NM wavelength scales provide good SDR adjustments and have improved product accuracy
- The OMPS NM SDRs show a small cross-track bias in their calibration
- The OMPS NP has experienced a small amount of throughput degradation for the shortest wavelengths but its time dependence is accurately determined
- The OMPS NP has an annual cycle in its wavelength registration, and the 27-day and 11-year solar activity produces corresponding radiance variations.
- The OMPS NP SDRs show a small, wavelength-dependent bias in their calibration versus NOAA-19 SBUV/2

SMCD/CICS Cluster for JPSS Reprocessing

- Cluster: 36 nodes with each node having 24 cores
- Hard disk/node: 236 GB
- Memory/core: 64 GB
- Total distributed cluster storage: 1 Petabytes
- Operating system: 64-bit Linux (Red Hat)
- Aggregated network speed (storage to compute): 56 gigabits / second
- Job management: PBS Torque and MAUI
- Optimized ways of job submission for different sensors

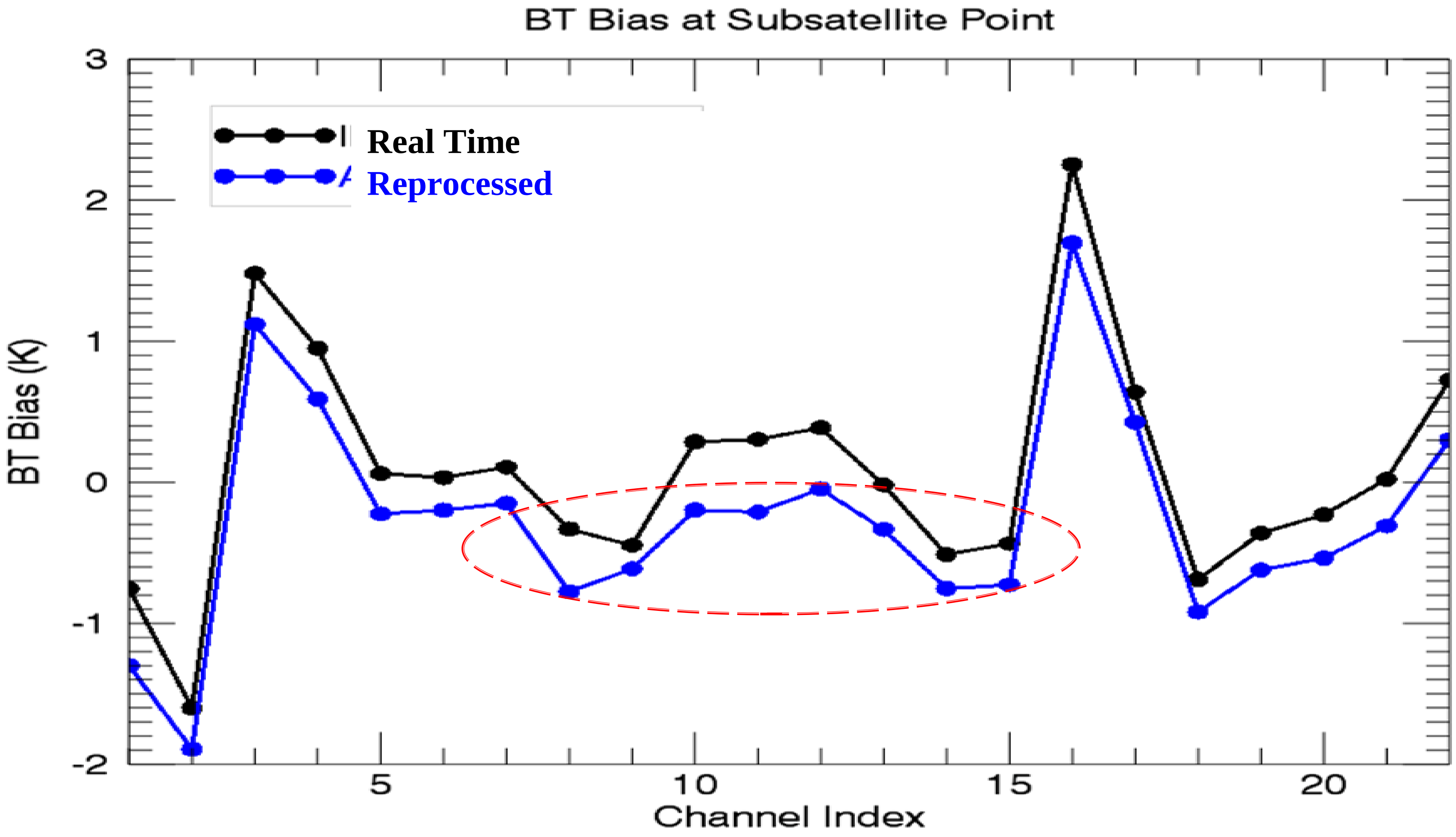
Suomi SNPP SDR Reprocessing Benchmark Tests

Instrument	Process Time Needed for One-Year SDR Data
ATMS	5 hours
CrIS	1 day
OMPS NP	2.8 hours
OMPS TC	18 hours
VIIRS	8.5 days
S-NPP Total	10 days

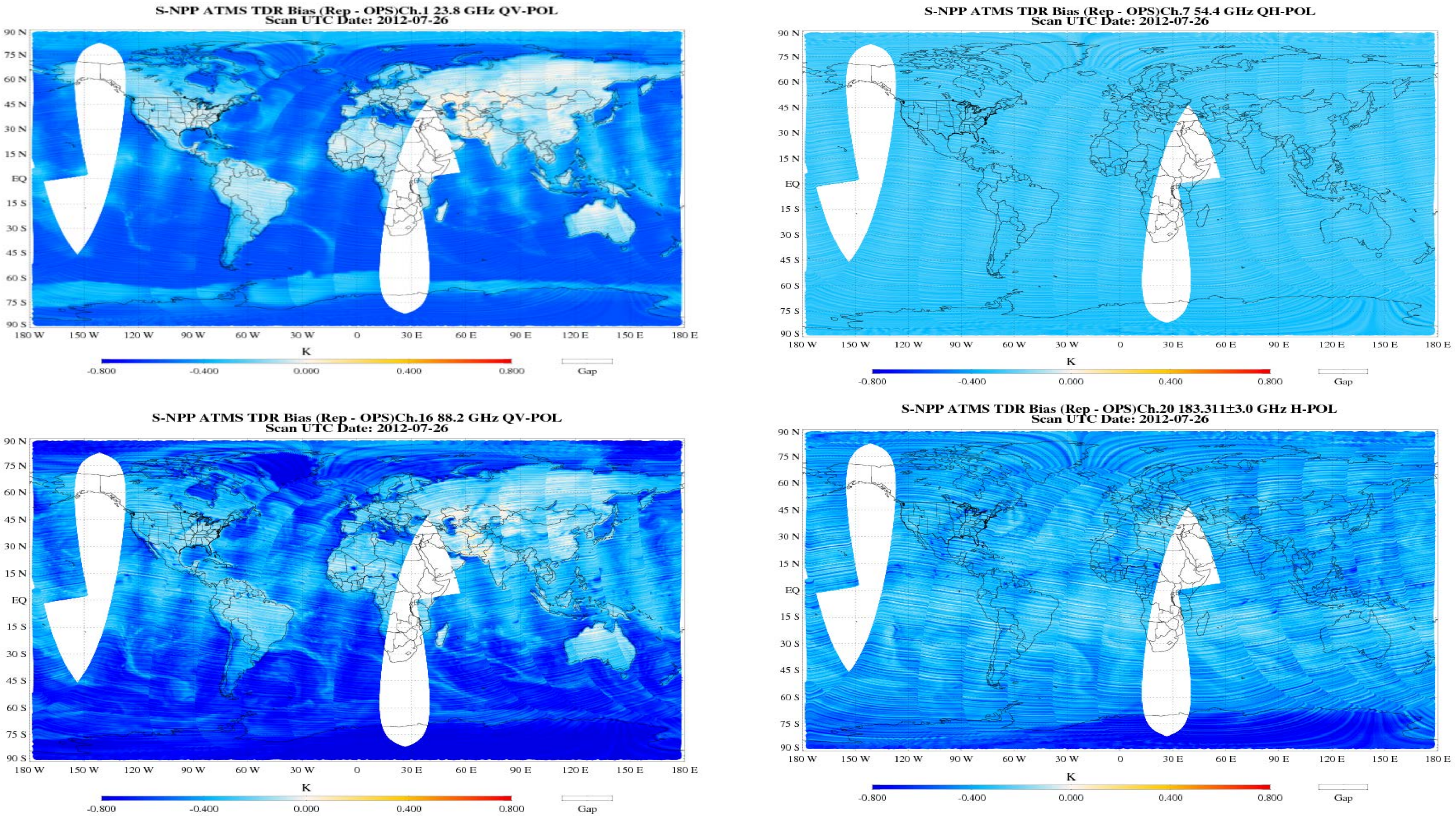
Suomi NPP Yearly SDR Data Volume

Instrument	Input Data	Output Data
ATMS	185 GB	400 GB
CrIS	6.57 TB	17.2 TB
OMPS NP	30 GB	86 GB
OMPS TC	138 GB	1.1 TB
VIIRS	20 TB	230 TB
S-NPP Total	27 TB	275 TB

ATMS TDR Mean Bias after Reprocessing



ATMS TDR Difference between Reprocessing and Operation

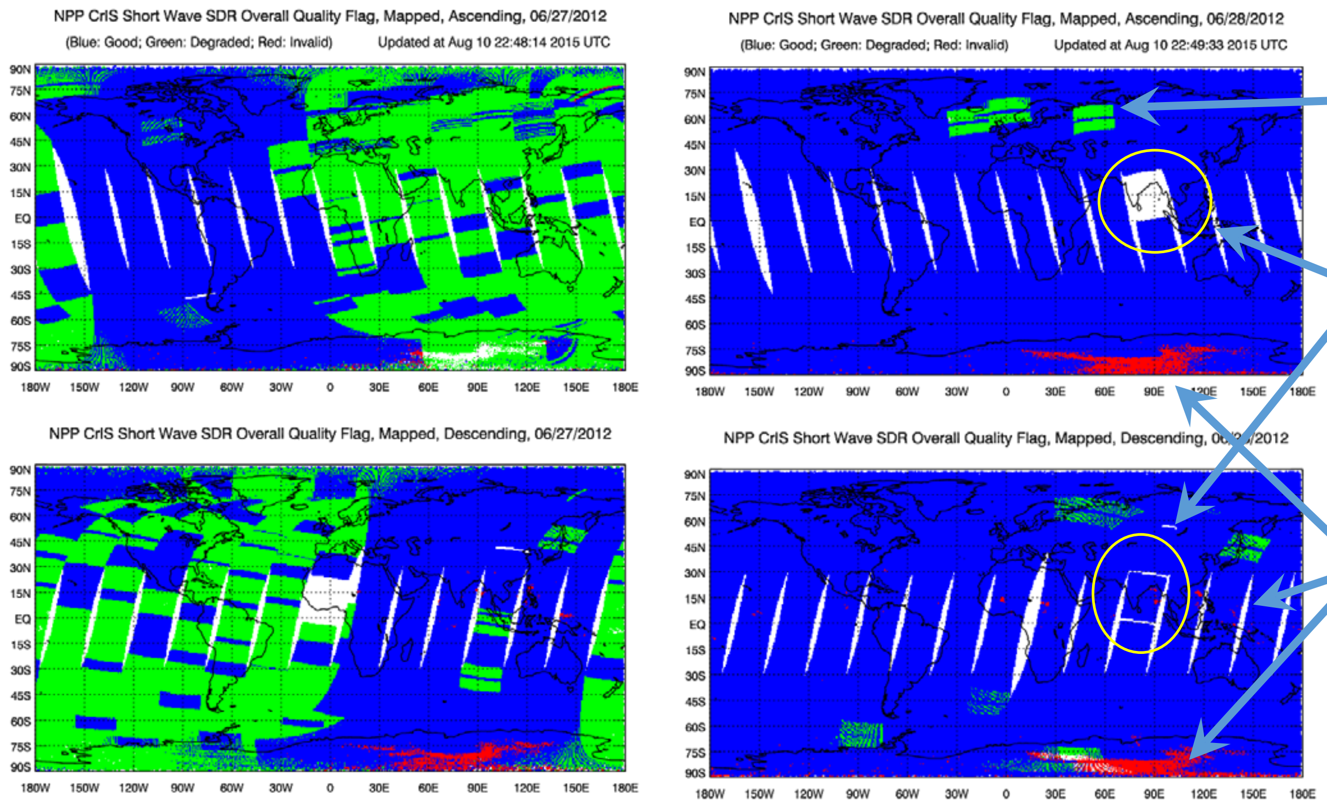


Impacts of CrIS SDR Algorithm Update on Data Quality

Internal thermal drift thresholds in engineering packet were updated around 14:00 on June 27, 2012

The next day after this update

Remaining issues will be fixed after reprocessing

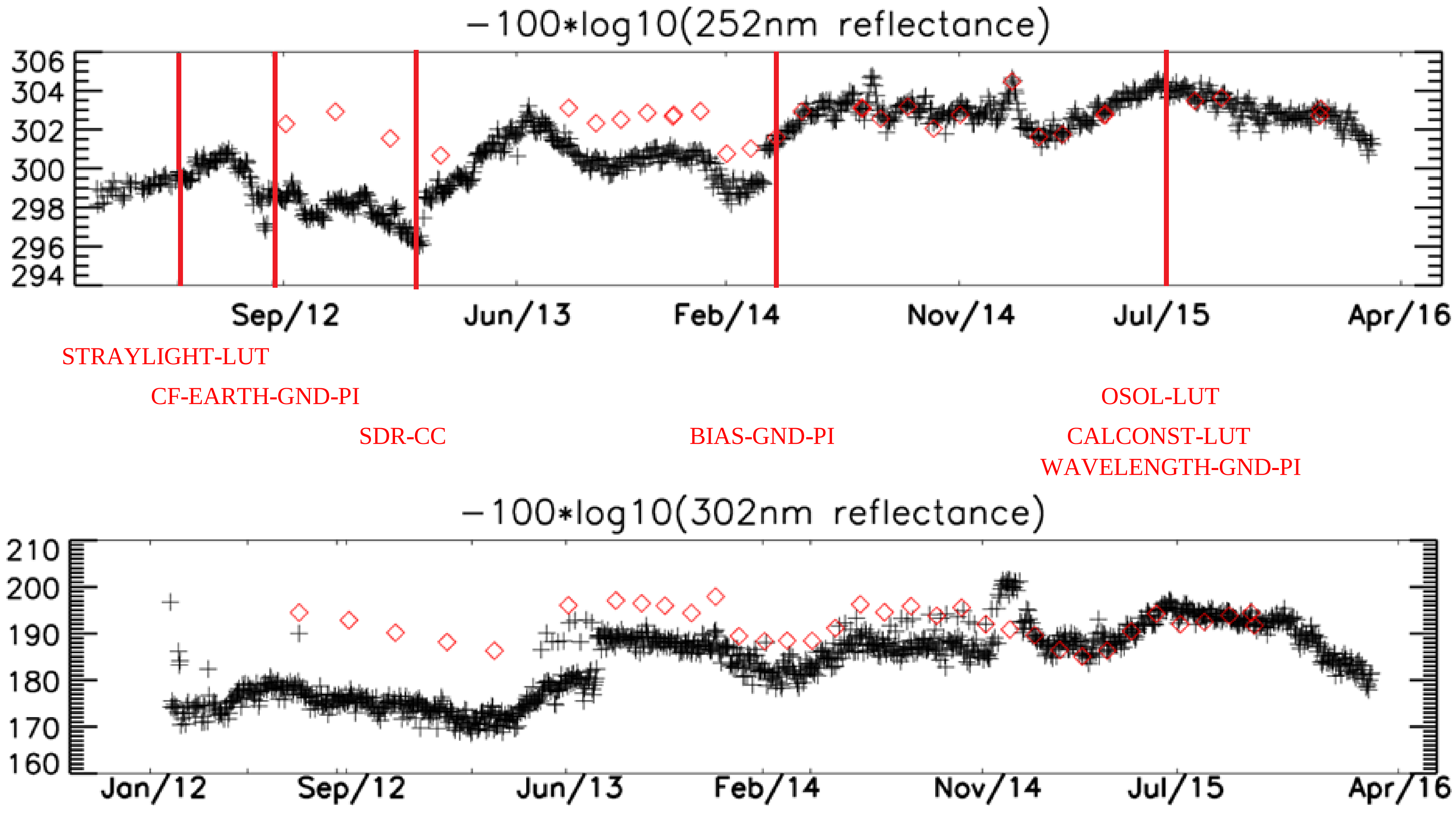


Cooler stage thermal drift limit is still too tight

Blank granules with pre-defined filled values, i.e. the '1958' granules

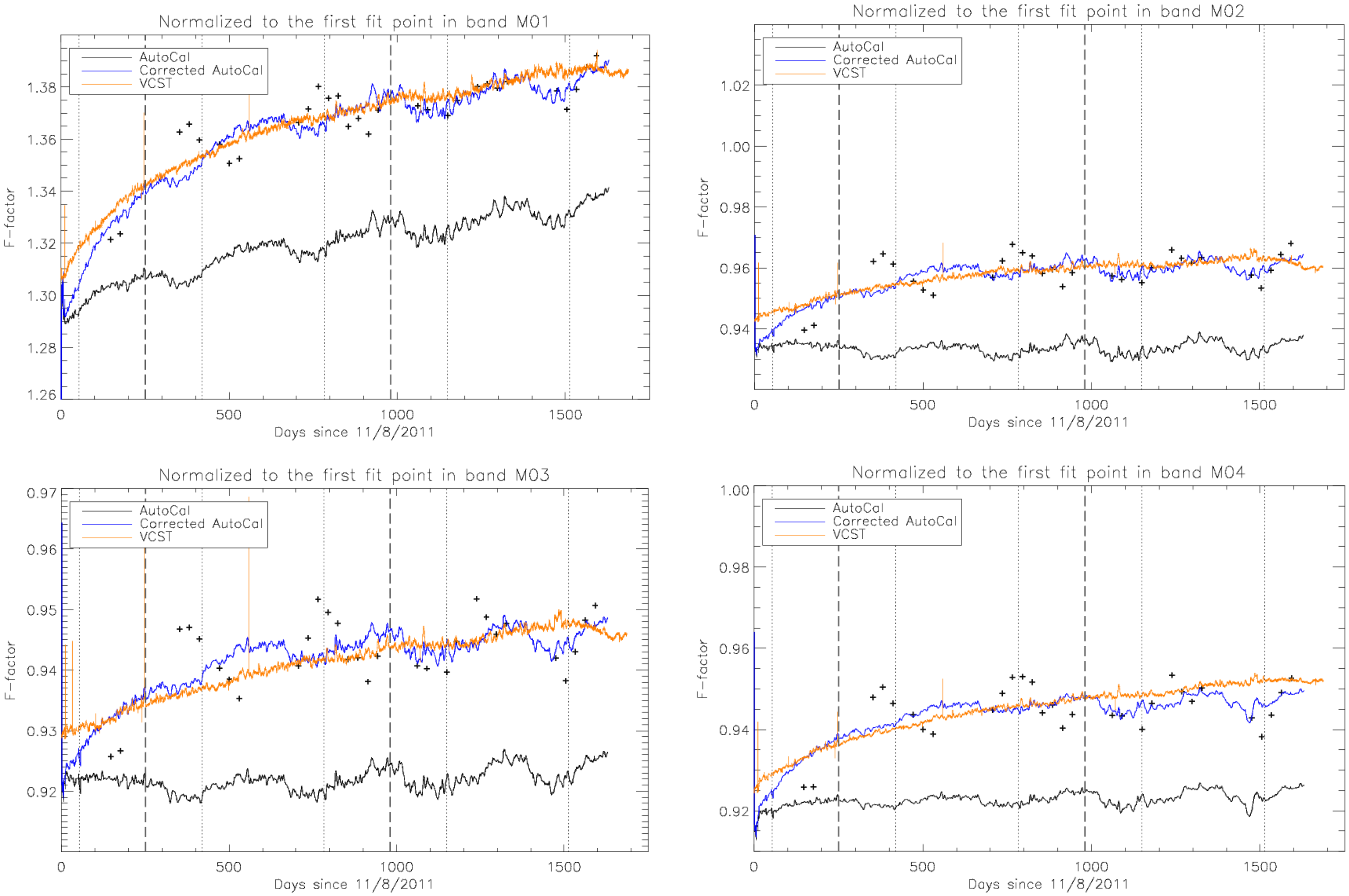
False alarm: Negative values as thresholds for Short-wave radiance invalidity over very cold scenes, i.e. Antarctic, Tropical cloud tops

Impacts of OMPS SDR Algorithm LUT Update on Data Quality



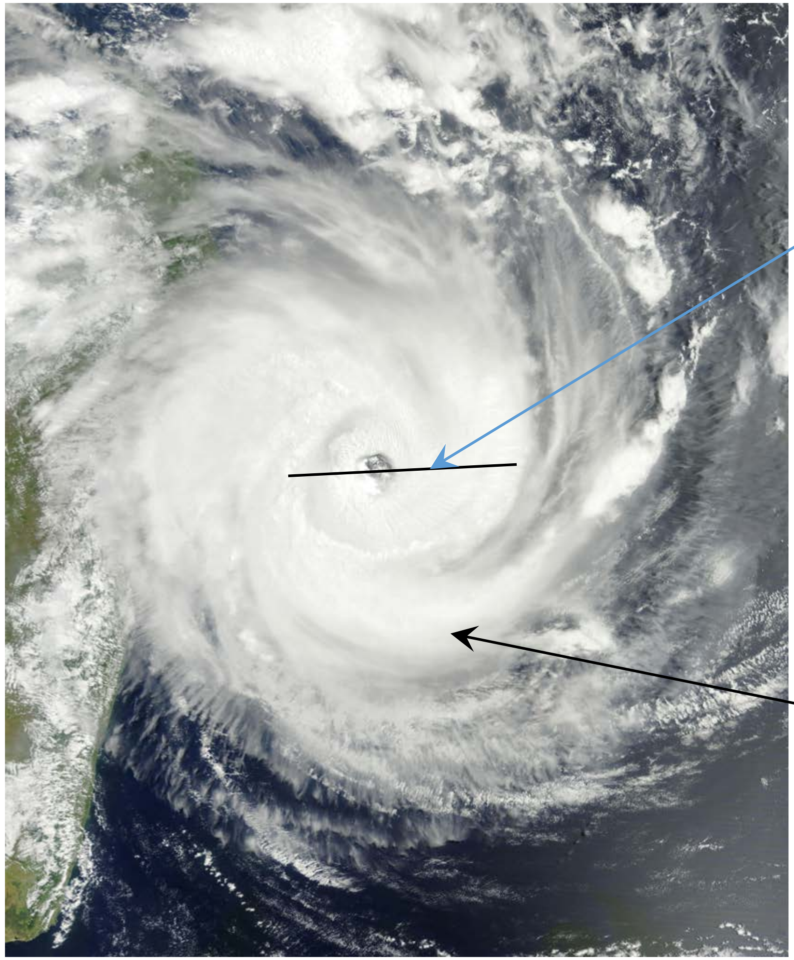
OMPS daily nadir view reflectance trending produced by ADL4.2 with up-to date table

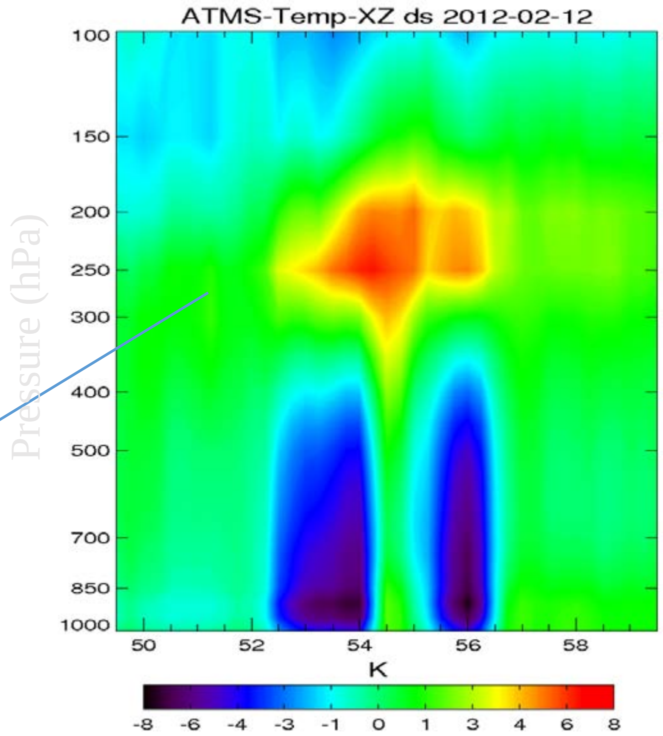
VIIRS SDR F-Factor from Lunar-Corrected RSBAutocal



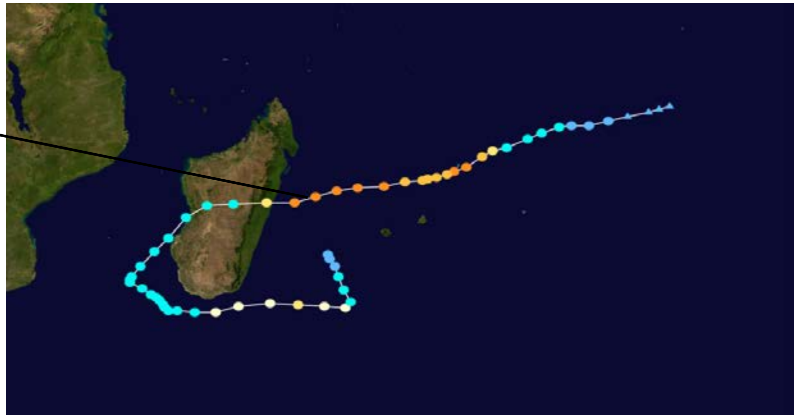
ATMS Monitors Well the Development of Tropical Cyclone Giovanna

Giovanna at Feb 13 2012 0630Z
MODIS Visible Channel

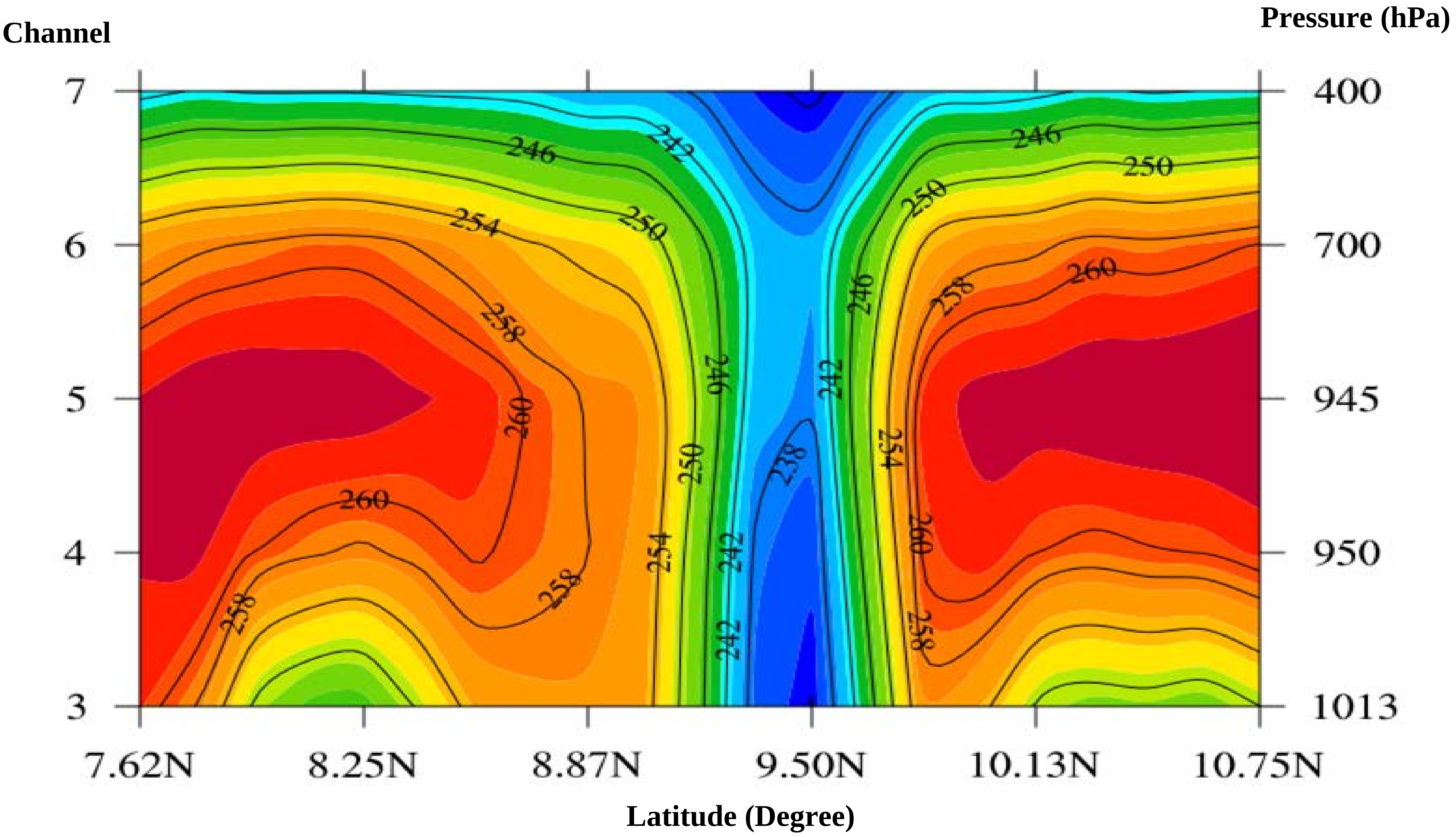




A warm core of 8K
ore more at 250 hPa
from ATMS
indicated
a category 4 to 5
hurricane intensity

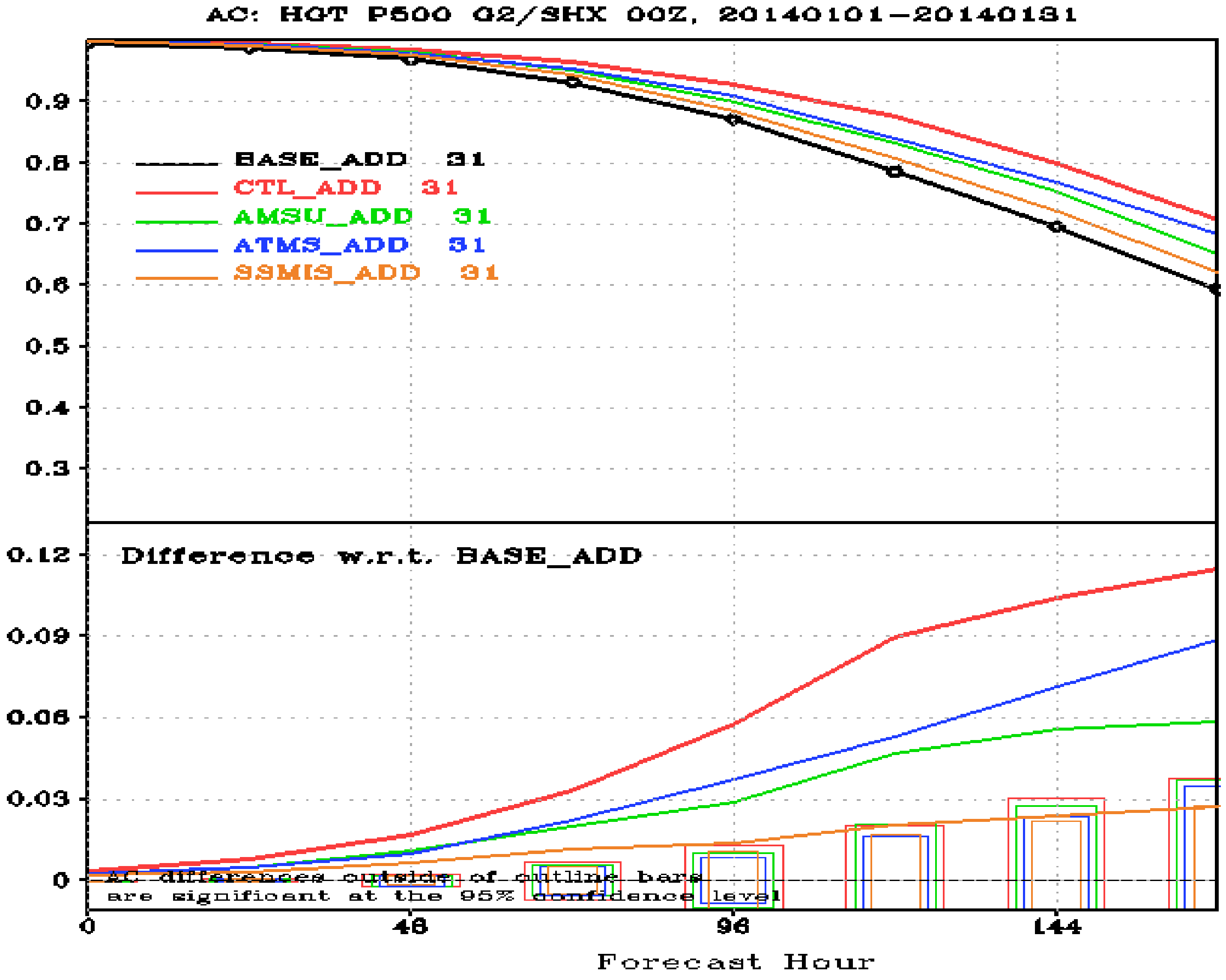


New ATMS Channel Composite Reveals Hurricane Structures



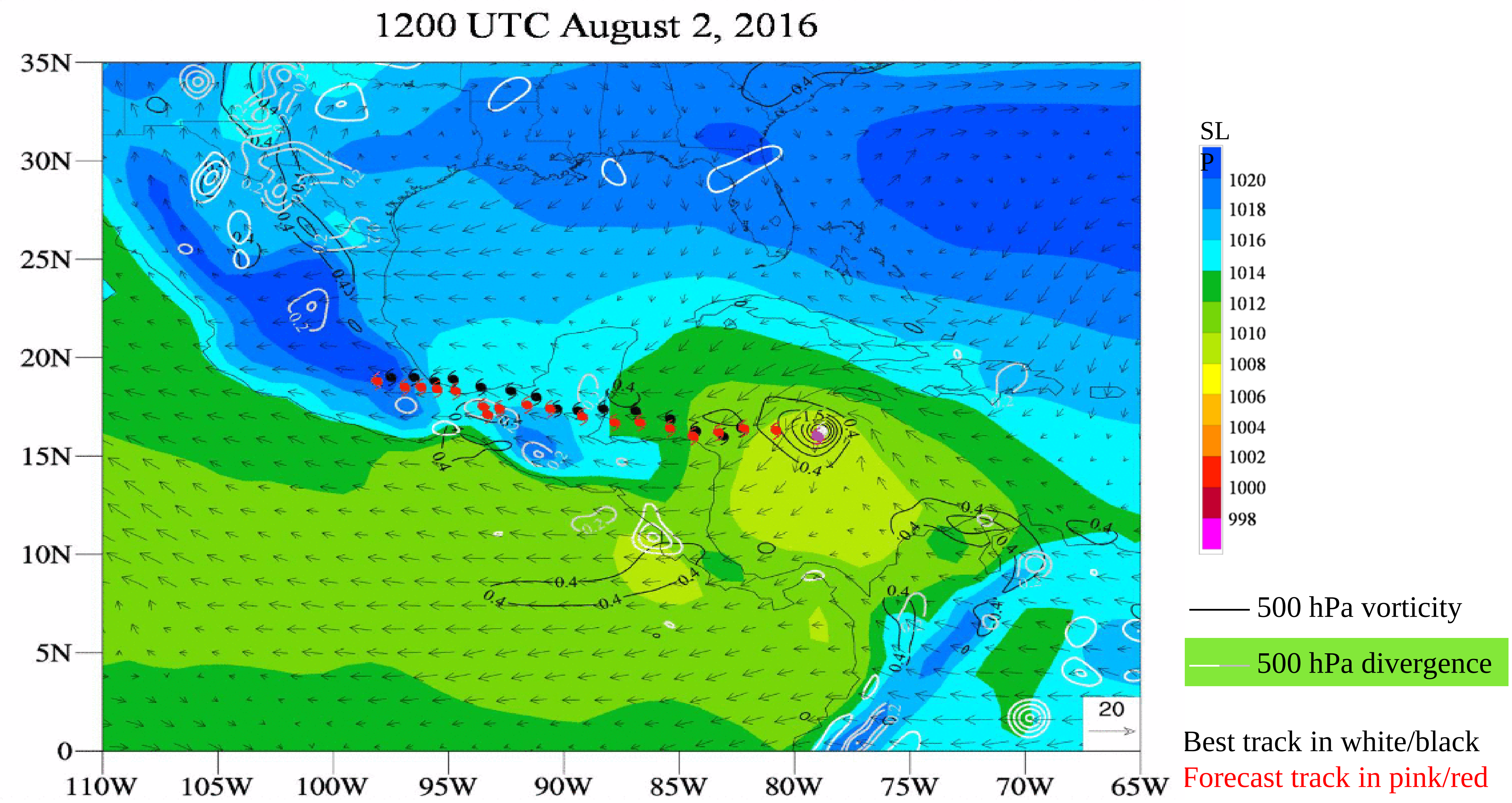
Impacts of Microwave Sounders in NCEP GFS

500 hPa Southern Hemisphere AC scores for 20140101 – 20140131 00Z



Assimilation of ATMS radiances in NCEP GFS produces a largest impact on global medium-range forecast, especially in southern hemisphere. The baseline experiment includes the conventional and GPSRO data and the control experiment includes all the satellite instruments and conversional data.

2016 Hurricane Earl Predicted by HWRF



ATMS DA Research Highlighted in Nature

METEOROLOGY

Satellite improves storm forecasts

Data from a US Earth-observing satellite could help improve the accuracy of prediction of hurricane track and strength.

When generating hurricane forecasts the US National Weather Services does not use real-time information from weather satellites. But Xiaolei Zou at Florida State University in Tallahassee and her colleagues looked at the effect of including data from the Suomi NPP satellite, launched in 2011, on hurricane forecasts.

The satellite's microwave instrument measures air temperature and humidity.

Incorporating Suomi data into the government's hurricane model for four 2012 storms, including Sandy(pictured), made for more accurate forecasts of track and intensity. The work suggests a way to improve the notoriously difficult predictions of storm strength. J. *Geophys. Res. Atm.*, 118, 11558-11576(2013)

ROBERT SIMMON/NASA/NOAA GOES

12 DECEMBER 2013 VOL 504 NATURE [19]

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Suomi NPP launch date: October 28, 2011

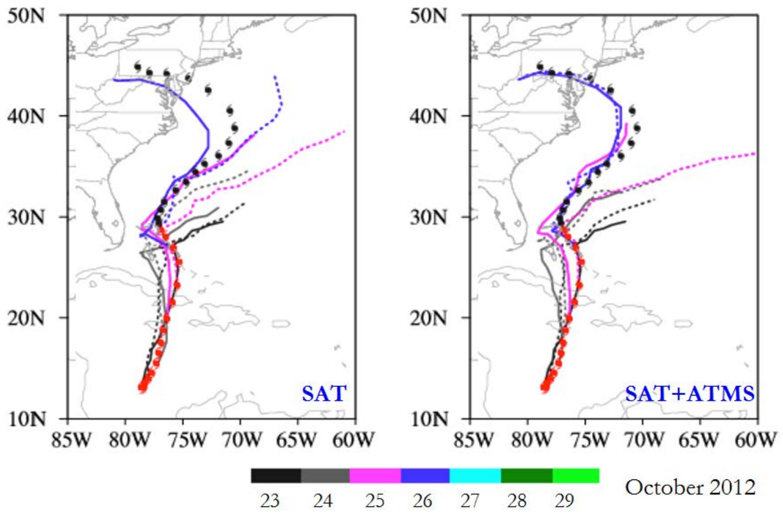
ATMS into NCEP operational system: May 25, 2012

Impact test completed: Spring 2013

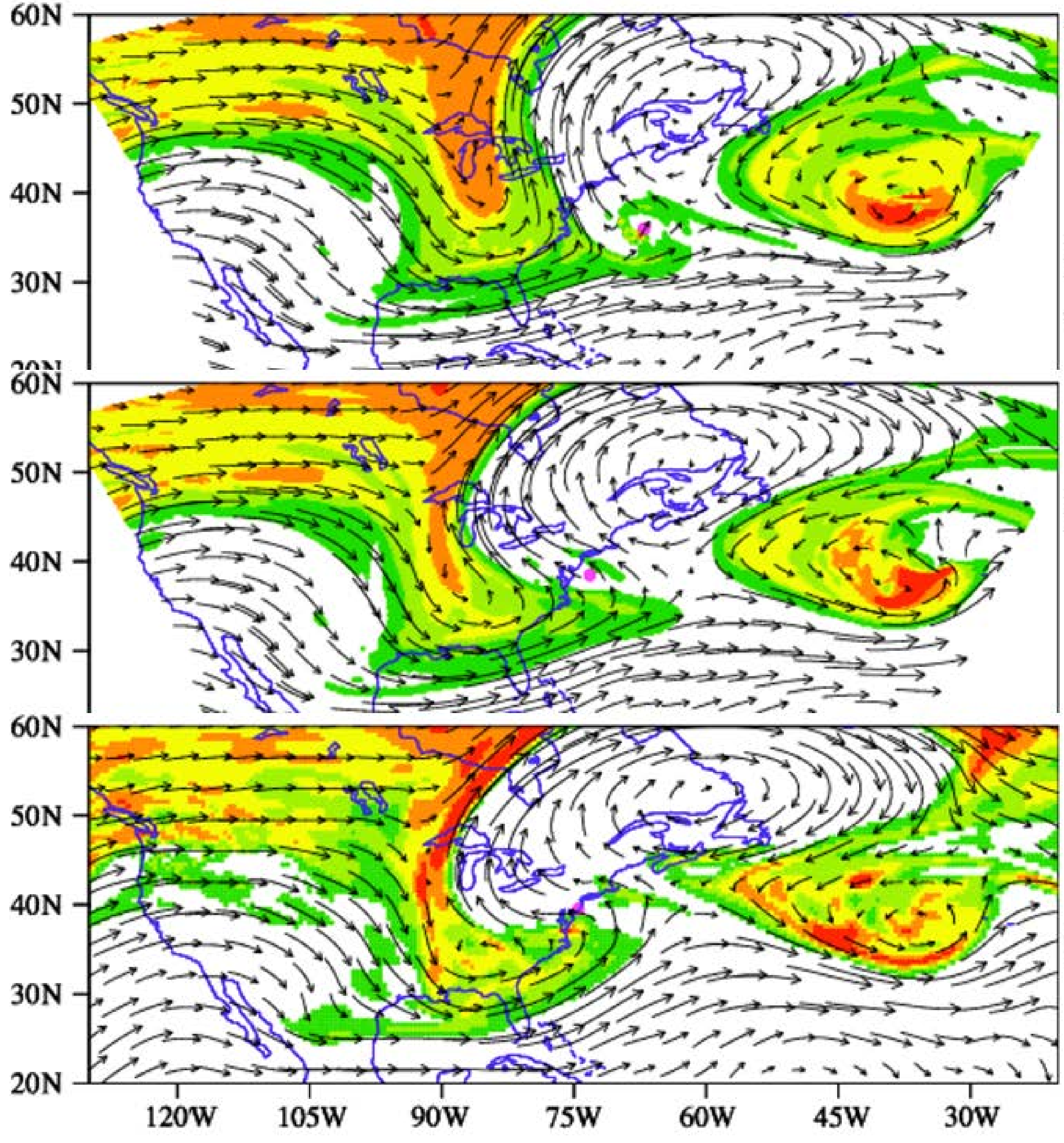
Results published: Fall 2013

ATMS data assimilation in GSI/HWRF results in a consistent positive impact on the track and intensity forecasts of the four landfall hurricanes in 2012.

Impacts of ATMS Data Assimilation on Track Forecast of Hurricane Sandy



Hurricane Sandy (PV at 200 hPa)



84-h Forecast without ATMS

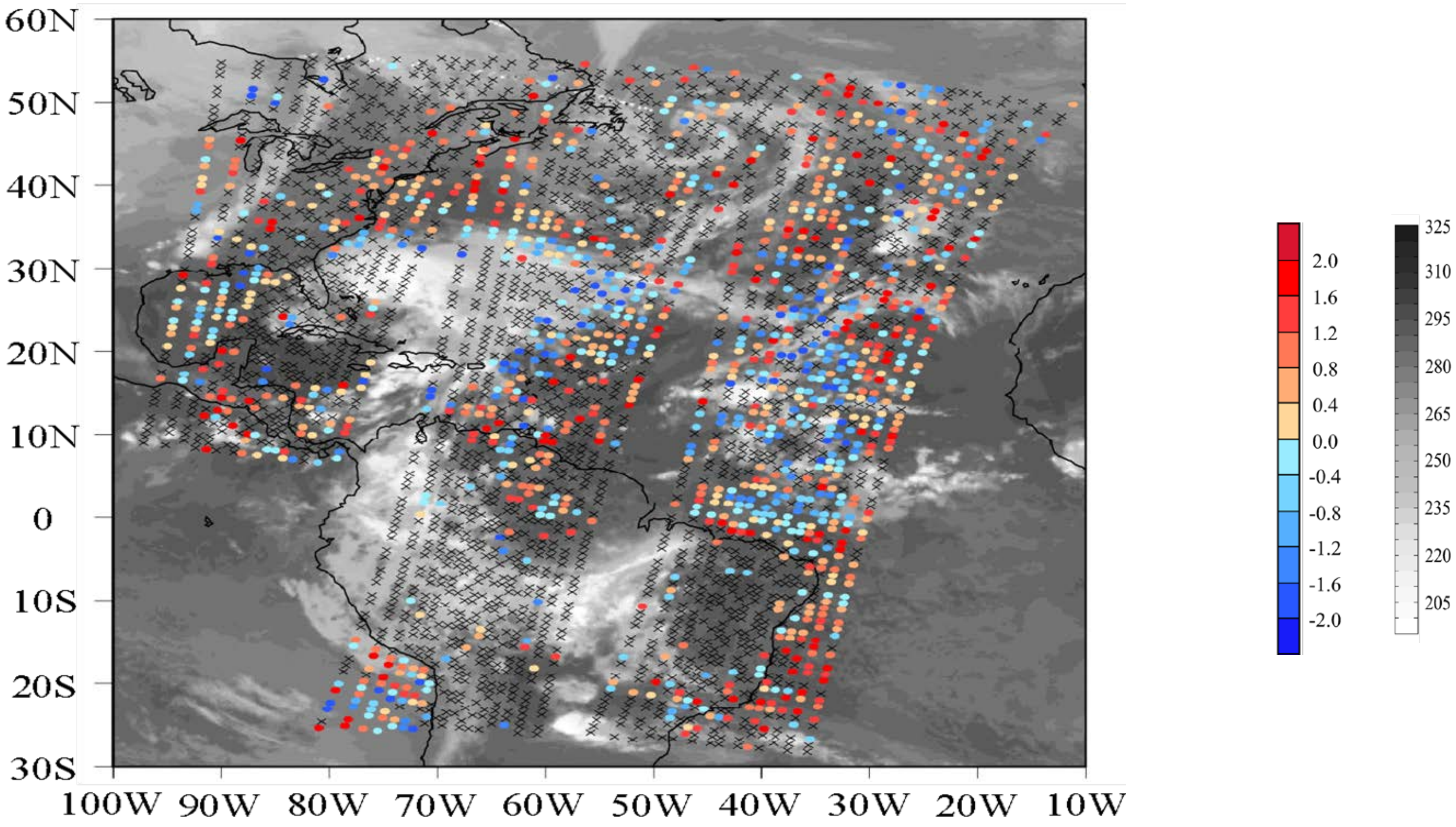
84-h Forecast with ATMS

NCEP GFS analysis

0000UTC October 30

ATMS Quality Control in HWRF/GSI

O-B
ATMS
Ch19

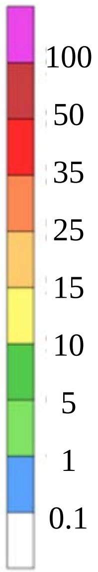


GSI QC performs well for ATMS water vapor sounding channels due to the use of more window channels (1, 2, 16, 17) for cloud detection

0600-0900 UTC 1200-1500 UTC

AMSU-A and MHS data assimilation improves forecasts of Hurricane ISAAC's rainbands

Observed
3-h rainfall



CTRL

AMSU-A, MHS assimilation as two data streams

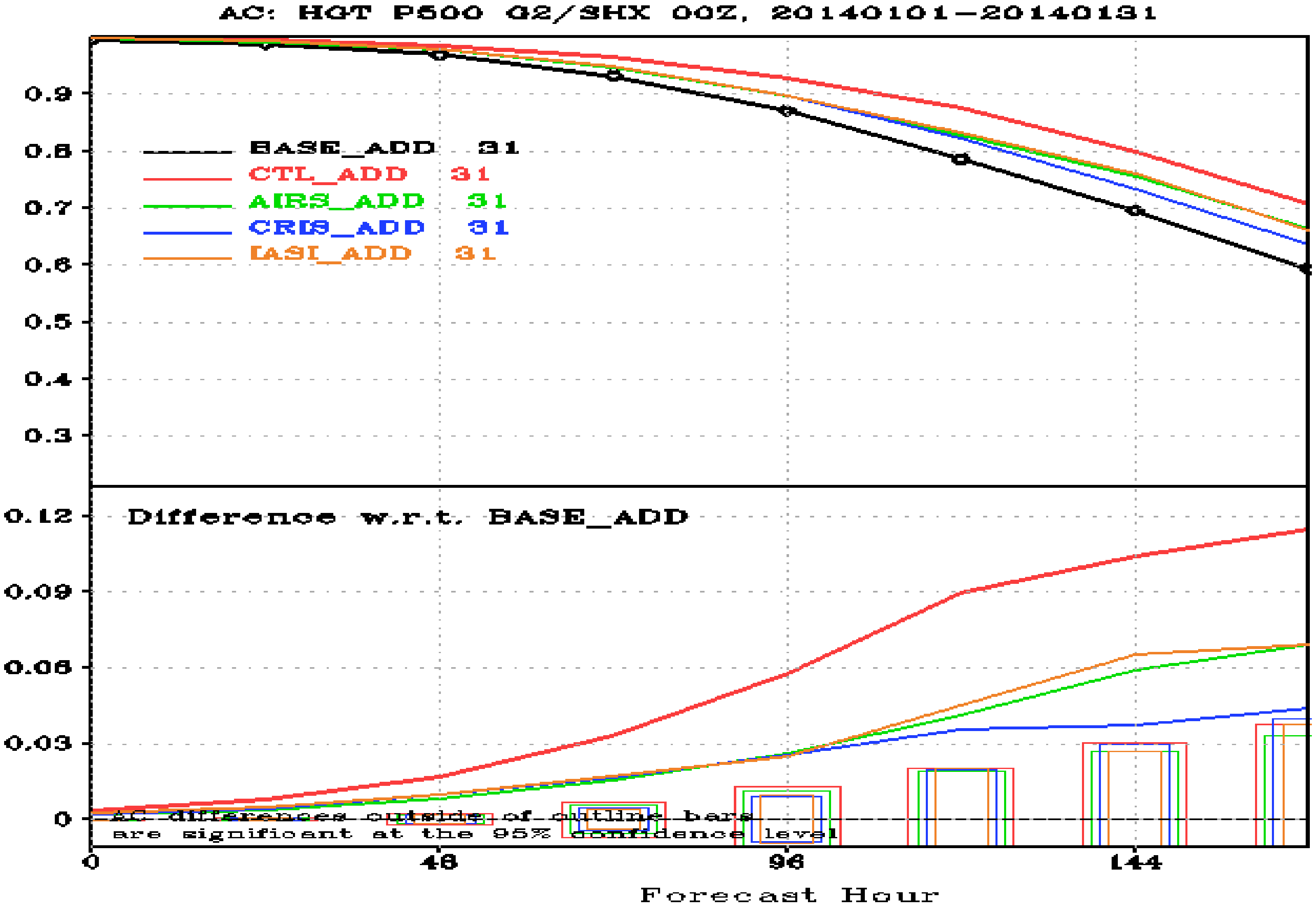
ODS

AMSU-A, MHS assimilation as one data stream

August 30, 2012

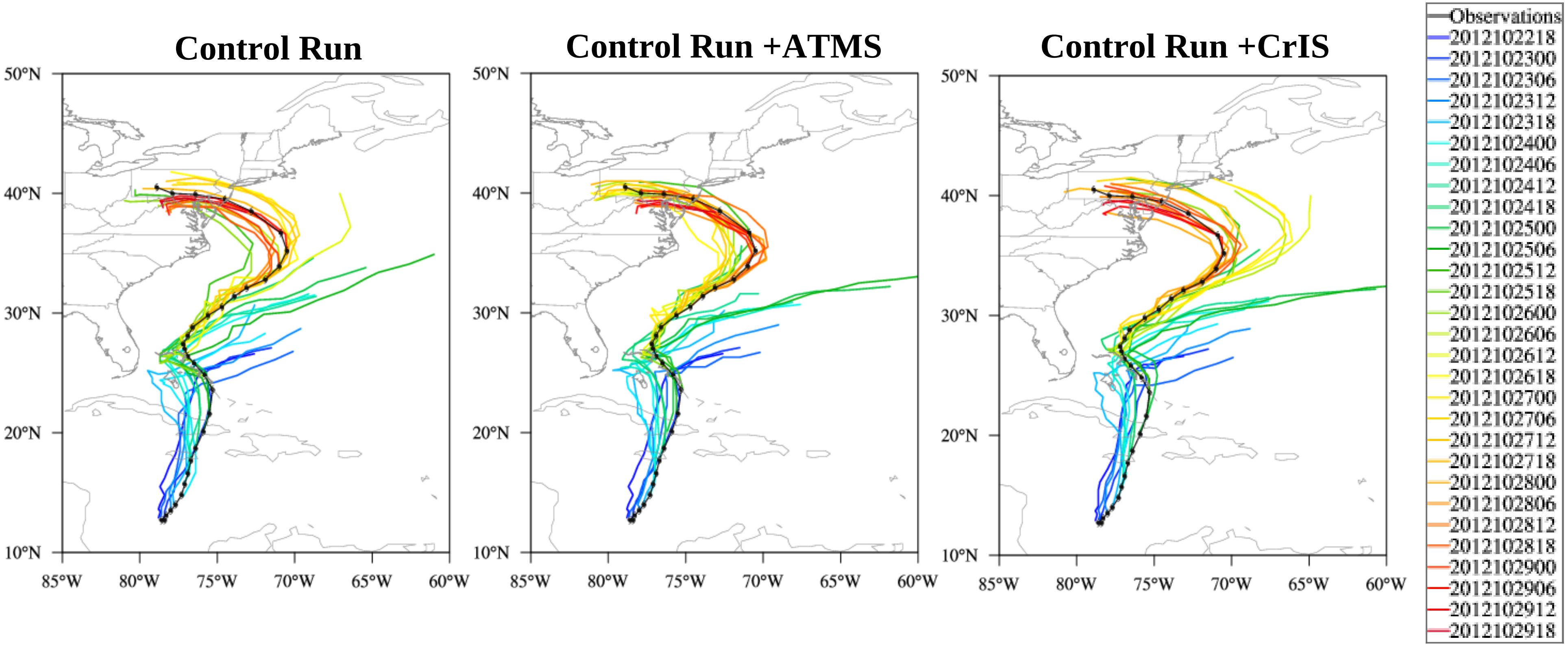
Impacts of Infrared Sounder in NCEP GFS

500 hPa Southern Hemisphere AC scores for 20140101 – 20140131 00Z



The impact from assimilation of CrIS radiances in NCEP GFS is smaller, compared to that from AIRS and IASI.
The baseline experiment includes the conventional and GPSRO data and the control experiment includes all the satellite instruments and conversional data.
The new quality control is required for ….

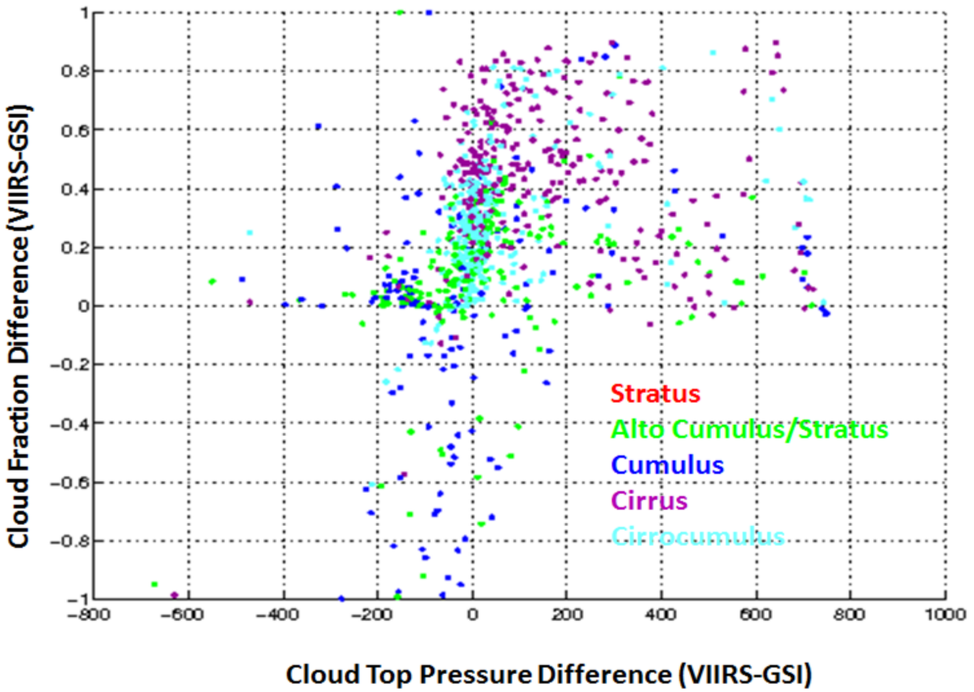
Impacts of CrIS and ATMS DA on Hurricane Forecasts

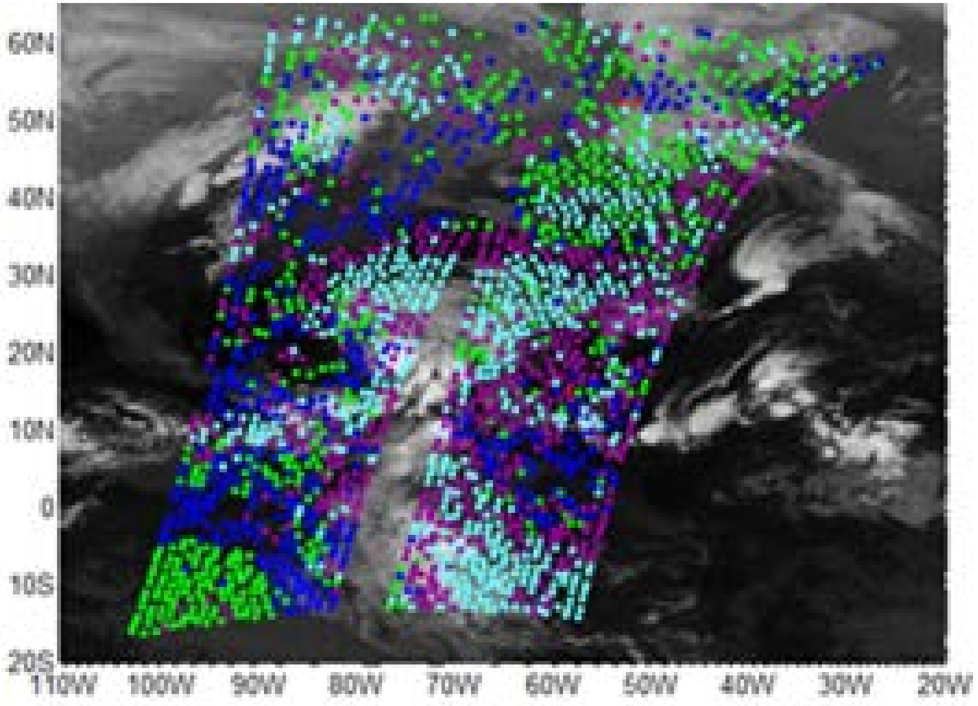


Unlike ATMS data, assimilation of CrIS radiance observations in HWRF degraded the forecasts of Superstorm Sandy tracks.。 Some fundamental issues related to QC of CrIS data are yet to be resolved!

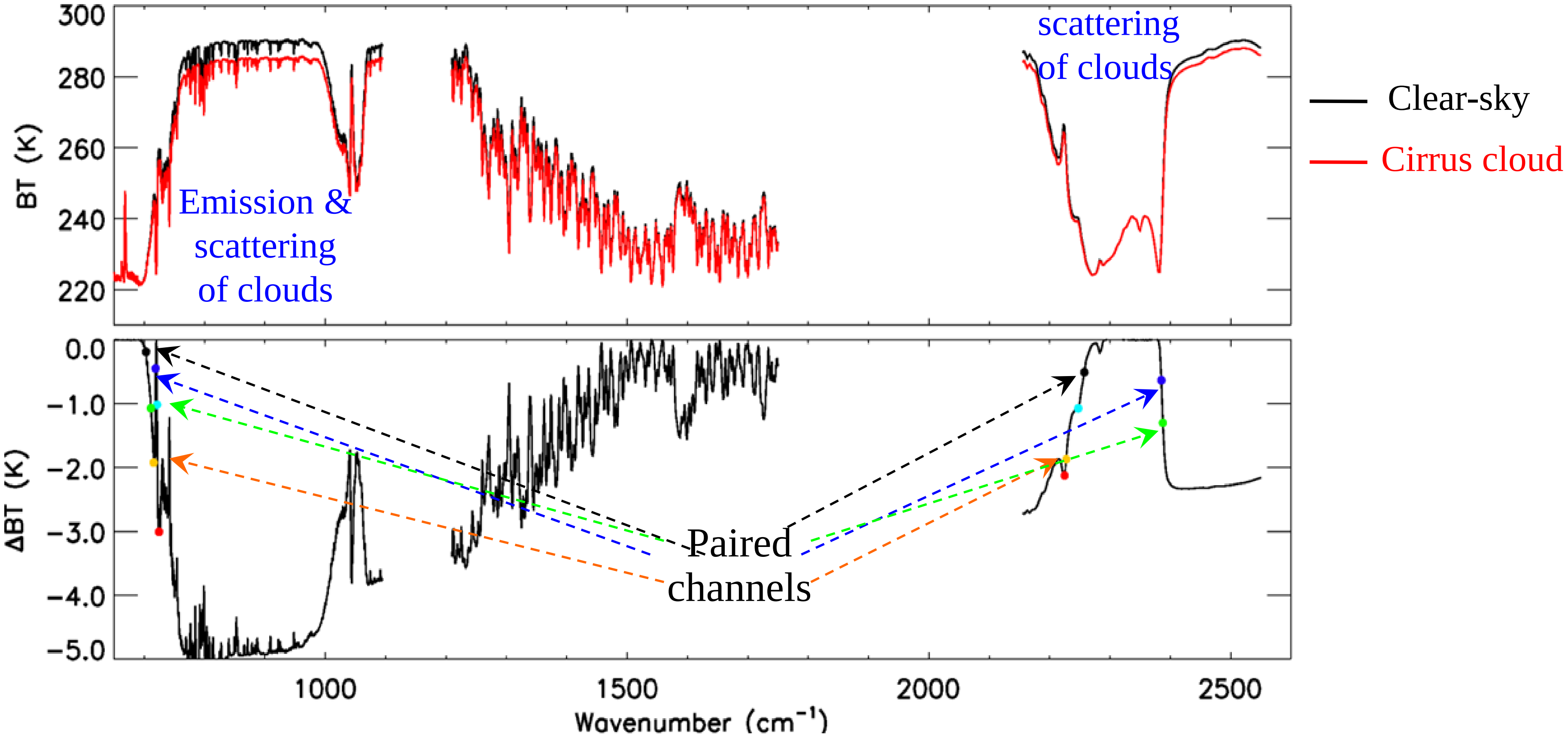
Issues with the Current GSI Cloud Detection

- The IR semi-transparent thin cirrus clouds are poorly detected by the current GSI QC scheme and thus the cloud-affected CrIS radiances could be treated as clear-sky radiances and assimilated wrongly into GSI.
- Compared with VIIRS cloud products, both CrIS cloud fraction and cloud top pressure derived in the current GSI are significantly biased.
- A new cloud detection algorithm needs to be developed for better discrimination of the optically thin cirrus clouds within CrIS FOVs.





Physical Basis for CrIS Double CO_2 Cloud Detection Algorithm



- The CrIS BTs at both LW (e.g., 670-750 cm^{-1}) and SW (e.g., 2200-2400 cm^{-1}) CO_2 channels display different responses to the changes of cloud vertical structures.
- A new cloud detection algorithm will be developed using the two CrIS CO_2 bands.

A New Cloud Index for CrIS DA QC Using CrIS Double CO2 Bands

A linear regression is established between the paired CrIS SWIR and LWIR channels.

$$T_{b,SWIR}^{regression} = \alpha T_{b,LWIR}^{obs} + \beta$$

where the regression coefficients α and β are obtained by minimizing the following cost function

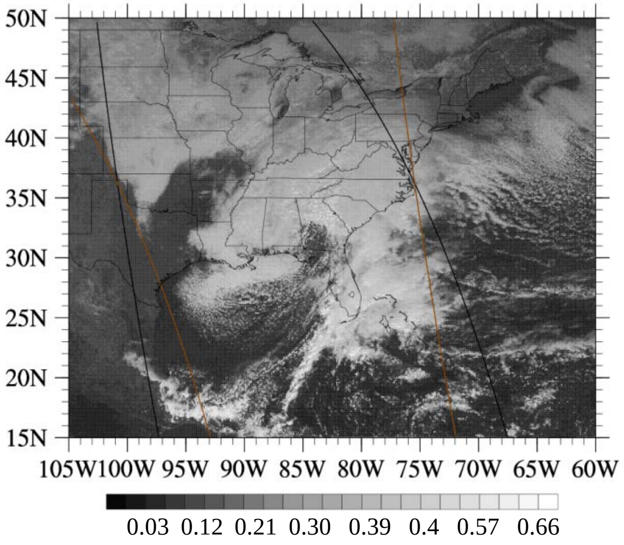
$$\min J(\alpha_i, \beta_i) = \sum_{j=1}^{JJ} \left(T_{b,SWIR}^{regression}(i,j) - T_{b,SWIR}^{CRTM}(i,j) \right)^2 \quad \text{(Clear pixels)}$$

An empirical cloud emission and scattering index (CESI) is defined for cloud detection at various altitudes

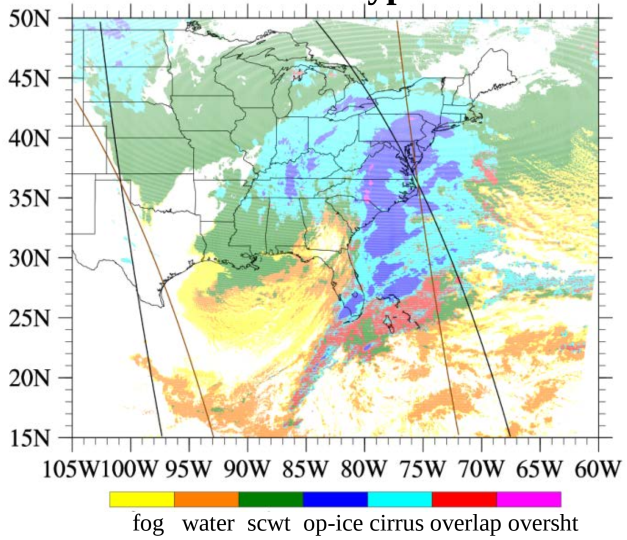
$$CESI = T_{b,SWIR}^{regression} - T_{b,SWIR}^{obs}$$

Validation of CESI by GOES Cloud Products

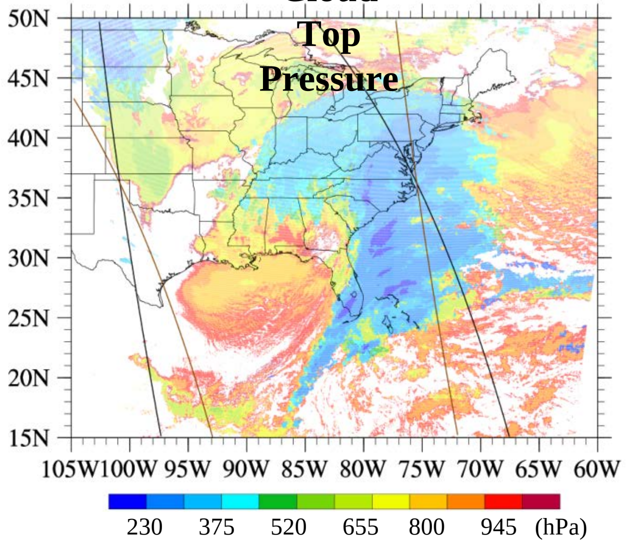
Reflectance of VIS Channel



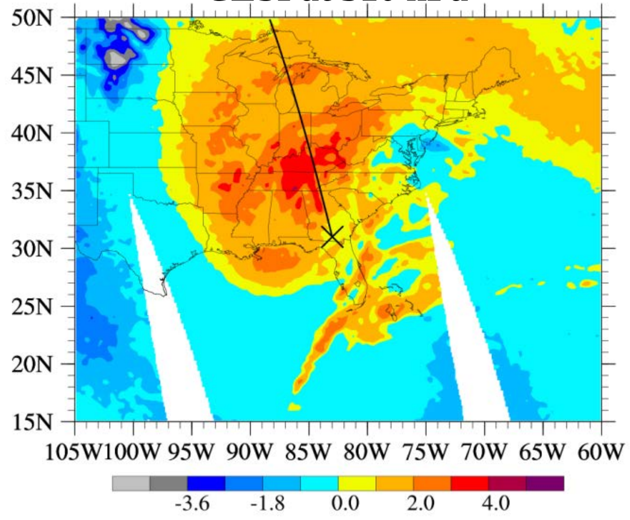
Cloud Types



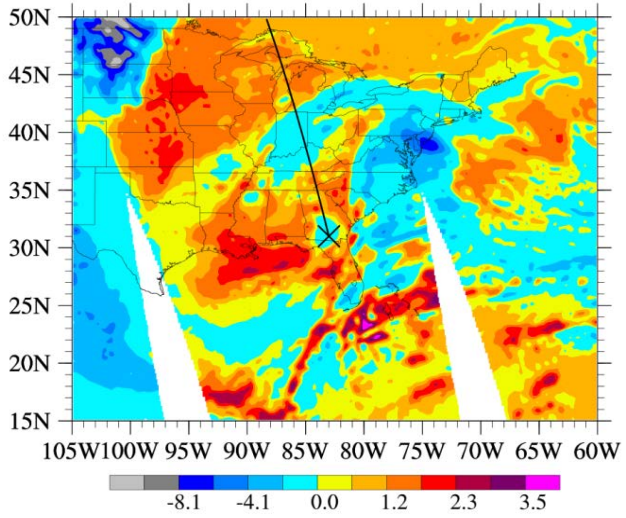
Cloud Top Pressure



CESI at 310 hPa



CESI at 469 hPa



Advanced Satellite Data Assimilation Activities

- Generate the new LUT for CRTM using discrete dipole approximation (DDA) to advance the cloudy radiance assimilation

- Develop a new interface for CRTM to incorporate the polarization capability

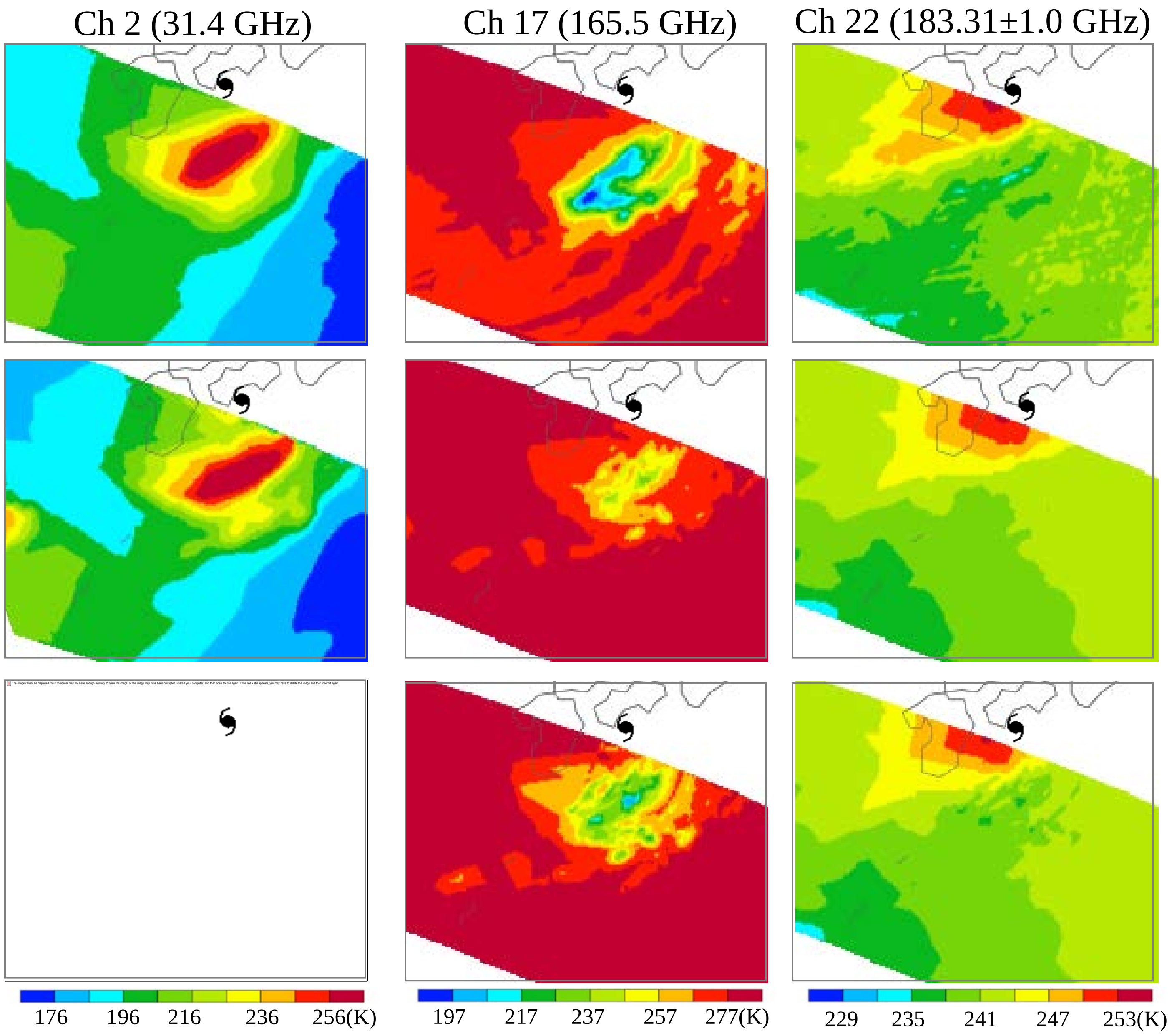
- Prepare CRTM readiness for uses of CrIS unapodized radiance data

- Evaluate cloud scattering and absorption table at infrared wavelengths

- Implement NLTE and solar reflection modules in CRTM

- Improve CRTM microwave surface emissivity model

Updates on ATMS Cloudy Radiance (O-B) from CRTM (Mie vs. DDA)



- The DDA can correct the over-estimation of scattering by Mie theory at 165 GHz
- The lower frequency channels are mainly affected by water phase clouds, thus the difference between DDA and Mie is not significant
- Scattering effect is not significant for upper-air temperature channels

J1 SDR Algorithm Readiness and Deliverables

- ATMS SDR:
  - Delivery of Pre-Launch Characterization Package: Feb-16
  - Delivery of PCT updates (ADR8199, CCR-2955): Jun-16
  - J-1 PCT with mounting Coefficients (ADR 8224, CCR-2981): Jul-16
- CrIS SDR:
  - FCE updates: updated delivery (with ADL5.3_PSAT16; ADR 4481, CCR-2898): Apr-16
  - J-1 updates (DQI, A4, and Geo) (ADR 4481, 8057, 7968, and 7487, CCR-2979): Jun-16
  - J-1 PCT with mounting Coefficients (for TS & FS) (ADR 8210, CCR-2978): Jun-16
- VIIRS SDR:
  - Delivery of algorithm updates based on TVAC (ADR8036, CCR-2590): updated delivery: Nov-15
  - Delivery of LUTs updates based on TVAC (ADR7996,CCR-2589): updated delivery: Dec-15
  - J-1 Geo code update (ADR8160, CCR-2890): Apr-16
  - J-1 Launch Ready LUTs with mounting Coefficients (ADR 8161, CCR-2859): Jul-16
- OMPS SDR:
  - LUTs for S-NPP Block 2.0 (TC: ADR8088, CCR-2764; NP: ADR8139, CCR-2765):
    - ❖ Delivery: Mar-16; updated delivery (with ADL5.3_PSAT16): Apr-16
  - JPSS-1 Launch Ready LUTs (Initial delivery. TC: ADR8158, CCR-2848; NP: ADR8159, CCR-2849):
    - ❖ Delivery: Mar-16; updated delivery (with ADL5.3_PSAT16): Apr-16
  - JPSS-1 Launch Ready LUTs (final delivery) with mounting Coefficients
    - ❖ TC: ADR 8211, CCR-2962; NP: ADR 8212, CCR-2963
    - ❖ Delivery: Jul-16

J1 TDR/SDR Algorithm Schedule

Beta

- CrIS L+68D
- ATMS L+20D
- VIIRS L+70D
- OMPS NM L+68D, NP: L+68D

Provisional

- CrIS L+90D
- ATMS L+36D
- VIIRS L+90D
- OMPS NM L+90D, NP L+90D

Validated

- CrIS L+9M
- ATMS L+6M
- VIIRS L+9M
- OMPS NM: L+9M, NP: L+9M

Summary and Conclusions

- Suomi NPP instruments are well calibrated and their performance in orbit meet the specification
- Many of ATMS instrument calibration and SDR science advances have been published through peer-reviewed process (2013 JGR special issue, 2016 Remote Sensing special issues, etc)
- JPSS IDPS processing system is enhanced with new SDR sciences (e.g. CrIS FSR, ATMS antenna reflector emission, VIIRS RSB autocal-Lunar corrected)
- STAR ICVS is transitioned into operation and monitoring all the instrument performance in orbit
- SNPP SDR data are successfully assimilated into NWS global and regional forecast models and produced the largest positive impacts.

Satellite Oceanography & Climatology Division (STAR/SOCD) and JPSS Ocean EDRs:

A sea of activity

Paul M. DiGiacomo and Veronica P. Lance
With contributions from: Mark Eakin, Daniel Tong, Avichal Mehra, Eric Bayler, Cara Wilson, Eileen Maturi, Sasha Ignatov, Menghua Wang, Michael Soracco

2016 STAR/JPSS Annual Science Meeting
College Park, MD, 8-12 August 2016

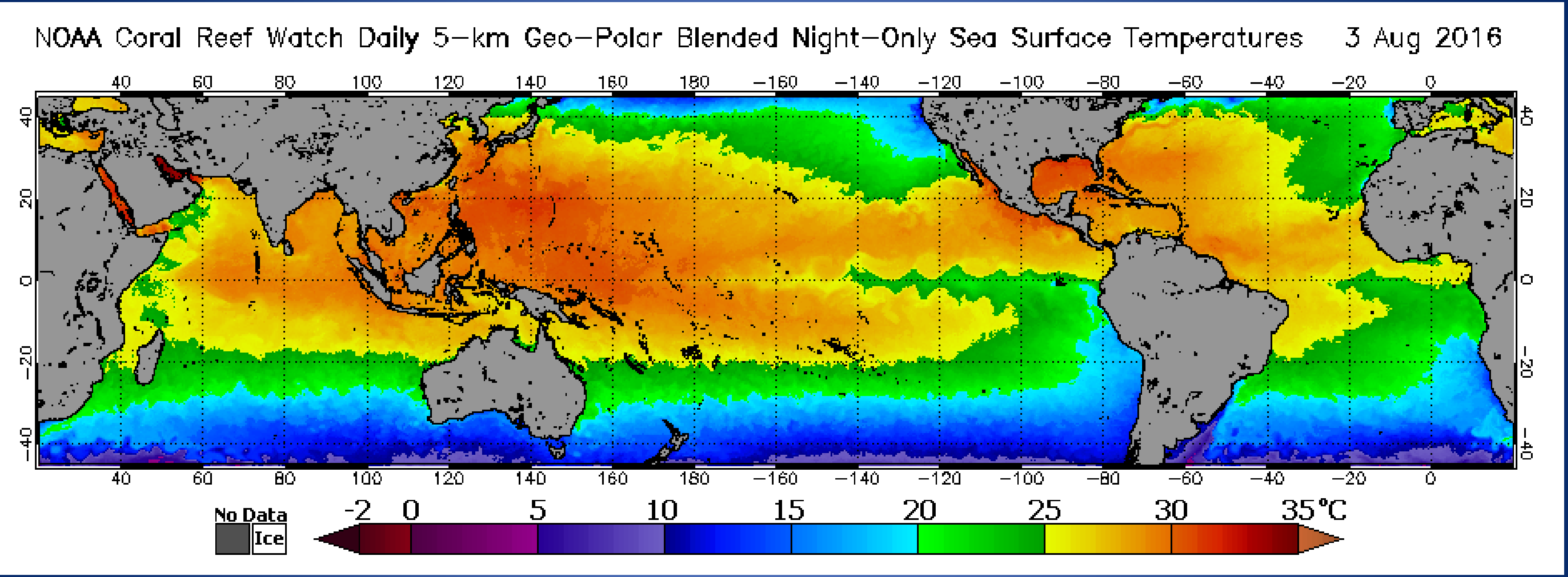
STAR JPSS Oceans

Outline

- Users & Applications – representation from NOS, NMFS, NWS, OAR and NESDIS
- Highlights from VIIRS SST and Ocean Color EDR Teams
- Reprocessing (Oceans) at STAR
- Non-NOAA data at STAR

STAR JPSS Oceans

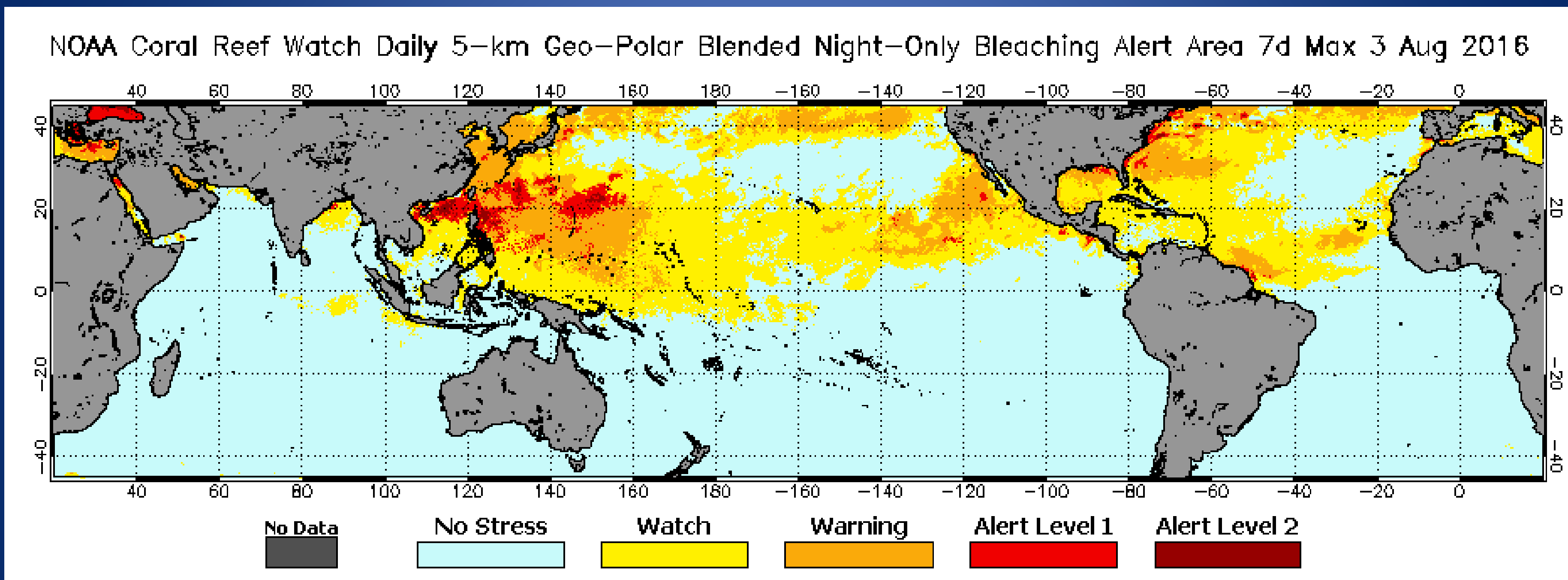
VIIRS SST User: NESDIS & NOAA Coral Reef Conversation Program



Coral Reef Watch uses the latest 5 km global blended GOES-POES Sea Surface Temperature (SST) product …

STAR JPSS Oceans

VIIRS SST User: NESDIS & NOAA Coral Reef Conversation Program



… to generate a new climatology for their bleaching alert and monitoring products for coral reef managers around the globe.

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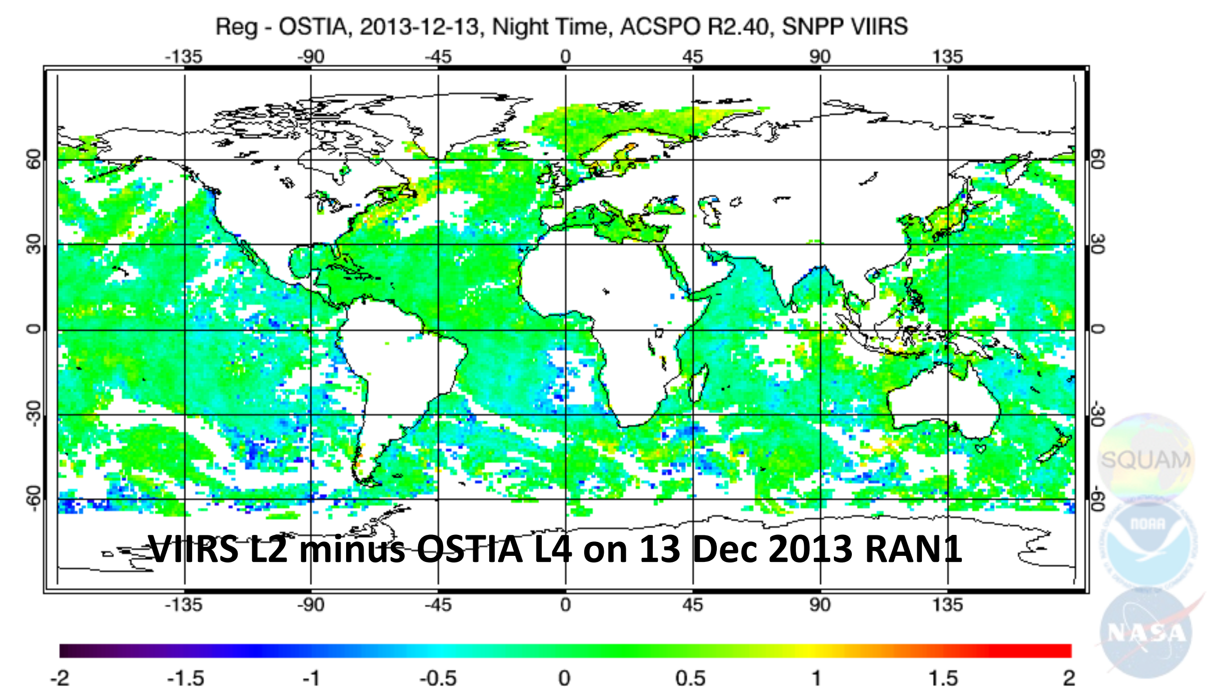
VIIRS SST Users: GHRSST and International Met Offices



GHRSST, UK Met office, Canada Met Office, BoM of Australia, Japanese Met Agency and other agencies, academics, etc.

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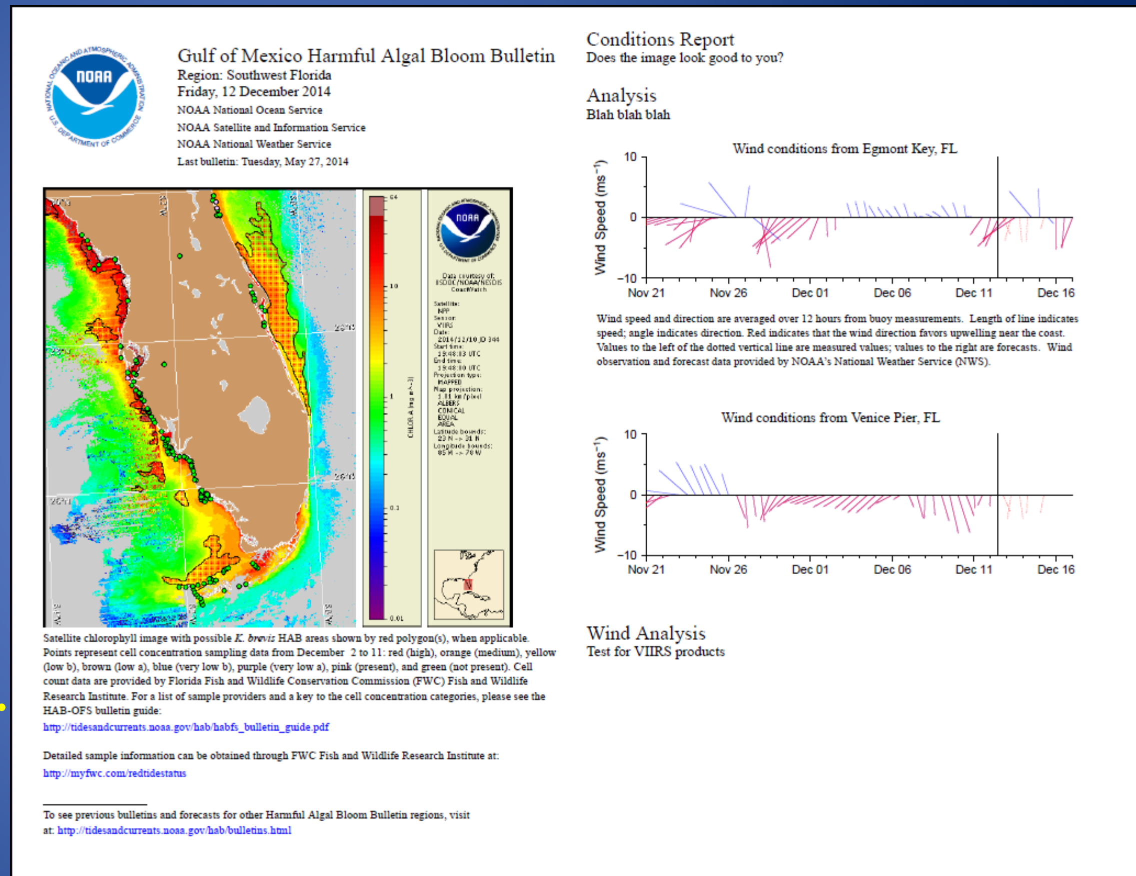
VIIRS Ocean Color User: NOS

- JPSS PGRR Program has supported integration of VIIRS ocean color data into NOS HAB bulletins.
- Currently testing Science Quality dataset to better interpret NRT data stream.


Gulf of Mexico Harmful Algal Bloom Bulletin
Region: Southwest Florida
Friday, 12 December 2014
NOAA National Ocean Service
NOAA Satellite and Information Service
NOAA National Weather Service
Last bulletin: Tuesday, May 27, 2014

Satellite chlorophyll image with possible *K. brevis* HAB areas shown by red polygon(s), when applicable. Points represent cell concentration sampling data from December 2 to 11: red (high), orange (medium), yellow (low b), brown (low a), blue (very low b), purple (very low a), pink (present), and green (not present). Cell count data are provided by Florida Fish and Wildlife Conservation Commission (FWC) Fish and Wildlife Research Institute. For a list of sample providers and a key to the cell concentration categories, please see the HAB-OFS bulletin guide:
http://tidesandcurrents.noaa.gov/hab/habfs_bulletin_guide.pdf

Detailed sample information can be obtained through FWC Fish and Wildlife Research Institute at:
http://myfwc.com/redtidestatus

To see previous bulletins and forecasts for other Harmful Algal Bloom Bulletin regions, visit at: http://tidesandcurrents.noaa.gov/hab/bulletins.html

Conditions Report
Does the image look good to you?

Analysis
Blah blah blah

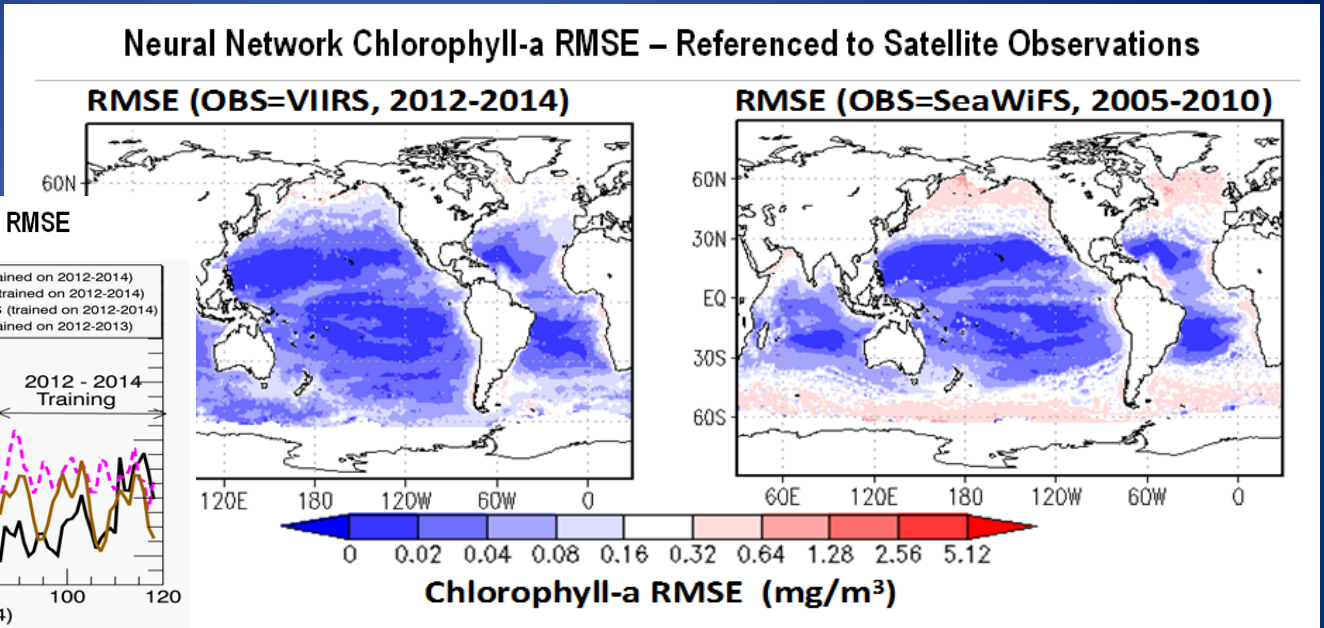
Wind speed and direction are averaged over 12 hours from buoy measurements. Length of line indicates speed; angle indicates direction. Red indicates that the wind direction favors upwelling near the coast. Values to the left of the dotted vertical line are measured values; values to the right are forecasts. Wind observation and forecast data provided by NOAA's National Weather Service (NWS).

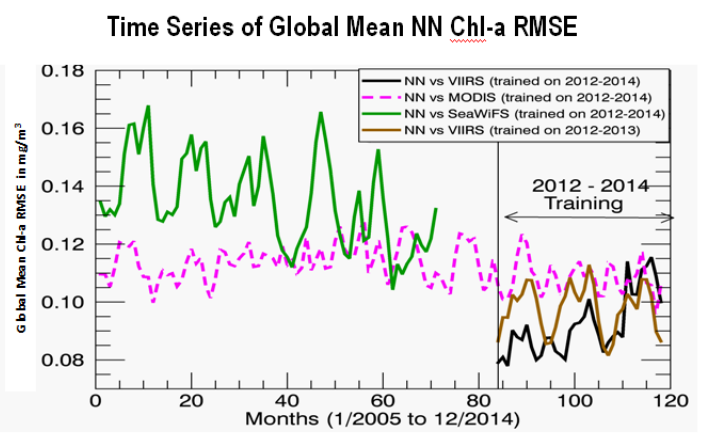
Wind Analysis
Test for VIIRS products

NOAA CoastWatch is working with NOS as part of the NOAA Ecological Forecasting Initiative

STAR JPSS Oceans

VIIRS Ocean Color
User: NWS





NWS/NCEP/EMC is using VIIRS Ocean Color to train a neural network to estimate gap-free, consistent ocean color fields (e.g., chlorophyll-a) to be assimilated into a pre-operational environment for NOAA's operational ocean models (HYCOM, MOM4). (And see Kim et al. at OC Breakout, Wednesday afternoon.)

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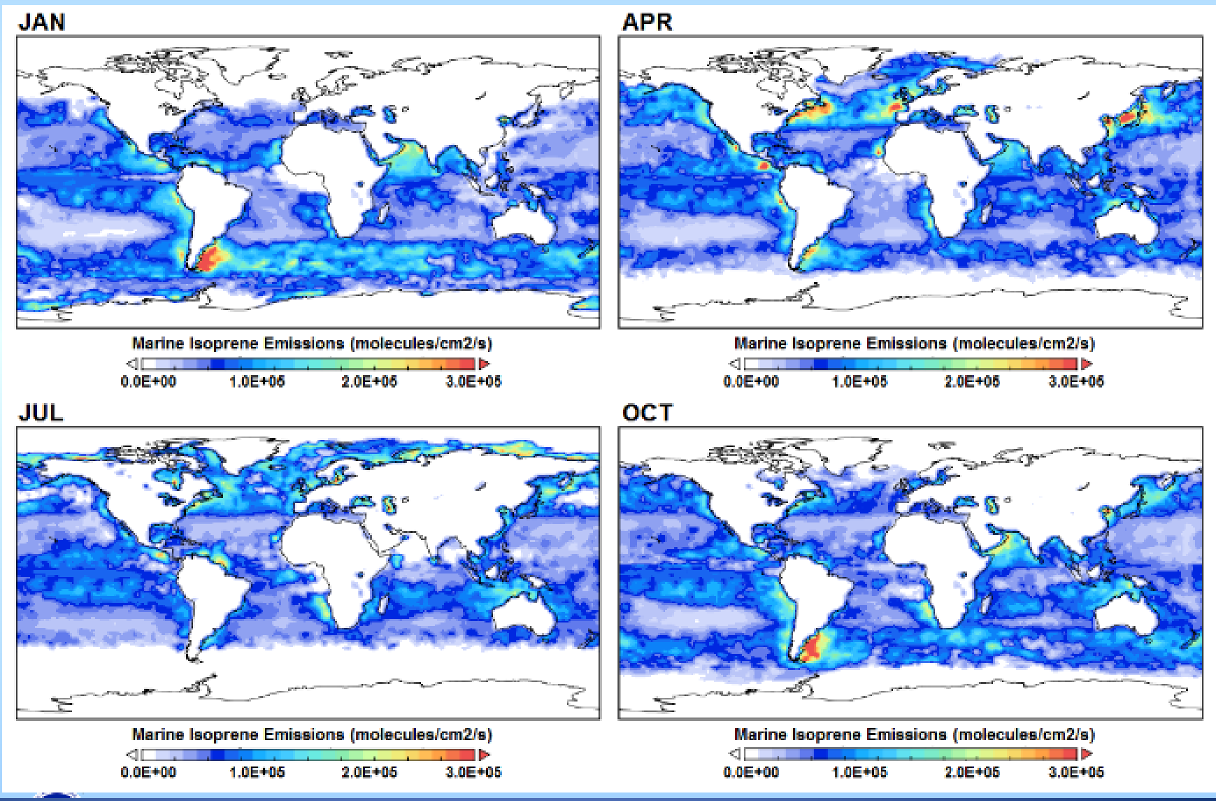
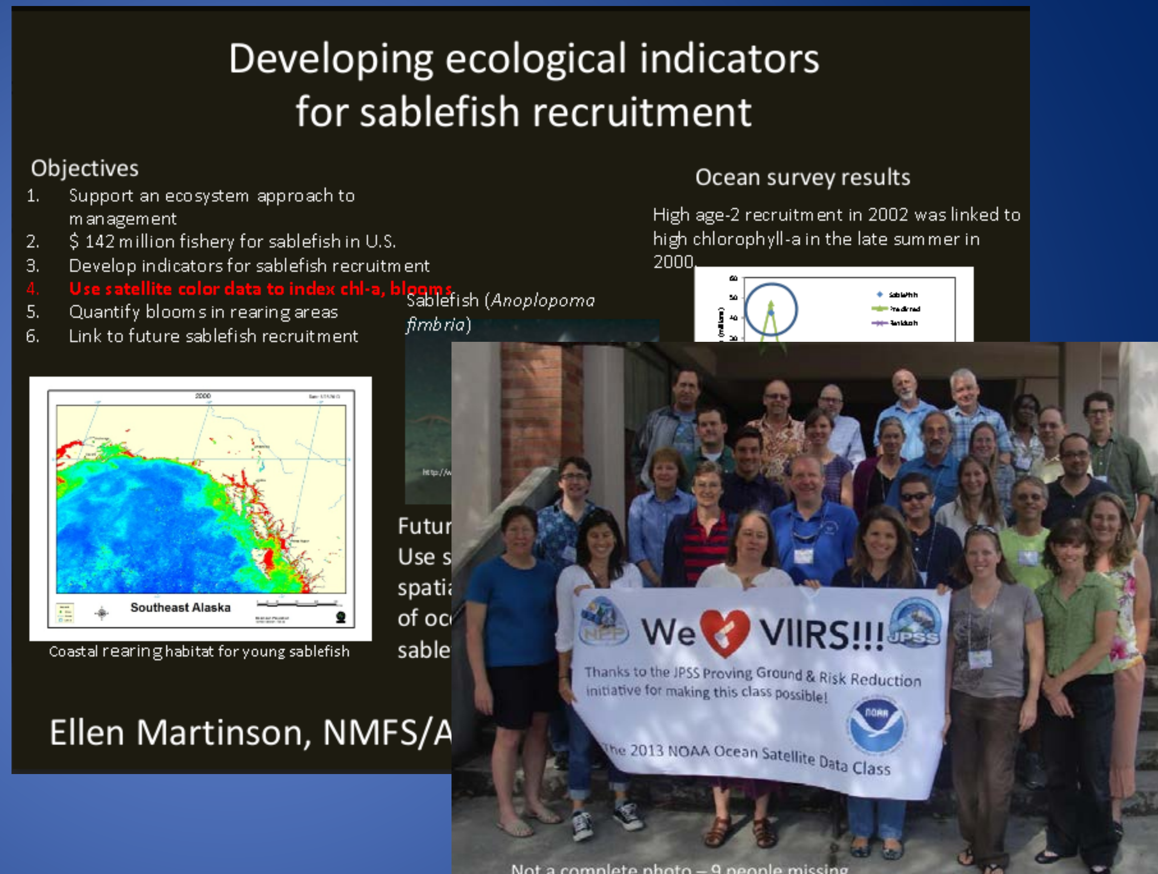
VIIRS Ocean Color User: OAR



The **NOAA Air Resources Laboratory** (OAR) derives the global distribution of marine isoprene which is then incorporated into emission models for the National Air Quality Forecasting Capability (NAQFC).

VIIRS Ocean Color & SST Data Users: NMFS

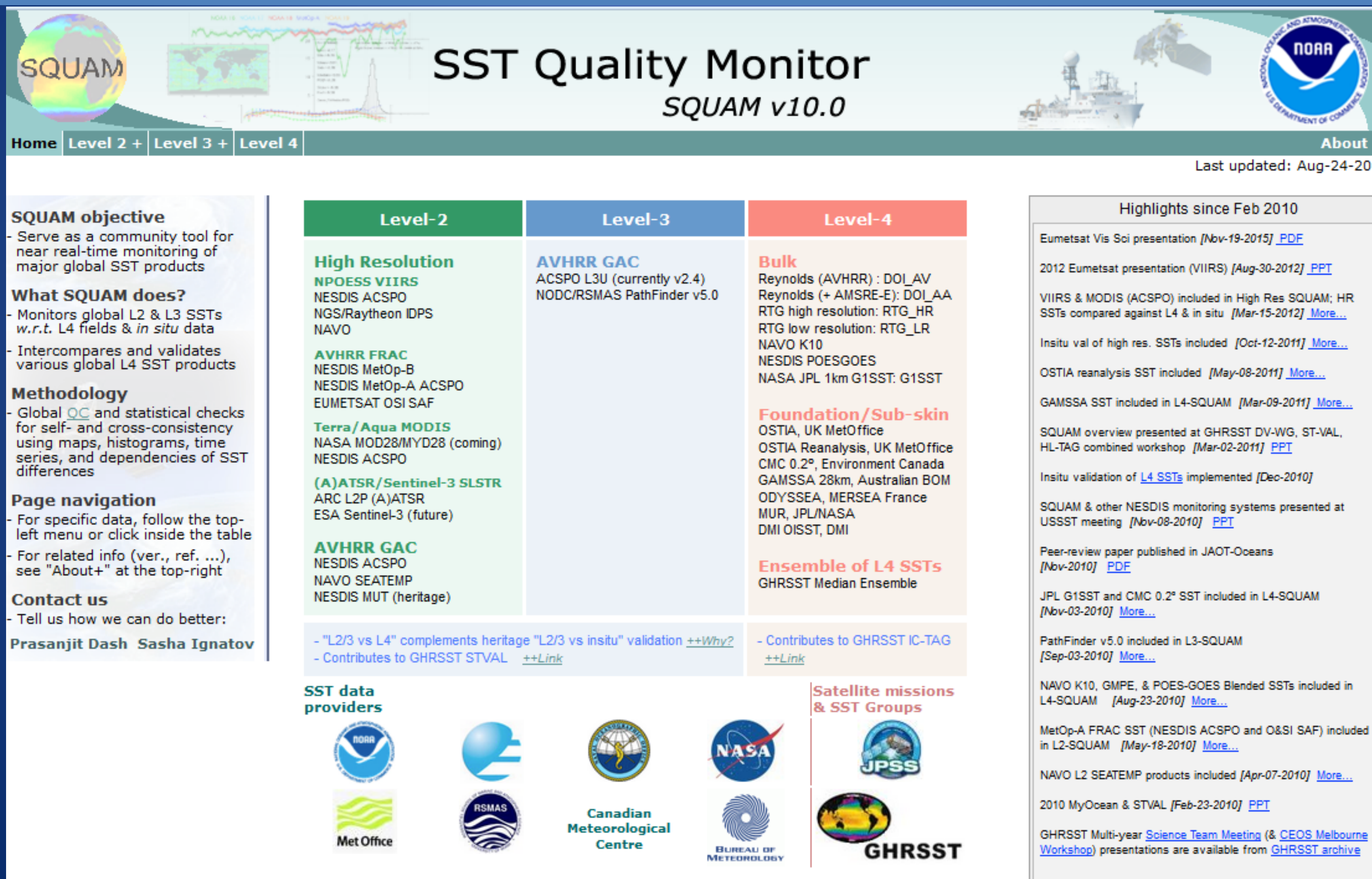


The **Satellite Data Training Course** conducted by Cara Wilson of **NMFS/SEFSC** is enabling fisheries research &operational applications.

High quality, long term time series satellite data are essential to an "Integrated Ecosystem Assessment" approach to fisheries management at NMFS.

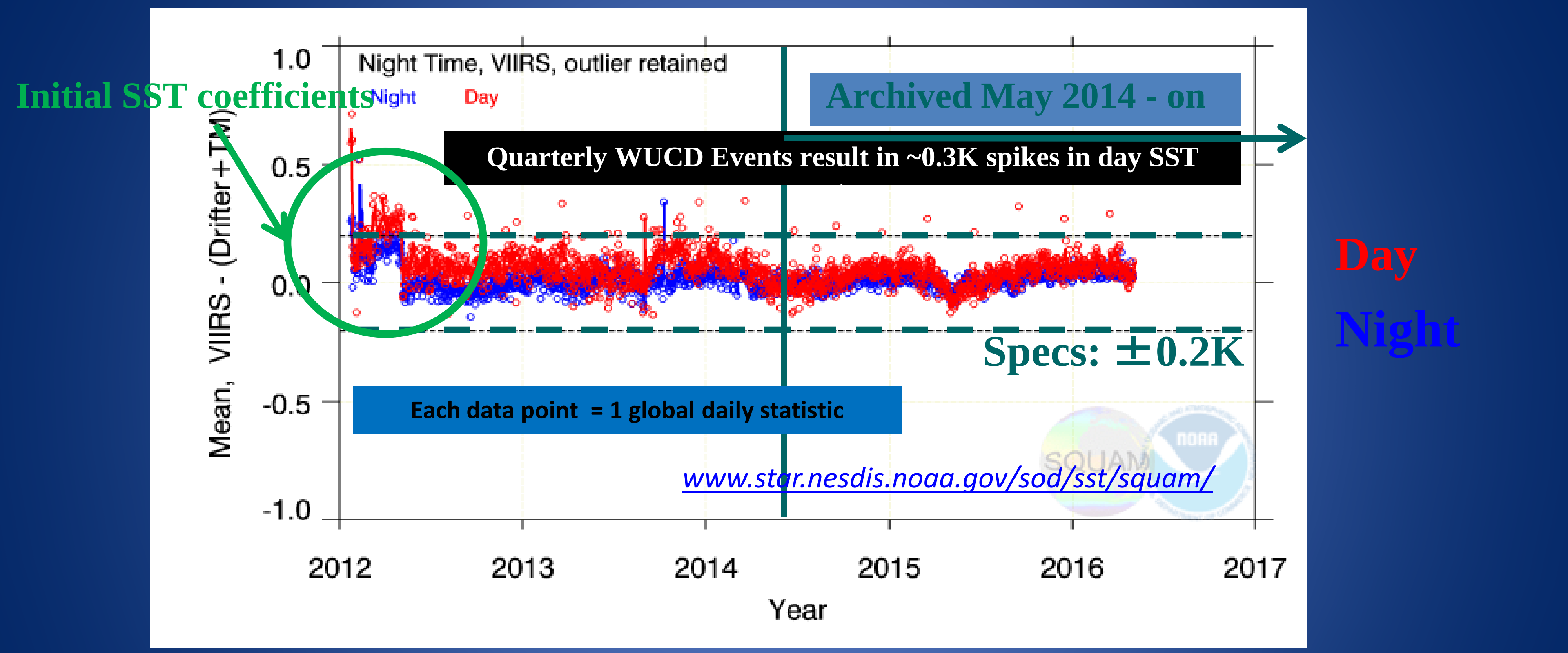
Highlights from VIIRS SST

Redesigned SQUAM AVHRR GAC page and updated ACSPO AVHRR RAN1 in SQUAM



Global VAL BIAS VIIRS L2 vs. *i*Quam *in situ* SSTs

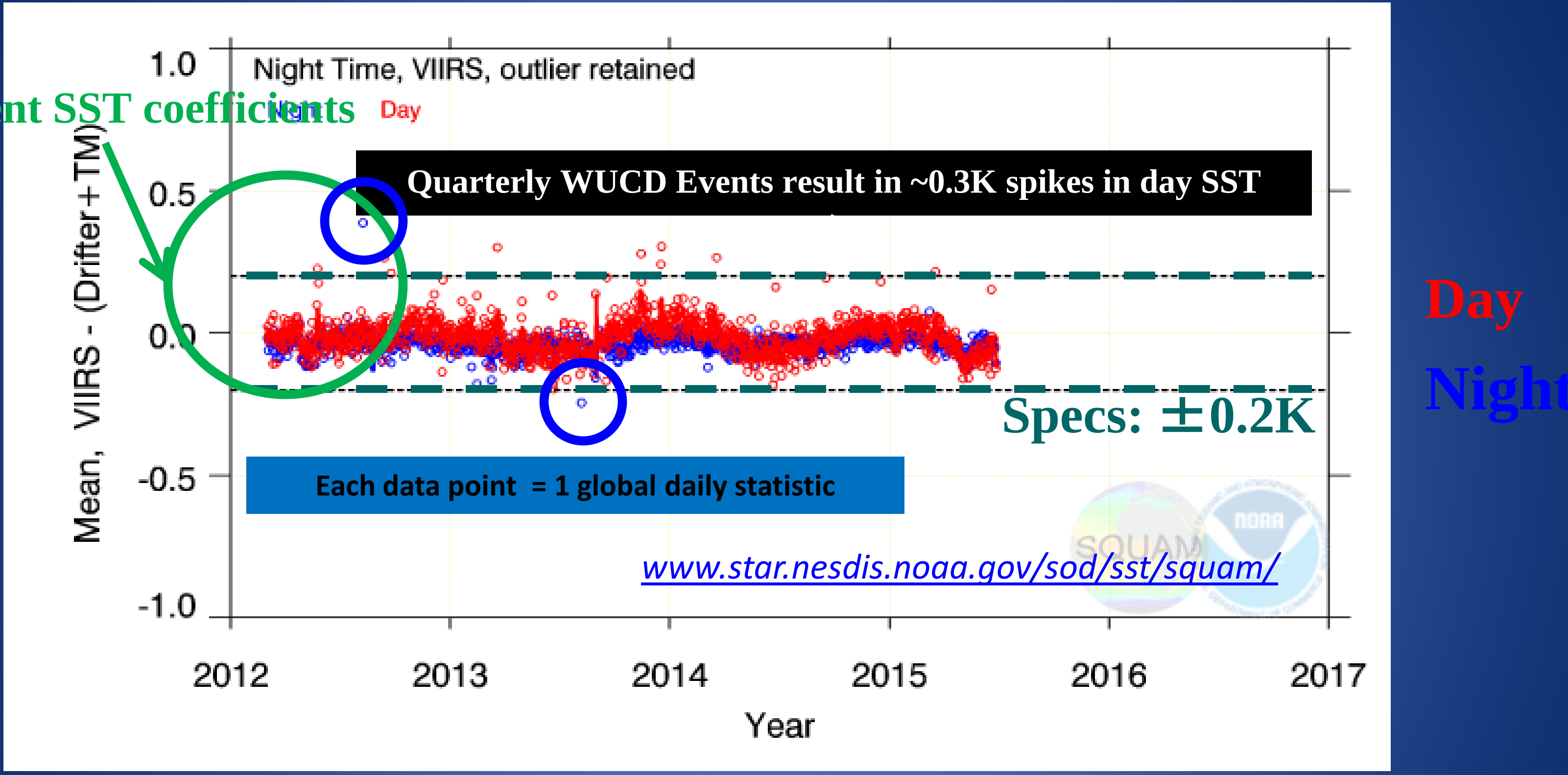
Real Time



Advanced Clear-Sky Processor for Oceans (ACSPO)
Near real time data

Global VAL BIAS VIIRS L2 vs. *i*Quam *in situ* SSTs

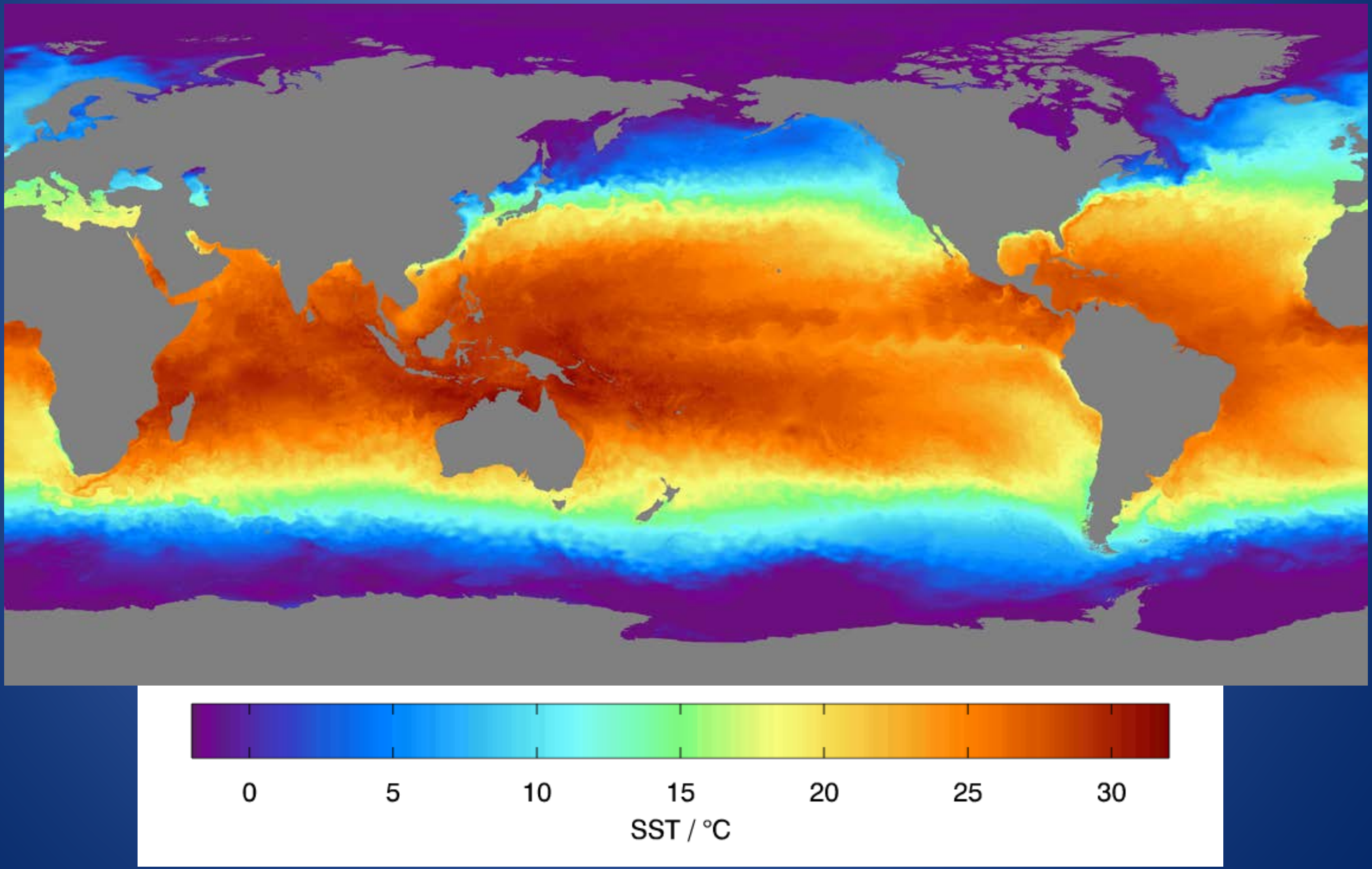
RAN1



Advanced Clear-Sky Processor for Oceans (ACSPO) reprocessed long term science quality data

STAR JPSS Oceans

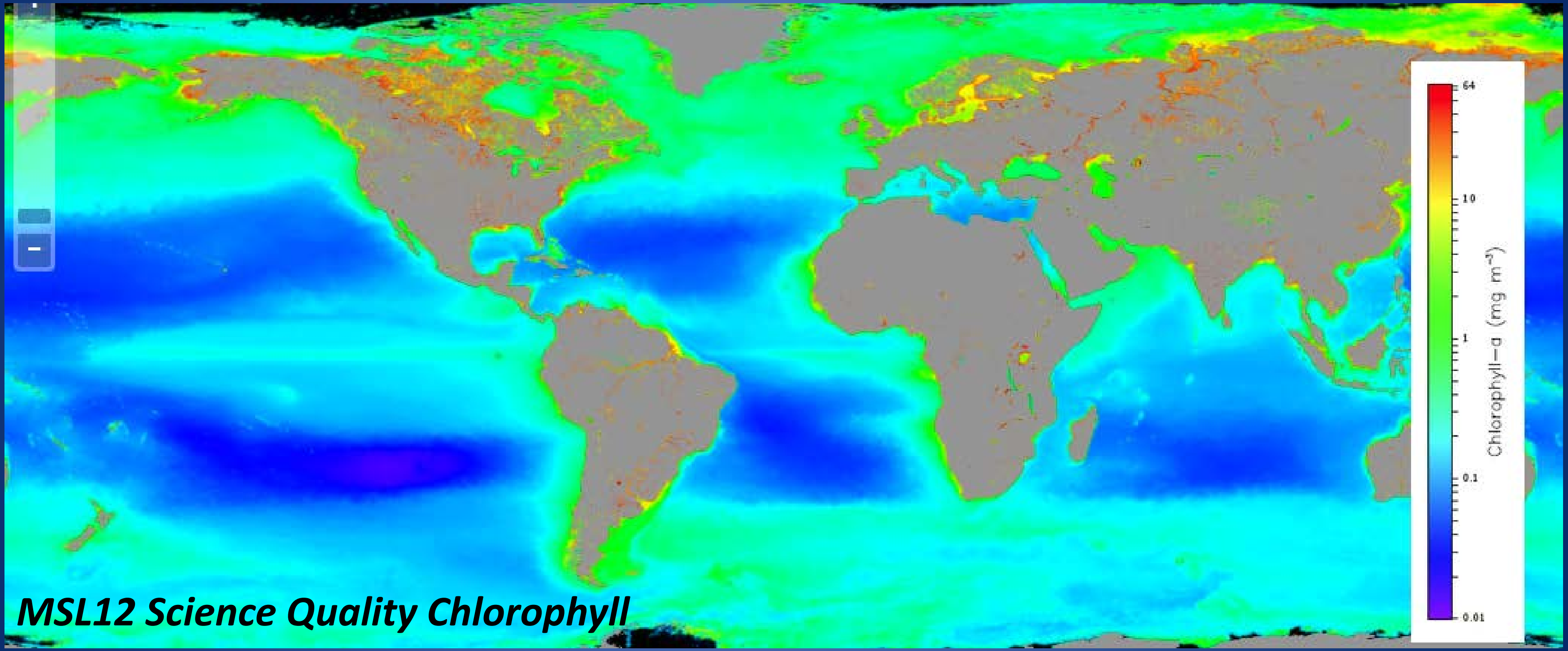
5-km Global Blended SST Analysis (includes VIIRS)



2016 STAR/JPSS Annual Science Meeting
College Park, MD ; 8-12 August 2016

Highlights from VIIRS Ocean Color

VIIRS SNPP MSL12 mission-long science quality climatology



Including greatly improved retrievals for high altitude lakes

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Multi-Sensor Level 1 to Level 2 Processing System (MSL12)

Both NRT and mission -long science quality data

Attribute	Near-Real Time	Science Quality Delayed Mode
Processing System	MSL12	MSL12
Latency:	Best effort, as soon as possible (~12-24h)	Best effort, ~1-2 week delay
SDR:	IDPS Operational SDR	OC-improved IDPS SDR
Ancillary Data:	Global Forecast System (predicted)	Science quality (assimilated)
Spatial Coverage:	May be gaps due to various issues	Complete global coverage
Processed by:	CoastWatch, transferring to OSPO	NOAA/STAR
Distributed by:	CoastWatch	CoastWatch, NCEI
Archive Plans:	Yes, NCEI, via OSPO	Yes, NCEI, via CoastWatch
Reprocessing:	No	Yes, ~2-3 years or as needed

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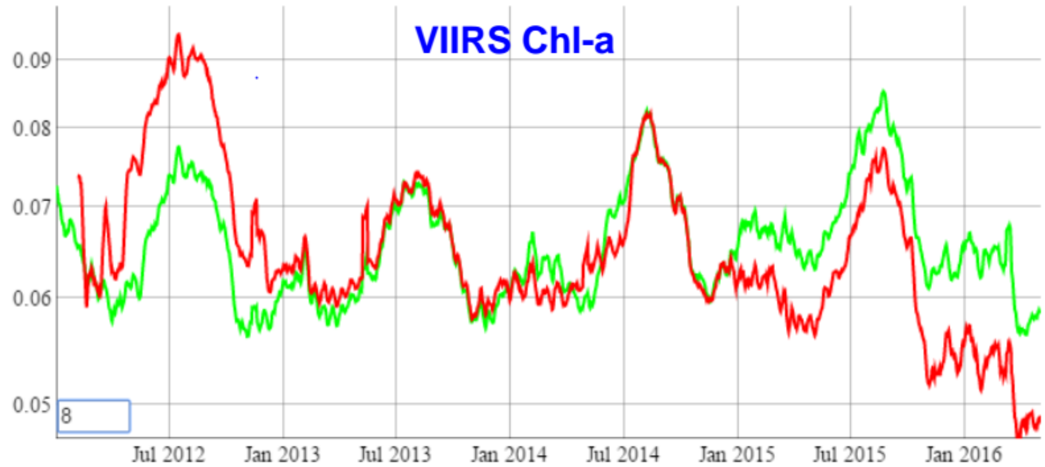
Global Oligotrophic Waters



Red: VIIRS **IDPS-SDR**
Near-real-time data

Green: VIIRS **OC-SDR**
Science quality data

Both data are reprocessed using the same MSL12!

Statistics of VIIRS Data vs. In Situ (MOBY)
(2012-01-01 ~ 2016-04-27)

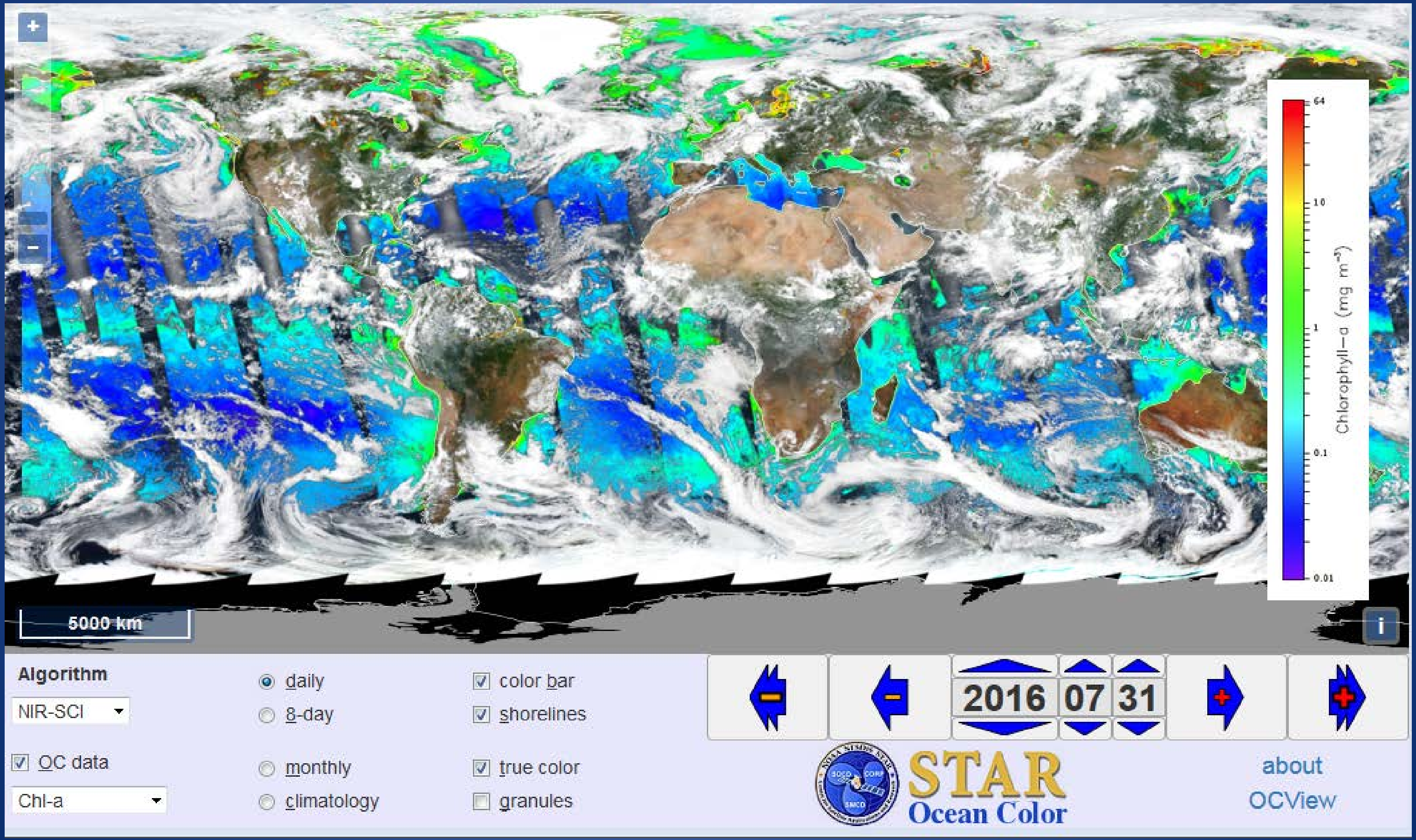
	IDPS-SDR MSL12 (ver. 1.10) (Near-Real-Time Data)				OC-SDR MSL12 (ver. 1.10) (Science Quality Data)			
	AVG	MED	STD	No	AVG	MED	STD	No
[illegible]	**1.0083**	1.0065	0.0961	463	**1.0164**	1.0157	0.0956	509
[illegible]	**1.0191**	1.0005	0.1733	475	**1.0083**	1.0062	0.0899	509
[illegible]	**1.0258**	0.9991	0.1861	475	**1.0110**	1.0103	0.0846	509
$nL_w(551)$	**1.0604**	0.9809	0.4910	475	**1.0148**	1.0004	0.1338	509
$nL_w(671)$	**1.3366**	1.0059	2.1345	487	**1.1762**	1.1053	0.5393	505
Chl-a	**1.0508**	0.9764	0.4254	468	**1.0141**	1.0041	0.1647	509
$K_d(490)$	**1.0135**	0.9826	0.2437	471	**0.9842**	0.9760	0.1007	505

MOBY

NIR Gain 8 = [0.979954, 0.974892, 0.974685, 0.965832, 0.979042, 0.982065, 1.00000, 1.01812, 0.994676, 1.20252]

STAR JPSS Oceans

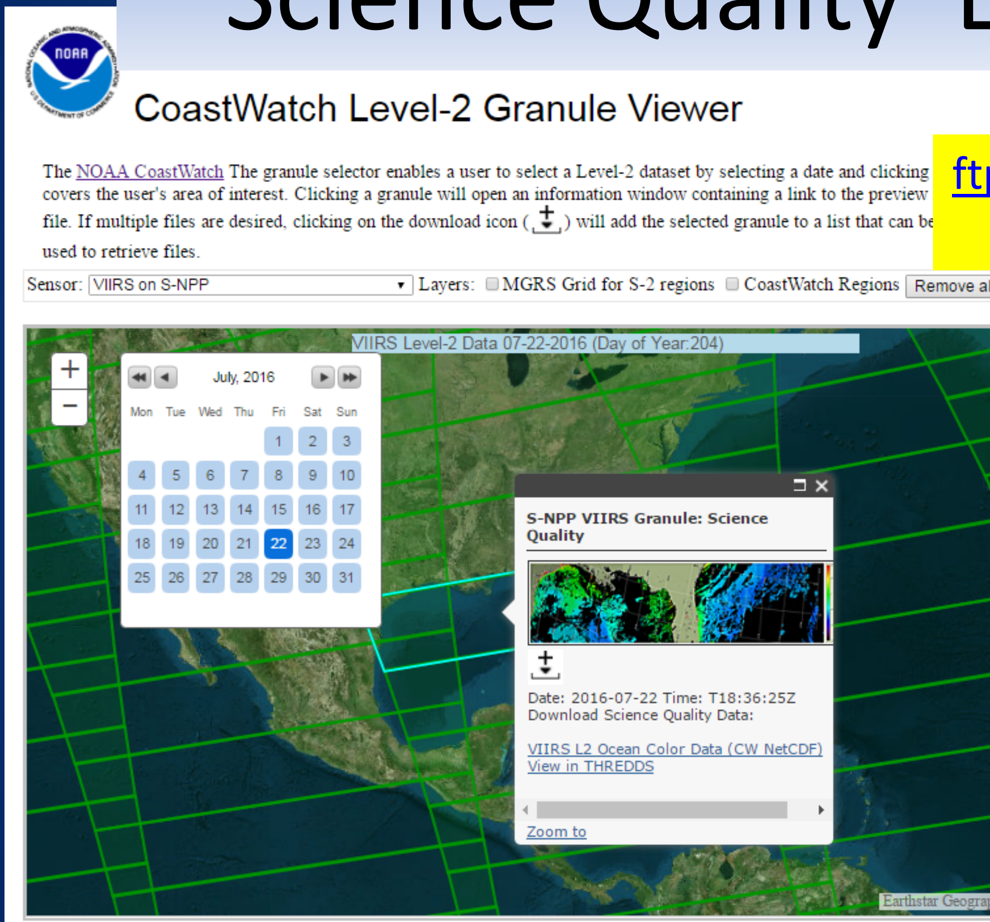
VIIRS Ocean color EDR Team: Introduced OCView tool for easy, interactive image monitoring



http://www.star.nesdis.noaa.gov/sod/mecb/color/

NOAA CoastWatch/OceanWatch Data Dissemination of VIIRS Ocean Color and SST

Science Quality 'Life-of-Mission'



http://coastwatch.noaa.gov/cwn/cw_granule_selector.html

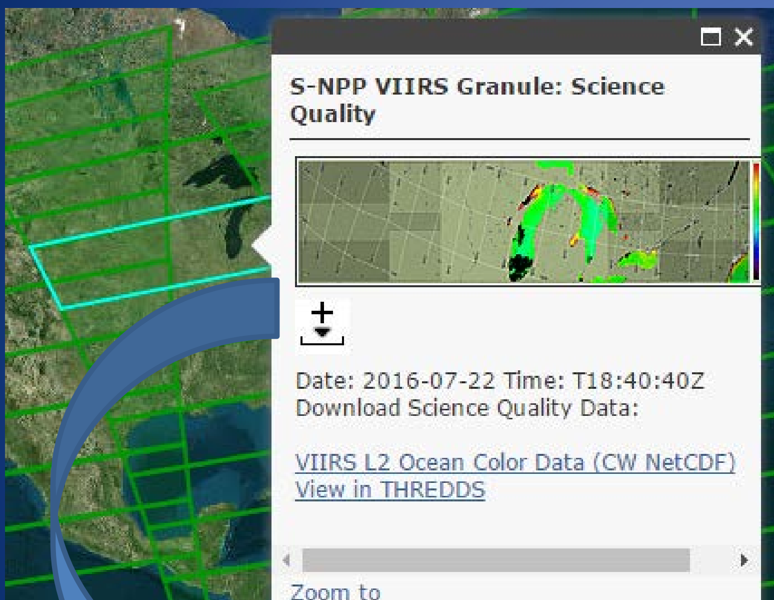
- FTP OC 2012 to [Present – 15 days]:

  ftp://ftp.star.nesdis.noaa.gov/pub/socd1/mecb/coastwatch/viirs/science/L2/

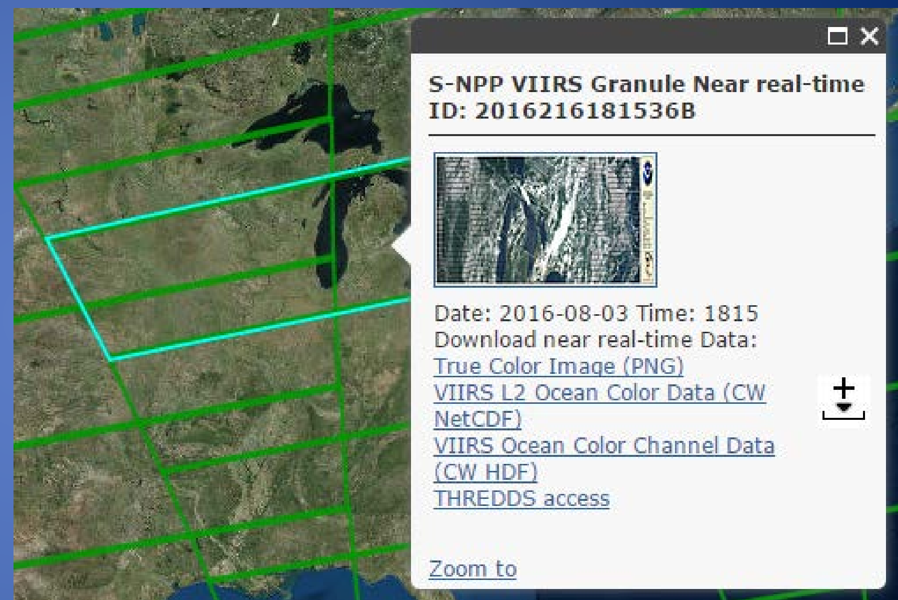
- Integrated with the same L2 Granule Selector tool
  - Present – 15 days: NRT Granules
  - 15 days old and prior: Science Quality
  - Includes data preview and data cart
- VIIRS SST Science Quality will be included when ready

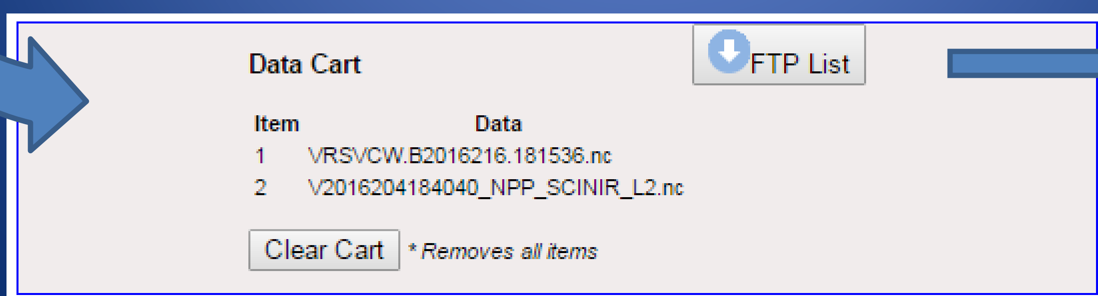
Example of VIIRS OC Data Cart

Science Quality (forward processing)

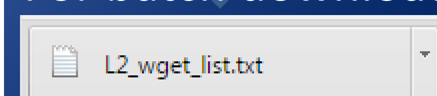


Near real-time





For batch download



The case for Reprocessing

- **WHY”? ALL NOAA Line Offices** have expressed a need for consistent, fit-for-purpose quality, long-term time series ocean satellite observations to do their part in support of the NOAA Mission.

- **Reprocessing is essential** for the production of science quality time series data for earth and ocean observations and is expected by satellite data product user communities both within and external to NOAA.

STAR JPSS Oceans

- Operational:
- Science:
- Requirements:
- Measurement-Based:
- Integrated:

STAR JPSS Oceans

- **Operational:** Redefine
  Not just Near Real Time
- **Science:**
- **Requirements:**
- **Measurement-Based:**
- **Integrated:**

STAR JPSS Oceans

- **Operational:** Redefine
  Not just Near Real Time
- **Science:** Crucial at every step
  Not just product development
- **Requirements:**
- **Measurement-Based:**
- **Integrated:**

STAR JPSS Oceans

- **Operational:** Redefine
  Not just Near Real Time
- **Science:** Crucial at every step
  Not just product development
- **Requirements:** Allow to Evolve
  Not etched in stone tablets
- **Measurement-Based:**
- **Integrated:**

STAR JPSS Oceans

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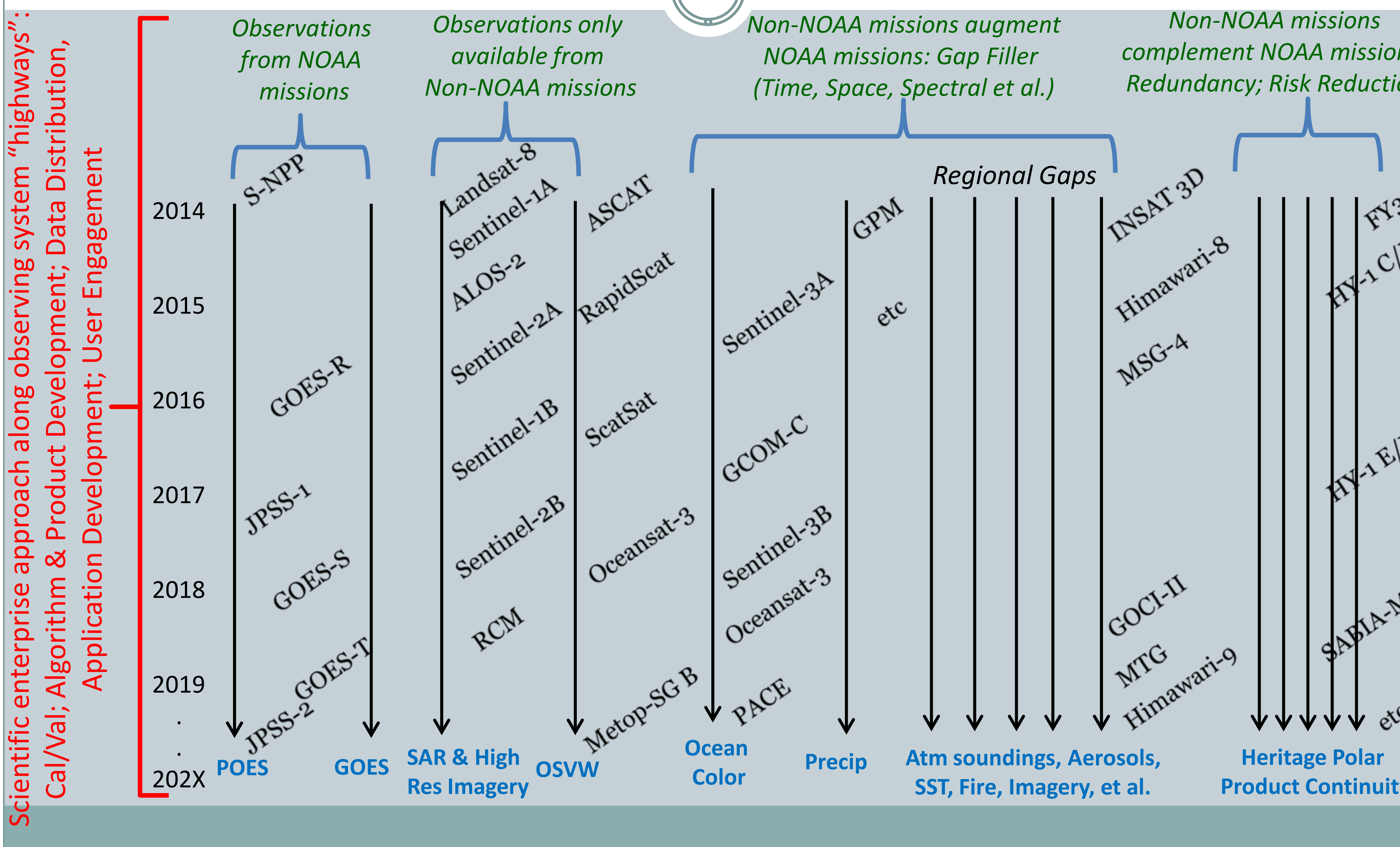
- **Requirements:** Allow to Evolve
  Not etched in stone tablets
- **Measurement-Based:** Mission agnostic approach
- **Integrated:**

Measurement-based approach in support of users: Ensuring continuity & coverage

Observing System Highways: Utilize satellite data from NOAA & non-NOAA missions

Leverages existing science, technical, programmatic et al. infrastructure in NESDIS



Courtesy: Paul DiGiacomo & Paul Chang

STAR JPSS Oceans

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  approach
- **Integrated:** Fundamentally integrate
  non-NOAA observations,
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STAR JPSS Oceans

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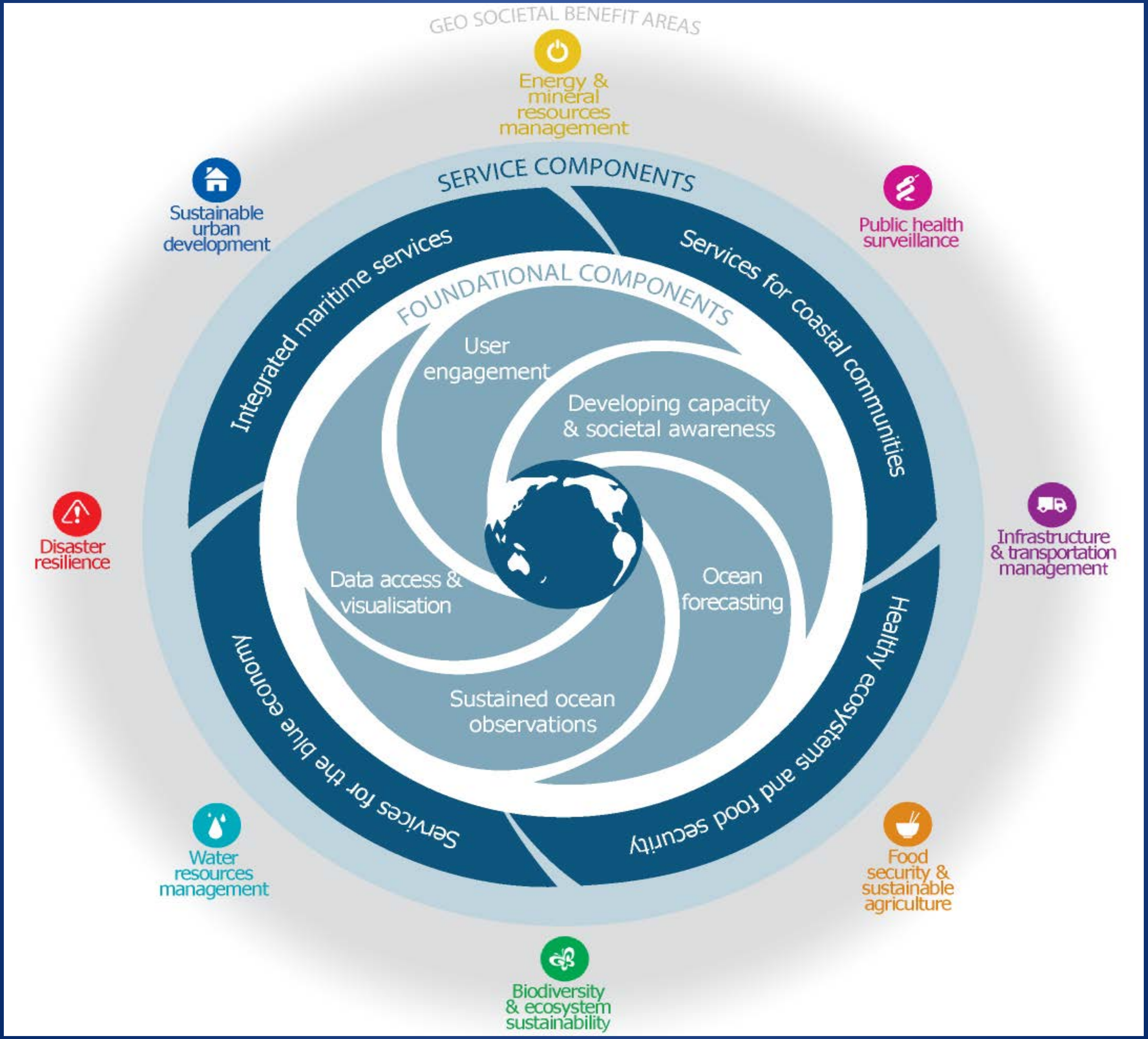
GEO Blue Planet Initiative



Thank you - Questions?

Suomi NPP/JPSS Land EDR Overview

Products, Applications and J1 Readiness

Ivan Csiszar

NOAA/NESDIS/STAR

and the NOAA JPSS Land Team

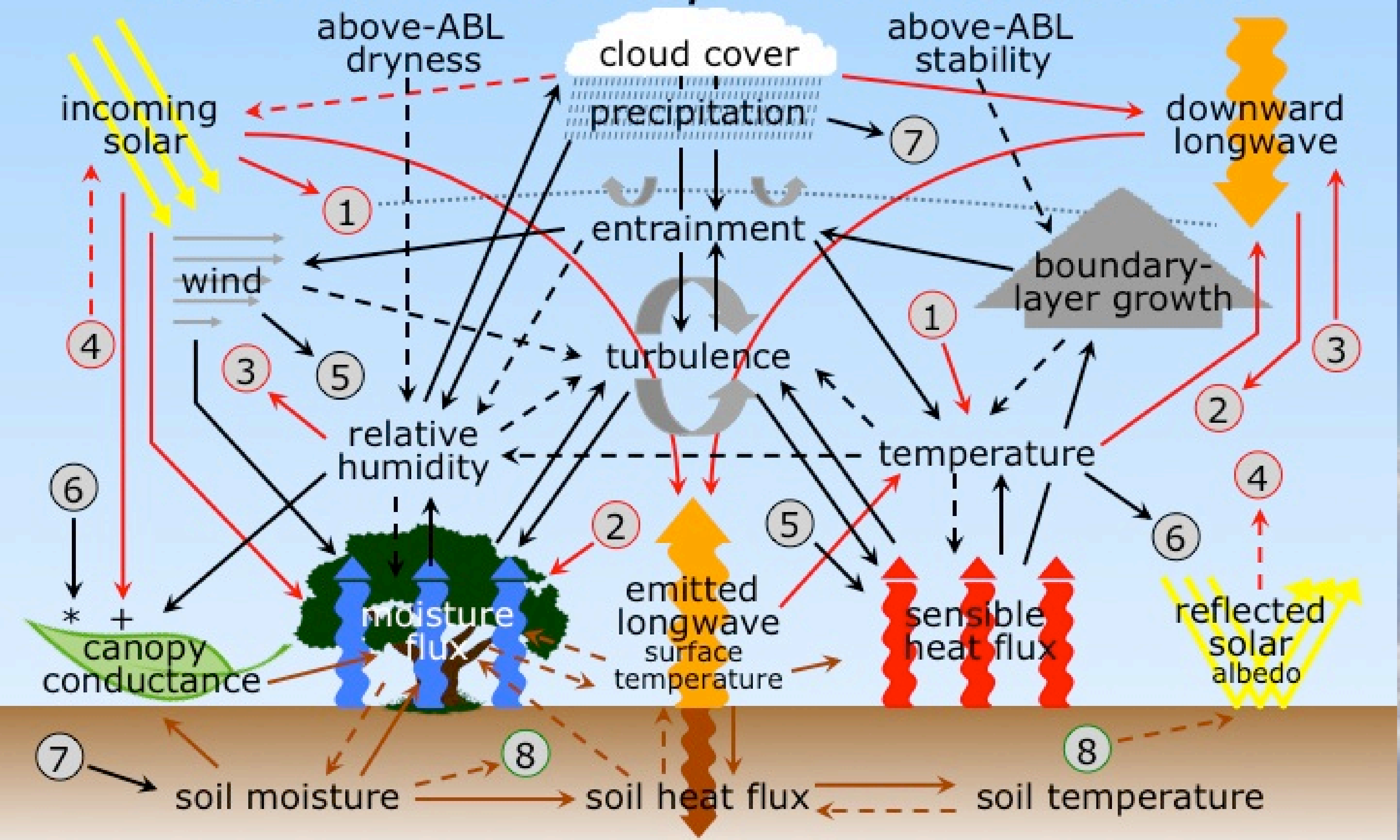
see slides for individual credits

Why monitor land surface?

- Land surface is an important component of the **integrated Earth System**
  - Interactions between land surface and all other “spheres” (e.g. energy, momentum, carbon)
  - Critical role of terrestrial ecosystems
- Most **human activities** take place there e.g.
  - Agriculture
  - Land use and land cover change
  - Urbanization
  - Sources of emissions

- Various **disasters** involve land surface processes e.g.
  - Droughts
  - Floods
  - Fires
  - Insects
- Land surface variables are critical inputs to numerical **weather and climate models**
  - Previously used climatologies are replaced by real-time data

Local Land-Atmosphere Interactions



radiation — surface layer & ABL — land-surface processes — feedbacks: positive, negative

+positive feedback for C3 & C4 plants, negative feedback for CAM plants

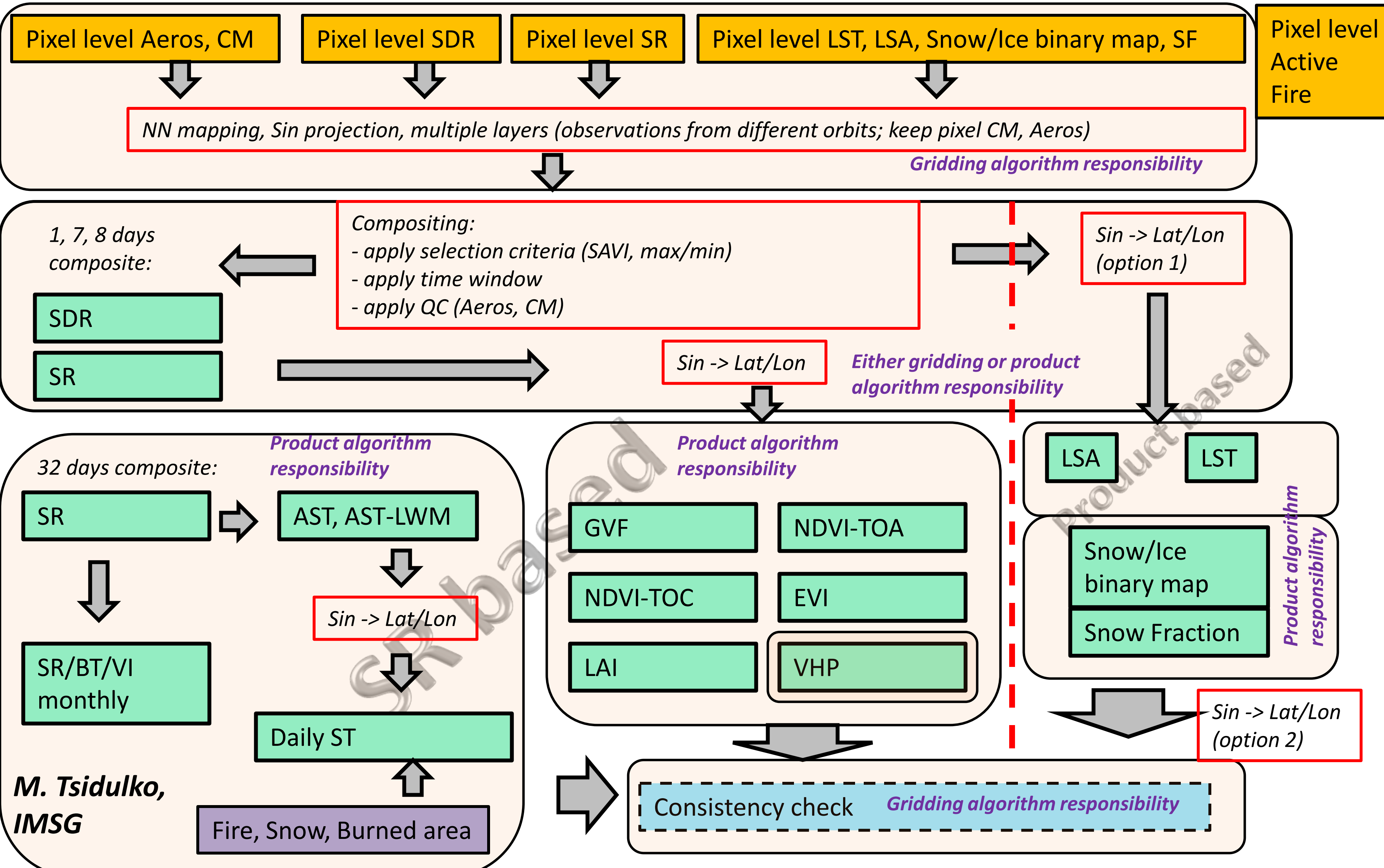
***negative feedback above optimal temperature**

M. Ek, NOAA/NCEP

Land algorithm status

- Land algorithms are currently transitioning to Enterprise solutions
  - changes in retrieval algorithm, product content, format
  - see presentations from the NOAA JPSS Enterprise Workshop for details
  - http://www.star.nesdis.noaa.gov/star/meeting_SJEAW2016.php)
- Long-term product monitoring and maintenance continues
  - http://www.star.nesdis.noaa.gov/jpss/EDRs/index.php
- Product development is directly in synch with operational applications
  - NCEP/EMC land: consistent, gridded, global, 1-km composites
  - biophysical variables for terrestrial ecological studies
  - fire radiative power for smoke/air quality applications
  - etc.
- Preparations for reprocessing are ongoing
  - http://www.star.nesdis.noaa.gov/star/meeting_JPSS2016_LDRW.php

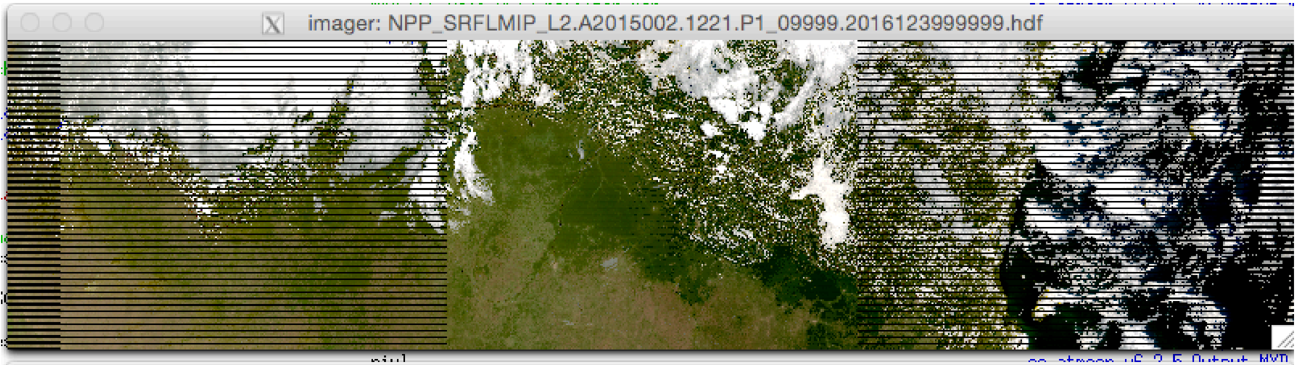
Schematic view of proposed Land Enterprise System



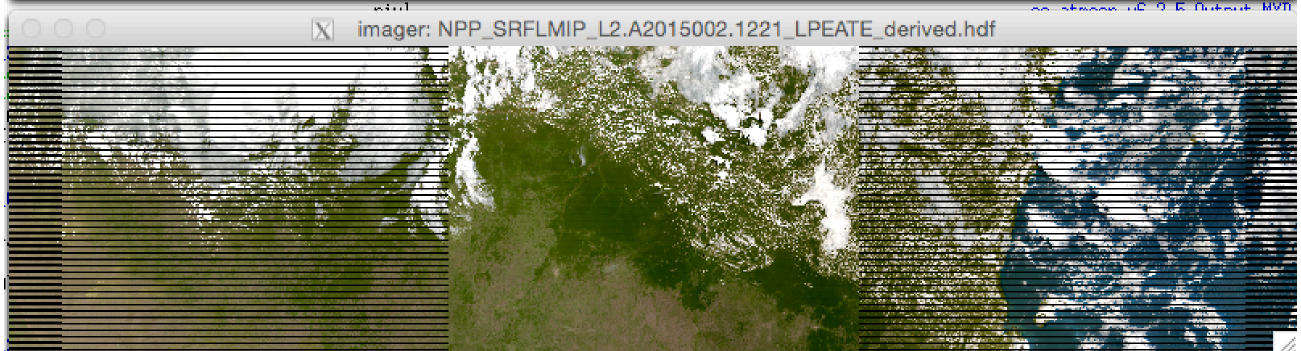
M. Tsidulko, IMSG

VIIRS Surface Reflectance

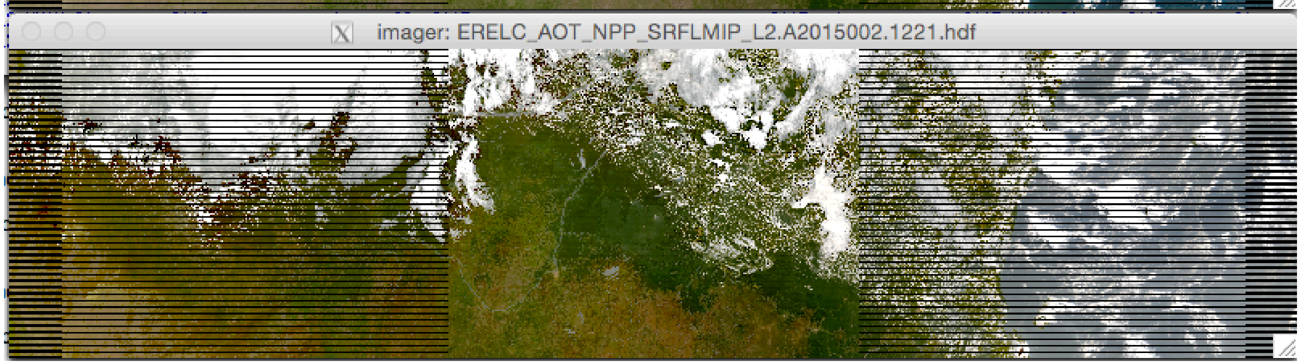
NOAA
Enterprise



NASA LSIPS C5



NASA LSIPS C6



Critical Design Review for implementation of the NOAA Enterprise version is ongoing.

E. Vermote, NASA

VIIRS VEGETATION INDEX PRODUCTS

- Enterprise Algorithm for Vegetation Products (EAVP) is being developed that will run operationally at NDE
- The new Vegetation products (Phase-1:EVI, EVI2*, NDVI, GVF) will be global gridded at 1* km resolution
- For generating these new vegetation products, the EAVP will ingest the enterprise versions of the VIIRS SDR, CM, SR, and AOT datasets
- These new Vegetation products generated with the EAVP will incorporate all the refinements in sensor calibration (VIIRS SDR), improvements to the input datasets (CM, SR, and AOT), as well as changes/improvements to the VI-EDR algorithm (additional quality flags, new TOC NDVI dataset, improved quality definition, etc)

*there is no JPSS requirement yet

FUTURE (PHASE–1) ENTERPRISE ALGORITHM FOR VEGETATION PRODUCTS (EAVP)

The Normalized Difference Vegetation Index (TOA and TOC)

$$NDVI = \frac{\rho_{\mathrm{NIR}} - \rho_{\mathrm{red}}}{\rho_{\mathrm{NIR}} + \rho_{\mathrm{red}}}$$

The Enhanced Vegetation Index (TOC)

$$EVI = 2.5 \frac{\rho_{\mathrm{NIR}} - \rho_{\mathrm{red}}}{\rho_{\mathrm{NIR}} + C_1 \cdot \rho_{\mathrm{red}} - C_2 \cdot \rho_{\mathrm{blue}} + 1}$$

The 2-band EVI (no Blue band)

$$EVI2 = 2.5 \frac{\rho_{\mathrm{NIR}} - \rho_{\mathrm{red}}}{\rho_{\mathrm{NIR}} + 2.4\rho_{\mathrm{red}} + 1}$$

The Green Vegetation Fraction

$$GVF = \frac{EVI - EVI_0}{EVI_\infty - EVI_0}$$

Global Gridded Vegetation Products

- Projection: Geographic Lat/Lon
- Spatial resolution: 0.009 degree (1 km @ nadir)
- Temporal resolution: daily, weekly updated daily, bi-weekly updated daily
- Quality Flags: Land/Water, Coastal, Clouds, Aerosols, Snow/Ice, etc
- Additional Scientific Data Layers: Gridded, composited surface reflectance and observation geometry for use in science/advanced data analysis
- Format: tiled in NetCDF4

M. Vargas, STAR

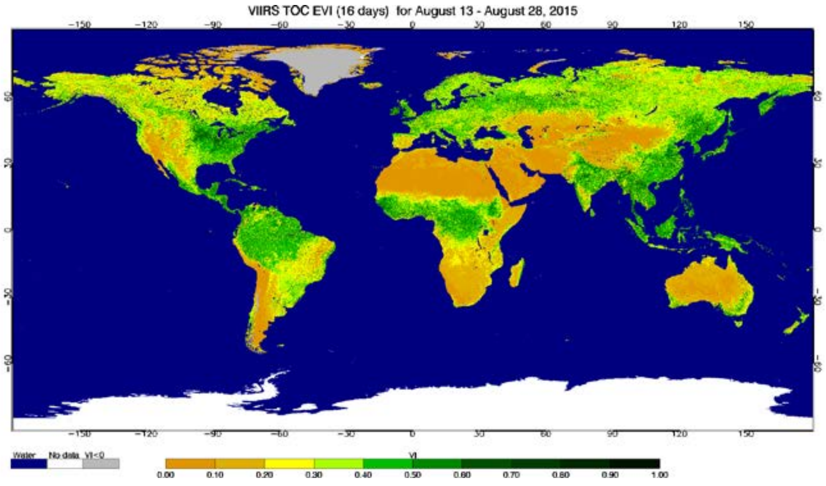
Phase - 2 Enterprise Algorithms for Vegetation Products

Phase - 2 Vegetation Products	Retrieval Strategy
Leaf Area Index (LAI): a measure of the amount of one-sided leaf area per unit ground area in a pixel	Following the MODIS heritage, the VIIRS **LAI** and **FPAR** products will be derived from a lookup table (LUT) based on three-dimensional canopy modeling combined with measurements of reflectance, surface type and viewing geometry
Fraction of Photosynthetically Active Radiation (fPAR): a measure of absorbed photosynthetically-active radiation (PAR) by vegetation	
(Daily) Net Photosynthesis (PSN): net carbon exchange over 1 day (photosynthesis – respiration)	$PSN = \varepsilon \cdot VI \cdot PAR$ **PAR** is the incident photosynthetically active radiation and **ε** is the light use efficiency
(Annual) Net Primary Production (NPP): the net flux of carbon from the atmosphere into green plants per unit time, i.e., the amount of vegetable matter produced (net primary production) per year	$NPP = \sum_{annual} PSN$ **NPP** is the time integral of **PSN** over a single year (will therefore be reported annually on a global 1-km grid)

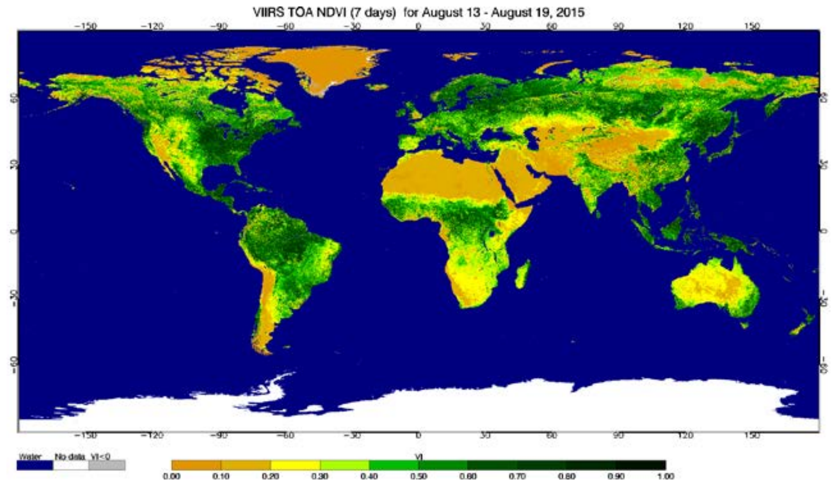
M. Vargas, STAR

Sample Global Gridded VIIRS Vegetation Products

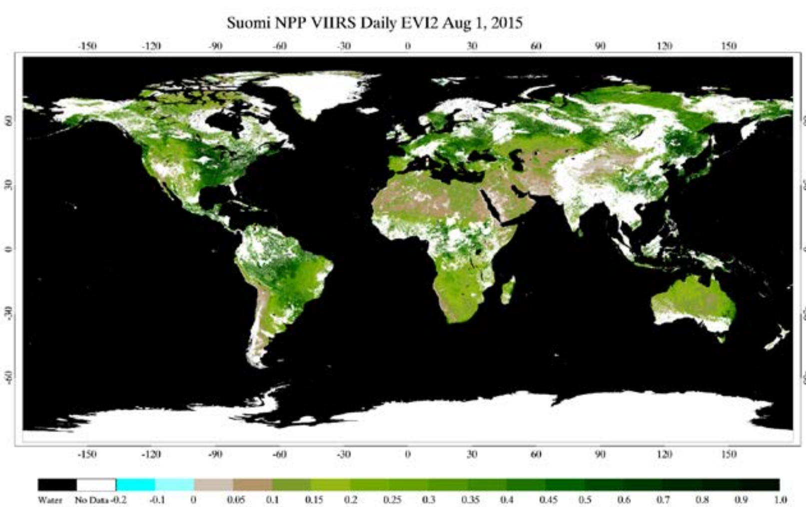
16-day TOC EVI August 13-28, 2015



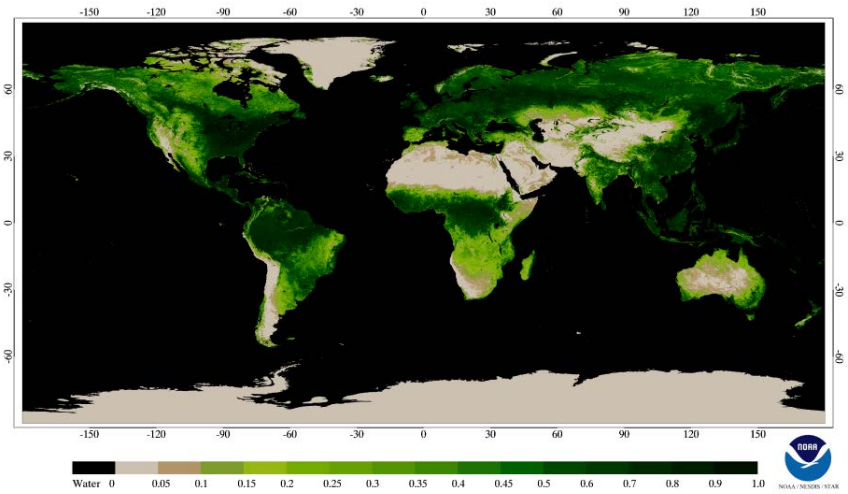
7-day TOA NDVI August 13-19, 2015



Daily TOC EVI2 August 01, 2015



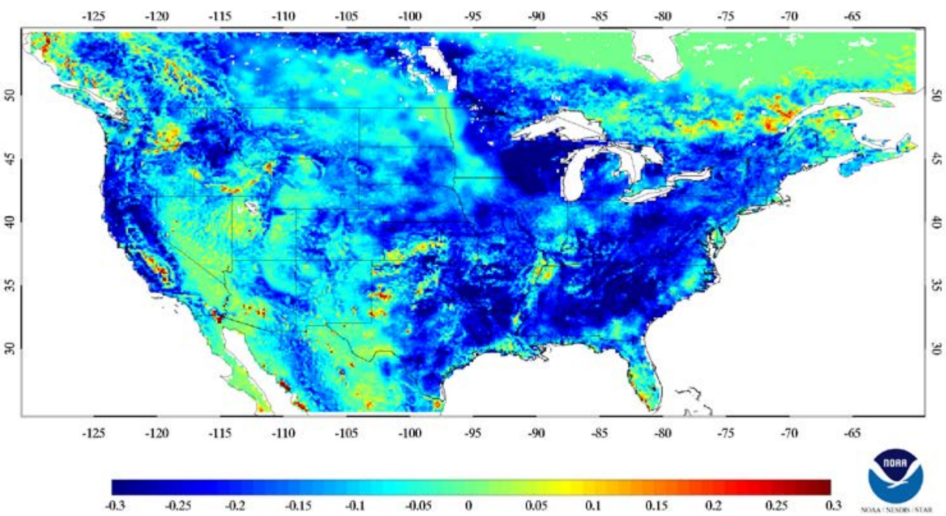
Weekly GVF August 7-13, 2015



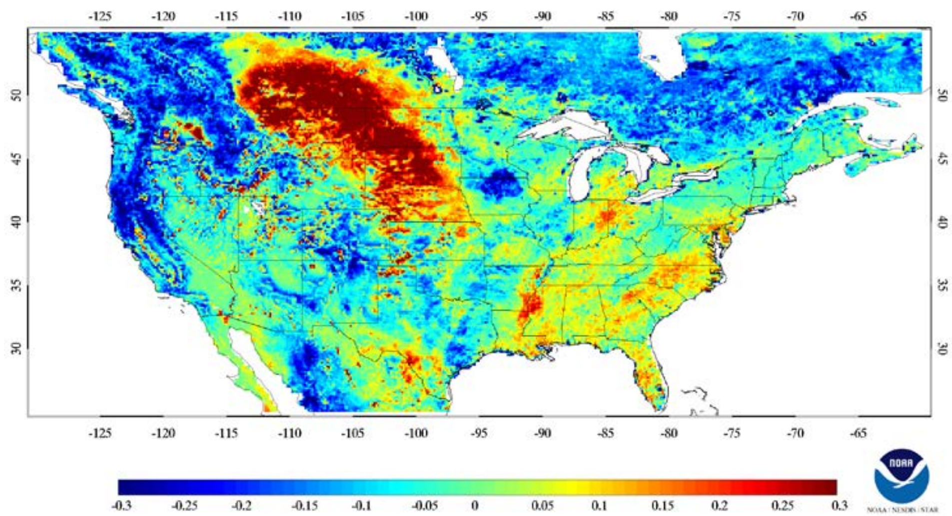
M. Vargas, STAR

GVF difference (VIIRS-AVHRR clim.)

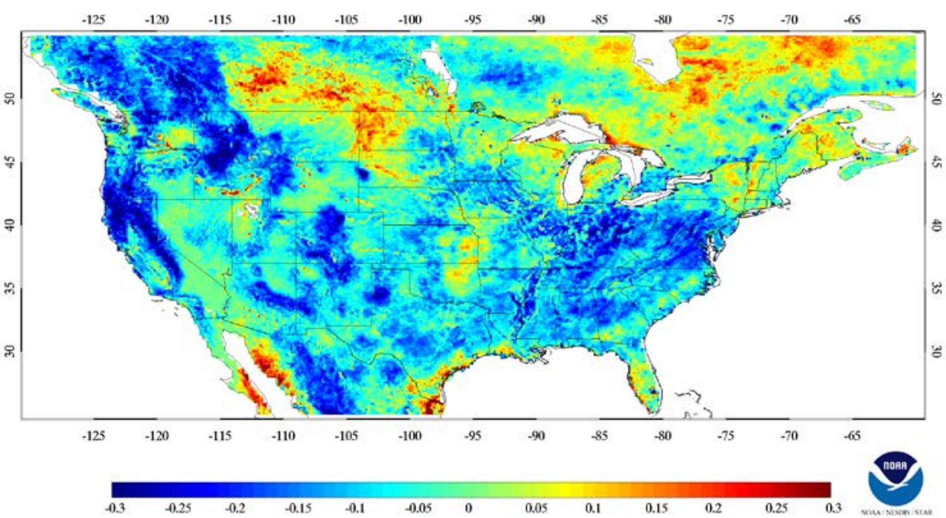
GVF difference (VIIRS - GVF_clim) April 9 - April 15, 2013



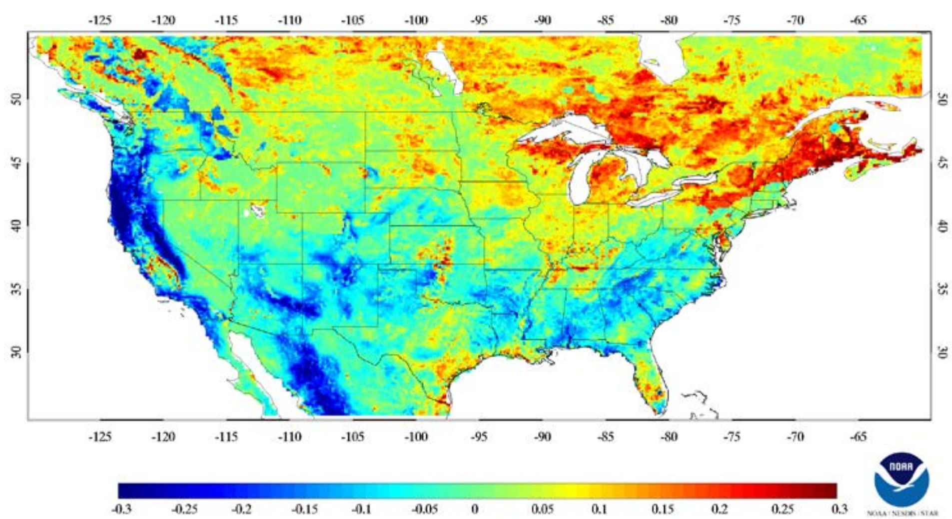
GVF difference (VIIRS - GVF_clim) July 9 - July 15, 2013



GVF difference (VIIRS - GVF_clim) October 9 - October 15, 2015



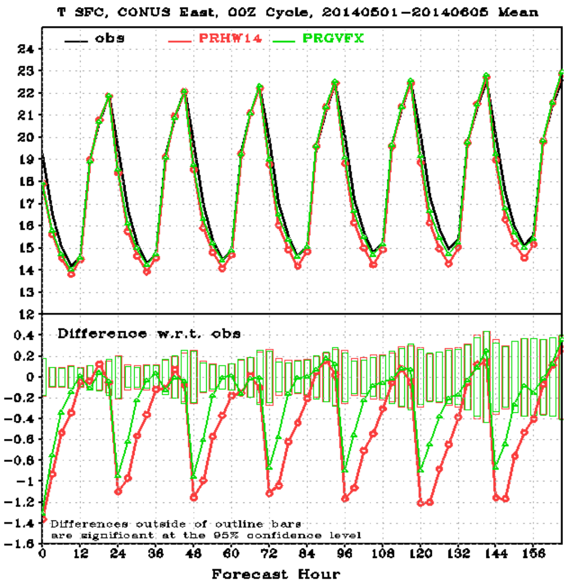
GVF difference (VIIRS - GVF_clim) January 9 - January 15, 2016



AVHRR GVF “climatology” is higher than VIIRS GVF over vegetated area in spring

M. Vargas, STAR

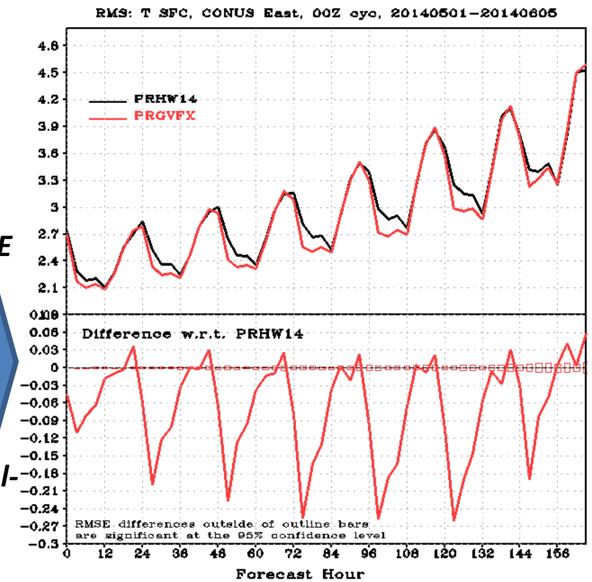
Green Vegetation Fraction Impacts



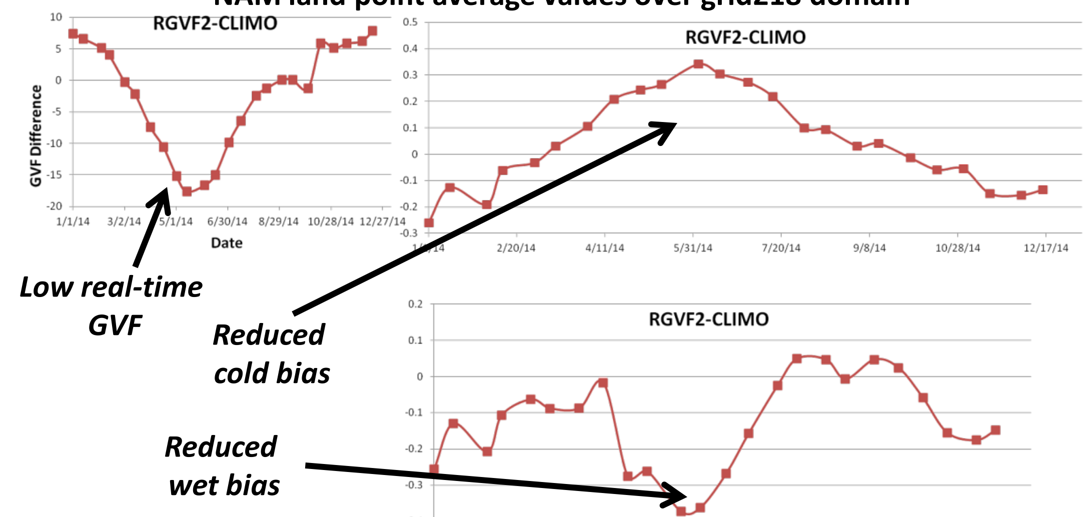
Surface temperature (T_{sfc}) for GFS model runs for the Eastern CONUS for May 1 – June 5, 2014.

T_{sfc} (top) and T_{sfc} [forecast – obs] (bottom). Black: observed; red: control run using multi-year AVHRR; green: experimental run using VIIRS near-real-time data.

T_{sfc} RMSE (top) and RMSE [VIIRS] – RMSE [control] (bottom). Black: control run using multi-year AVHRR; red: experimental run using VIIRS near-real-time data.



NAM land point average values over grid218 domain



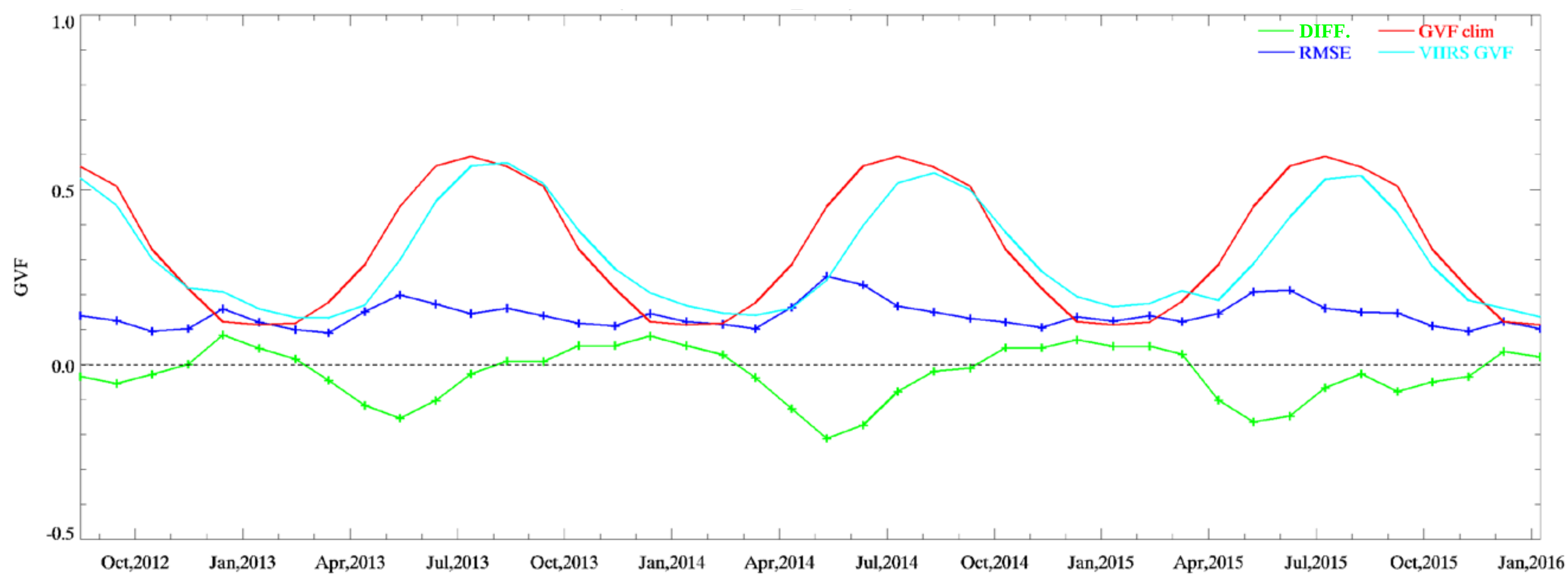
NWS NGGPS Project: Incorporation of near-real-time Suomi NPP Green Vegetation Fraction and Land Surface Temperature data into NCEP Land modeling suite

PIs: I. Csiszar (STAR), M. Ek (EMC)

Team: M. Vargas, W. Zheng, Y. Wu, Y. Yu, Z. Jiang, Z. Song

Impact of real-time VIIRS (RGVF2) vs. multi-year mean AVHRR GVF (CLIMO) on NAM near-surface air and dewpoint temperatures in 2014

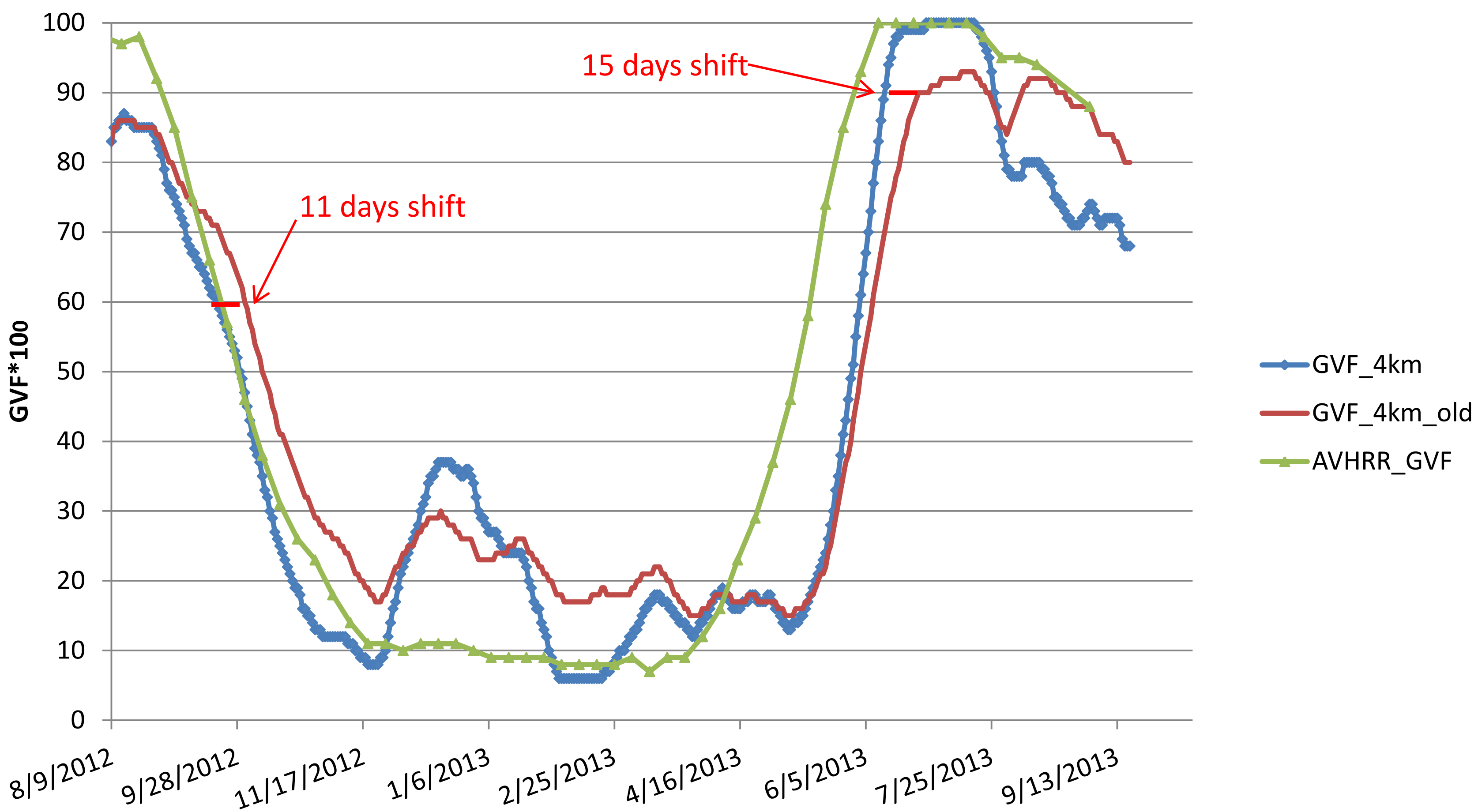
Difference and RMSE between VIIRS and AVHRR GVF Climatology



- Mean GVF climatology is slightly higher than VIIRS GVF
- Positive difference in winter and negative difference in spring and summer
- RMSE is relatively low

M. Vargas, STAR; J. Jiang, Riverside / AER

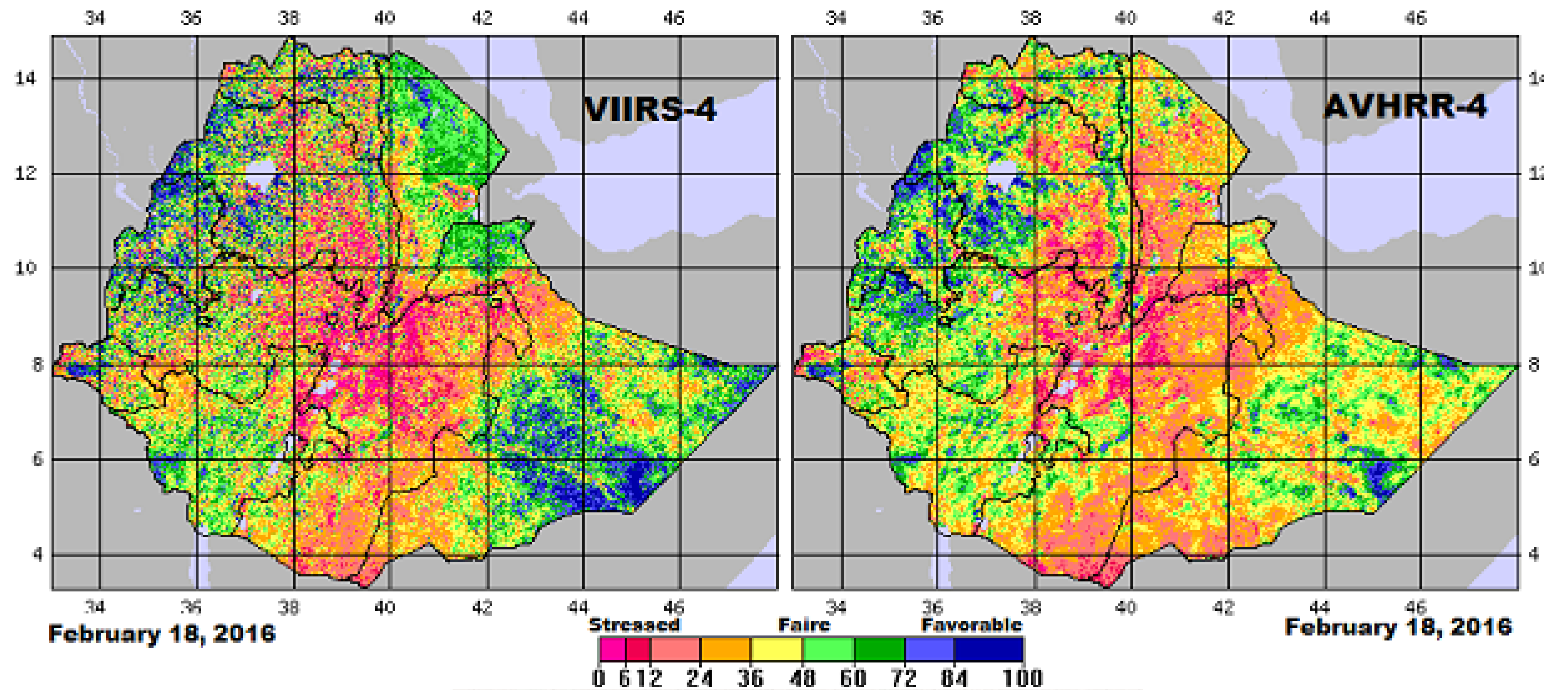
Updated VIIRS GVF at Changbai mountain



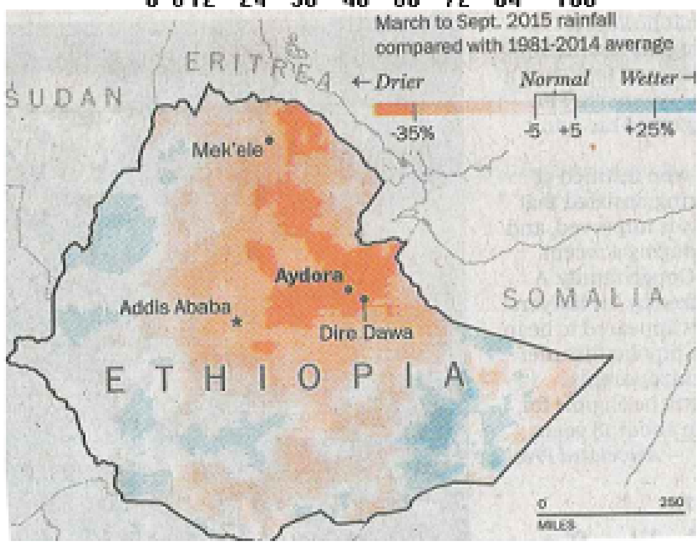
Biome: Mountain Forest

M. Vargas, STAR; J. Jiang, Riverside / AER

Vegetation Health



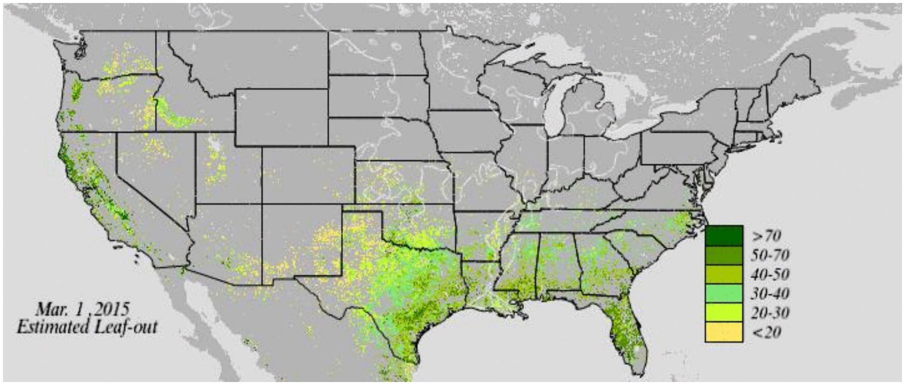
VIIRS vs AVHRR & Precipitation ETHIOPIA 2016

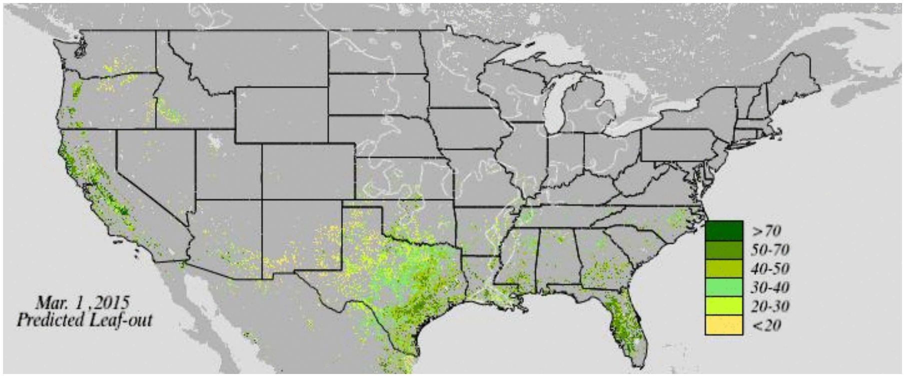


March-September 2015 precipitation anomaly (deviation from 1981-2014 average)

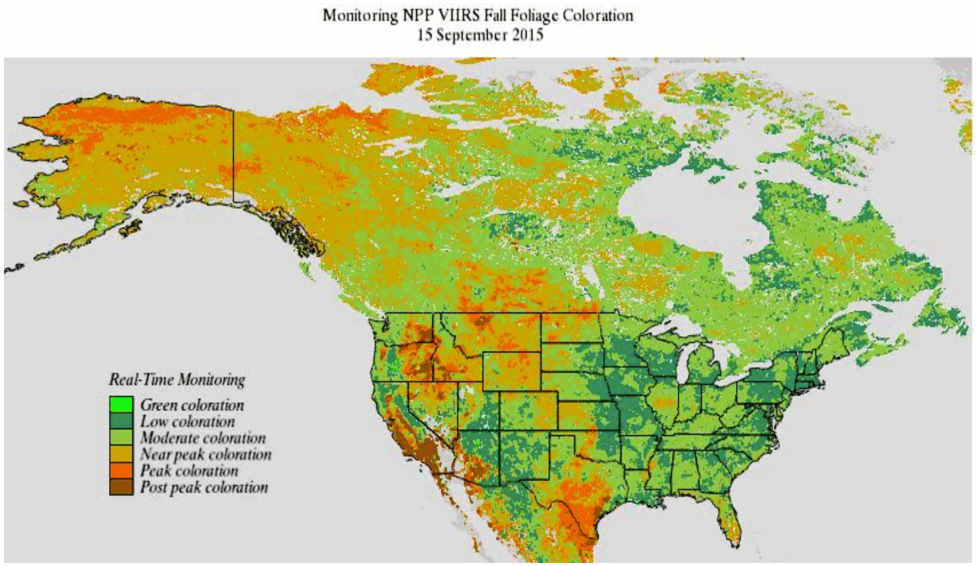
F. Kogan, STAR

Phenology: monitoring and prediction of vegetation changes





Monitoring and predicting vegetation phenology supports applications in agriculture, ecosystem monitoring, numerical weather prediction and tourism.

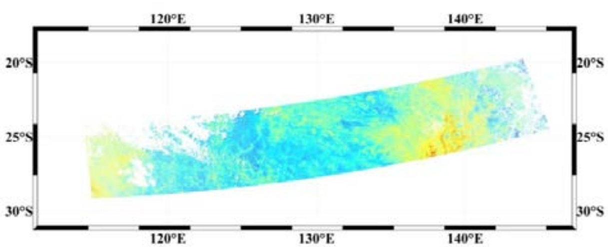


http://www.star.nesdis.noaa.gov/JPSS/EDRs/products_Foliage.php

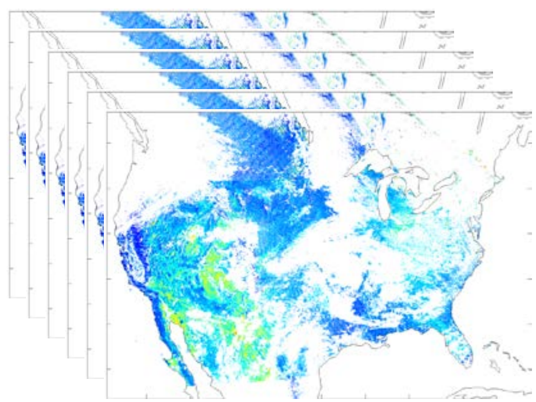
Y. Yu, STAR; X. Zhang, SDSU

Enterprise land surface albedo

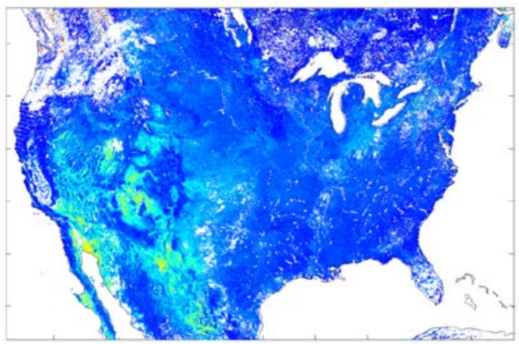
- Quality of SDR, cloud mask and surface types will have direct impacts on albedo retrievals
- Land Surface Albedo reprocessing first will be based on the granule product first
  - Eventually will include a new gridded daily LSA product
- Limited retrospective reference data and validation tools are available.



granule



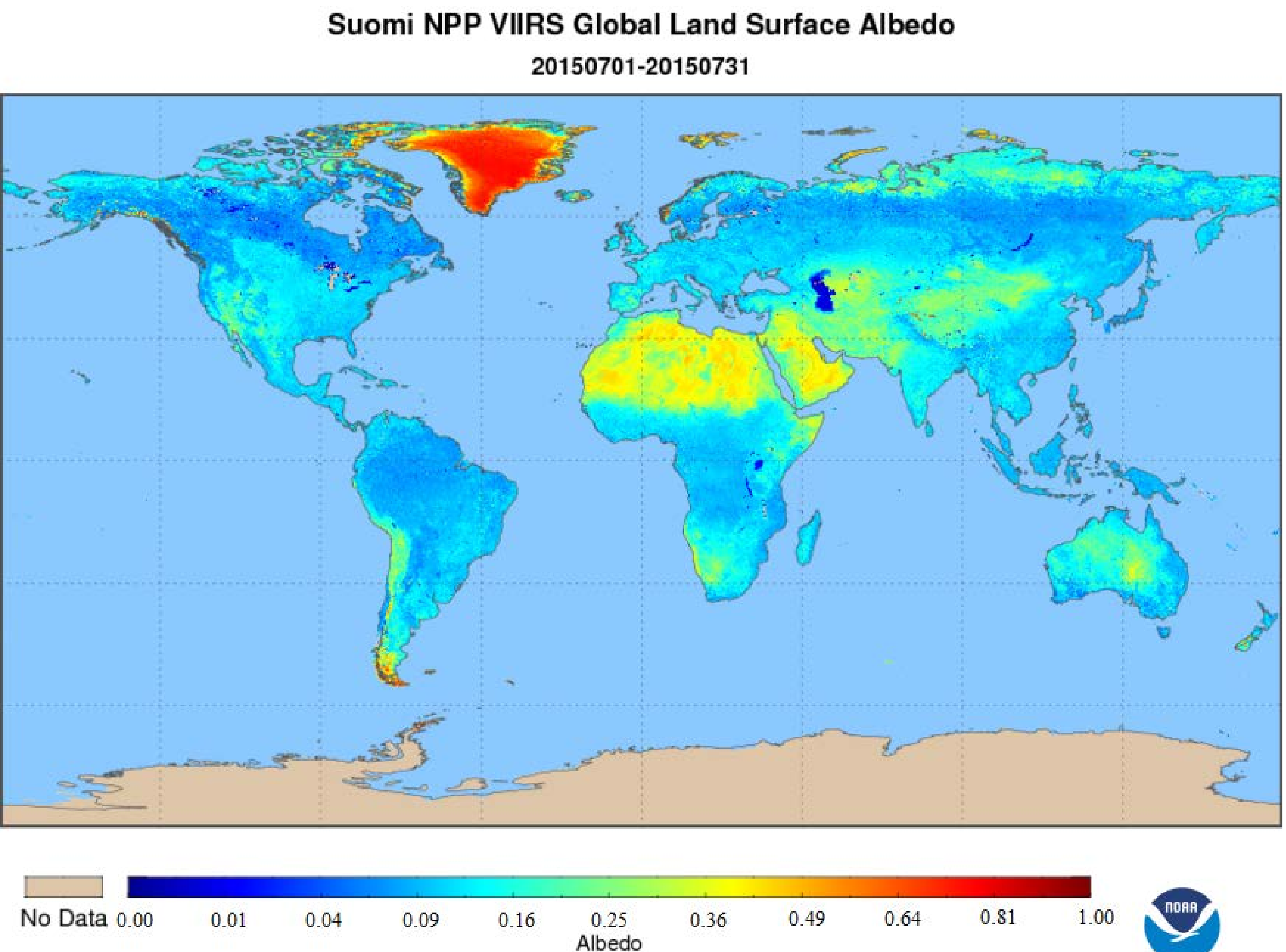
daily gridded



multi-day gridded

Y. Yu, STAR

Albedo: surface energy balance, numerical weather and climate modeling



NOAA/NESDIS/STAR

A gridded albedo product is in development to serve the needs of NOAA's land surface modeling activities.

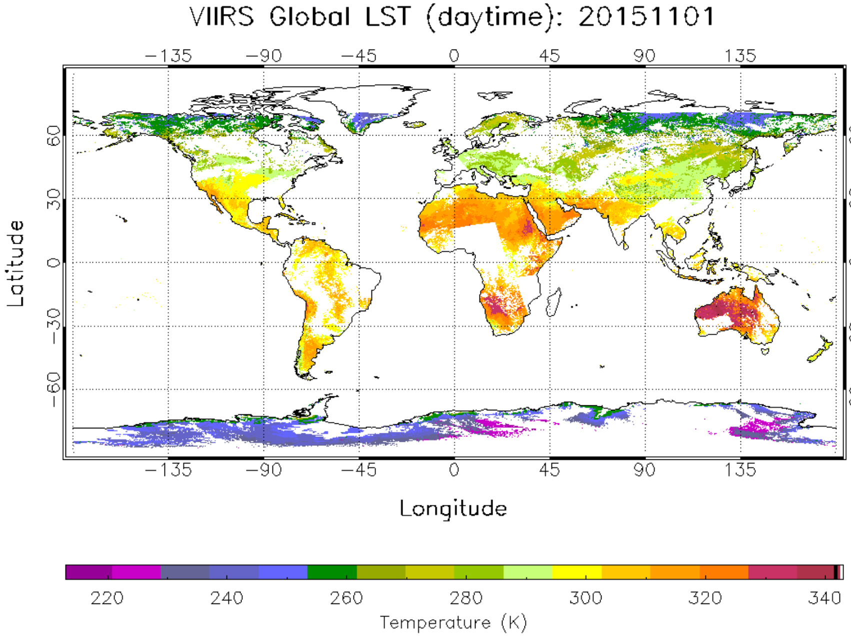
www.star.nesdis.noaa.gov/jpss/albedo.php

Y. Yu, STAR

Enterprise Land Surface Temperature

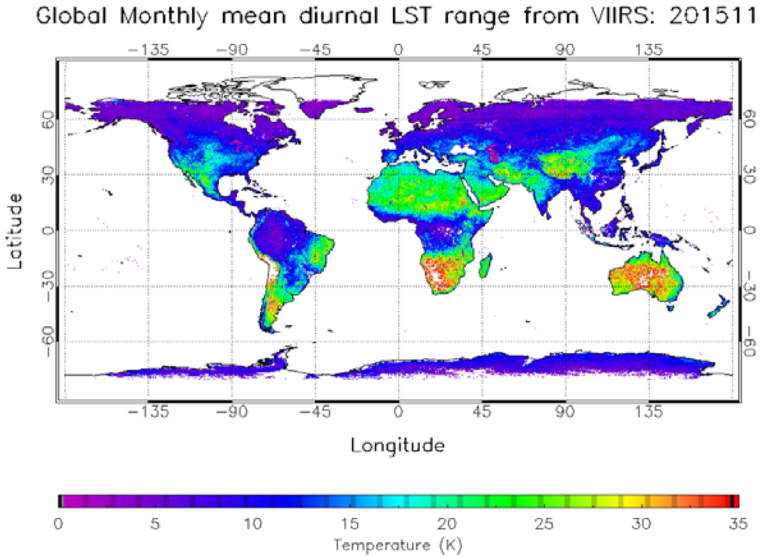
- Based on (enterprise) upstream data: SDR, cloud mask, surface type and AOT if possible
- LST production will rely on an enterprise algorithm that applies emissivity data explicitly
- The input/output data structure as well as the QC flags are determined for enterprise LST algorithm
- The software code for the enterprise LST calculation is ready in local environment
- Possible risk is the availability of corresponding water vapor information
- Limited retrospective reference data and validation tools are available.

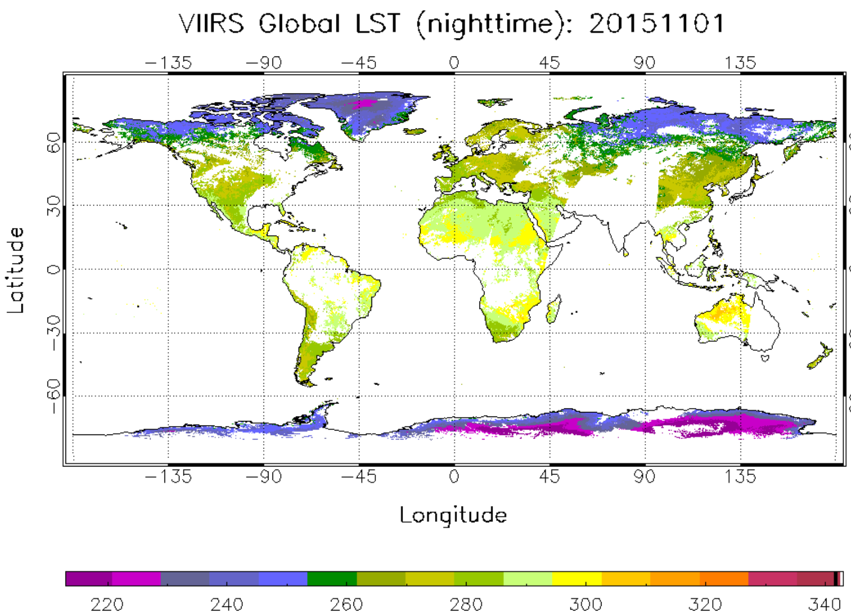
Y. Yu, STAR



Land Surface Temperature: numerical weather, climate modeling, agriculture

A gridded land surface temperature product is in development to serve the needs of NOAA's land surface modeling activities.





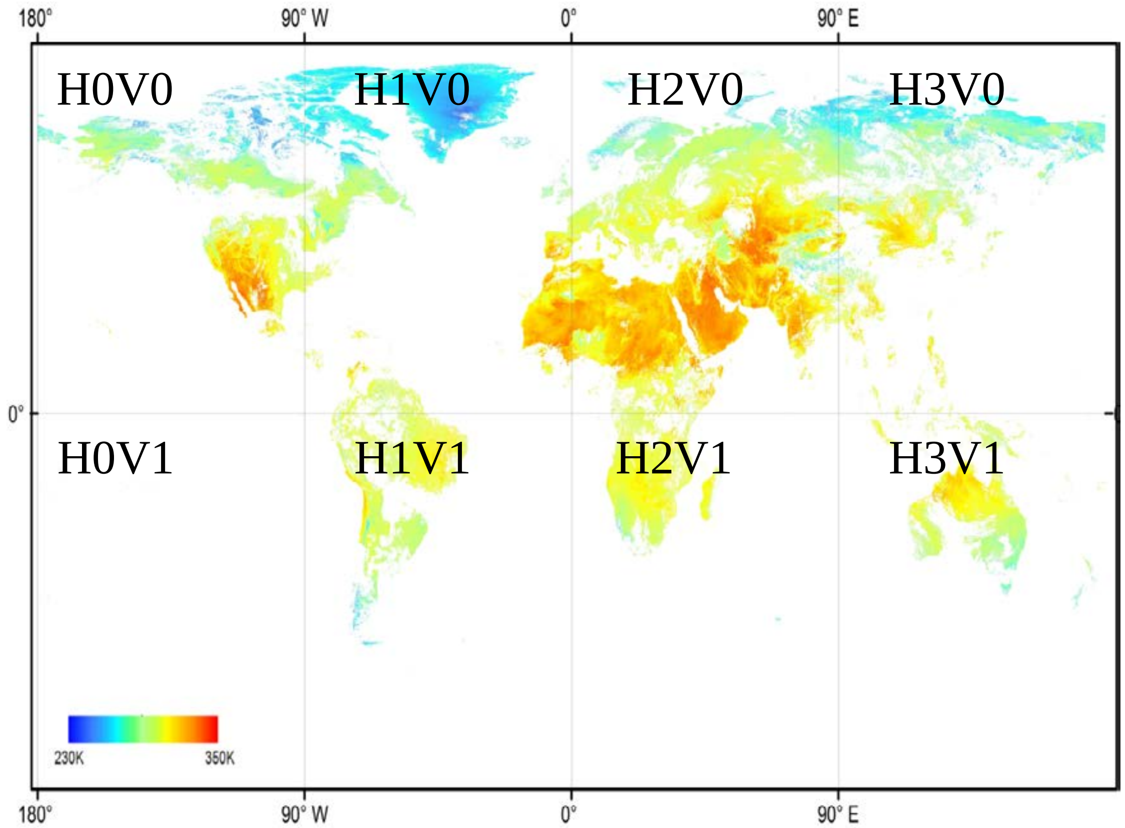
http://www.star.nesdis.noaa.gov/jpss/lst.php

Y. Yu, STAR

VIIRS gridded LST (Level 3 LST,VLSTL3)

- **Gridded composite global products suitable for integration and model performance evaluation**:
- 0.01 degree, daily
- 8 tiles for global, day/night separately, each tile within 150M
- Processing time less than 1.5hr for daily products

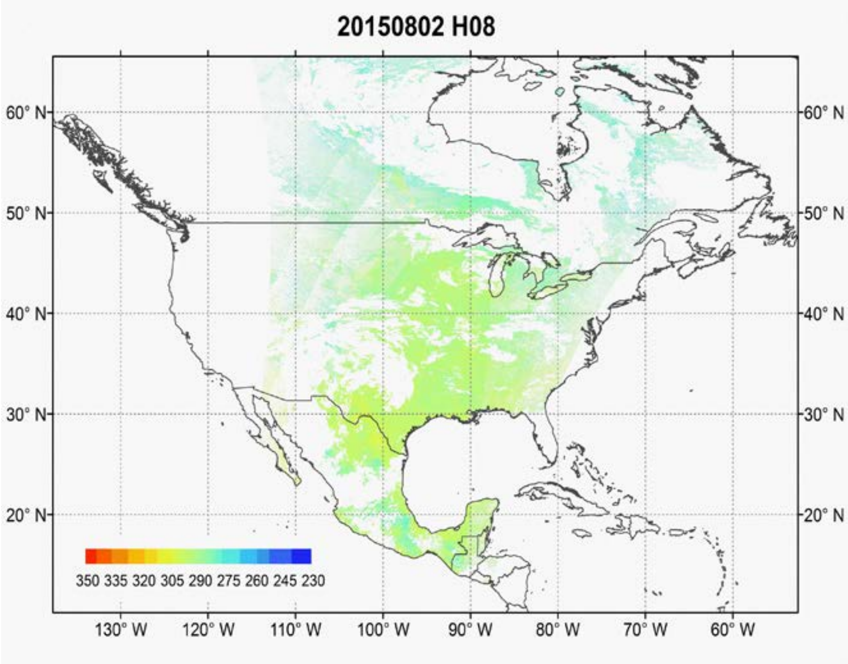
Example products: 20150602 VLSTL3 for Daytime



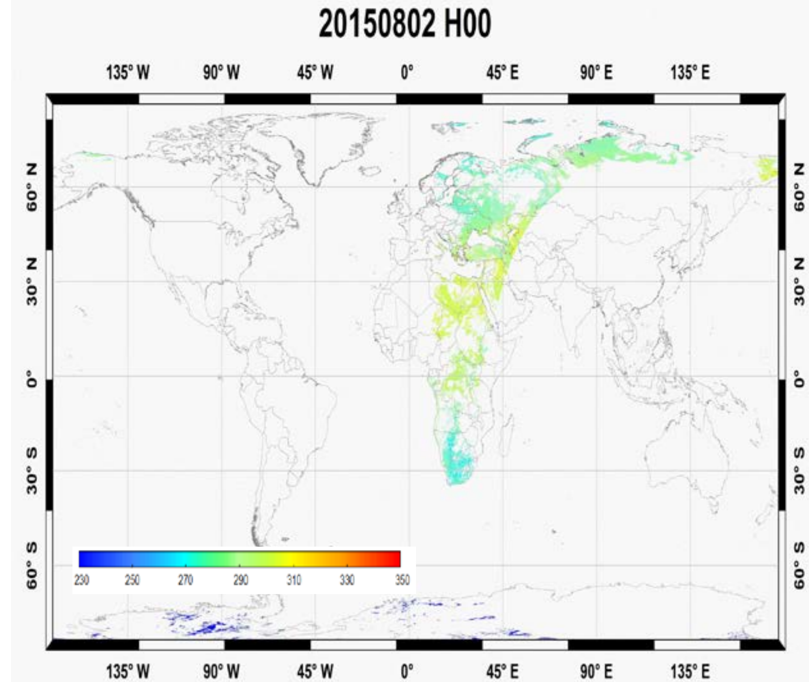
Y. Yu, STAR

Gridded LST Products and their NWP application

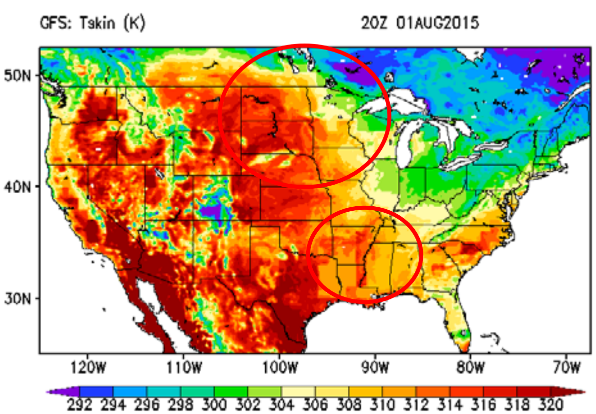
0.009 Degree for NAM CONUS



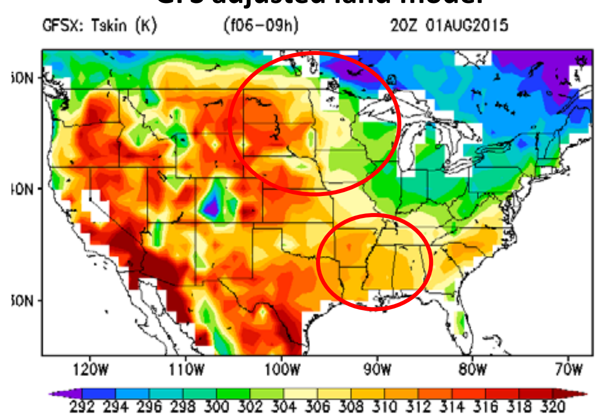
0.036 Degree for GFS GLOBAL



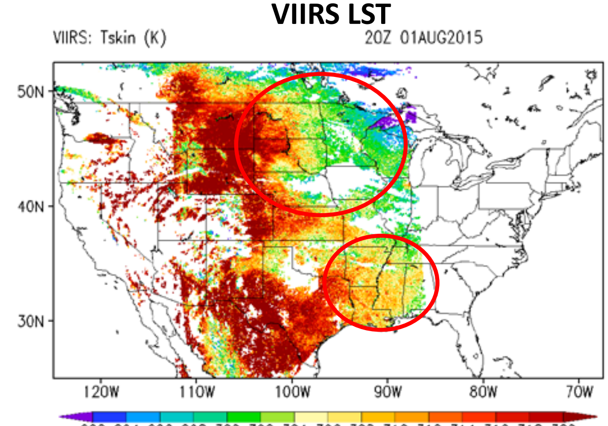
Operational GFS



GFS adjusted land model



VIIRS LST



Y. Yu, STAR; W. Zheng, IMSG

Combining polar and geostationary data for complete coverage

Geostationary data provide the diurnal cycle of land surface temperature and help match satellite measurements with model data.

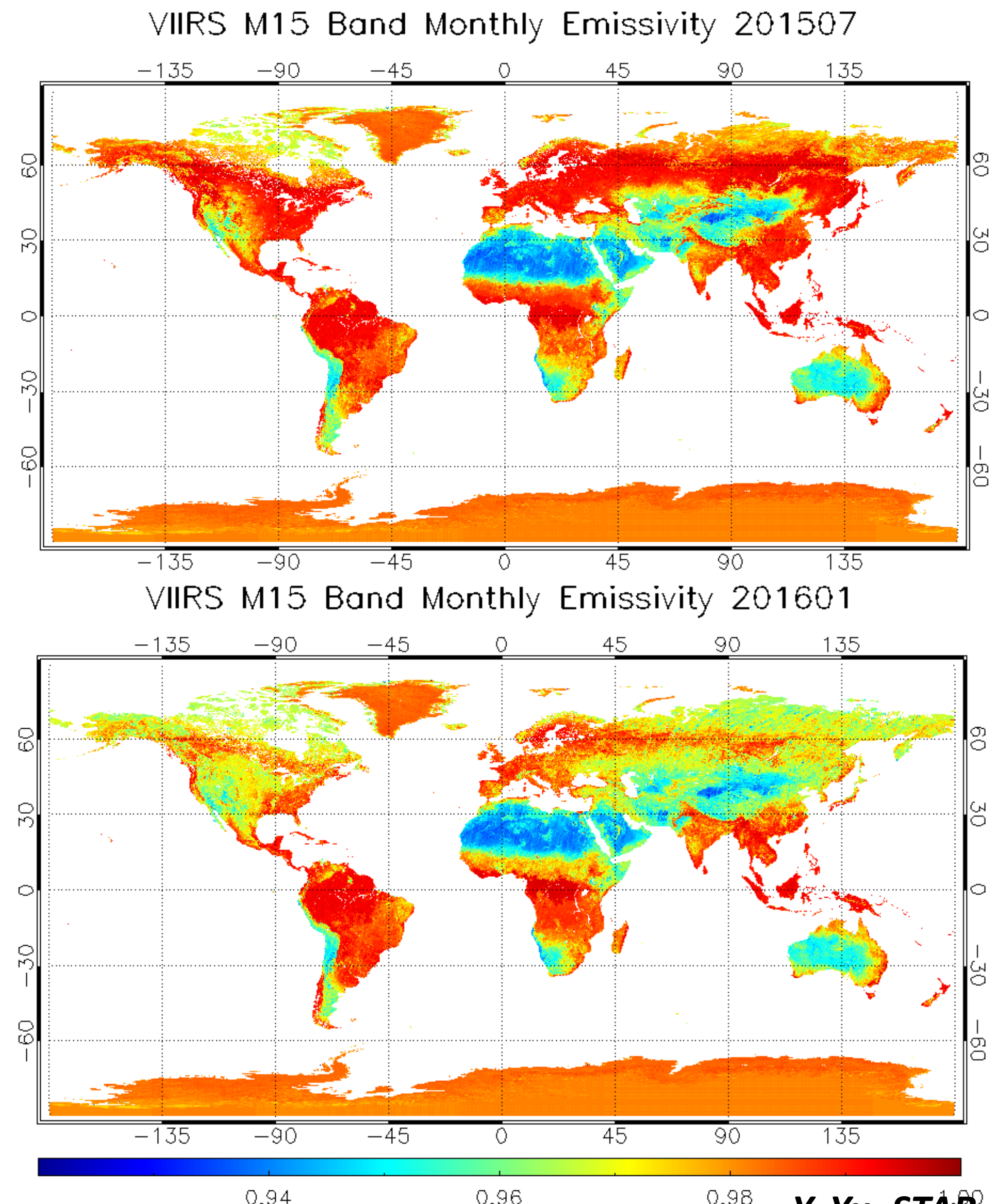
VIIRS Land Surface Emissivity

VIIRS Land Surface Emissivity (LSE) -- Derived for LST retrieval

Purpose:
- Enhance LST retrieval and validation
- Support the forecasting model

Method:
- Using historic emissivity product to generate background (soil or snow) emissivity climatology
- Using real time vegetation and snow information to adjust the static emissivity.

Main Features:
- Daily global gridded dataset
- Up to 0.009 degree resolution
- VIIRS split window bands (M15&M16)
- QF for each grid
- Uncertainty better than 0.015



Y. Yu, STAR

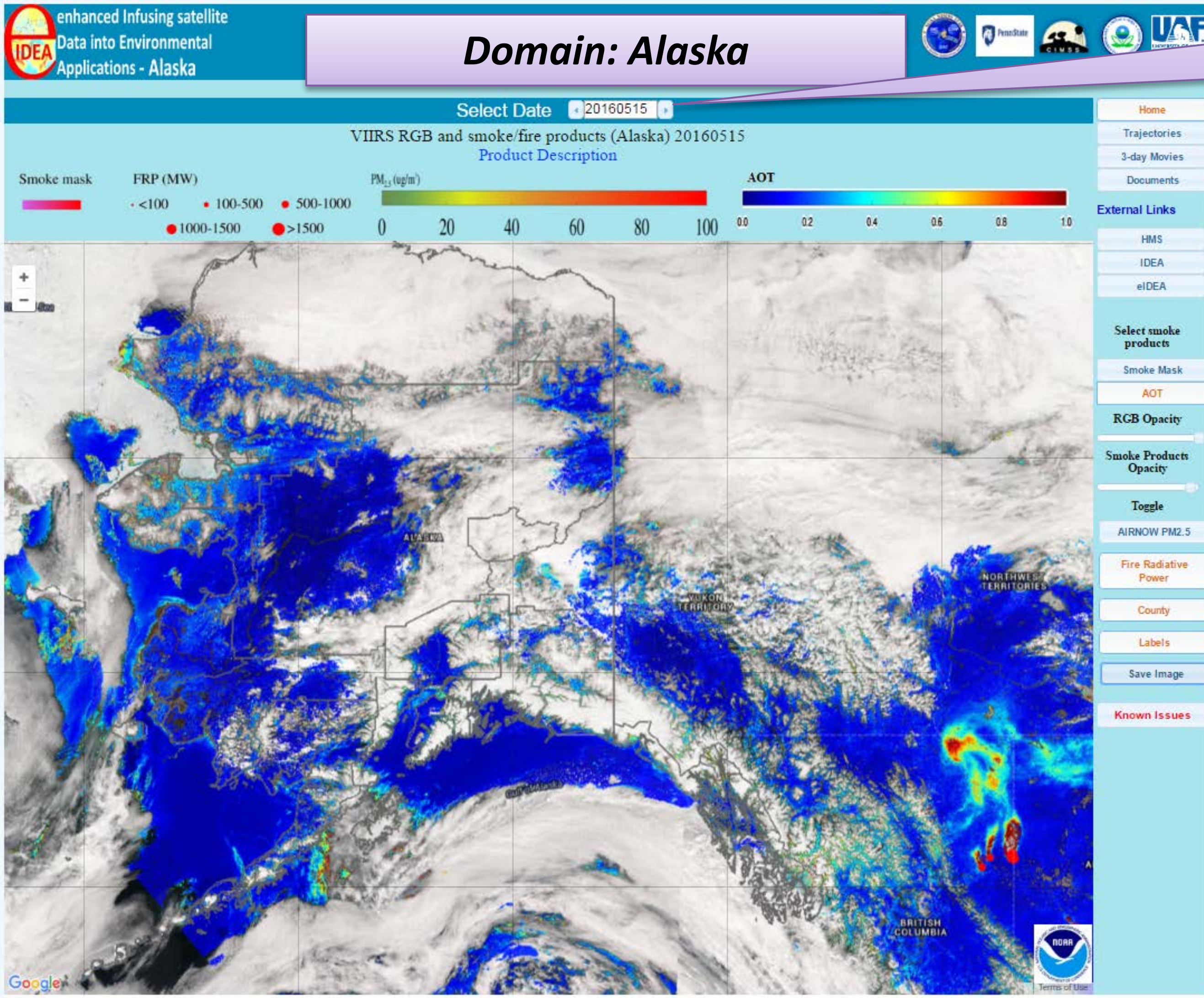
NOAA Operational VIIRS Fire Product Status (2/1)

- Tailored version of the M-band UMD / NASA ST algorithm operational within the Suomi NPP Data Exploitation (NDE) system since March 15, 2016
  - includes fire mask and fire radiative power (FRP)
- Data available from OSPO in simplified text and other formats
  - ftp://satepsanone.nesdis.noaa.gov/FIRE/VIIRS/
- Data available from CLASS
  - currently ftp interface at ftp://ftp-npp.class.ngdc.noaa.gov/
  - pick the date, then to the folder NDE-L2/VIIRS-Active-Fire-EDR-NOAA-Enterprise-Algorithm/
  - ordering capability through the Web interface will be available in August
  - all operational data will be backfilled by late summer from the STAR archive
- Long-term quality monitoring ongoing (including both NDE and IDPS products)
    - https://www.star.nesdis.noaa.gov/jpss/EDRs/products_activeFires.php

NOAA Operational VIIRS Fire Product Status (2/2)

- Ongoing integration into NOAA operational and experimental systems e.g.
  - Hazard Mapping System
  - eIDEA – extended Infusing Satellite Data into Environmental Applications
    - http://www.star.nesdis.noaa.gov/smcd/spb/aq/eidea/
  - NWS Advanced Weather Interactive Processing System (AWIPS-II)
  - High Resolution Rapid Refresh (HRRR) http://rapidrefresh.noaa.gov/HRRRsmoke/
- IDPS production, long-term monitoring and maintenance until all downstream products in NDE / NOAA ESPC Enterprise system
- Other ongoing activities:
  - JPSS-1 testing / preparations
  - preparations for VIIRS SDR reprocessing
  - code integration into CSPP (Community Satellite Processing Package)
  - work towards UMD / NASA I-band / hybrid product transition to operations
  - end user interaction / support - NOAA JPSS Fire and Smoke Initiative
    - RealEarth™ – Google Maps etc.

Web-Based Blended Fire and Smoke Product: eIDEA-Alaska



Domain: Alaska

Calendar to select date of interest

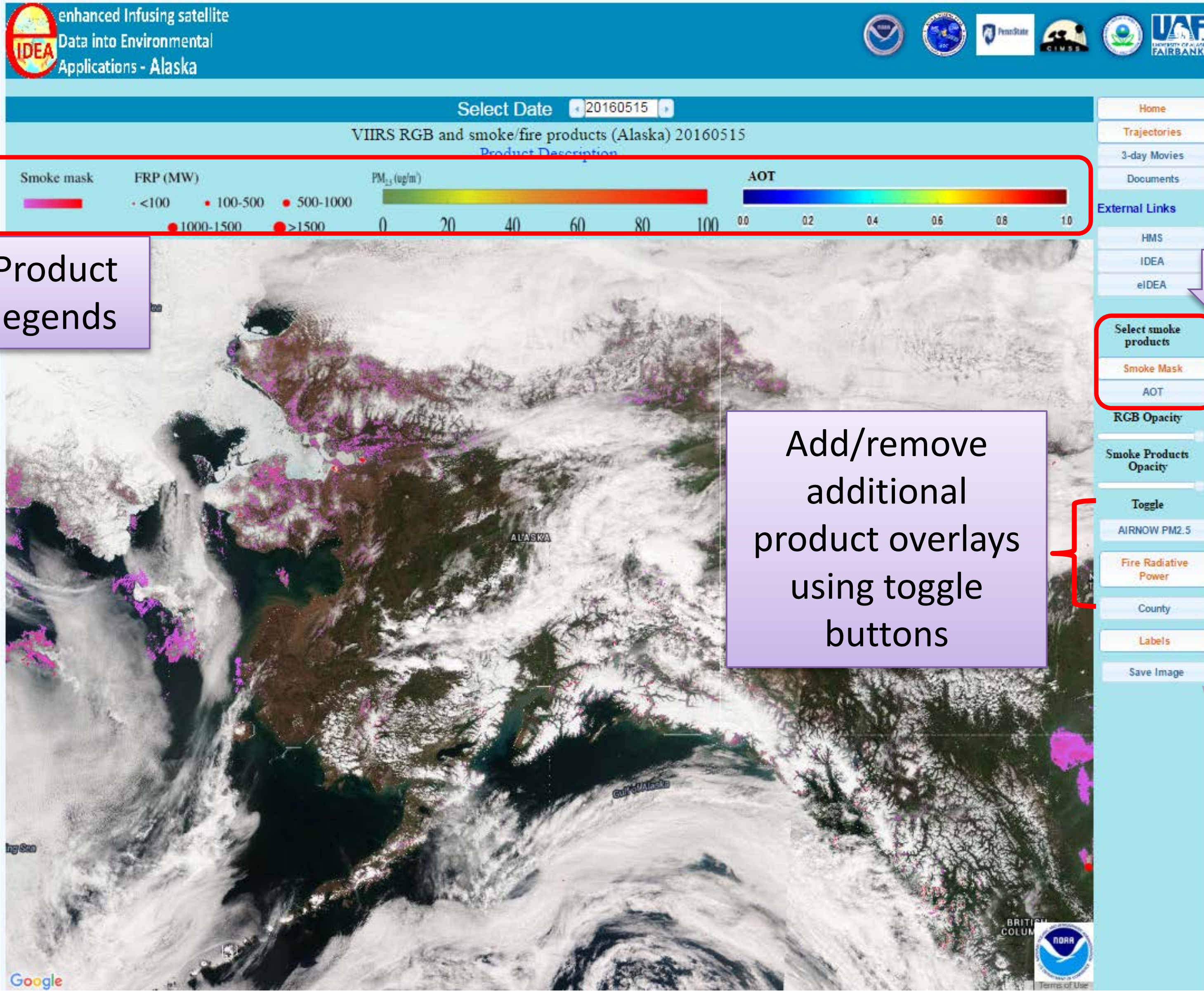
Main product overlay buttons

VIIRS SDR data from GINA DB.
Aerosol and fire products generated at STAR.

http://www.star.nesdis.noaa.gov/smcd/spb/aq/eidea-ak/

S. Kondragunta, STAR

eIDEA-Alaska: Overlays



Product legends

"Smoke Mask" is default smoke product; click on "AOT" or "Satellite Derived $PM_{2.5}$" to switch b/w smoke products

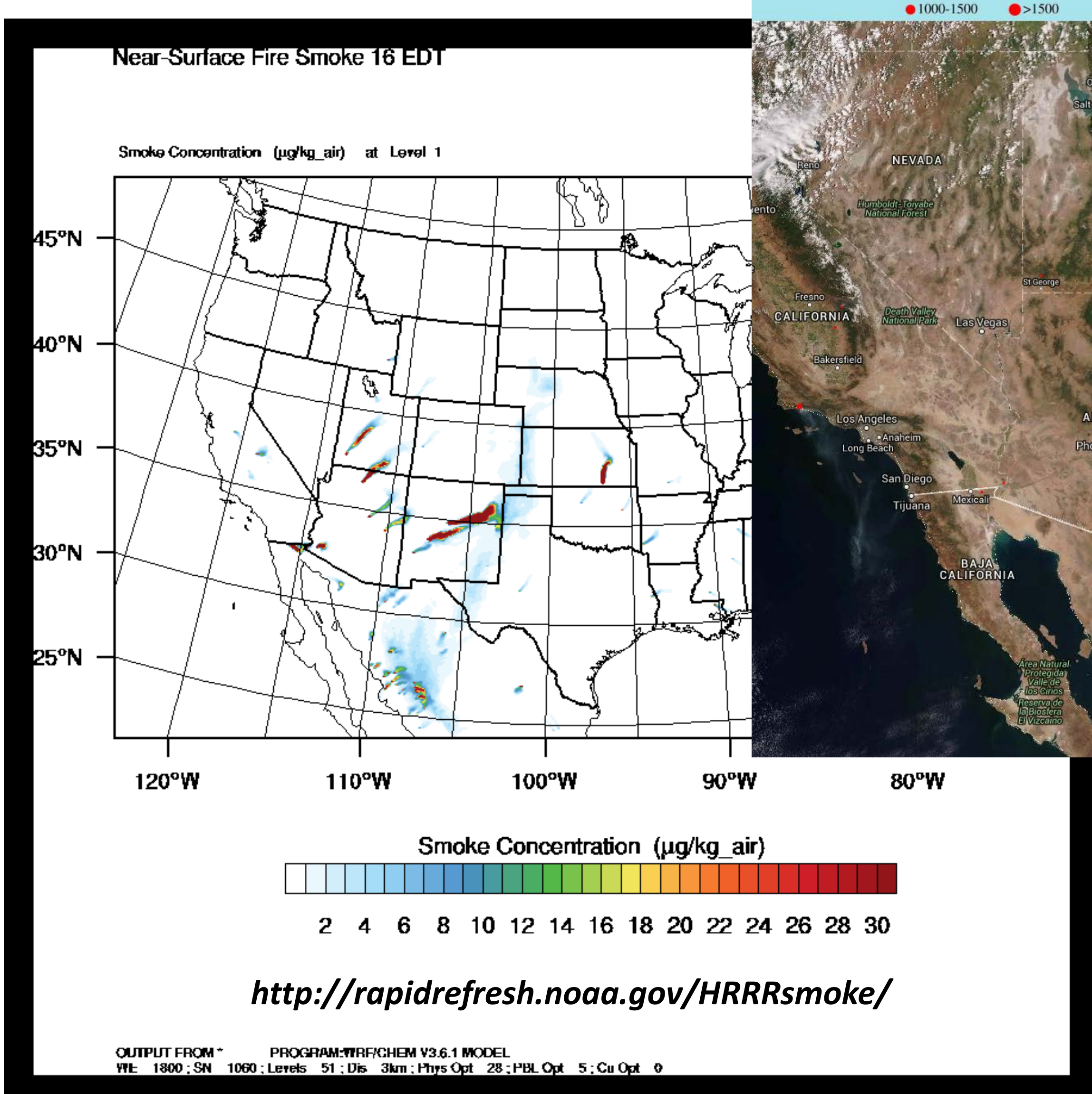
Slider bars adjust opacity of RGB and smoke products

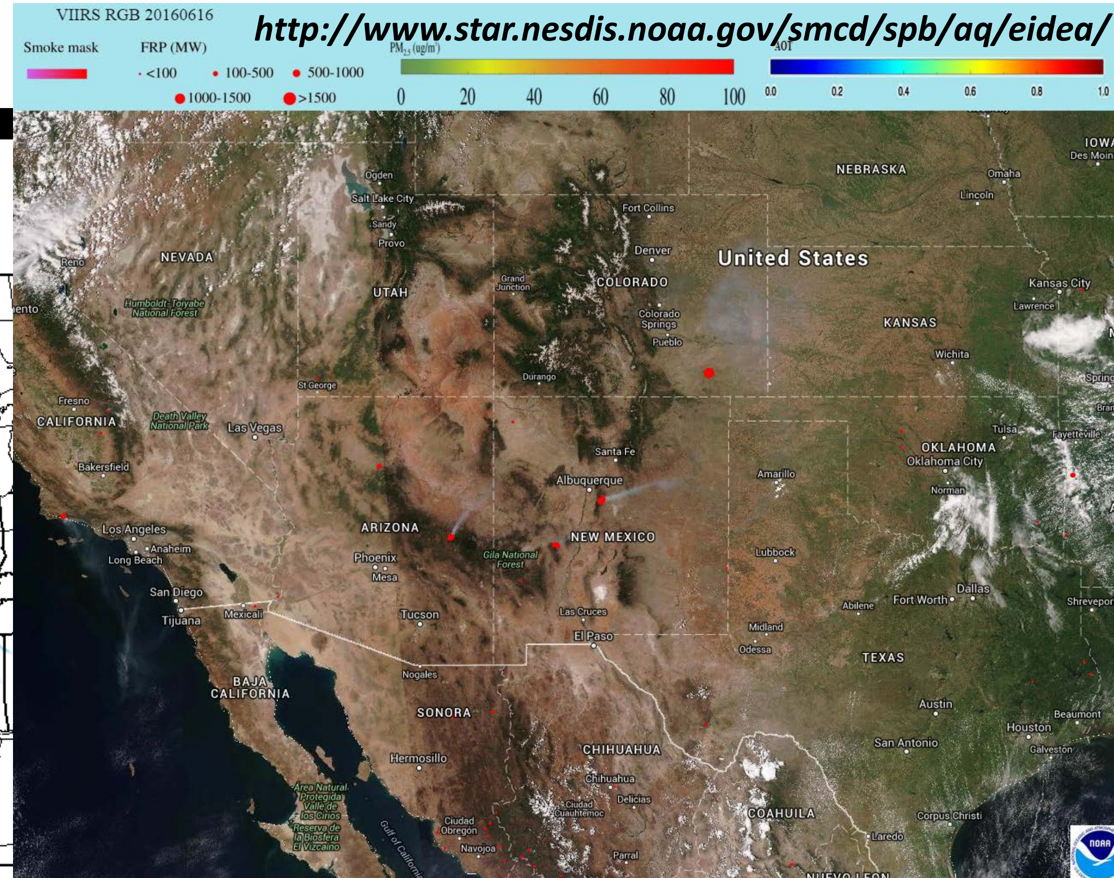
Add/remove additional product overlays using toggle buttons

Click "Save Image" to save configuration as a graphics file

S. Kondragunta, STAR

HRRR smoke forecast vs. eIDEA observations





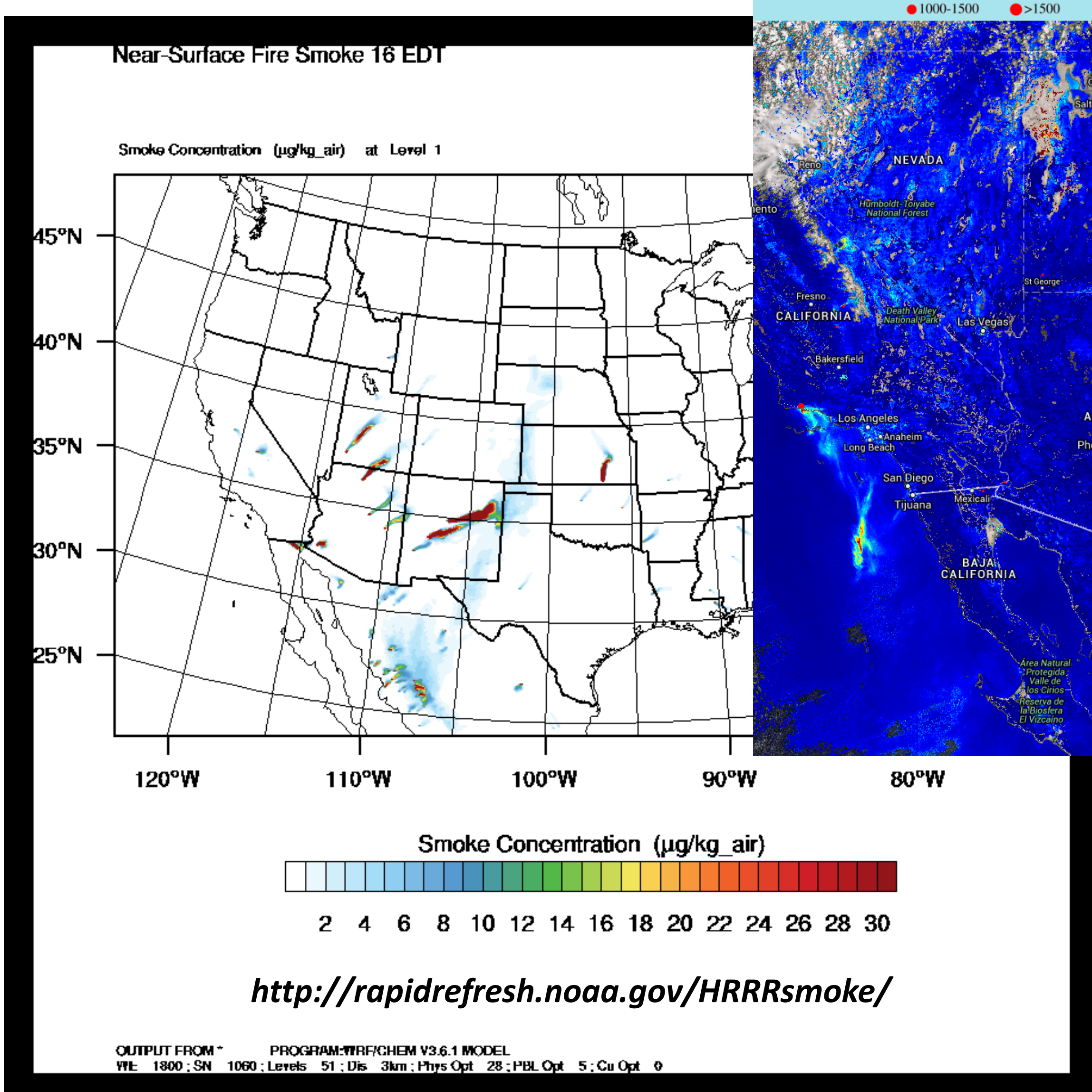
HRRR: High Resolution Rapid Refresh

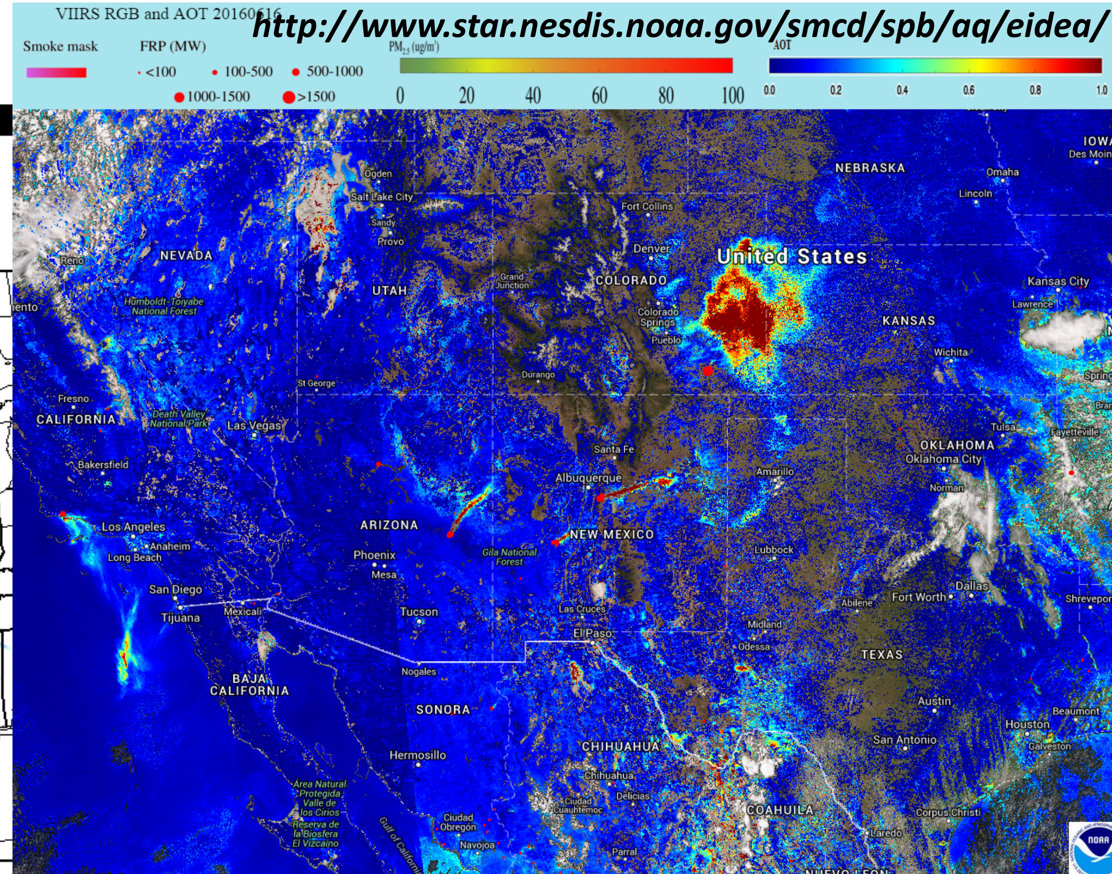
June 16, 2016

G. Grell, R. Ahmadov, NOAA ESRL

S. Kondragunta, STAR

HRRR smoke forecast vs. eIDEA observations



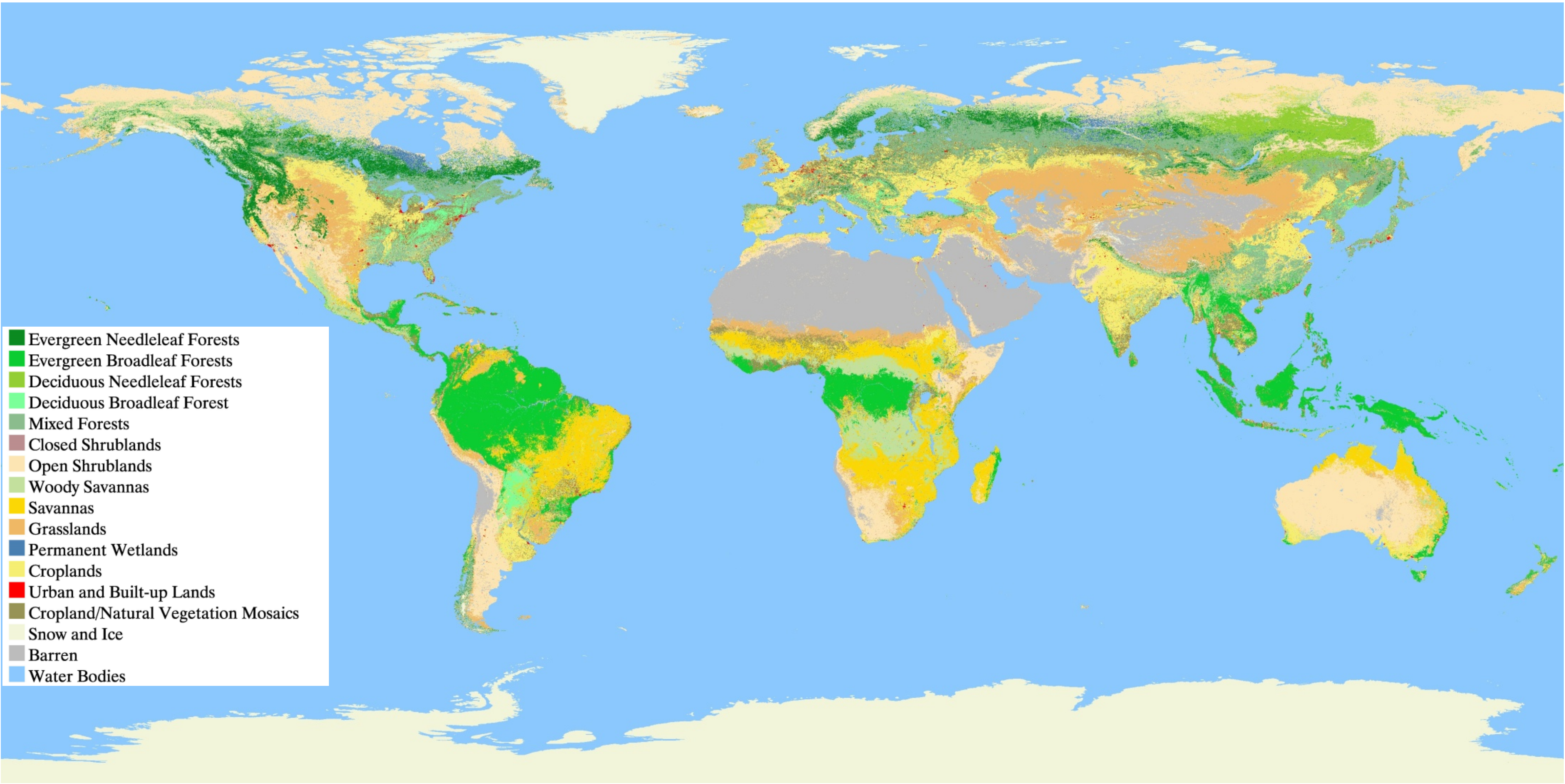


June 16, 2016

G. Grell, R. Ahmadov, NOAA ESRL

S. Kondragunta, STAR

VIIRS Annual Surface Type



A new 1km surface type map is produced every year from VIIRS. The data are used to support numerical weather, climate, hydrological and ecological modeling.

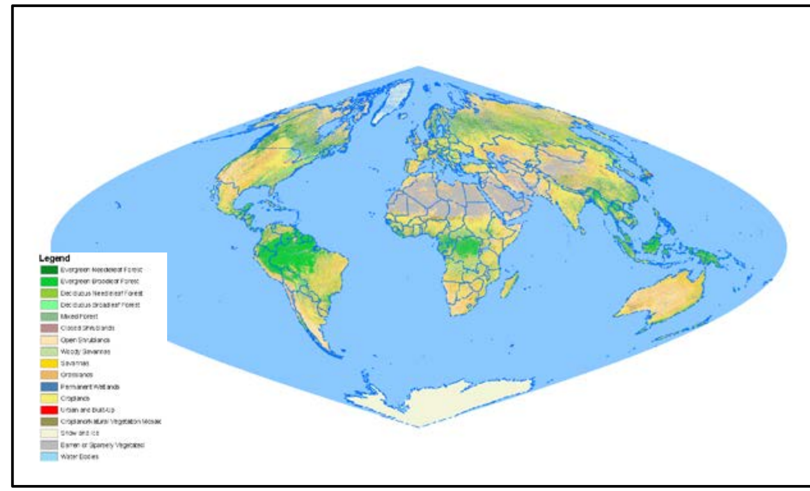
http://www.star.nesdis.noaa.gov/jpss/st.php
http://vct.geog.umd.edu/st/

X. Zhan, STAR

VIIRS Annual Surface Type (AST)

- √ Global Gridded, 1km, 17 IGBP surface type classes. Required typing accuracy ~70%
- √ Generated annually to reflect recent year changes
  - – Based on VIIRS gridded surface reflectance products
  - – Use Support Vector Machine (SVM) algorithm for classification
  - – Training data are the best available
- √ Validated with ~5000 ground "truth" data
- √ Merged with 3 tundra types for NCEP NWP and climate models

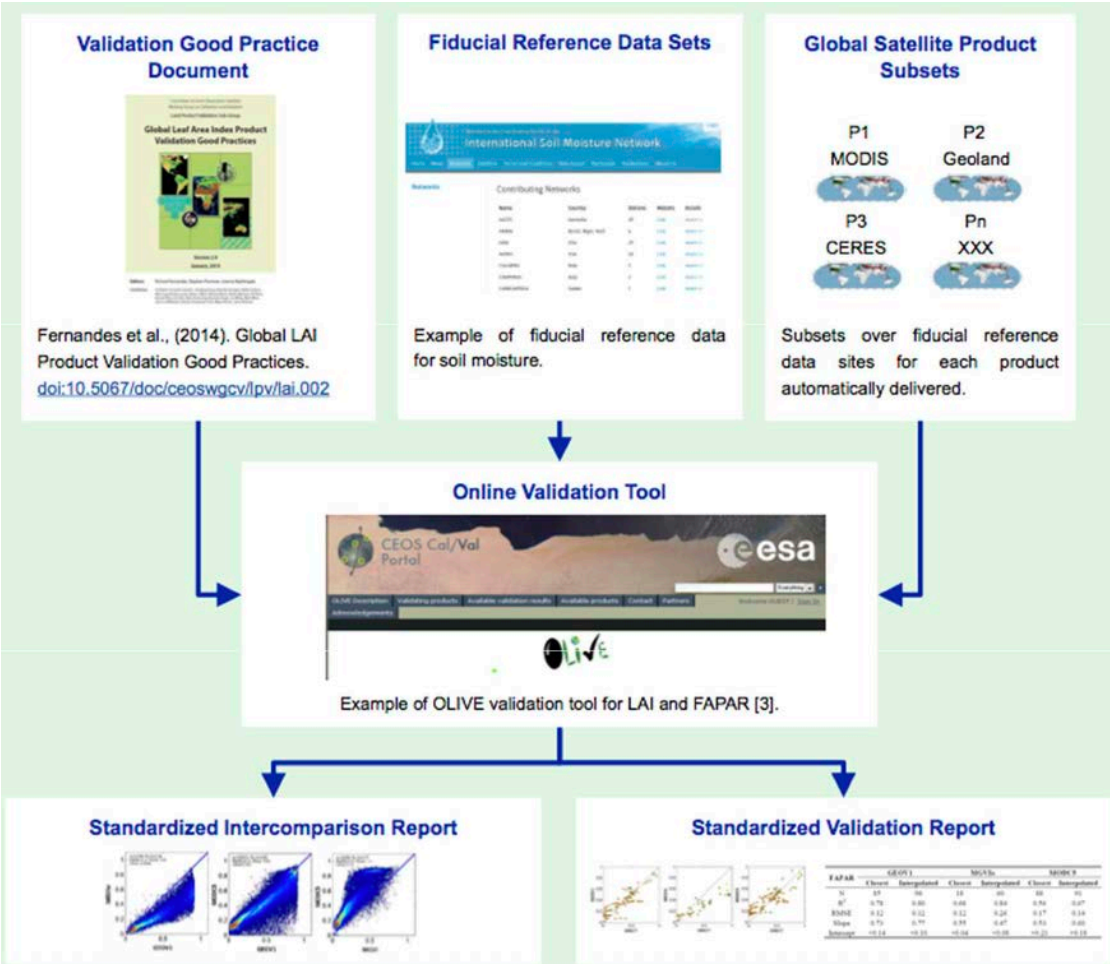
Suomi NPP VIIRS Surface Type Map of 2014



VIIRS Surface Type Validation Data Collection Tool

X. Zhan, STAR

CEOS-WGCV Land Product Validation (LPV) Framework



- ***JPSS Land cal/val team has adopted the CEOS/WGCV LPV framework & validation stages.***
- ***Key JPSS contributions:***

1. Tower-based reference data (CRN, BSRN-SURFRAD)
2. Airborne-UAV reference data (MALIBU: Román et al.)
3. Land Product Characterization System (LPCS: K. Gallo)

- ***Participating CEOS member agencies:*** *NOAA-STAR, NOAA-NCDC, USGS-EROS, NASA-GSFC, ESA-ESRIN.*

CEOS/WGCV/LPV subgroup has developed a framework for land product intercomparison and validation based on: **(1) a citable protocol, (2) fiducial reference data, and (3) automated subsetting**. These components are integrated into an **online platform** where quantitative tests are run, and standardized intercomparison and validation results reported.

M. Román, NASA

Standards and Protocols – LPV Validation Hierarchy

	Validation Stage - Definition and Current State	Variable
1	Product accuracy is assessed from a small (typically < 30) set of locations and time periods by comparison with in-situ or other suitable reference data.	**Fapar** **Snow Cover** **Phenology** **LST & Emissivity** **Fire Radiative Power**
2	Product accuracy is estimated over a significant set of locations and time periods by comparison with reference in situ or other suitable reference data. Spatial and temporal consistency of the product and consistency with similar products has been evaluated over globally representative locations and time periods. Results are published in the peer-reviewed literature.	**Leaf Area Index** **Burned Area**
3	Uncertainties in the product and its associated structure are well quantified from comparison with reference in situ or other suitable reference data. Uncertainties are characterized in a statistically rigorous way over multiple locations and time periods representing global conditions. Spatial and temporal consistency of the product and with similar products has been evaluated over globally representative locations and periods. Results are published in the peer-reviewed literature.	**Land Cover** **Albedo** **Soil Moisture**
4	Validation results for stage 3 are systematically updated when new product versions are released and as the time-series expands.	

Adopted by **all CEOS-WGCV subgroups** and LPV sponsor agencies: **NASA** (Terra/Aqua: MODIS, MISR, ASTER, EO-1, Suomi-NPP, SMAP, LANCE**)**, **NOAA** (AVHRR, GOES, Suomi-NPP/JPSS), **USGS** (Landsat-8), **CNES** (SPOT/POLDER), **ESA** (MERIS, Proba-V, Sentinel Land CCI products), **EUMETSAT** (MSG-3/4).

M. Román, NASA

NOAA/USGS Land Product Characterization System

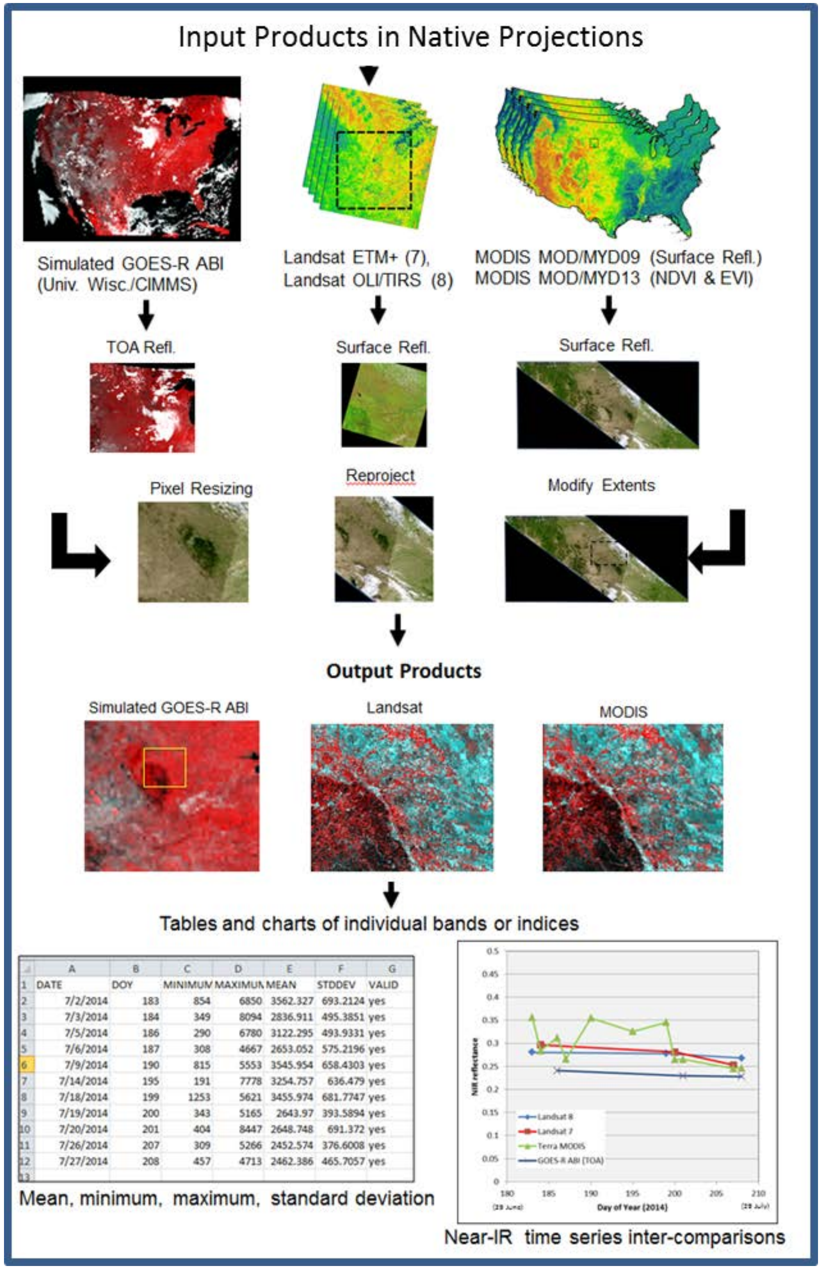
A web-based system that is designed to use moderate- to high-resolution satellite data for the characterization and validation of CEOS-endorsed time series products, including GOES-R ABI, Landsat-8/Sentinel-2, and the Land Science products from MODIS and VIIRS.

The LPCS includes:

- data inventory
- access and
- analysis functions

that will permit selection of data to be easily identified, retrieved, co-registered, and compared statistically through a single interface.

Kevin Gallo: NOAA/NESDIS/STAR
John Dwyer: USGS/EROS
Greg Stensaas: USGS/EROS
Ryan Longhenry: USGS/EROS



	A	B	C	D	E	F	G
1	DATE	DOY	MINIMUM	MAXIMUM	MEAN	STDDEV	VALID
2	7/2/2014	183	854	6850	3562.327	693.2124	yes
3	7/3/2014	184	349	8094	2836.911	495.3851	yes
4	7/5/2014	186	290	6780	3122.295	493.9331	yes
5	7/6/2014	187	308	4667	2653.052	575.2196	yes
6	7/9/2014	190	815	5553	3545.954	658.4303	yes
7	7/14/2014	195	191	7778	3254.757	636.479	yes
8	7/18/2014	199	1253	5621	3455.974	681.7747	yes
9	7/19/2014	200	343	5165	2643.97	393.5894	yes
10	7/20/2014	201	404	8447	2648.748	691.372	yes
11	7/26/2014	207	309	5266	2452.574	376.6008	yes
12	7/27/2014	208	457	4713	2462.386	465.7057	yes
13							

Land reprocessing and JPSS-1 readiness

- Test datasets of upstream products are needed for algorithm validation and verification
  - SDR, SR, AOT, VCM
  - Opportunity for accelerated product maturity
  - Training / validation datasets are needed
  - JPSS-1 cal/val plan and CEOS validation protocol, as applicable
- Reprocessing schedule is contingent on
  - Reprocessing of upstream products
    - Reprocessing should be done after evaluation by downstream product teams
  - Readiness of Enterprise algorithm and processing code
    - At least validated maturity Stage 2 level is required
      - Full global and seasonal sampling
- JPSS-1 readiness in general is confirmed
  - Evaluated test datasets provided to STAR
  - Ran select algorithms in STAR environment
    - Further interaction with NDE needed for pre-launch testing

Summary

- Finalizing Enterprise algorithm development and preparations for reprocessing are done in parallel
  - Overall, algorithms will be ready within the next FY for at least the granule-based products
- Reprocessing and data continuity
  - Consistency over the entire mission
  - Continuity (as much as possible) with heritage AVHRR and MODIS data
- Consistency between different geophysical products
  - e.g. signal from all products should indicate vegetated vs. clear land etc.
- Cross-fertilization between NOAA and NASA efforts continues
  - SDR science content consistent or at least well understood
  - Algorithms and formats
  - Validation (including coordination through CEOS)
- Properly stratified evaluation / validation datasets
- Land / cryosphere breakout session: Thursday, August 11

JPSS-1 Post Launch Test (PLT) and Integrated Mission Timeline (IMT) Snapshot

August 8, 2016

Natalie Provost
Instrument Post Launch Test Lead
NASA Flight Operations

Agenda

- What is a PLT?
- PLT and IMT Status
- Orbit Raising Campaign Summary
- Open Items
- Overall Power On and Door Deployment Sequence
- JPSS LEO&A Timeline
- Back-up (PLT List)

What is a Post Launch Test (PLT)?

- Operational testing that starts shortly after launch and continues until operations handover to OSPO (during LEO&A)
  - Includes tests on spacecraft bus, instruments, and science data
  - Characterization, ops testing, and on-orbit validation (not verification) of requirements
  - Executed in accordance with the PLT Management Plan (472-00373)
- What makes a PLT
  - A more formal planning and reporting of the test data and its analysis will benefit normal/sustaining operations. (e.g. trending, TDRS C&T angle characterization)
  - There is potential for change of performance from ground tests due either to the launch environment or space v. ground environment. (e.g. vibration sensitive)
  - Unable to validate performance or characterize on the ground. (e.g. instrument noise, star tracker performance)

PLT and IMT Status

- Instrument and System Post Launch Test (PLT) Peer Reviews are complete and included NOAA and NASA science representation
- The majority of instrument PLTs have been exercised in JCTs, with the remaining ones scheduled for JCT-4
- Integrated Mission Timeline
  - Days 9 – 52 (Instrument activation through doors open) have been thoroughly reviewed and rehearsed (with the exception of maneuvers)
    - Doors closed stored commanding sequences are still in work
  - Days 53 – 90 have not been thoroughly reviewed, and typically are scheduled where they occurred on NPP
    - Science teams are working with us to better define/schedule this timeframe
  - All existing instrument PLTs have been accounted for in the IMT, however some are not assigned a date yet
  - This presentation is a snapshot of our current status and is subject to change
  - Orbit Raising Campaign is heavily dependent on launch date and has impacts to instrument commissioning activities (see next slide)

Orbit Raising Campaign Summary

- A meeting was held on August 1st to communicate to instrument vendor and science stakeholders the orbit raising campaign scenarios
- Target injection altitude is 10 km lower than the operational altitude
  - 13 seconds / orbit different if 10 km lower (3 minutes per day)
  - The time it takes J1 to lap NPP is 35 days
- Final orbit day varies based on launch time/date, launch vehicle performance, and desired time between burns
  - Current launch date of 3/16/17 results in on orbit on L+19 days
  - 3 Day Burn Cadence results in on orbit:
    - Best case: L+18 days
    - Worst case: L+50 days
  - 6 Day Burn Cadence results in on orbit:
    - Best case: L+30 days
    - Worst case: L+62 days
  - High Separation Altitude likely increases the wait time and could lead to on orbit on L+70 days (3 day burn cadence)
- The scenarios are on a 16 day repeat cycle
- This presentation is assumes a January 20 launch date, which is almost the worst case scenario

Open Items

- Orbit raising implications
  - Instrument vendors and scientists have been asked to think about whether doors opening and subsequent activities need to be delayed until all orbit raising burns are complete (or possibly just inclination burn complete)
- VIIRS Nadir door opening will move
  - It currently occurs at the end of outgassing right before CRD (Day 43)
  - It may move up to 2 weeks after VIIRS activation (like NPP; ~Day 23)
  - It may move past CRD opening for stray light calibration
  - Direction from NOAA Science is needed
- J1/NPP Cross-calibration
  - Of 13 of 16 cases, J1 will fly under S-NPP for a few days
  - However, orbit raising will begin *after* the overlap; and therefore instrument doors will likely be closed (ATMS is exception)
  - We have no current requirement for cross-calibration

Overall Power On and Door Deployment Sequence

- Power ON
  1. OMPS
  2. VIIRS
  3. ATMS
  4. CrIS
  5. CERES

- Door Deployment
  1. ATMS (no doors)
  2. VIIRS NAD
  3. CrIS
  4. VIIRS CRD
  5. CERES
  6. OMPS

Cool down at same time (CrIS and VIIRS CRD)

No Change since NPP

JPSS-1 LEO&A Timeline

Launch **(000:00:00 MET/020:09:47:07 GMT)**

0 (0 MET)

Autonomous Initialization

- Cmd Path Verification (hi rate) with TDRSS Side 1& 2
- Enable Command Randomization
- Cmd Path Verification (lo rate) with GND Side 1& 2
- Verify post ACBM Config (S/C Power Positive)
- 32K Tlm check via GND
- GND TLM Downlink Test – DSU Dump
- Reset Separation TMONs
- Cmd Path Verification (hi rate) with GND Side 1& 2
- 16k Tlm check with TDRSS
- BEGIN configuring select heaters to Operational Settings
- Mnvr to Primary Sun Vector
- Initiate S/C Roll (nominal Sun Acq Mode)

Autonomous Initialization,
Ref: SER 2359479

- S/C Separation from Launch Vehicle (LV) **(000:57:30 MET, 020:10:54:30 GMT)**
- Autonomous Initialization **(00:57:31)**
- Set ADCS Acquire Sun state **(00:58:16)**
- Inst Survival heaters enabled **(00:58:48)**
- Solar Array deploy **(01:02:57 to 1:06:58)**
- Comm CBM starts **(01:07:02)**
- Redundant S/A deploy **(02:08 to 02:13)**

First Shift

- Perform S/A Drive Checkout
- Start GPS-1 Activation: Power ON GPS
- SCP Power configuration
- Complete GPS activation/monitor convergence
- Open Prop Latch Valve 1
- **Earth Point Mode** O010
- Turn On/Enable Star Trackers
- Solar Array uses Measured Sun Vector

Second Shift

- Load Early Routine CSM
- Open Prop Latch Valve 2
- Load CBM DBA1/2
- Prim/Rdnt Cat Bed heater verification

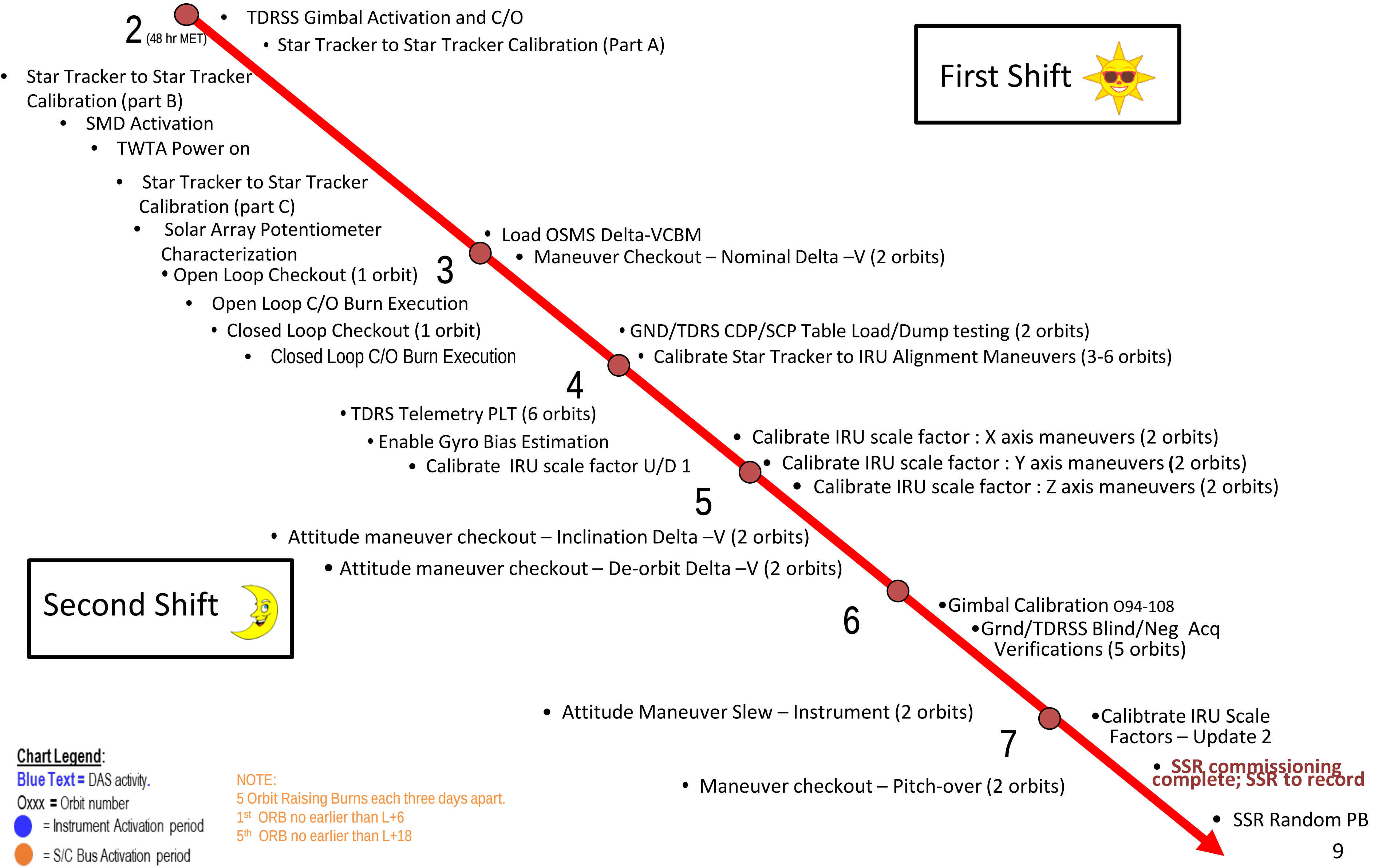
1 (24hr MET)

- Transition to **Mission-Point Mode** O015
- DBA-1 Deploy Mid-Hinge
- DBA-1 Deploy Base-Hinge
- DBA-2 Deploy Mid-Hinge
- DBA Deploy complete
- Primary Cat Bed heater verification
- COMM Secure Mode
- CDP Activation
- SSR on, begin commissioning
- Rdnt Catbed heater verification
- **Configure SSR-1 for Early Ops**
- HRD Tx1 Activation
- Grnd Gimbal Activation and C/O

Chart Legend:
Blue Text = DAS activity.
Oxxx = Orbit number
(blue dot) = Instrument Activation period
(orange dot) = S/C Bus Activation period

Based on **January 20th, 2017 Launch Date**

JPSS-1 LEO&A Timeline



JPSS-1 LEO&A Timeline

8 (MET)

- KA-Band Antenna Alignment Part A/B O111
- SMD SSR Sequential Dump thru GND O113
- KA-Band Antenna Alignment Part A/B

9

- **OMPS Activation and Aliveness (PWR/SH Mode) O131**
- OMPS Initiate_Decon_Default (OG) O132
- Spacewire Bus Initialization O133
- CrIS Activation of Warm-Up Heaters O134
- **VIIRS Initial Turn-On All A-Side Configuration O134-135**

First Shift

- Release VIIRS RTA Launch Locks on SC Side 1 O136
- Apply VIIRS RTA Stow Power O136
- Enable VIIRS Auto Trans to Safe Due to Missed TOD Pkts & Critical Tlm Failure O136
- Transition VIIRS to Operational-Day Mode & Synch C/O
- Enable VIIRS Survival Heater Interlock)O137
- VIIRS Load Stored Cmd Tbl w Day/Night Transitions and SDMS Collects (Table ID 2) O139
- VIIRS Transition to Op Night/Day/SDSM Cal@
- VIIRS Transition to Operational Day @O139

1st VIIRS SDSM cal

Full ATMS science data available

10

- **ATMS Activation (Electronics) O139**
- ATMS Functional Evaluation - Video Test & Timing O140
- ATMS Functional Evaluation End O141
- CrIS Transition from Survival to Safe Mode O143
- **CERES Initial Operations Power ON O145**
- CERES Diag Patch and mem dump O146
- CERES Initial Gimbal Motion O148
- OMPS Functional Checkout/Verification O149/150
- CrIS SSM Scan Mirror at ICT O152
- CrIS Begin Outgas O152

Second Shift

Active Outgassing Begins

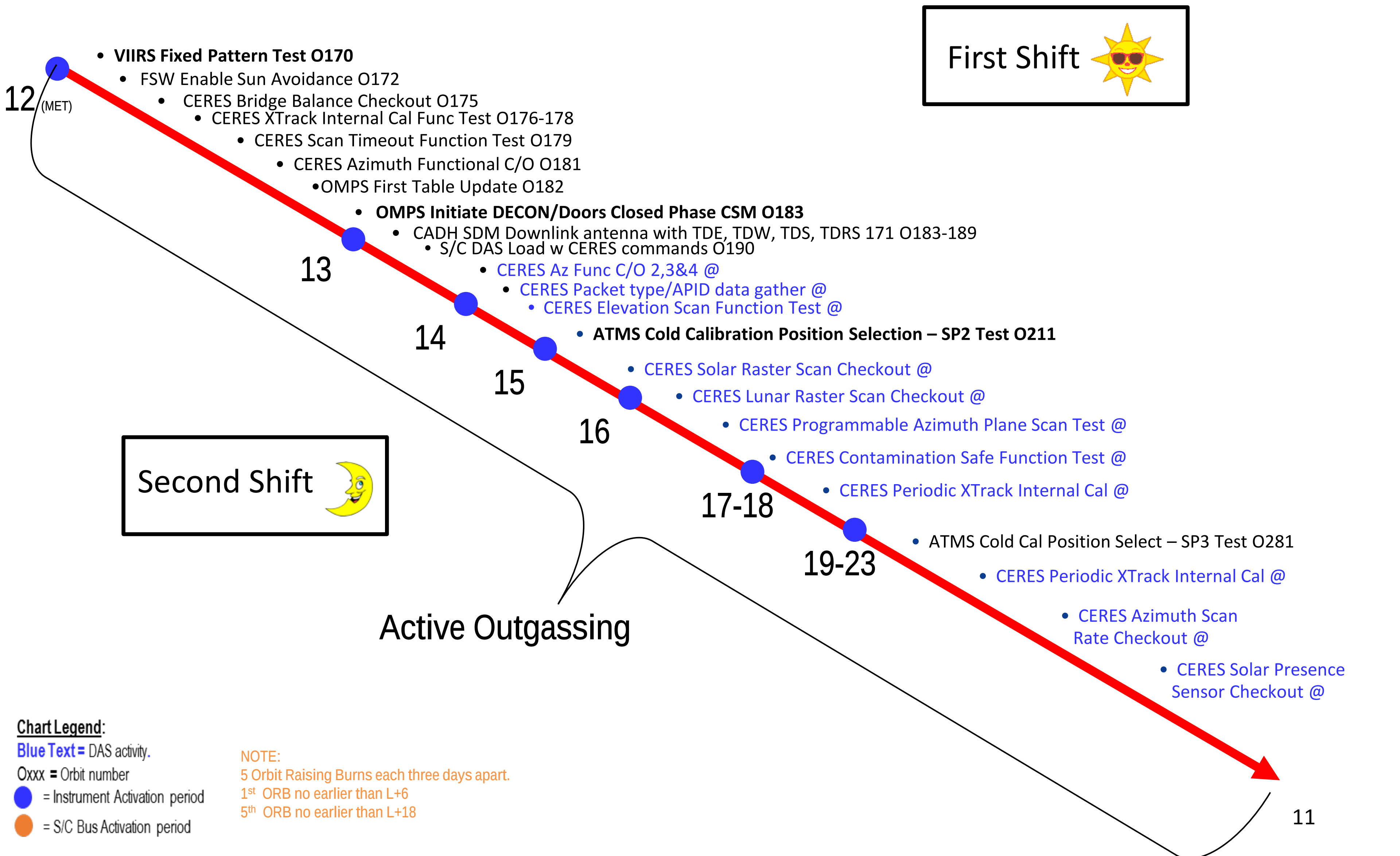
11

- CrIS Dsbl W/U Htr, Arm W/U Htr TMON O152
- CERES FSW Uploads O154-157
- FSW CSM CMD delete O158
- SVL/FCA Antenna C/O O159-163
- SMD dwnlnk Antenna MC-2/TR-3 O163 - 167

Chart Legend:
Blue Text = DAS activity.
Oxxx = Orbit number
● = Instrument Activation period
● = S/C Bus Activation period

NOTE:
5 Orbit Raising Burns each three days apart.
1st ORB no earlier than L+6
5th ORB no earlier than L+18

JPSS-1 LEO&A Timeline



JPSS-1 LEO&A Timeline

First Shift

Second Shift

20-23 (MET)
- CERES Solar Presence Sensor Checkout Cleanup O294

24
- **ATMS Cold Calibration Position Selection – SP4 Test O351**

25-28
- NO PLANNED ACTIVITIES

29
- **ATMS Cold Calibration Position Selection – SP1 Test O421**

30-32
- **ORB #1 Thruster Bank A Checkout Prep O445**
- **ORB #1 Thruster Bank A Checkout Execute O450**

33-34
- **ORB #2 Thruster Bank B Checkout Prep O487**
- **ATMS Cold Calibration Position Selection – Final Selection O491**
- **ORB #2 Thruster Bank B Checkout Execute O492**
- ATMS Roll Calibration, Cross Track Scan Check, -65-deg O492

35-36
- **ATMS Roll Calibration, Image Earth Limb, +25-deg** O507

37
- **ORB #3 Inclination Adjust O534**

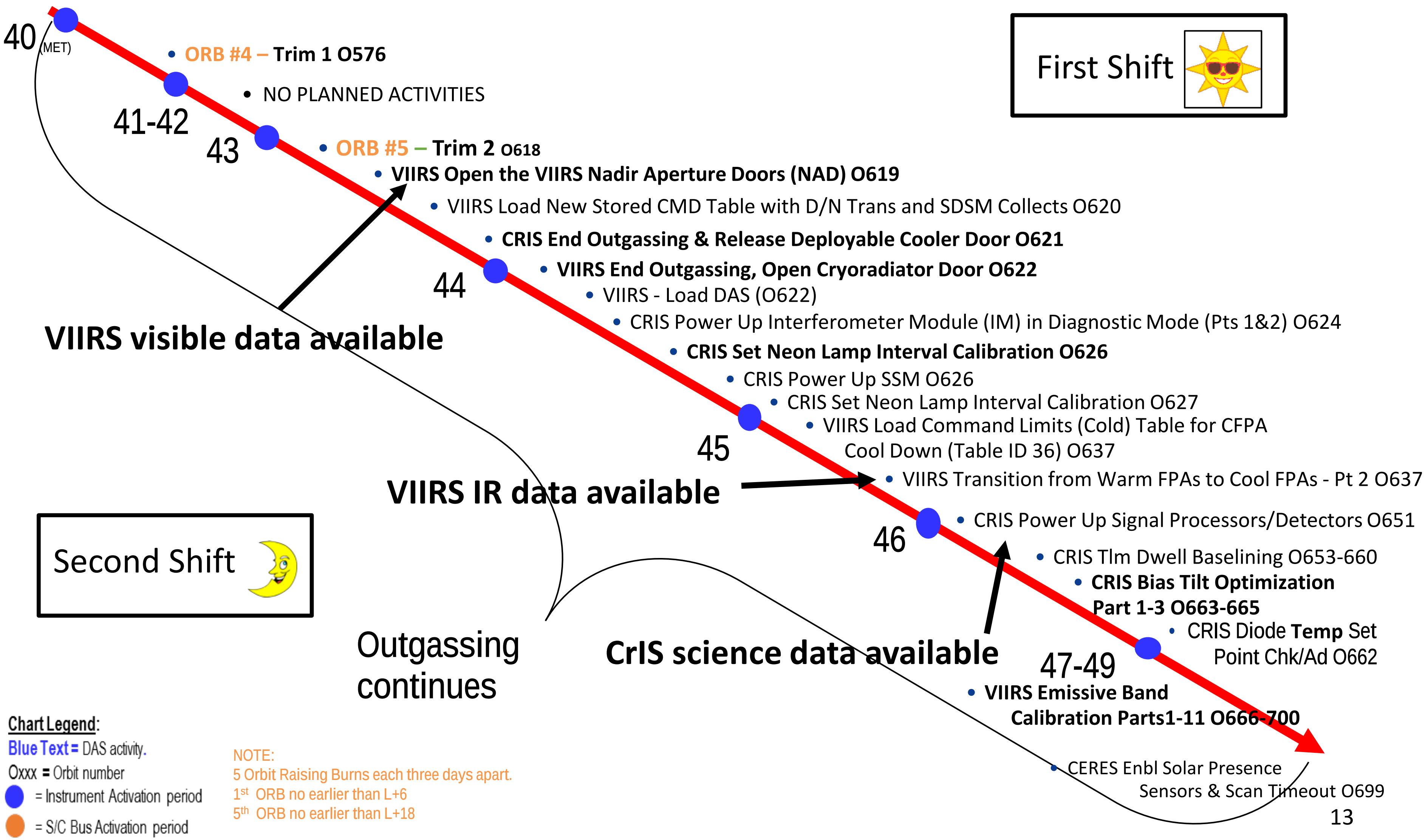
38-39
- NO PLANNED ACTIVITIES

Outgassing continues

Chart Legend:
Blue Text = DAS activity.
Oxxx = Orbit number
(blue dot) = Instrument Activation period
(orange dot) = S/C Bus Activation period

NOTE:
5 Orbit Raising Burns each three days apart.
1st ORB no earlier than L+6
5th ORB no earlier than L+18

JPSS-1 LEO&A Timeline



JPSS-1 LEO&A Timeline

OMPS science data available

CERES science data available

First Shift

50 (MET)

- CERES Cover Ops O706-709
- OMPS End Outgassing O712
- CERES Science (XTRACK mode) O713
- VIIRS Emissive Band Calibration Part -12 O714
- S/C DAS Load w CERES commands

- Outgassing Ends

51

- CRIS IR Channel Programmable Amplifier Gain Check/Adjustment (Part 1/2)

52

- CRIS IR Channel Programmable Amplifier Gain Check/Adjustment (Part 2/2)

53

- CRIS Bit Trim and Impulse Noise Mask Check/Adjustment (Part 1 of 2)
- CRIS Bit Trim and Impulse Noise Mask Check/Adjustment(Part 2 of 2)

53-57

- VIIRS DNB Offset Determination@
- VIIRS DNB Dark Offsets Measurement@
- OMPS Table Loads for Cal Updates
- OMPS Data Rate Optimization
- ATMS Dwell Starts and Stops
- ATMS Noise Characterizations
- ATMS Lunar Intrusion Mitigation
- VIIRS Load DNB Offset Tables Side A

Second Shift

Chart Legend:

Blue Text = DAS activity.

Oxxx = Orbit number

● = Instrument Activation period

● = S/C Bus Activation period

NOTE:

5 Orbit Raising Burns each three days apart.

1st ORB no earlier than L+6

5th ORB no earlier than L+18

JPSS-1 LEO&A Timeline

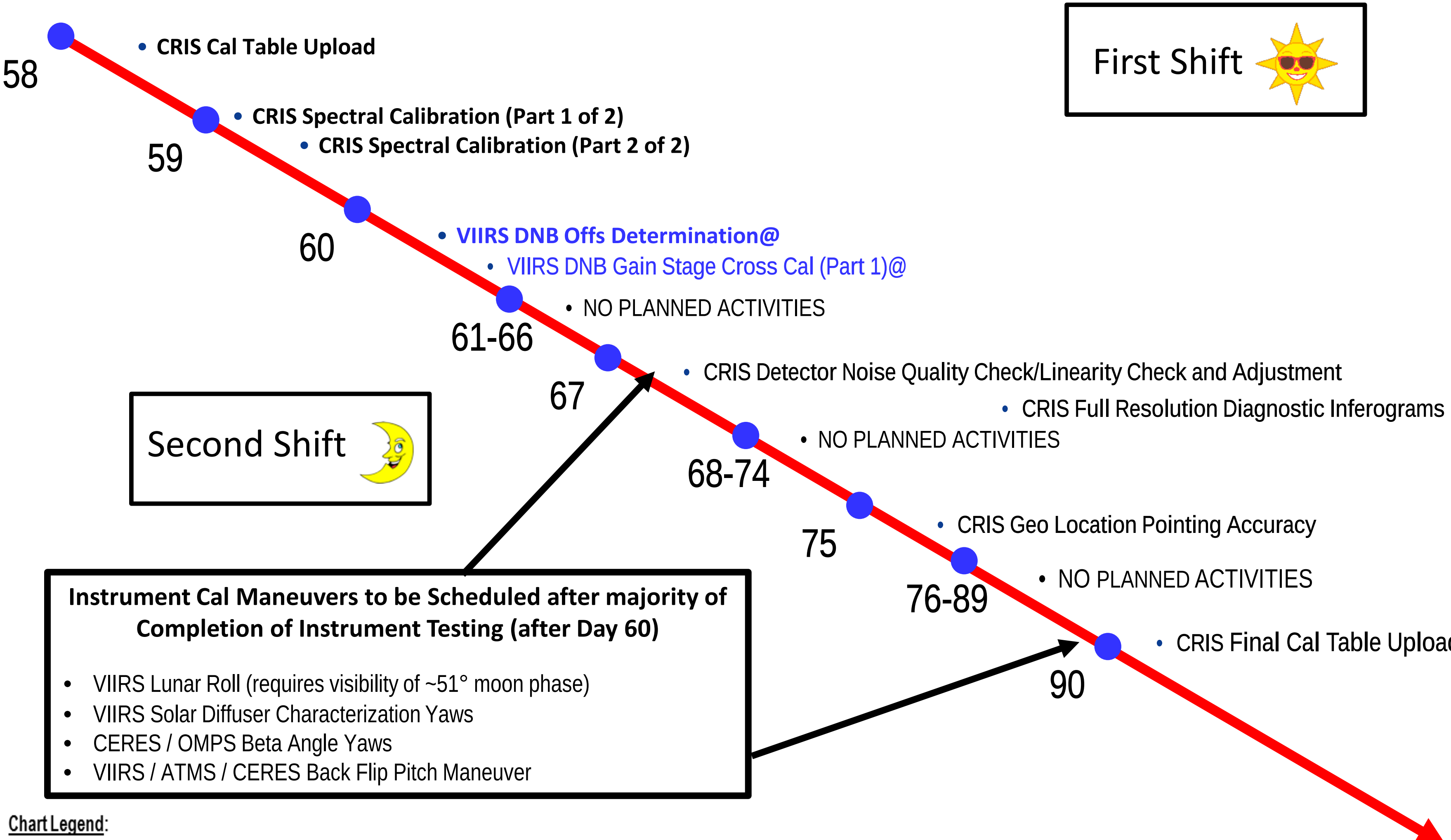


Chart Legend:
Blue Text = DAS activity.
Oxxx = Orbit number
● = Instrument Activation period
● = S/C Bus Activation period

Back-up – PLT List

Instrument PLTs (1 of 2)

Instrument	Document Number	Test Name	POC
ATMS	472-00614	ATMS Activation	Eric Graham
ATMS	472-00615	ATMS Trending	Eric Graham
ATMS	472-00616	ATMS Dynamic Range	Ed Kim \ Joseph Lyu
ATMS	472-00617	ATMS Noise Characterization	Eric Graham
ATMS	472-00638	ATMS Radiometric Sensitivity	Ed Kim \ Joseph Lyu
ATMS	472-00TBD	ATMS Eviornmental Characterization	Ed Kim \ Joseph Lyu
ATMS	472-00618	ATMS Pointing Angles	Eric Graham
ATMS	472-00619	ATMS Cold Calibration Position Selection	Eric Graham
ATMS	472-00620	ATMS Functional Evaluation - Video Test & Timing	Eric Graham
ATMS	472-00591	ATMS Lunar Intrusion Mitigation	Eric Graham
ATMS	472-00621	ATMS Geolocation	Ed Kim \ Joseph Lyu
ATMS	472-00592	ATMS Center Frequency Stability	Ed Kim
ATMS	472-00593	ATMS Dwell parameter	Eric Graham
CERES	472-00622	CERES Activation	Tony Salerno \ Adhemar Rivera
CERES	472-00623	CERES Trending	Tony Salerno \ Adhemar Rivera
CERES	472-00624	CERES Geolocation/Pointing Accuracy	Chris Brown
CERES	472-00625	CERES Bridge Balance	Tony Salerno \ Adhemar Rivera
CERES	472-00626	CERES El scan test	Tony Salerno \ Adhemar Rivera
CERES	472-00686	CERES Science Trending	Kory Priestly
CERES	472-00628	CERES Solar Raster Scan	Tony Salerno \ Adhemar Rivera
CERES	472-00629	CERES Lunar Raster	Tony Salerno \ Adhemar Rivera
CERES	472-00630	CERES Azimuth Checkout	Tony Salerno \ Adhemar Rivera
CERES	472-00631	CERES SPS checkout	Tony Salerno \ Adhemar Rivera
CrIS	472-00632	CrIS Activation	Mike Stager \ Jason Osmann
CrIS	472-00633	CrIS Trending	Mike Stager \ Jason Osmann
CrIS	472-00634	CrIS Noise Characterization	Dave Johnson
CrIS	472-00636	CrIS Geolocation/Pointing Accuracy	Dave Johnson \ Mike Stager

Instrument PLTs (2 of 2)

Instrument	Document Number	Test Name	POC
CrIS	472-00637	CrIS Jitter Performance	Dave Johnson
CrIS	472-00639	CrIS Bias Tilt Optimization	Mike Stager \ Jason Osmann
CrIS	472-00675	CrIS PCE Telemetry Dwell and Baselining	Mike Stager \ Jason Osmann
CrIS	472-00676	CrIS Diode temperature Set Point Check and Adjustment	Mike Stager \ Jason Osmann
CrIS	472-00677	CrIS Bit Trim and Impulse Noise Mask Checks and Adjustments	Mike Stager \ Jason Osmann
CrIS	472-00679	CrIS Programmable Amplifier Gain Check and Adjustment	Mike Stager \ Jason Osmann
CrIS	472-00680	CrIS Detector Linearity Check	Mike Stager \ Jason Osmann
CrIS	472-00641	CrIS Laser Stability	Mike Stager \ Jason Osmann
CrIS	472-00642	CrIS Full Resolution Diagnostic Interferograms	Dave Johnson \ Mike Stager
OMPS	472-00643	OMPS Activation	Eric Graham
OMPS	472-00644	OMPS Data Rate Characterization	Tom Kelly \ Glen Jaross
OMPS	472-00645	OMPS Trending	Eric Graham
OMPS	472-00687	OMPS Science Trending	Tom Kelly \ Glen Jaross
OMPS	472-00646	OMPS Noise Characterization	Tom Kelly \ Glen Jaross
OMPS	472-00647	OMPS Dynamic Range	Tom Kelly \ Glen Jaross
OMPS	472-00648	OMPS Calibration	Tom Kelly \ Glen Jaross
OMPS	472-00649	OMPS Geolocation/Pointing Accuracy	Tom Kelly \ Glen Jaross
VIIRS	472-00650	VIIRS Activation	Jodi Vezzeti \ Helena Smith
VIIRS	472-00651	VIIRS Trending	Jodi Vezzeti \ Helena Smith
VIIRS	472-00652	VIIRS Dynamic Range and Linearity Verification	Kurt Thome
VIIRS	472-00653	VIIRS DNB Offset Determination	Jodi Vezzeti \ Helena Smith
VIIRS	472-00654	VIIRS Solar Diffuser Calibration	Jodi Vezzeti \ Helena Smith
VIIRS	472-00655	VIIRS Geolocation/Pointing Accuracy	Kurt Thome \ Slawomir Blonski
VIIRS	472-00657	VIIRS DNB Gain Stage Cross Calibration and Dark Offsets Measurement	Jodi Vezzeti \ Helena Smith
VIIRS	472-00658	VIIRS Electronic Cross Talk Evaluation	Jodi Vezzeti \ Helena Smith
VIIRS	472-00659	VIIRS Lunar Calibration and Sector Rotation	Jodi Vezzeti \ Helena Smith
VIIRS	472-00660	VIIRS Emissive Band Calibration	Jodi Vezzeti \ Helena Smith
VIIRS	472-00661	VIIRS Fixed Pattern test	Jodi Vezzeti \ Helena Smith
VIIRS	472-00635	VIIRS FPA Electronics Self-Test	Jodi Vezzeti \ Helena Smith
VIIRS	472-00673	VIIRS Cryoradiator Door Opening	Jodi Vezzeti \ Helena Smith
VIIRS	472-00688	VIIRS Nadir Door Openeing	Jodi Vezzeti \ Helena Smith

System PLTs

Title	Test Description	POC
Pitch offset (backflip) for instrument calibration	Perform back-flip over 1/3 of orbit entirely in eclipse.	Andy Lopatin
ATMS Cross Track Scan Check	Roll to -65° to acquire data during crossing of the Earth's limb. Stay at -65° roll angle for 4 minutes to allow scan across cold space. Return to Earth view orientation.	Andy Lopatin / Ed Kim
ATMS Image Earth Limb	Roll far enough (max +25°) so that main lobes of outermost beams are well off earth limb. During maneuver, acquire data during limb crossing and deep space view. Stay at final roll angle for 5 minutes and return to Earth view orientation. Must be done before CrIS cooler shade & VIIRS CRD deployments.	Andy Lopatin / Ed Kim
VIIRS Lunar Calibration	Start after VIIRS is commissioned at first moon phase of ~51°. Approximately 8-9 rolls per year performed on daylight side of orbit, roll of -14° or less allows VIIRS to image moon.	Jodi Vezzetti / Kurt Thome
VIIRS Solar Diffuser Characterization	15 yaws at different yaw angles (max -20° to max +20°) in consecutive orbits. Yaws are performed in sunrise and begin dwell for 10 minutes in sun.	Jodi Vezzetti / Kurt Thome
CERES Solar Cal / Interference / Glint Evaluation & OMPS Solar Diffuser Goniometric Cal	12-14 yaws at different angles between -14.5° and 14.5°. Requires 35 minutes at the slewed angle, 30 minutes in sunlight before the northern terminator crossing and 17.5 minutes in eclipse.	Andy Lopatin / Tom Kelly / Glen Jaross / Kory Priestly
SEU Trending	Roll up report of all the SEU detections seen during the 90 days, instrumets and SC.	Rich Kavanagh
Concurrent Operations (Proof of Concept Putting JPSS-1 & NPP on the Same String)	Plan ~2 day proof of concept putting JPSS-1 & NPP on the same string. (Some time after ~L+68 when instruments are 'operationally ready'.) Plan to include a 'worst case' day, eg DAS load day. Plan to move JPSS-1 to the same string as NPP prior to handover.	Rich Kavanagh
Spacecraft Jitter Characterization	Characterize S/C jitter caused by all instruments and mechanisms	Jeremy Meduvsky

JPSS Common
Ground System

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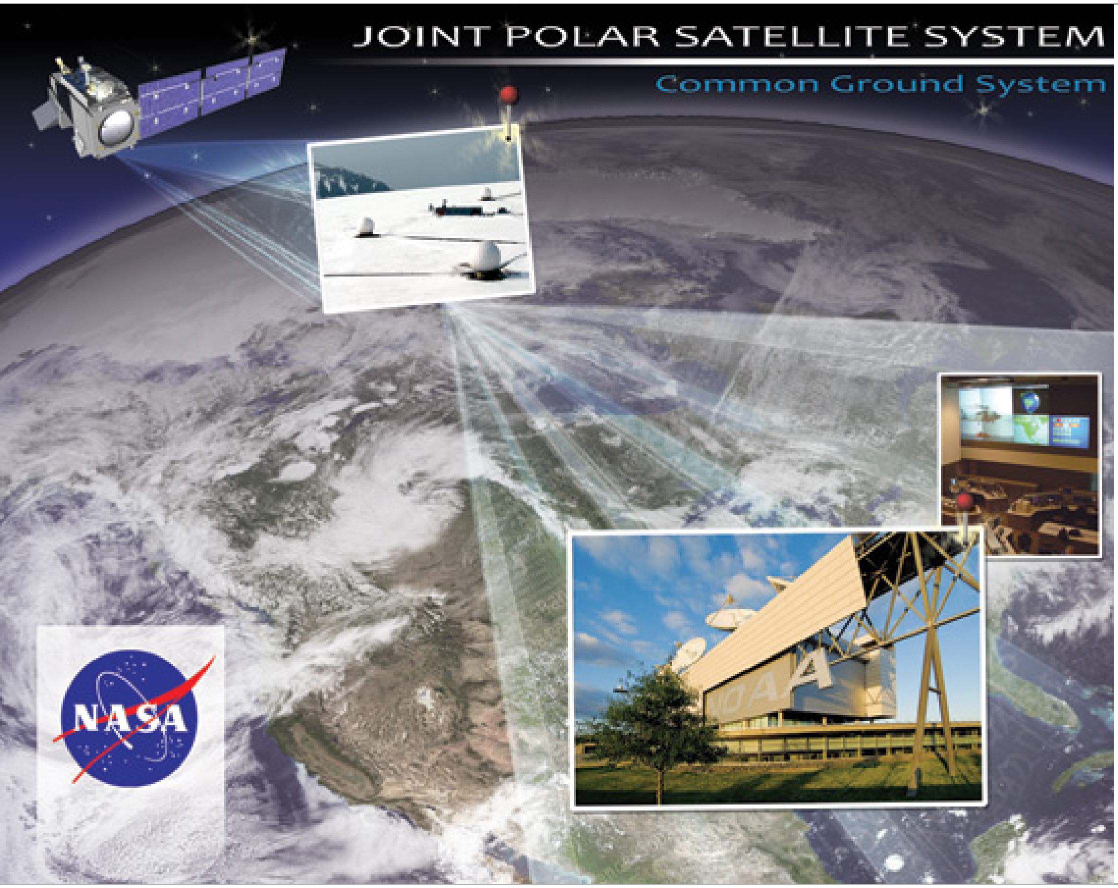
Intelligence, Information and Services



JPSS IDPS System JPSS-1 Readiness – IDPS Product Perspective

Wael Ibrahim

STAR JPSS
2016 Annual Science Team Meeting
NCWCP, College Park, MD
August 8, 2016

RAYTHEON COMPANY
INTELLIGENCE, INFORMATION AND SERVICES (IIS)
JPSS CGS PROGRAM
AURORA, COLORADO

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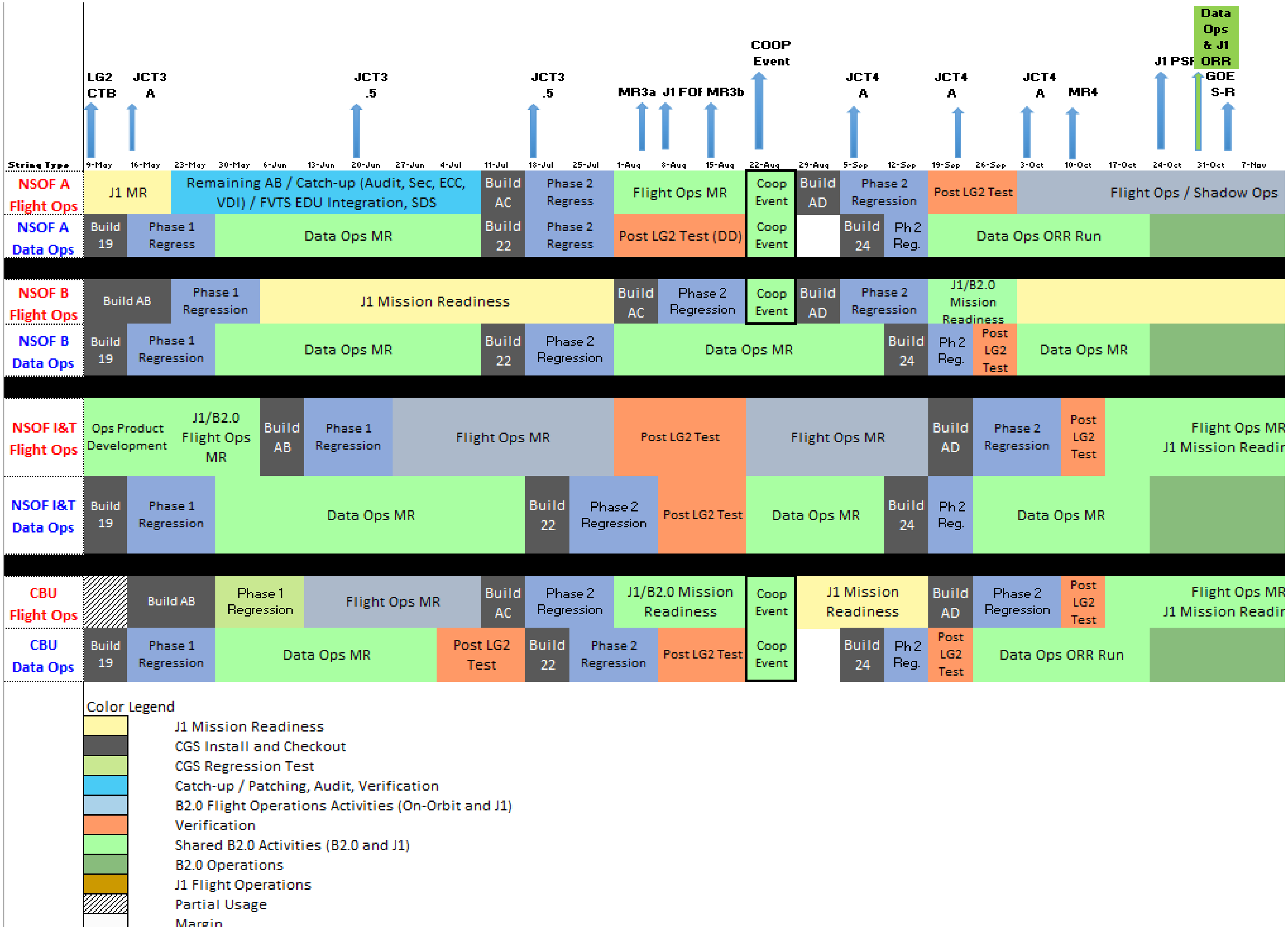
Outline

- Block 2.0 – IDPS Milestones
- Block 2.0 – IDPS Build Plan
- Block 2.0 – ADL Build Plan
- ATMS Algorithm and SRS Updates
- CrIS Algorithm and SRS Updates
- OMPS Algorithm and SRS Updates
- VIIRS SDR/GEO Algorithm and SRS Updates
- VIIRS Imagery Algorithm and SRS Updates
- LG2 Test Analysis Results
- Post LG2 Test Event

Block 2.0 – IDPS Milestones



Block 2.0 - IDPS Build Plan (v77)

Time Frame	Build	Identifier	Linux shared CSI branch open for	COTS Upgrade Eval Complete	Final Code Cutoff	SegInt Nightly Checkout	Letter Build Date	PDR Generation	Letter Build Checkout Completed	Content	Milestone
PSAT	PSAT_13	I2.0.00.00.13	11/13/2015	11/12/2015	11/30/2015	12/1/2015	12/2/2015	N/A	12/9/2015	GPAT Critical PCRs OMPS Compression AMSR2	
	PSAT_14	I2.0.00.00.14	12/1/2015	12/1/2015	12/14/2015	12/15/2015	12/16/2015	N/A	12/18/2015	GPAT Critical PCRs	
	PSAT_15	I2.0.00.00.15	12/15/2015	12/22/2015	1/14/2016	1/15/2016	1/18/2016	1/20/2016	1/21/2016	JCT/ORR Critical PCRs	R3G2 25 Jan--22 Feb
	PSAT_16	I2.0.00.00.16	1/15/2016	1/18/2016	2/4/2016	2/5/2016	2/8/2016	2/11/2016	2/19/2016	JCT/ORR Critical PCRs M11 at night CrIS (FS) SDR	Targeted DRs 29 Feb-11 Mar
	PSAT_16.01	I2.0.00.00.16 .01	N/A	N/A	3/15/2016	3/15/2016	3/15/2016	N/A	3/16/2016	PCR055913--Data Production Report Deliveries	LG2 TRR 24 Mar
	PSAT_17	I2.0.00.00.17	2/5/2016	2/22/2016	3/3/2016	3/4/2016	3/7/2016	3/10/2016	3/15/2016	VIIRS Sensor Char Oracle Failover: Connection Pooling JCT/ORR Critical PCRs	
	PSAT_18	I2.0.00.00.18	3/4/2016	3/7/2016	3/17/2016	3/18/2016	3/21/2016	3/24/2016	3/28/2016	JCT/ORR Critical PCRs Oracle Failover: DMS low-level DB auto retry	
	PSAT_19	I2.0.00.00.19	3/18/2016	3/28/2016	4/7/2016	4/8/2016	4/15/2016	4/17/2016	4/26/2016	JCT/ORR Critical PCRs ATMS Full Radiance	Phase 1 CGS Regression Development Release (4/25)
	PSAT_20	I2.0.00.00.20	4/8/2016	4/18/2016	4/28/2016	4/29/2016	5/2/2016	5/5/2016	5/17/2016	JCT/ORR Critical PCRs	
	PSAT_21	I2.0.00.00.21	4/29/2016	5/9/2016	5/19/2016	5/20/2016	5/23/2016	5/26/2016	6/6/2016	JCT/ORR Critical PCRs OMPS NP Table Updates	
	PSAT_22	I2.0.00.00.22	5/20/2016	5/30/2016	6/9/2016	6/10/2016	6/13/2016	6/16/2016	6/17/2016	JCT/ORR Critical PCRs	Phase 2 CGS Regression Development Release (7/11)
	PSAT22.01	I2.0.00.00.22 .01	7/6/2016	7/6/2016	7/6/2016	7/6/2016	7/7/2016	7/7/2016	7/7/2016	VCID/APID Mapping Updates (CCR-1049)	
	PSAT_23	I2.0.00.00.23	6/10/2016	6/20/2016	6/30/2016	7/1/2016	7/4/2016	7/7/2016	7/8/2016	JCT/ORR Critical PCRs	
	PSAT_24	I2.0.00.00.24	7/1/2016	7/11/2016	7/21/2016	7/22/2016	7/28/2016	7/29/2016	8/1/2016	JCT/ORR Critical PCRs ATMS Sensor/Table Updates	Phase 3 CGS Regression Development Release (9/5) ORR Release
	PSAT_25	I2.0.00.00.25	7/22/2016	8/1/2016	8/11/2016	8/12/2016	8/15/2016	8/18/2016	8/19/2016	JCT/ORR Critical PCRs	
	PSAT_26	I2.0.00.00.26	8/12/2016	8/22/2016	9/1/2016	9/2/2016	9/5/2016	9/8/2016	9/9/2016	JCT/ORR Critical PCRs	
	PSAT_27	I2.0.00.00.27	9/2/2016	9/12/2016	9/22/2016	9/23/2016	9/26/2016	9/29/2016	9/30/2016	JCT/ORR Critical PCRs	
	PSAT_28	I2.0.00.00.28	9/23/2016	10/3/2016	10/13/2016	10/14/2016	10/17/2016	10/20/2016	10/21/2016	JCT/ORR Critical PCRs	
	PSAT_29	I2.0.00.00.29	10/14/2016	10/24/2016	11/3/2016	11/4/2016	11/7/2016	11/10/2016	11/11/2016	JCT/ORR Critical PCRs	ORR 10/28

Block 2.0 - ADL Build Plan (v9)

Build		IDPS Baseline Compatibility	IDPS Letter Build Date	ADL Letter Build Date	Content	Notes
ADL5.3_PSAT_22	**ADL5.3_2.0.00.00.22**	**I2.0.00.00.22**	6/17/2016	7/1/2016	JCT/ORR critical PCRs	Available on Common CM and media delivered
ADL5.3_PSAT_23	**ADL5.3_2.0.00.00.23**	**I2.0.00.00.23**	7/8/2016	7/22/2016	JCT/ORR critical PCRs	Available on Common CM and media delivered
ADL5.3_PSAT_24	**ADL5.3_2.0.00.00.24**	**I2.0.00.00.24**	8/1/2016	8/15/2016	JCT/ORR critical PCRs	
ADL5.3_PSAT_25	**ADL5.3_2.0.00.00.25**	**I2.0.00.00.25**	8/19/2016	9/2/2016	JCT/ORR critical PCRs	
ADL5.3_PSAT_26	**ADL5.3_2.0.00.00.26**	**I2.0.00.00.26**	9/9/2016	9/23/2016	JCT/ORR critical PCRs	
ADL5.3_PSAT_27	**ADL5.3_2.0.00.00.27**	**I2.0.00.00.27**	9/30/2016	10/14/2016	JCT/ORR critical PCRs	
ADL5.3_PSAT_28	**ADL5.3_2.0.00.00.28**	**I2.0.00.00.28**	10/21/2016	11/4/2016	JCT/ORR critical PCRs	
ADL5.3_PSAT_29	**ADL5.3_2.0.00.00.29**	**I2.0.00.00.29**	11/11/2016	11/25/2016	JCT/ORR critical PCRs	

ATMS Algorithm Updates

ADR	Title	Description	X-Ref	Build	Status
8224	Update JPSS-1 ATMS PCT with final instrument mounting matrix coefficients	Update instr2scMatrix coefficients in J1 ATMS PCT with post-dynamic measurement results.	474-CCR-16-2981	PSAT_xx	
8199	JPSS-1 ATMS PCT (Preliminary Version) Delivery	Preliminary version of JPSS-1 ATMS PCT is going to be delivered based on current NGES TVAC draft report. A good part of coefficients are still under revision. According to NASA flight	474-CCR-16-2955 PCR058549	PSAT_24	
8070	ATMS SDR: Triggering Logic Issues with (KAV/WG/Shelf) PRT Conversion Error QFs	As part of the RTN IDPS AAV verification activity, we tried at the factory to create a non-nominal condition to trigger these QFs, but we were unsuccessful. We believe there are	PCR052649		Rejected
8068	ATMS 8-17-2015 TDR/SDR outages related to scan reversal	From recent ATMS scan reversal event on Aug. 17, 2015, we found some unexpected TDR/SDR outages which lasted for at least 7 min.	PCR052498		Rejected
7966	ATMS Full Radiance Processing	Change ATMS calibration processing by full radiance instead of R-J approximation. This will affect both ATMS TDR and ATMS SDR.	474-CCR-15-2497 PCR053562 (PRO) PCR053563 (DPGD) PCR053564 (OAD)	PSAT_19	
7954	Correct errors in ATMS PCT warmBiasCorrection	In January, Joseph Lyu discovered, and Neal Baker confirmed, that the warmBiasCorrection coefficients (3x22 array) in the ATMS PCT are using the wrong values. They should be the values from the NPP Cal Data Book, but somehow other values are in place. This is a simple correction to restore the correct	474-CCR-15-2497 PCR053562 (PRO) PCR053563 (DPGD) PCR053564 (OAD)	PSAT_19	

ATMS Software Requirements Specification (SRS) Updates

- CCR-15-2745 - Update JPSS Algorithm Specifications– ATMS RDR/TDR/SDR Volume I and II
  - SRS Vol II update for QF19 (ATMS Data Gap Quality Flag) in Table 5.1.2-1 ATMS TDR Product Profile from CCR-15-2228 (ADRs 7820/7942)
- CCR-16-2991 - ATMS SDR - Corrections to SRS Parameter File (SRSPF)
  - SRSPF update to provide clarification of the ATMS “shelfPRT_ConvERR” QF triggering logic; driven by Block 2.0 Analysis and Verification (AAV) activity

CrIS Algorithm Updates (1/2)

ADR	Title	Description	X-Ref	Build	Status
8223	ADL BLK 2.0 cannot process J1 test data	The J1 test data are generated by the DRL STPS software in HDF5 format. First, ADL BLK 2.0 was not able to unpack the			
8210	CrIS Mounting Coefficients for J1	The mounting coefficients is a 3 X 3 rotation matrix. The coefficients are stored as part of the PCT input file.	474-CCR-16-2978	PSAT_26 (TBD)	
8209	ADL unpacker not working with J1 test data (15 granule file)	The J1 spacecraft level testing data are aggregated into 15 granules (60 scan, 8 minutes) file. The ADL unpacker in Block			
8188	Missing TLE	Raytheon uncovered a bug when the TLE files was older than 30 days in LGG testing. PCR 0571511 was submitted	PCR057151	PSAT_21	
8178	CrIS RDR of Block 1.2 and Block 2.0 differ	On 4/8/2016 IDPS generated CrIS SDR for block 1.2 and 2.0 at full spectral resolution as part of LGG testing. It was found			Closed
8175	CrIS SDR anomaly on 4/1/2016	CrIS SDR produced bad data for about 45 minutes on 4/1/2016 due to the in-track servo motor tilt error. A possible			Cancelled
8069	CrIS SDR: Issues with CrIS SDR DS/ICT Spectral Stability Calculation when missing DS/ICT packets	The purpose of this ADR is to document the following issue and agree on a path forward to understand/fix it: The Issue:	PCR053286 (Blk 1 - rejected) PCR052650 (Blk 2)	PSAT_22	
8057	Inconsistent DQI in FCE module	The FCE module was delivered on 08/2015. These 2 tests were performed: 1) run the original J1 code with the FCE module turned OFF, 2) Run the J1 code with FCE module turned ON	474-CCR-16-2979 DR4481 DR7487	PSAT_26 (TBD)	
8001	CrIS Incorrect FOR set to 32	One granule was incorrectly set to FOR =32. However, the CrIS SDR processing did not calculate the product for 9 granules.on	DR7571		Cancelled
7982	Change maxLunarRadiance to an array and check all bands for lunar intrusion	In the PCT file, the parameter named maxLunarRadiance has the value 10.0 (float32). This value should be changed into	474-CCR-16-2979 DR4481	PSAT_26 (TBD)	
7968	CrIS SDR FOV Remapping	In CrIS SDR, the geolocation parameters are remapped such that FOV 1 to FOV 3, 3 to 1, 4 to 6, 6 to 4, 7 to 9, and 9 to 7.	474-CCR-16-2979 DR4481	PSAT_26 (TBD)	
7951	Geolocation Issue-Orbital Inclination differs from TLE	Given S/C position R and velocity V vectors, the orbital inclination (i) is			Cancelled
7895	CrIS Concurrent Archival Full Spectral SDR and Operational Truncated Spectral SDR	For Block: 2.0 The current IDPS Block 1.2 produces CrIS truncated spectral (TS) SDR, and that SDR is a key product. We must continue to produce the TS SDR until the Program has validated that transition to a full spectral (FS) SDR may be accomplished	474-CCR-15-2536 PCR051646 (OAD) 474-CCR-15-2278 PCR048581 (Parent) PCR048586 (PRO)	PSAT_16	Closed

CrIS Algorithm Updates (2/2)

ADR	Title	Description	X-Ref	Build	Status
7850	CrIS SDR Spectral Ringing	The CrIS SDR spectral IDPS outputs are seen to demonstrate ringing, where ringing is defined as noticeable amplitude oscillations (positive to negative). Initial observation of CrIS SDR spectral ringing was made prior to CrIS SDR Validated	474-CCR-15-2395 DR7851 DR7926 474-CCR-15-2304	Post J1 Launch (TBD)	
7487	Reorder CrIS Calibration Equations	Update CrIS SDR software to reorder the calibration equations to improve the accuracy of the SDR product.	474-CCR-16-2979 DR4481	PSAT_26 (TBD)	
7486	CrIS High Resolution Processing	Update CrIS SDR software to support reading the high resolution RDR data and produce high resolution SDR data Impact Statement: Without this improvement only low	474-CCR-15-2278 PCR048586 (PRO)	SAT_06	Closed
7445	CrIS SDR: Impulse Noise Count Threshold Issues in the CrIS PCT/Code	While performing analysis work for the "PCR035944/DR7363 CrIS Incorrect Impulse Noise Count", I found the following issue: The CrIS PCT: CrIS-SDR-	PCR049994 (Blk 2) PCR036519 (Blk 1 - rejected) 474-CCR-16-2895 (SRS DD Vol II)	PSAT_13	Closed
4508	Earth spectra quality flag set to degraded when FCE detected	Considering only the event where an Earth spectrum has a FCE and it has been	PCR029555	Post J1 Launch (TBD)	
4481	Fringe count error correction algorithm does not work for cold Earth scenes.	The CrIS SDR ATBD (D443773 Rev D) on page 51 states: "..(CrIS) SDR algorithm uses only the positive square root term in the denominator of phase extraction function, equation (14), to	474-CCR-16-2898 474-CCR-16-2985 (SRS)	PSAT_26 (TBD)	

CrIS SRS Updates (1/2)

- CCR-15-2536 - Update CrIS SDR OAD for Full Spectral Resolution Values-One Section
  - Update to OAD Section 2.1.1.2 to account for updated wavelengths, bin numbers, etc. per CrIS FSR SDR updates per CCRs 15-2278 and 15-2446
- CCR-15-2587 - Update the SRSPF for CrIS Full Spectral Resolution SDR
  - Update to SRSPF to account for updated QF conditions per CrIS FSR SDR updates per CCRs 15-2278 and 15-2446
- CCR-16-2814 - ALG SRS CrIS RDR_SDR Vol I&II
  - Multiple updates, e.g., tables, QF logic, etc.; driven by CrIS Science Team and Raytheon
- CCR-16-2895 - Remove Field Impulse Noise – ADR 7445
  - Update to SRS Vol II “Data Dictionary” to per updated software implementation per ADR 7445/PCR049994

CrIS SRS Updates (2/2)

- CCR-16-2979 - CrIS SDR update for inconsistent DQI - ADR 8057
  - Update to SRS Vol II “Data Dictionary” per updated software implementation per CCR 16-2979
- CCR-16-2985 - Update 474-00448-01-03 SRS for CrIS FCE Exception
  - Update to SRS Vol I to indicate that the activation of fringe count error processing, per CCR 16-2898, will be deferred until the optimization of the algorithm meets latency.
- CCR-16-2992 - CrIS SDR - Corrections to SRSPF
  - SRSPF update to provide clarification of the CrIS “ICT Spectral Stability” QF triggering logic; driven by Block 2.0 Analysis and Verification (AAV) activity

OMPS EV SDR Algorithm Updates

ADR	Title	Description	X-Ref	Build	Status
8225	OMPS Dark Cal transition to GRAVITE	Weekly OMPS Dark Count Ground-PIs are currently manually produced, tested, and put through the Fast Track CCR process.			
8212	OMPS NP J1 prelaunch tables - v2	Deliver the second version of the OMPS NP J1 prelaunch tables based on further analysis of prelaunch test data.	474-CCR-16-2963	PSAT_xx (TBD)	
8211	OMPS TC J1 prelaunch tables - v2	Deliver the second version of the OMPS TC J1 prelaunch tables based on further analysis of prelaunch test data.	474-CCR-16-2962	PSAT_xx (TBD)	
8198	Short granules and offset granules between OMPS NP and NM	We have implemented an aggregator in the OMPS NM SDR processing and plan to use it to allow expanded content in			
8159	OMPS NP J1 prelaunch tables - v1	Deliver the initial version of the OMPS NP J1 prelaunch tables based on analysis of prelaunch test data.	474-CCR-16-2849 PCR057419 (DPGD)	PSAT_21	
8158	OMPS TC J1 prelaunch tables - v1	Deliver the initial version of the OMPS TC J1 prelaunch tables based on analysis of prelaunch test data.	474-CCR-16-2848 PCR057417 (DPGD)	PSAT_23	
8139	OMPS Nadir Profiler table updates for S-NPP Block 2.0	Tables compatible with the Block 2.0 OMPS Nadir Profiler algorithm are needed.	474-CCR-16-2765 PCR057152	PSAT_20	
8088	OMPS Nadir Mapper table updates for Block 2.0	Three new tables were provide for the OMPS Nadir Mapper for Block 1.2 in CCR 15-2547.	474-CCR-16-2764 PCR056817	PSAT_20	
7826	OMPS TC Wavelength GND-PI and Solar irradiance LUT fields values in the CDFCB are	A functional test of a Wavelength GND-PI update and OSOL LUT uncovered fields that were out of bound. These fields are	474-CCR-15-2546 PCR051639 (PRO DPGD, Blk	SAT_10	Closed
7825	OMPS NP SDR Wavelength GND-PI inconsistent field values in the XML	A functional test of a Wavelength GND-PI update for CCR 2053, uncovered fields that seemed out of bound and an	474-CCR-15-2546 PCR051639 (PRO DPGD, Blk	SAT_10	Closed
7340	TC EV SDR pre-processor to ingest high-resolution data	The current J1 plans include the generation of high-resolution data. In particular, the plans include a 3D flexible data cube	474-CCR-15-2432 (Phase 2) PCR051556 (PRO)	SAT_13, SAT_14	
7249	JPSS -1 Algorithm Improvements: Mandated: OMPS NP SDR	The OMPS NP SDR cal/val team has identified JPSS-1 algorithm improvements mandated in the Level 1 RD. This DR serves as	PCR051582 (PRO) 474-CCR-15-2469 (Phase 2)	SAT_13, SAT_14	
7248	JPSS-1 Algorithm Improvements: Mandated: OMPS NTC SDR	The OMPS NTC SDR cal/val team has identified JPSS-1 algorithm improvements mandated in the Level 1 RD. This DR	474-CCR-15-2432 (Phase 2) PCR051556 (PRO)	SAT_13, SAT_14	

- CCR-16-vvvv/ADR zzzz - J1 OMPS Sensor Mounting Coefficients (PSAT_xx (TBD))

OMPS EV SDR SRS Updates

- CCR-15-2629 - OMPS NP SDR Correct SRSPF
  - SRSPF update to provide clarification of the NP LIN CORR QF triggering logic and removal of MISS Fill condition; driven by Block 2.0 Analysis and Verification (AAV) activity
- CCR-15-2630 - OMPS TC SDR Correct SRSPF
  - SRSPF update to provide clarification of the TC LIN CORR QF triggering logic and clarification/correction of MISS and VDNE Fill conditions; driven by Block 2.0 Analysis and Verification (AAV) activity
- CCR-15-2731 ALG SRS Vol II OMPS TC RDR_SDR
  - Multiple table updates per updated software implementation per CCRs 15-2283 and 15-2546
- CCR-16-2818 ALG SRS OMPS Nadir RDR_SDR Vol I&II
  - Multiple table updates driven by OMPS Science Team and Raytheon

VIIRS SDR/GEO Algorithm Updates (1/9)

ADR	Algorithm	Title	Description	X-Ref	Build	Status
8226	SDR	Is the VIIRS DNB radiation thresholding working?	The huge discrepancy between adjacent pixels in a largely uniform cloud-top background suggests that the SAA threshold			
8208	GEO	Calculate Bounding Box numCrosses and numQuadrants issues (PCR054702)	During a testing event, received an invalid number of dateline crossings message	PCR054702		
8197	SDR	VIIRS SDR Update for J1 Radience Limits	J1 VIIRS radiance limits are expected to be different from SNPP radiance limits due in part to the absence of RTA degradation			
8196	GEO	SNPP spacecraft z-axis off nadir 17 degrees during orbit adjust maneuvers	SNPP and the follow-on JPSS spacecraft perform orbit adjustment maneuvers to maintain the orbit configuration for			
8176	GEO	Erroneous timestamp step limits in VIIRS Geo LUT document from Ops values	In 474-00001-08_JPSS-CDFCB-X-Vol-VIII_0124, Table 3.2.1.4.80-1, we found errors in two entries in the VIIRS SDR GEO PARAM PC			
8164	GEO	VIIRS GEO QF2 erroneously described in OAD	The GEO QF2 in Table 13 is erroneously described.			
8161	SDR	J1 VIIRS Prelaunch LUTs: Version 2	Deliver the first update (version 2) of the J1 Prelaunch LUTs based on prelaunch test data analysis, and inputs from the data working group, the vendor, and the flight project	474-CCR-16-2859 474-CCR-15-2589 (DR 7996)	PSAT_xx	
8160	GEO	Sector rotation flagging in SNPP VIIRS ground SW will set FILLs in J1 VIIRS SDR(Cal)/Geo	The existing SNPP VIIRS SDR (Cal + Geo) code will set FILLs to the J1 VIIRS Cal and Geo products, rendering the J1 VIIRS	474-CCR-16-2890 PCR057420	PSAT_21	
8137	GEO	Spacecraft Diary drops and subsequent Two Line Element use in IDPS 2016 updates and	TLE use continues on a regular basis and the VIIRS Geolocation team believes this should be made a Mission	Mission DR#?		
8059	SDR	VIIRS SDR radiometry error when saturated thermal band pixels are included in on-board aggregation	Single gain bands are aggregated on-board for scan angles from Nadir to about 45 degrees. In the case of thermal bands when viewing very hot fires, the M15 and other bands saturate			
8047	SDR	J1 Prelaunch LUTs: Version 0	Deliver the initial version of the J1 Prelaunch LUTs based on prelaunch test data analysis, and inputs from the data			
8036	GEO	VIIRS GEO Code Change to Accommodate J1 DNB Agg Mode Change	JPSS J1 VIIRS DNB has anomalous non-linear response at high scan angles based on prelaunch testing. The flight project has	474-CCR-15-2590		
8018	GEO	J1 VIIRS Geo SCE SideB HAM mirror LUT Missing	For NPP VIIRS geolocation LUTs, resolution of DR 4737 made a field in the LUT, namely, poly_coef_tel for converting the telescope encoders to angles from one-dimensional to two-			

VIIRS SDR/GEO Algorithm Updates (2/9)

ADR	Algorithm	Title	Description	X-Ref	Build	Status
8012	SDR	Update VIIRS-SDR-CAL-AUTOMATE-LUT to put RSBAUTOCAL for F, H, and DNB LGS Gain in Automated Mode	After thorough analysis of the H factors, F factors, and DNB LGS Gain values from RSBAUTOCAL in manual mode, the Aerospace RSBAutoCal development team has determined that these calibration objects will be ready to be switched to automated	474-CCR-15-2608 PCR053550	Mx8.11.03	
7996	SDR	J1 VIIRS DNB calibration LUTs for DNB Option 21 (Option 26): Version 0	Deliver the initial version of the J1 DNB Calibration LUTs for Option 21 (Option 26) based on prelaunch test data analysis,	474-CCR-15-2589 PCR055094	PSAT_17	
7755	SDR	VIIRS SDR include band M11 in nighttime operations	Intro: Need to support the Nightfire Algorithm, currently using DNB,	474-CCR-14-2020 PCR054867	PSAT_16	

- CCR-16-qqqq/ADR nnnn - J1 VIIRAS Sensor Mounting Coefficients (PSAT_xx (TBD))

VIIRS SDR/GEO Algorithm Updates (3/9)

- CCR-14-1681 VIIRS SDR DQTT Update & DQN Activation - DR 7140
  - VIIRS SDR DQTTs (22 bands: 5 I-Band “I1-I5”, 16 M-Band “M1-M16” and DNB) were updated under CCR 14-1681
  - The Updated 22 DQTTs were delivered to OPS I&T under WR-24737 on 2015-07-29 18:26:43z (5 I-Band and 16 M-Band) and 2015-07-29 22:34:42z (DNB); Mx8.10
  - RTN IDPS OAA analyses that drove the current DQTT values were based on data from:
    - CLASS: Oct'12 (Mx6.4), Jan'13 (Mx6.5)
    - Factory GISF I&T w/ enabled DQTTs: Mar'13 (Mx6.6)
  - RTN MST-MDA performed a high-level analysis using 2-wk worth of VIIRS SDR bands and generated DQNs (11/12/15 - 11/30/15); Mx8.10
  - The MST-MDA analysis shows bands DNB, I3 [RSB, D], M7 [RSB, D/N], M8 [RSB, D/N], M9 [RSB, D], M10 [RSB, D/N] and M11 [RSB, D], being the heavy hitters WRT DQN generation

VIIRS SDR/GEO Algorithm Updates (4/9)

- CCR-14-1681 VIIRS SDR DQTT Update & DQN Activation - DR 7140 (Cont.)
  - The MST-MDA study collected other associated granule-level information, e.g., Day/Night Status, Ascending/Descending Orbit, Graceful Degradation Condition, Maneuver Status, RDR-related information (% Erroneous, % Missing and % Not Applicable)
  - The “High Volume” DQN trend for the band sub-set was not observed in the conducted tests/analyses during the 2012/2013 (Mx6.4 – Mx6.6) data collection periods
  - For DNB, this trend is known and expected due to the negative impact of the Stray Light Correction (SL Corr) on the quality of the produced DNB SDR

VIIRS SDR/GEO Algorithm Updates (5/9)

- CCR-14-1681 VIIRS SDR DQTT Update & DQN Activation - DR 7140 (Cont.)
  - RTN IDPS OAA in-depth analysis (in progress; on and off depending on other competing priorities) focuses on identifying any correlation/dependency b/n the “High Volume” DQN trend for the listed bands and other factors/inputs as:
    - VIIRS SDR updates b/n Mx6.6 and Mx8.11 that would have impacted the logic for some of the lower-pixel-level QFs that feed into the pixel-level “SDR Quality” QF
    - “Day vs Night” granule status and if code updates were implemented that would have affected SDR Fill Value behavior
    - Updated DQTT values and whether some value relaxation is needed for some of the bands
    - Other factors
  - Once the “culprit” factor(s) is(are) identified and if it’s determined that code update/DQTT value update is required, OAA will communicate the findings to the VIIRS SDR Science team and NASA IDPS and receive their feedback and recommendation

VIIRS SDR/GEO Algorithm Updates (6/9)

- CCR-14-1681 VIIRS SDR DQTT Update & DQN Activation - DR 7140 (Cont.)
  - RTN IDPS OAA in-depth analysis (in progress; on and off depending on other competing priorities) focuses on identifying any correlation/dependency b/n the “High Volume” DQN trend for the listed bands and other factors/inputs as:
    - VIIRS SDR updates b/n Mx6.6 and Mx8.11 that would have impacted the logic for some of the lower-pixel-level QFs that feed into the pixel-level “SDR Quality” QF
    - “Day vs Night” granule status and if code updates were implemented that would have affected SDR Fill Value behavior
    - Updated DQTT values and whether some value relaxation is needed for some of the bands
    - Other factors
  - Once the “culprit” factor(s) is(are) identified and if it’s determined that code update/DQTT value update is required, OAA will communicate the findings to the VIIRS SDR Science team and NASA IDPS and receive their feedback and recommendation

VIIRS SDR/GEO Algorithm Updates (7/9)

- Missing S/C Diary Packets and TLE Usage in GEO Generation
  - Downlink from the S/C interleaves, or multiplexes, the Diary APs (APIDs 0, 8 and 11) with all other data streams, e.g., Sensor Science/CAL APs.
  - Space link VCID 0 contains the Diary APIDs, and other APIDs are sent on other channels
  - Ground link from Svalbard interleaves, or multiplexes, the Diary APs with all other data streams
  - IDPS ING assembles the Diary APIDs into Diary RDRs
  - Missing S/C Diary APs can be due to the S/C Downlink, C3S to IDPS or/and IDPS ING
  - If the missing S/C Diary APs are retransmitted to ING, ING would create repaired S/C Diary RDRs
  - Depending on the length “period” of the missing S/C Diary A&E APs, if the gap is small enough, then IDPS PRO SW could employ interpolation from neighboring packets to compensate for the missing A&E APs, a combination of interpolation and TLE usage could be used (larger gap), or only TLE is used (much larger gap)

VIIRS SDR/GEO Algorithm Updates (8/9)

- Missing S/C Diary Packets and TLE Usage in GEO Generation (Cont.)
  - IDPS GEO QF "A&E Availability Status" is triggered accordingly to indicate nominal case (value of zero; S/C Diary is used), or missing S/C A&E APs (values of 1, 2, or 3)
  - IDPS PRO SW uses the TLE (provided by CGS C3S once/day), propagates using SGP4 and creates ephemerides (EPH only no ATT; perfect attitude is assumed "Zero RPY")
  - If S/C Diary APs are missing or arrive late WRT to sensor Science/CAL APs, then, triggered SDR Controller (based on available sensor Science RDR) forces triggered corresponding GEO product to use TLE due to the absence of the corresponding S/C Diary RDRs
  - Repaired S/C Diary RDR (e.g., A2) will NOT trigger the creation of an A2 GEO granule. If it happens that a repaired VIIRS SCI RDR is created and that repaired VIIRS SCI RDR caused the tasking of the SDR controller, then a repaired GEO granule will be created that may use that repaired S/C Diary RDR

VIIRS SDR/GEO Algorithm Updates (9/9)

- Missing S/C Diary Packets and TLE Usage in GEO Generation (Cont.)
  - To fix the problem of sync_ing the downlinked S/C Diary with the downlinked Science/Instrument data JSH PCR PCR058497 is created.
  - As part of IDPS effort to reduce A2 generation, IDPS ING is updating RDR release timing CFG (PCR058806) and evaluating the impact of adding the S/C Diary to the Science SDR Workflow Preconditions (PCR038616)

VIIRS SDR/GEO SRS Updates (1/2)

- CCR-16-2993 - VIIRS SDR-Corrections to SRSPF
  - SRSPF update to provide clarification on the triggering of the "SDR Quality" QF to remove the condition of "SDRQual - No Calibration when saturation occurs;" driven by Block 2.0 Analysis and Verification (AAV) activity
- CCR-16-2891 – VIIRS SDR Correct SRSPF (ADR 7995)
  - SRSPF update to provide clarification on the triggering of the GEO "Automatic" QF to remove the 'degraded' condition and state that the QF is only set when the HAM/RTA Encoder flag is set to 'Bad' or 'Missing' data; driven by Block 2.0 Analysis and Verification (AAV) activity
- CCR-16-2768 - ALG SRS VIIRS RDR_SDR Vol I & II
  - Multiple Vol II updates driven by VIIRS Science Team and Raytheon:
    - Update Radiance and Reflectance/Brightness Temperature Bounds/Ranges & Quality Flag inconsistencies per CCRs 15-2345 and 15-2321
    - VIIRS GEO update to accommodate J1 DNB Agg Mode Change per CCR 15-2590
    - Scan Controller Electronics Side QF per CCR 12-0730

VIIRS SDR/GEO SRS Updates (2/2)

- CCR-16-2767 - VIIRS RDR_SDR Correct SRSPF
  - SRSPF updates driven by Block 2.0 Analysis and Verification (AAV) activity:
    - Add in APIDs 827 and 828 for VIIRS DNB
    - Correction and clarification to QF logic
    - Correction to Fill values for certain fill conditions
- CCR-15-2510 – SRSPF Updates for VIIRS M11 at Night

VIIRS Imagery Algorithm Updates

ADR	Title	Description	X-Ref	Build	Status
8161	J1 VIIRS Prelaunch LUTs: Version 2	Deliver the first update (version 2) of the J1 Prelaunch LUTs based on prelaunch test data analysis, and inputs from the data working group, the vendor, and the flight project. VIIRS SDR Science team to create updated version of the J1 Prelaunch	474-CCR-16-2859 474-CCR-15-2589 (DR 7996)	PSAT_xx	
7257	JPSS-1 Algorithm Improvements: Recommended: VIIRS Imagery	The VIIRS Imagery EDR cal/val team has provided recommendations for JPSS-1 algorithm improvements. This DR serves as a tracking and	DR4653		

VIIRS Imagery SRS Updates

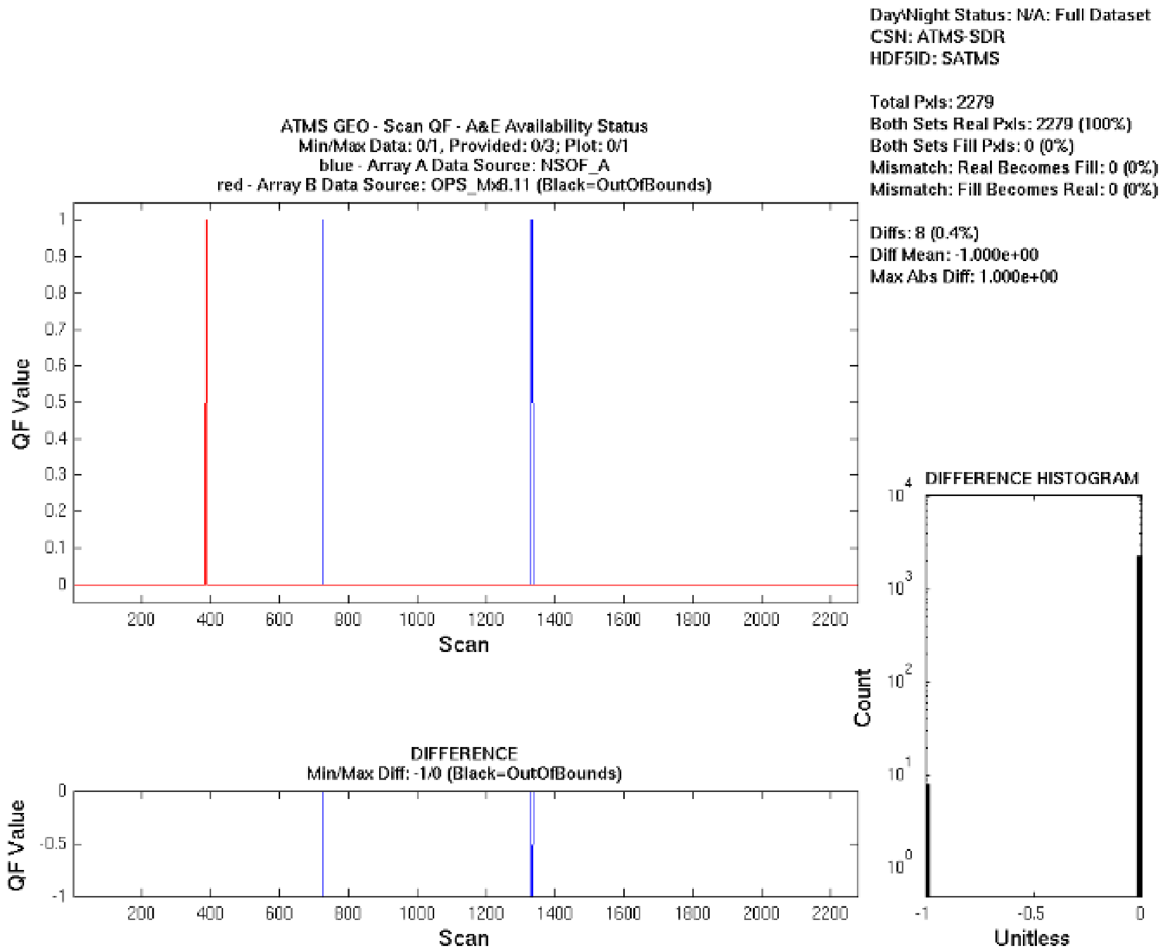
- CCR-15-2626 - VIIRS Imagery Correct SRSPF
  - SRSPF update to provide clarification on the usage of MISS and ELINT Fill values; driven by Block 2.0 Analysis and Verification (AAV) activity
- CCR-16-2776 - ALG SRS VIIRS Imagery Vol I & II
  - Multiple Vol II updates driven by VIIRS Science Team and Raytheon:
    - Update Radiance and Reflectance/Brightness Temperature Bounds/Ranges & Quality Flag inconsistencies per CCRs 15-2345 and 15-2321
    - Add previously missed processing coefficient format for the VIIRS Near Constant Contrast Imagery PCT VIIRS-NCC-EDR-AC

LG2 Test Analysis Results ATMS (1/5)

- ATMS TDR, SDR and GEO products from Block 2 LG2 (PSAT 16 based) “NSOF-A, NSOF-B, NOSF-I&T, CBU” and Block 1 OPS “Mx8.11” are analyzed (B2B).
- For SNPP configuration, 190 ATMS granules are generated from each of the Block 2 LG2 strings, i.e., NSOF-A, NSOF-B, NOSF-I&T, CBU and collected from Block 1 OPS “Mx8.11”, for Apr 5th, 2016, orbit 22999
  - Gran #1:
    - GATMO-SATMS-TATMS_npp_d20160405_t1027210_e1027526_b22999
  - Gran #190:
    - GATMO-SATMS-TATMS_npp_d20160405_t1208063_e1208379_b22999
- For J01 configuration “Time and/or Space Shifted SNPP-Proxy,”190 ATMS granules are generated from each of the Block 2 LG2 strings, i.e., NSOF-A, NSOF-B, NOSF-I&T, CBU
  - Gran #1:
    - GATMO-SATMS-TATMS_j01_d20160404_t2146196_e2146513_b04613
  - Gran #190:
    - GATMO-SATMS-TATMS_j01_d20160404_t2327076_e2327393_b04613

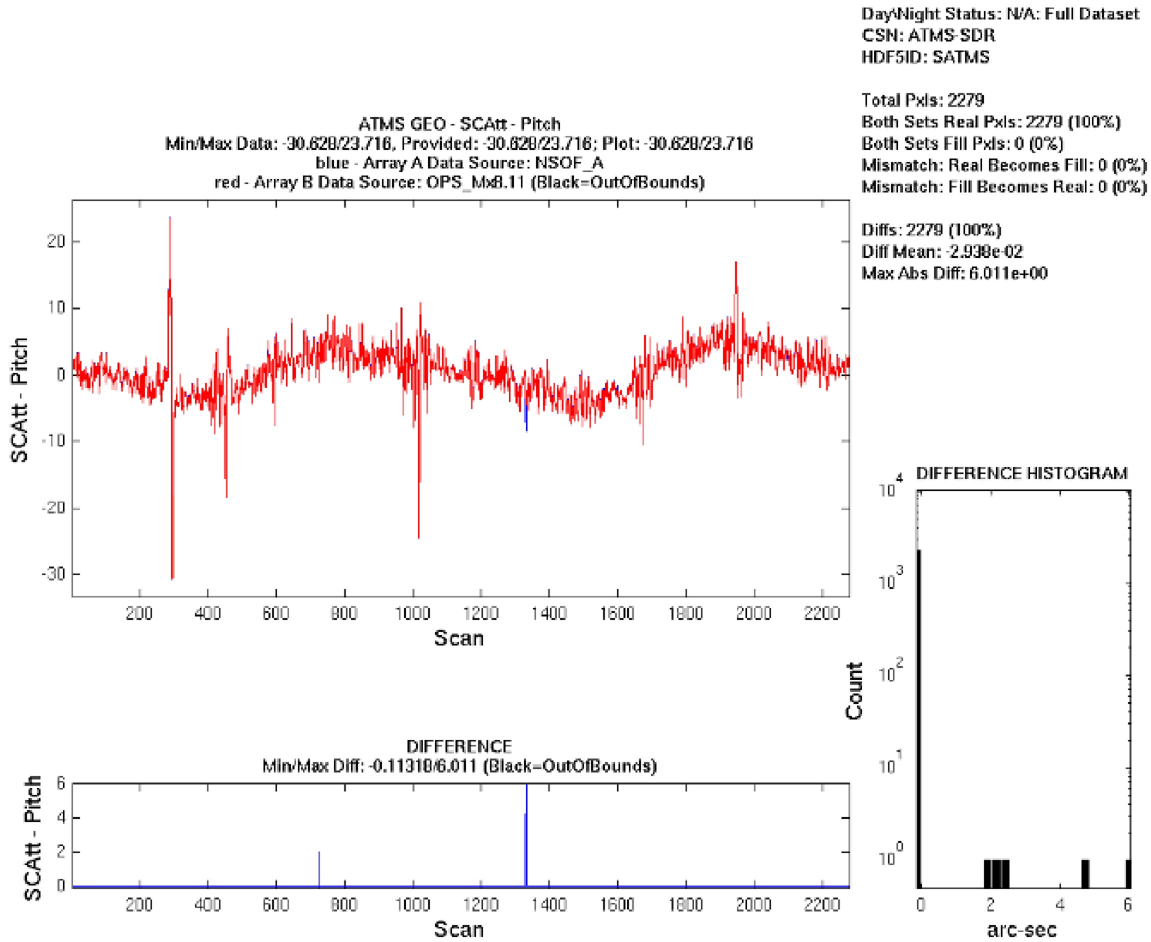
LG2 Test Analysis Results ATMS (2/5)

- SNPP-related Analyses
  - GEO Product
    - The following plot for the "ATMS GEO QF - A&E Availability Status" shows two issues:
    1. For some scans, QF is triggered with value of 1, indicating missing S/C Diary A&E packets (blue is for NSOF-A granules; red is for OPS "Mx8.11" granules). However, since the QF is triggered with value of 1, then, the gap caused by the missing S/C Diary A&E packets is small enough, such that, interpolation using information from the neighboring packets is employed (i.e., no TLE usage)
    2. The difference plot shows that, for some scans "8 scans," QF is triggered differently, i.e., difference of -1/+1. Thus, corresponding GEO field differences would be expected (see next slide)



LG2 Test Analysis Results ATMS (3/5)

- SNPP-related Analyses (Cont.)
  - GEO Product (Cont.)
    - The following plot for the “ATMS GEO S/C Attitude - Pitch” shows the corresponding differences WRT to the differences observed in the “ATMS GEO QF - A&E Availability Status”
    - The table in the next slide shows a summary of the corresponding differences in the GEO fields



LG2 Test Analysis Results ATMS (4/5)

- SNPP-related Analyses (Cont.)
  - GEO Product (Cont.)
    - The shown differences in the GEO fields are due to:

    1. Differences in scans where S/C diary A&E packets are missing → Differences in S/C Att fields (RPY, S/C Position, S/C Velocity)
    2. Platform-related machine precision level differences
    3. Differences between NOVAS-C 2.0.1 (in OPS Mx8.11) and NOVAS-C 3.1 library suites and the replacement of the IDPS-standalone geometrical/trigonometrical functions/calculations with corresponding NOVAS-C 3.1-provided functions/calculations (in PSAT 16).

Product	Diffs	MaxAbsDiff	Diff Mean
GEO - Beam Latitude CH 1 K-Band	99695	4.18E-04	-6.58E-07
GEO - Beam Latitude CH 2 Ka-Band	99644	4.22E-04	-6.81E-07
GEO - Beam Latitude CH 3 V-Band	99980	4.12E-04	-6.50E-07
GEO - Beam Latitude CH 16 W-Band	100090	4.16E-04	-6.70E-07
GEO - Beam Latitude CH 17 G-Band	99848	4.18E-04	-6.76E-07
GEO - Beam Latitude	99848	4.18E-04	-6.76E-07
GEO - Beam Longitude CH 1 K-Band	52018	3.00E-03	4.04E-06
GEO - Beam Longitude CH 2 Ka-Band	52074	1.10E-03	4.02E-06
GEO - Beam Longitude CH 3 V-Band	51909	2.36E-03	4.05E-06
GEO - Beam Longitude CH 16 W-Band	52189	2.07E-03	4.04E-06
GEO - Beam Longitude CH 17 G-Band	51781	1.39E-03	4.02E-06
GEO - Beam Longitude	51781	1.39E-03	4.02E-06
GEO - Solar Zenith Angle	185228	3.97E-04	-1.64E-07
GEO - Solar Azimuth Angle	149005	1.38E-03	3.75E-07
GEO - Satellite Zenith Angle	163448	7.32E-04	2.07E-07
GEO - Satellite Azimuth Angle	210588	1.83E-01	-2.51E-06
GEO - Height	1	1.00E+00	-1.00E+00
GEO - Satellite Range	68651	2.63E+01	1.08E-02
GEO - SCAtt - Roll	2279	1.20E+00	8.06E-04
GEO - SCAtt - Pitch	2279	6.01E+00	-2.94E-02
GEO - SCAtt - Yaw	2279	2.52E+00	-1.47E-03
GEO - SCPos - XComp	4	5.00E-01	-5.00E-01
GEO - SCPos - YComp	2	2.50E-01	-2.50E-01
GEO - SCPos - ZComp	4	5.00E-01	-3.75E-01
GEO - SCVel - XComp	4	7.32E-04	4.27E-04
GEO - SCVel - YComp	3	2.44E-04	8.14E-05
GEO - SCVel - ZComp	4	9.77E-04	7.32E-04
GEO - Scan QF - A&E Availability Status	8	1.00E+00	-1.00E+00

LG2 Test Analysis Results ATMS (5/5)

- SNPP-related Analyses (Cont.)
  - TDR and SDR Products
    - ZERO differences in all TDR/SDR fields and QFs.

LG2 Test Analysis Results CrIS (1/10)

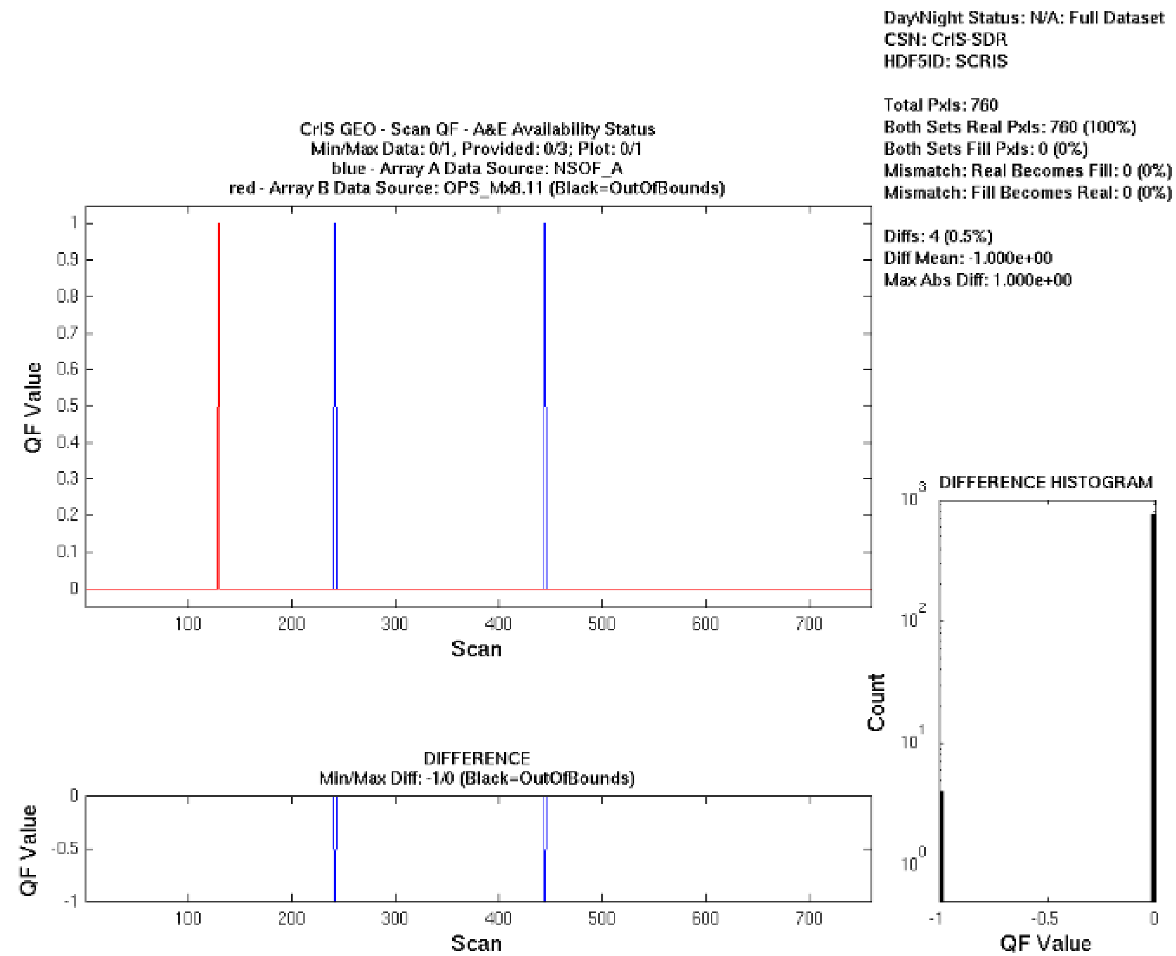
- CrIS SDR [TSR SDR “SCRIS” and FSR SDR “SCRIF”, where applicable] and GEO products from Block 2 LG2 (PSAT 16 based) “NSOF-A, NSOF-B, NOSF-I&T, CBU” and Block 1 OPS “Mx8.11” are analyzed (B2B).
- For SNPP configuration, 190 CrIS granules are generated from each of the Block 2 LG2 strings, i.e., NSOF-A, NSOF-B, NOSF-I&T, CBU and collected from Block 1 OPS “Mx8.11”, for Apr 5th, 2016, orbit 22999
  - Gran #1:
    - GCRSO-<SCRIF*>-SCRIS_npp_d20160405_t1027209_e1027507_b22999
  - Gran #190:
    - GCRSO-<SCRIF*>-SCRIS_npp_d20160405_t1208089_e1208387_b22999

  *FSR SDR “SCRIF” is not applicable to Block 1 OPS “Mx8.11”
- For J01 configuration “Time and/or Space Shifted SNPP-Proxy,”190 CrIS granules are generated from each of the Block 2 LG2 strings, i.e., NSOF-A, NSOF-B, NOSF-I&T, CBU
  - Gran #1:
    - GCRSO-SCRIF-SCRIS_j01_d20160404_t2146265_e2146563_b04613
  - Gran #190:
    - GCRSO-SCRIF-SCRIS_j01_d20160404_t2327065_e2327363_b04613

LG2 Test Analysis Results CrIS (2/10)

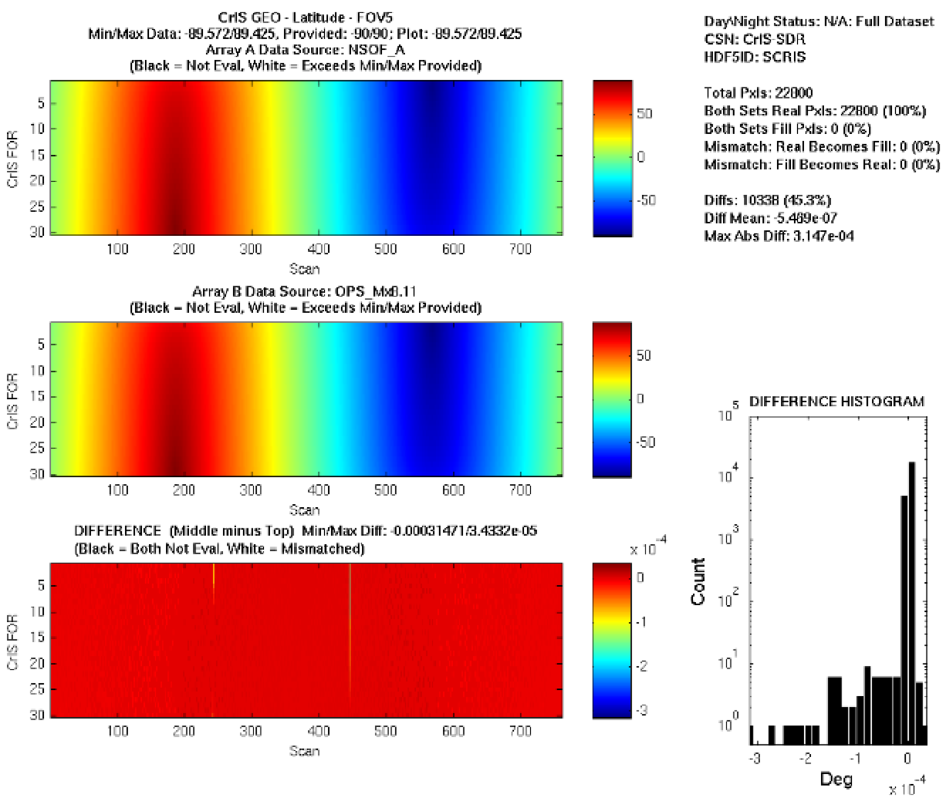
- SNPP-related Analyses
  - GEO Product
    - The following plot for the "CrIS GEO QF - A&E Availability Status" shows two issues:

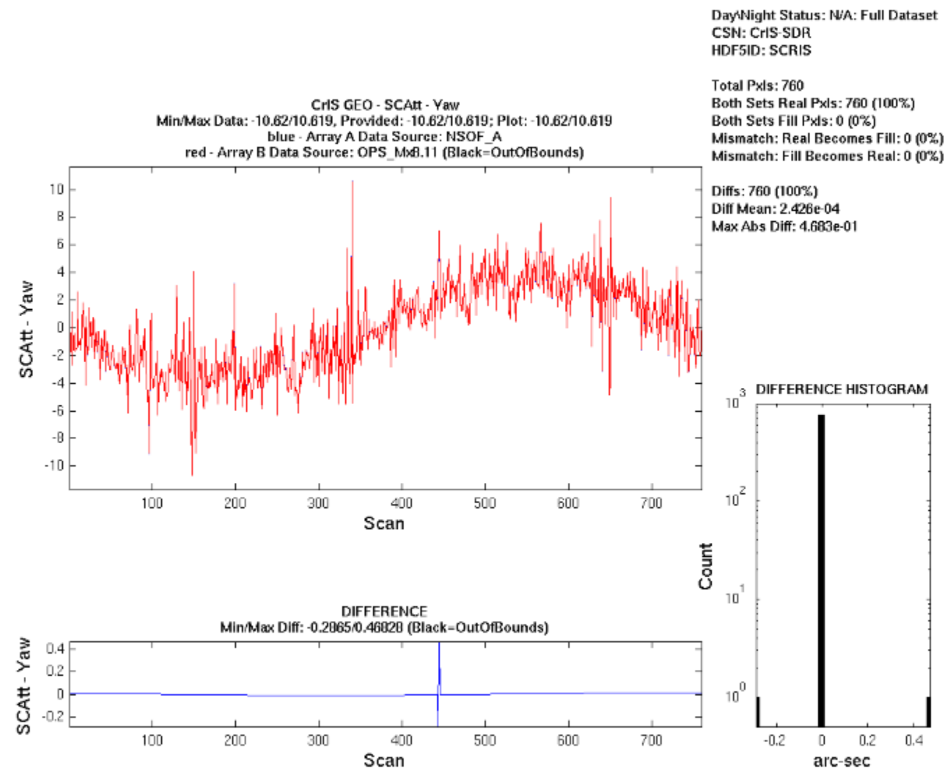
1. For some scans, QF is triggered with value of 1, indicating missing S/C Diary A&E packets (blue is for NSOF-A granules; red is for OPS "Mx8.11" granules). However, since the QF is triggered with value of 1, then, the gap caused by the missing S/C Diary A&E packets is small enough, such that, interpolation using information from the neighboring packets is employed (i.e., no TLE usage)
2. The difference plot shows that, for some scans "4 scans," QF is triggered differently, i.e., difference of -1. Thus, corresponding GEO field differences would be expected (see next slide)



LG2 Test Analysis Results CrIS (3/10)

- SNPP-related Analyses (Cont.)
  - GEO Product (Cont.)
    - The following 2 plots for the “CrIS GEO S/C Attitude - Yaw” and “CrIS GEO – Latitude – FOV5” show the corresponding differences WRT to the differences observed in the “CrIS GEO QF - A&E Availability Status”
    - The tables in the next slide show summaries of the corresponding differences in the GEO fields





LG2 Test Analysis Results CrIS (4/10)

- SNPP-related Analyses (Cont.)
  - GEO Product (Cont.)
    - The shown differences in the GEO fields are due to:

1. Differences in scans where S/C diary A&E packets are missing → Differences in S/C Att fields (RPY, S/C Position, S/C Velocity)
2. Platform-related machine precision level differences
3. Differences between NOVAS-C 2.0.1 (in OPS Mx8.11) and NOVAS-C 3.1 library suites and the replacement of the IDPS-standalone geometrical/trigonometrical functions/calculations with corresponding NOVAS-C 3.1-provided functions/calculations (in PSAT 16).

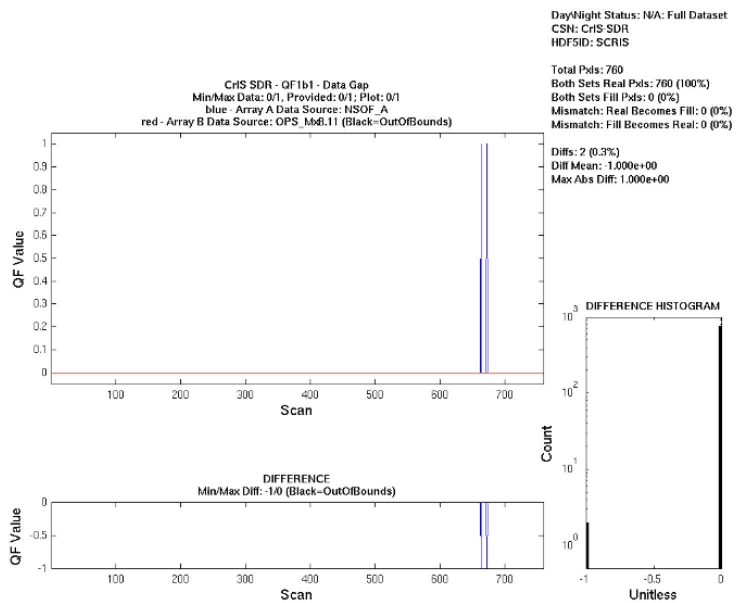
Product	Diffs	MaxAbsDiff	Diff Mean
GEO - Latitude - FOV1	10367	3.20E-04	-5.18E-07
GEO - Latitude - FOV2	10467	3.24E-04	-5.62E-07
GEO - Latitude - FOV3	10411	3.26E-04	-5.04E-07
GEO - Latitude - FOV4	10377	3.11E-04	-5.65E-07
GEO - Latitude - FOV5	10338	3.15E-04	-5.47E-07
GEO - Latitude - FOV6	10442	3.20E-04	-5.74E-07
GEO - Latitude - FOV7	10361	3.03E-04	-5.72E-07
GEO - Latitude - FOV8	10307	3.09E-04	-5.69E-07
GEO - Latitude - FOV9	10386	3.11E-04	-5.64E-07
GEO - Longitude - FOV1	5398	4.77E-04	4.57E-06
GEO - Longitude - FOV2	5396	6.94E-04	4.82E-06
GEO - Longitude - FOV3	5280	4.58E-04	4.56E-06
GEO - Longitude - FOV4	5370	4.58E-04	4.58E-06
GEO - Longitude - FOV5	5316	4.50E-04	4.74E-06
GEO - Longitude - FOV6	5302	4.41E-04	4.78E-06
GEO - Longitude - FOV7	5241	4.41E-04	4.80E-06
GEO - Longitude - FOV8	5353	4.35E-04	4.79E-06
GEO - Longitude - FOV9	5261	4.23E-04	4.90E-06
GEO - SolarZenithAngle - FOV1	19297	3.05E-04	-1.77E-07
GEO - SolarZenithAngle - FOV2	19382	3.05E-04	-1.92E-07
GEO - SolarZenithAngle - FOV3	19394	3.20E-04	-2.26E-07
GEO - SolarZenithAngle - FOV4	19284	2.90E-04	-1.68E-07
GEO - SolarZenithAngle - FOV5	19291	3.05E-04	-1.83E-07
GEO - SolarZenithAngle - FOV6	19367	3.05E-04	-1.26E-07
GEO - SolarZenithAngle - FOV7	19309	2.90E-04	-2.30E-07
GEO - SolarZenithAngle - FOV8	19357	2.90E-04	-1.34E-07
GEO - SolarZenithAngle - FOV9	19324	2.90E-04	-2.46E-07
GEO - SolarAzimuthAngle - FOV1	15559	5.42E-04	3.76E-07
GEO - SolarAzimuthAngle - FOV2	15456	6.94E-04	2.59E-07
GEO - SolarAzimuthAngle - FOV3	15533	5.19E-04	1.63E-07
GEO - SolarAzimuthAngle - FOV4	15463	5.21E-04	3.21E-07
GEO - SolarAzimuthAngle - FOV5	15513	5.09E-04	3.18E-07
GEO - SolarAzimuthAngle - FOV6	15564	5.00E-04	3.36E-07
GEO - SolarAzimuthAngle - FOV7	15594	5.00E-04	2.25E-07
GEO - SolarAzimuthAngle - FOV8	15574	4.90E-04	3.63E-07
GEO - SolarAzimuthAngle - FOV9	15526	4.81E-04	2.58E-07
[illegible]	[illegible]	[illegible]	[illegible]

Product	Diffs	MaxAbsDiff	Diff Mean
GEO - SatelliteZenithAngle - FOV1	17260	1.70E-03	8.74E-07
GEO - SatelliteZenithAngle - FOV2	17140	1.71E-03	9.06E-07
GEO - SatelliteZenithAngle - FOV3	17241	1.71E-03	9.55E-07
GEO - SatelliteZenithAngle - FOV4	17302	1.66E-03	-4.61E-07
GEO - SatelliteZenithAngle - FOV5	17268	1.68E-03	-3.42E-07
GEO - SatelliteZenithAngle - FOV6	17340	1.69E-03	-2.93E-07
GEO - SatelliteZenithAngle - FOV7	17369	1.63E-03	-1.69E-06
GEO - SatelliteZenithAngle - FOV8	17639	1.64E-03	-1.59E-06
GEO - SatelliteZenithAngle - FOV9	17294	1.65E-03	-1.63E-06
GEO - SatelliteAzimuthAngle - FOV1	22166	2.16E-02	4.17E-06
GEO - SatelliteAzimuthAngle - FOV2	22173	1.74E-02	-2.80E-07
GEO - SatelliteAzimuthAngle - FOV3	22091	2.43E-02	-4.16E-06
GEO - SatelliteAzimuthAngle - FOV4	22227	5.76E-02	2.58E-05
GEO - SatelliteAzimuthAngle - FOV5	22207	2.12E-02	-5.63E-07
GEO - SatelliteAzimuthAngle - FOV6	22231	6.25E-02	-2.76E-05
GEO - SatelliteAzimuthAngle - FOV7	22282	2.14E-02	2.69E-06
GEO - SatelliteAzimuthAngle - FOV8	22211	1.72E-02	-8.05E-07
GEO - SatelliteAzimuthAngle - FOV9	22231	1.94E-02	-4.34E-06
GEO - SatelliteRange - FOV1	6999	2.40E+01	4.69E-03
GEO - SatelliteRange - FOV2	7004	2.30E+01	9.58E-03
GEO - SatelliteRange - FOV3	7018	2.20E+01	6.89E-03
GEO - SatelliteRange - FOV4	6706	2.28E+01	-5.72E-03
GEO - SatelliteRange - FOV5	6757	2.19E+01	-9.62E-04
GEO - SatelliteRange - FOV6	6808	2.10E+01	4.50E-04
GEO - SatelliteRange - FOV7	6690	2.16E+01	-1.74E-02
GEO - SatelliteRange - FOV8	6758	2.08E+01	-1.72E-02
GEO - SatelliteRange - FOV9	6728	1.99E+01	-1.36E-02
GEO - Scan QF - A&E Availability Status	4	1.00E+00	-1.00E+00
GEO - SCAtt - Roll	760	1.00E+00	4.37E-04
GEO - SCAtt - Pitch	760	2.16E+00	-3.16E-02
GEO - SCAtt - Yaw	760	4.68E-01	2.43E-04
GEO - SCPos - XComp	2	5.00E-01	-5.00E-01
GEO - SCPos - YComp	1	2.50E-01	2.50E-01
GEO - SCPos - ZComp	1	5.00E-01	-5.00E-01
GEO - SCVel - XComp	2	4.88E-04	3.66E-04
GEO - SCVel - YComp	1	2.44E-04	2.44E-04
GEO - SCVel - ZComp	2	9.77E-04	7.32E-04

LG2 Test Analysis Results CrIS (5/10)

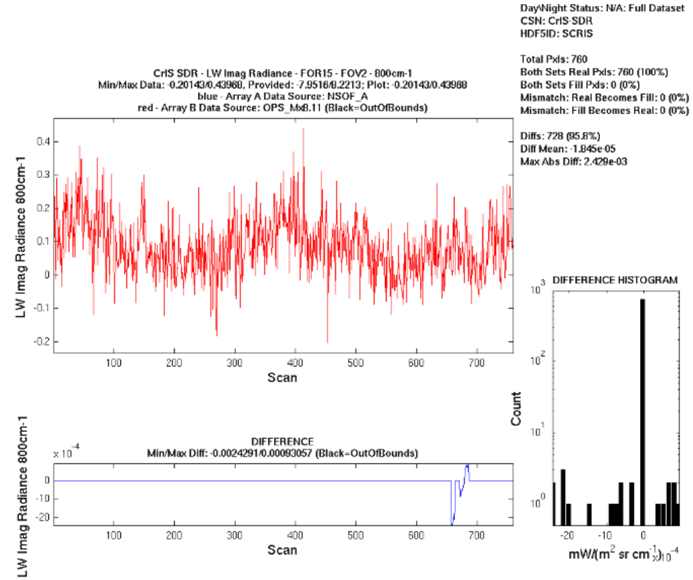
- SNPP-related Analyses (Cont.)
  - SDR Product (TSR SCRIS)
    - The following table lists the SDR fields and QFs that have differences. For each field and QF, the table lists the "Max Abs Diff" and "Diff Mean" values.
    - The found SDR fields and QF differences are due to:
      1. Differences in the QF1b1 "Data Gap" as shown in the following plot.
      2. Platform related difference (Blk 1 AIX vs. Blk 2 Linux):
         - BE vs. LE
         - Compiler and Complier Flag differences
         - OS differences
         - COTS differences
         - Math library differences
      3. Differences due to "CCR-15-2278/CCR-15-2446/DRs 7895 & 7486 – CrIS Full Spectral SDR Updates, "still producing only TSR SDR" that were implemented in Blk 2:
         - Updated the way the resampling laser wavelength was updated for each neon calibration.
         - Updated the NEdN algorithm to include spectral calibration.
         - The Blk 1 CMO AUX is split to 2 AUX files:
           » CrIS-Correct-Matrix-AUX
           » CrIS-SDR-ENGPKT-BACKUP-AUX
      4. Serial execution of CrIS SDR in Blk 1 vs parallel execution in Blk 2
    - The plots in the next 5 slides show examples of the differences in the SDR fields.

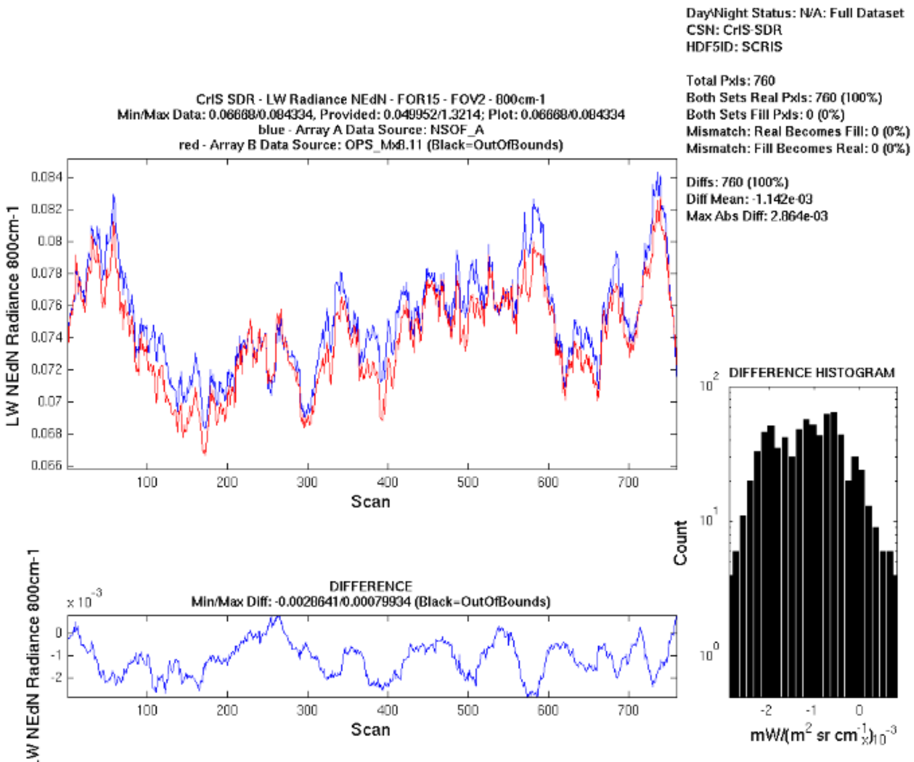
Product	MaxAbsDiff	Diff Mean
LW Real Radiance	8.52E-02	1.28E-05
LW Imag Radiance	8.77E-02	7.86E-05
LW Radiance NEdN	1.08E-01	1.23E-04
MW Real Radiance	9.58E-03	5.42E-06
MW Imag Radiance	1.10E-02	1.28E-05
MW Radiance NEdN	1.35E-02	1.13E-04
SW Real Radiance	1.41E-03	9.55E-07
SW Imag Radiance	1.28E-03	1.56E-06
SW Radiance NEdN	1.02E-03	2.48E-05
DS Window Size	3.00E+00	2.75E+00
ICT Window Size	4.00E+00	1.58E+00
DS Symmetry	8.44E+01	8.44E+01
DS Spectral Stability	2.56E-03	2.31E-06
ICT Spectral Stability	3.89E-03	1.62E-05
ICT Temperature Stability	2.71E-04	2.21E-05
ICT Temperature Consistency	5.87E-05	4.77E-05
Monitored Laser Wavelength	1.75E-04	6.92E-06
Measured Laser Wavelength	7.35E-05	-7.35E-05
Resampling Laser Wavelength	5.61E-05	3.65E-06
Valid PRT Temp No	1.00E+00	1.00E+00
QF1b1 - Data Gap	1.00E+00	-1.00E+00

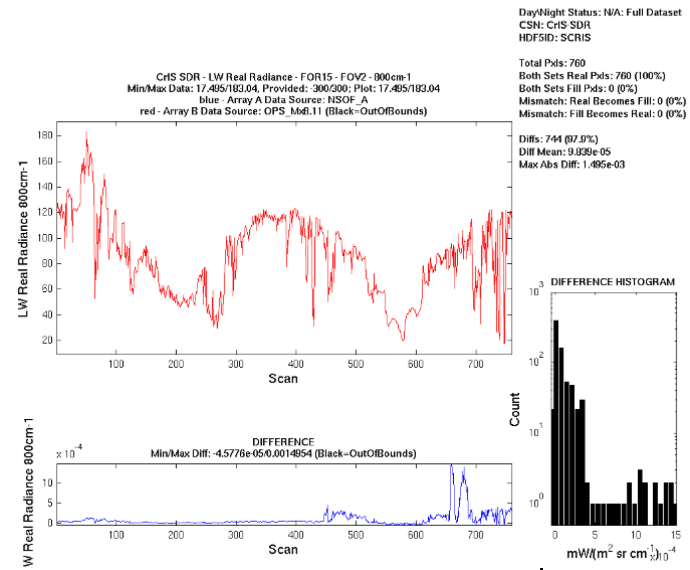


LG2 Test Analysis Results CrIS (6/10)

- SNPP-related Analyses (Cont.)
  - SDR Product (TSR SCRIS) (Cont.)
    - LW – Real Radiance, Imaginary Radiance – Pronounced differences are driven by the differences in the QF1b1 "Data Gap" (Ex: Imaginary Radiance) and due to CCR-15-2278/CCR-15-2446 updates (Ex: Real Radiance and Radiance NEdN)

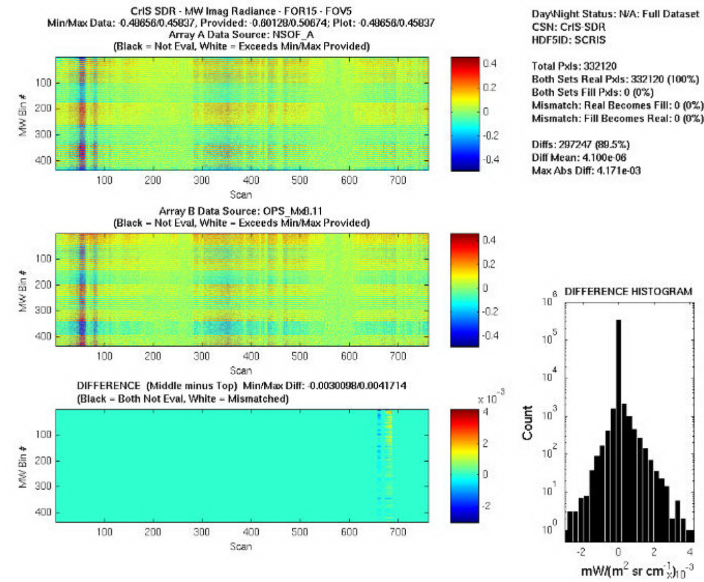


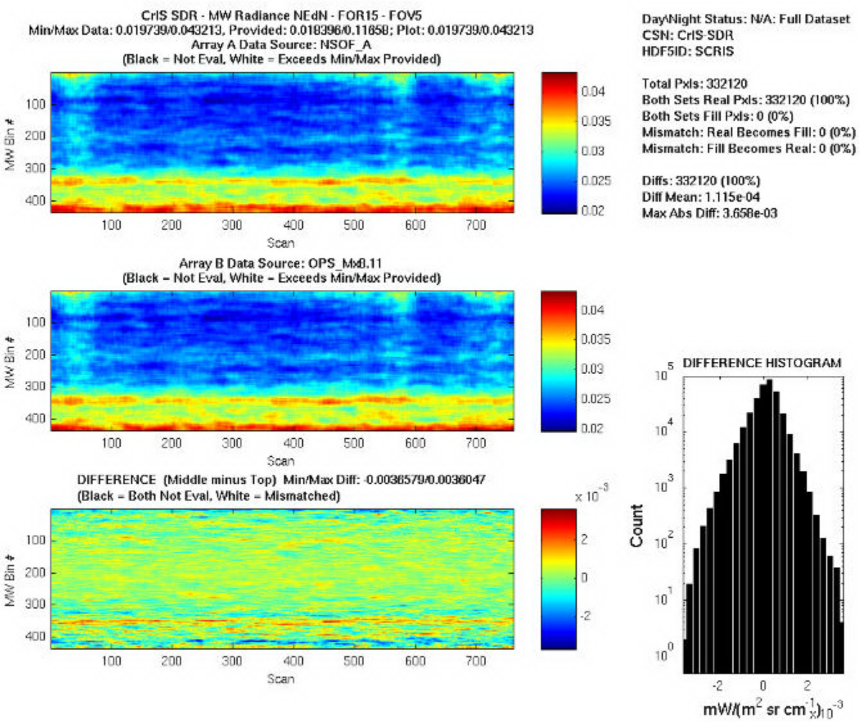


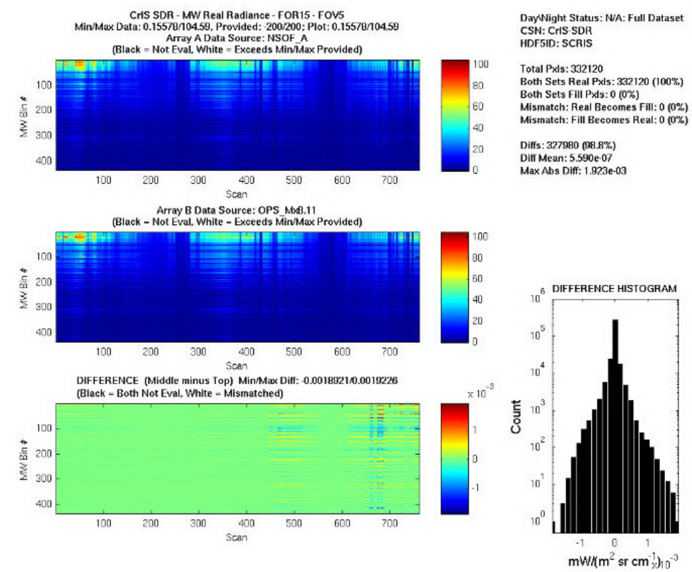


LG2 Test Analysis Results CrIS (7/10)

- SNPP-related Analyses (Cont.)
  - SDR Product (TSR SCRIS) (Cont.)
    - MW – Real Radiance, Imaginary Radiance – Pronounced differences are driven by the differences in the QF1b1 "Data Gap" (Ex: Imaginary Radiance) and due to CCR-15-2278/CCR-15-2446 updates (Ex: Real Radiance and Radiance NEdN)

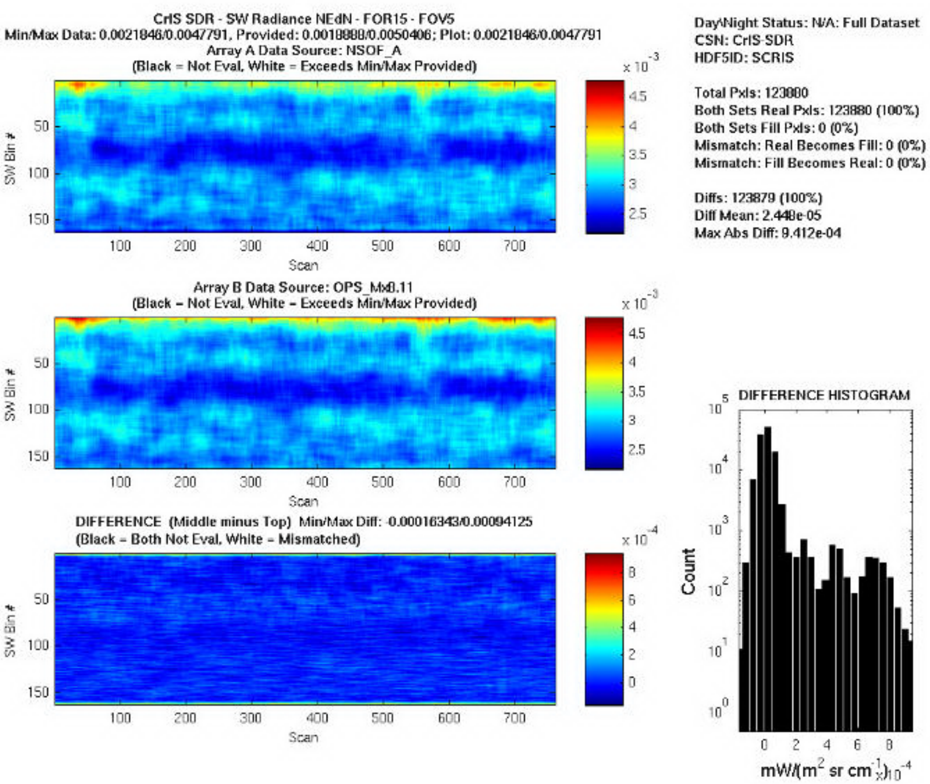


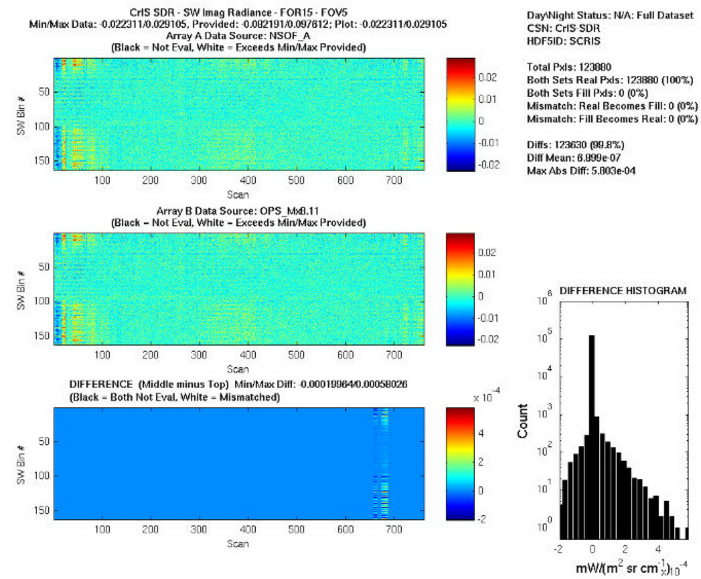


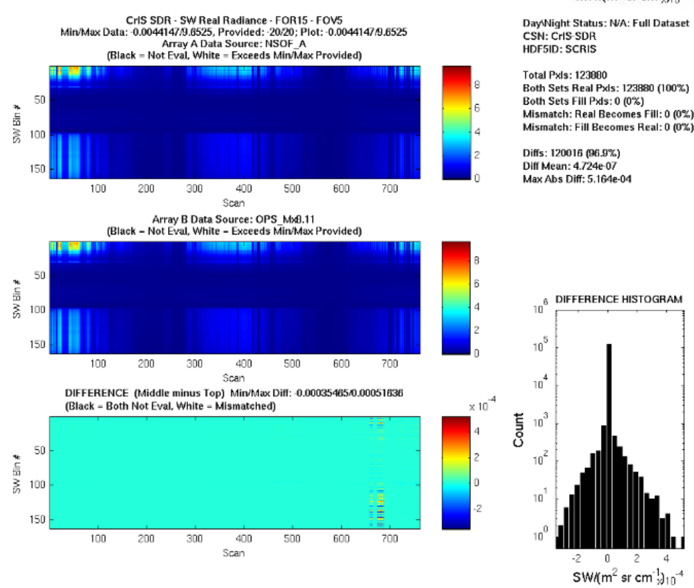


LG2 Test Analysis Results CrIS (8/10)

- SNPP-related Analyses (Cont.)
  - SDR Product (TSR SCRIS) (Cont.)
    - SW – Real Radiance, Imaginary Radiance – Pronounced differences are driven by the differences in the QF1b1 “Data Gap” (Ex: Imaginary Radiance) and due to CCR-15-2278/CCR-15-2446 updates (Ex: Real Radiance and Radiance NEdN)

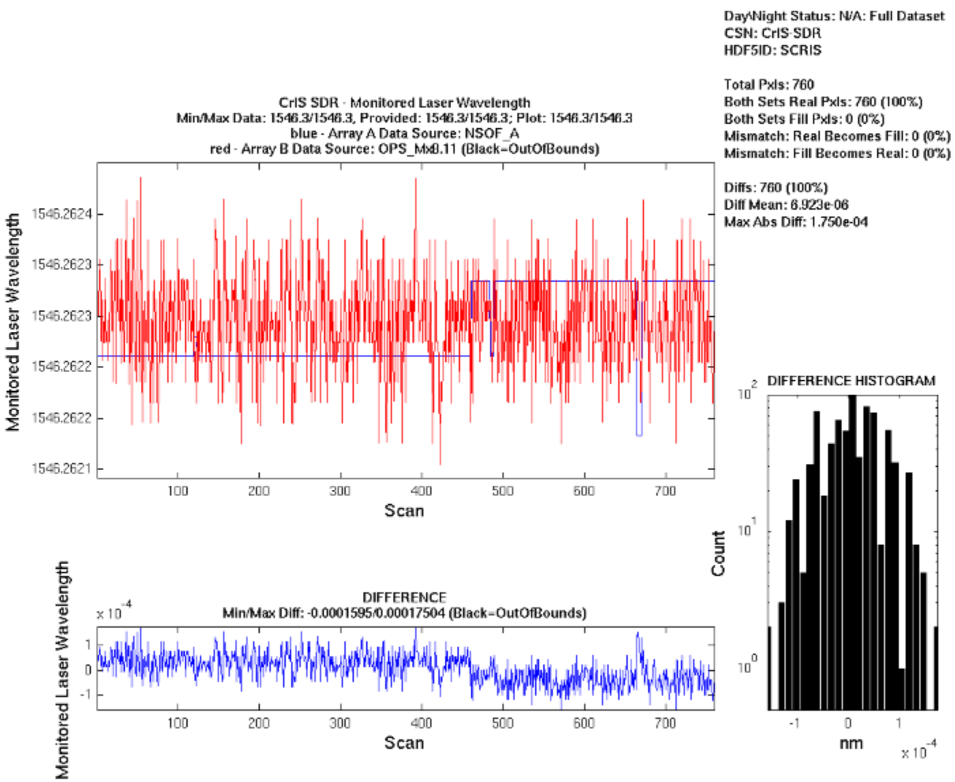


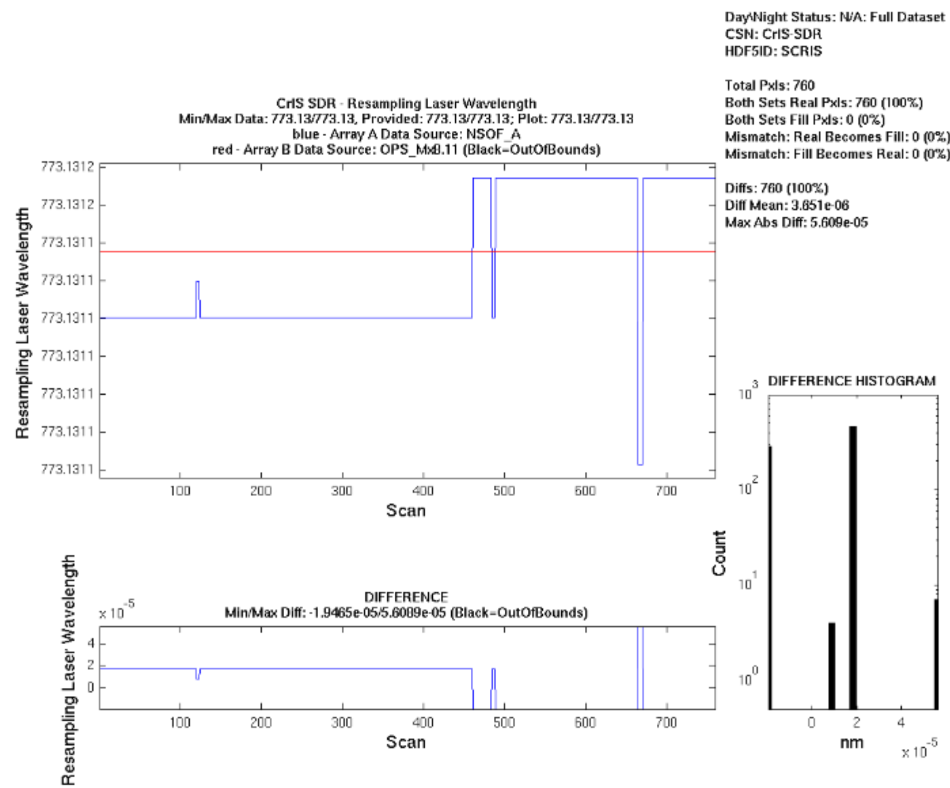




LG2 Test Analysis Results CrIS (9/10)

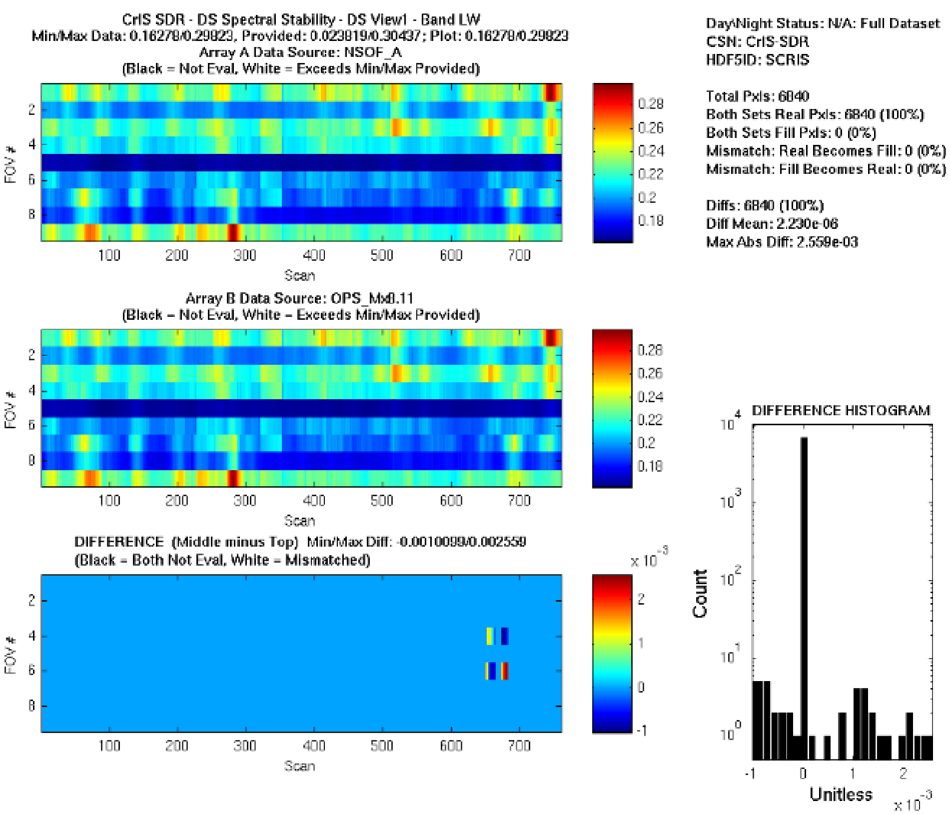
- SNPP-related Analyses (Cont.)
  - SDR Product (TSR SCRIS) (Cont.)
    - Monitored and Resampling Laser Wavelengths – Pronounced differences are due to CCR-15-2278/CCR-15-2446 updates

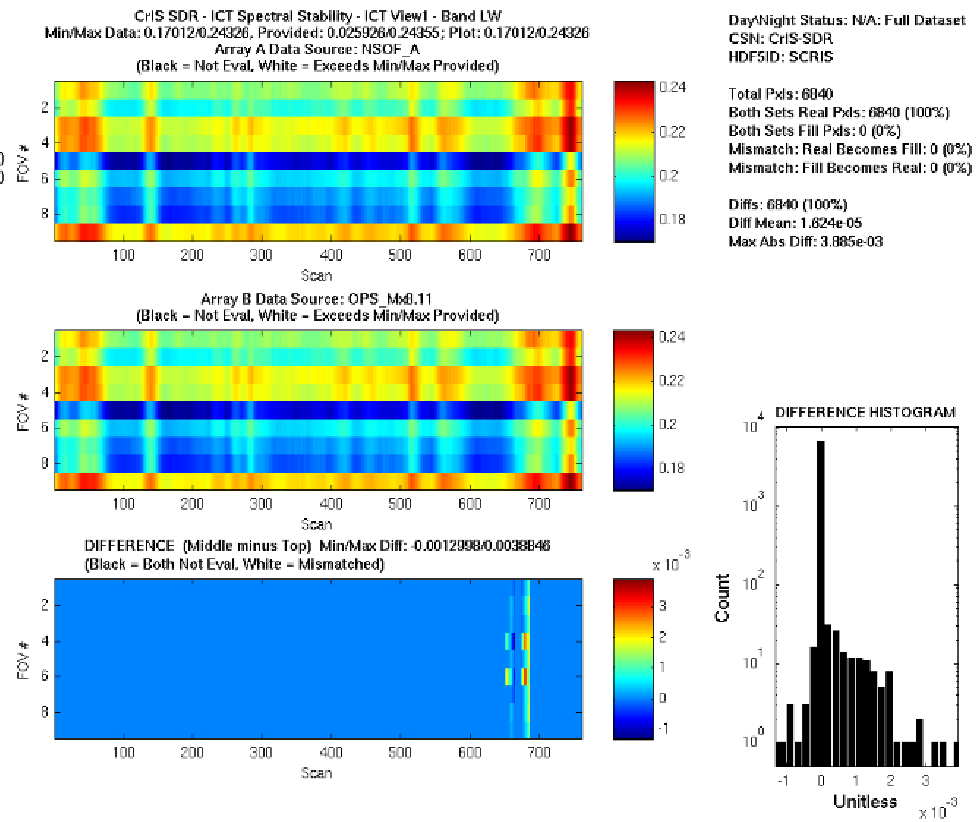




LG2 Test Analysis Results CrIS (10/10)

- SNPP-related Analyses (Cont.)
  - SDR Product (TSR SCRIS) (Cont.)
    - DS and ICT Spectral Stabilities – Pronounced differences are driven by the differences in the QF1b1 “Data Gap”

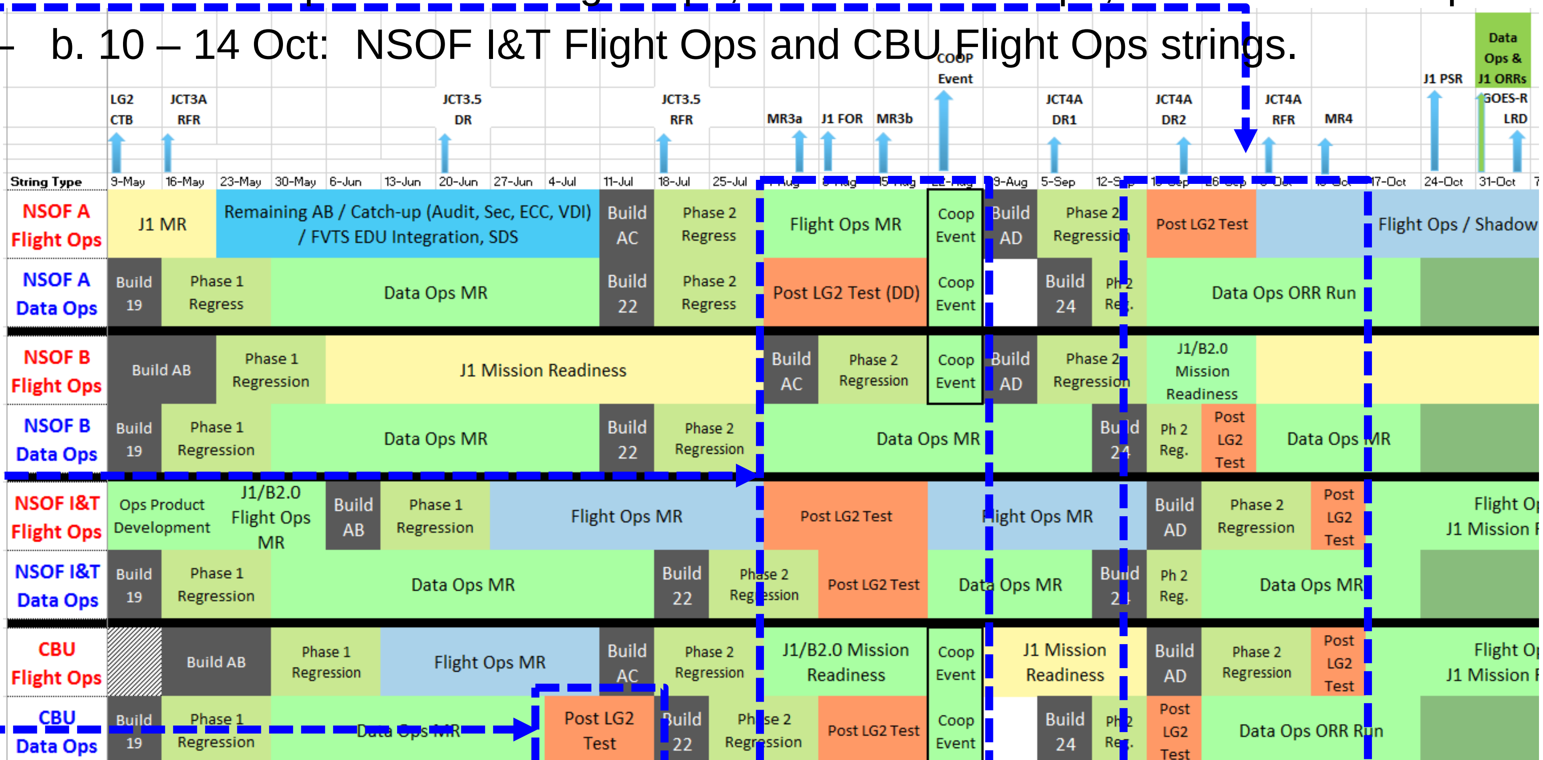




Post LG2 - Test Groups

Credit: JPSS Block 2.0 Post LG2 Group 2 Kickoff Meeting

- Group 1: July (5-15) event on CBU Data Ops String
- Group 2: August (1-26) utilizing NSOF A Data Ops ; NSOF I&T Flight Ops and Data Ops; and CBU Data Ops Strings
- Group 3:
  - a. 19 – 30 Sep: NSOF A Flight Ops, NSOF B Data Ops, and CBU Data Ops Strings
  - b. 10 – 14 Oct: NSOF I&T Flight Ops and CBU Flight Ops strings.



Post LG2 - Group 2 Data Sources

Credit: JPSS Block 2.0 Post LG2 Group 2 Kickoff Meeting

- **Data Source**
  - SMD: Live NPP & GCOM, 17-day time shifted J01
    - NOTE: The “2-day” dataset is a subset of the 17-day (same source data), used temporarily due to storage device issue at McMurdo
  - TLM: Live NPP, primarily PSS for J01
  - No additional specialty canned datasets in Group2
  - Data configuration: SGE1->JSHAO->IDPA
    Better look at data/configuration in the quicklook in the MCP as well as data request slide

- **J1 Dataset Expectations**
  - Base Source is ROOD NPP data from April 2014, validated dataset. Data characterization posted and expected results posted here: https://jpss-erooms.ndc.nasa.gov/eRoom/JPSSGround/GroundSEITWorkingGroups/0_593fe
  - Full VCID/APID coverage for S/C, ATMS, CrIS, OMPS, VIIRS, CERES
  - Scene content is from April and data is timeshifted with SOS/HALT, so geolocation will not be accurate nor will science quality

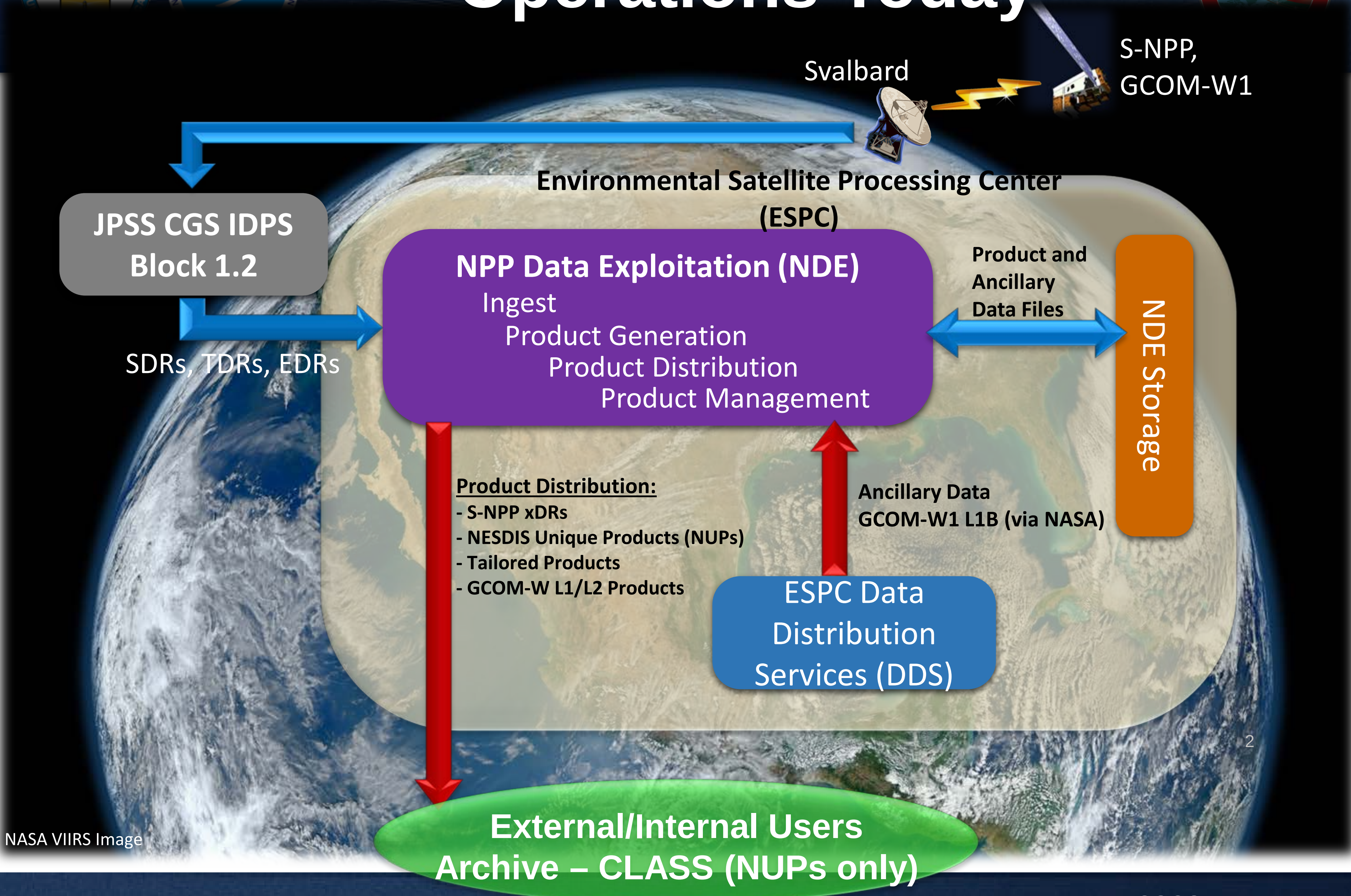
Changes to Near Real-time Product Generation and Distribution

Geof Goodrum

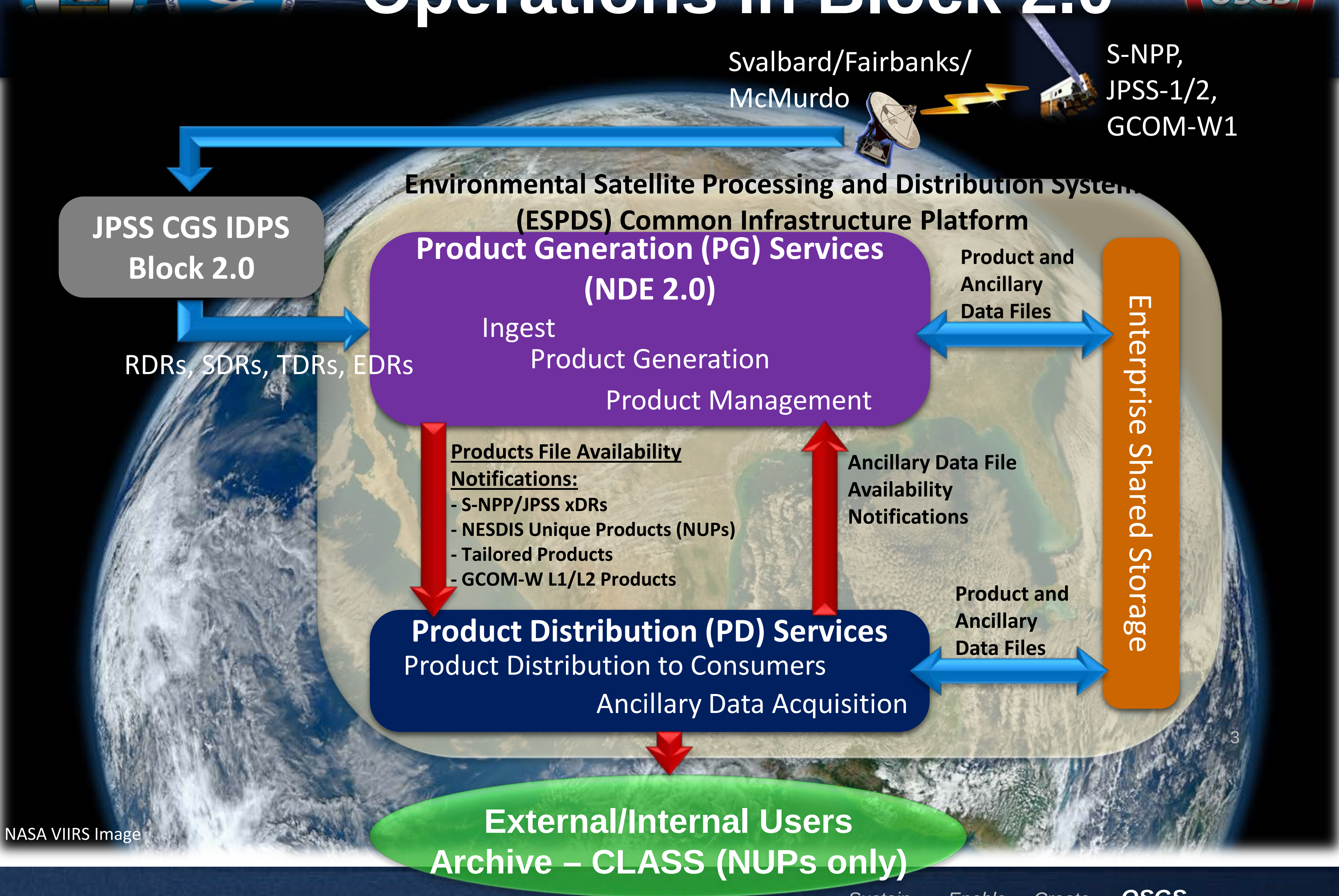
Geoffrey.P.Goodrum@noaa.gov
NOAA/NESDIS Office of Satellite Ground Services

With content from Solers, Inc., ESPDS PMO and OSPO

Operations Today



Operations in Block 2.0



Product Generation (PG)

- NPP Data Exploitation (NDE) in operations since July 2014 and has been distributing critical S-NPP data since soon after launch (November 2011)
- Established and mature process for efficiently transitioning new and updated science algorithms from the NOAA Center for Satellites Applications and Research (STAR) - in place since 2011
- Well defined, documented, and simple interface for modular algorithm integration allowing for a repeatable process and small integration team
- Data agnostic, execute algorithms for any platform/instrument (***“algorithm as a service” concept***)
- NDE 2.0 provides an Enterprise Product Generation (PG) framework implemented within the ESPDS common infrastructure platform
- Established solution for product generation for S-NPP, JPSS-1/2, GCOM-W1, and can be leveraged for other NOAA or non-NOAA missions

NOAA PG Transition to Operations Process

1 Define Requirements (JPSS Level 1)

2 Develop Algorithm
- Preliminary Design Review
- Critical Design Review
- Unit Test Readiness Review
- System (Algorithm) Readiness Review

Develop/test in NDE DEV Environment
- NDE operating system/compilers
- Science libraries
- VPN access
- Initial integration activities

3 Prepare Delivered Algorithm Package (DAP) for each Science Algorithm for delivery to NDE
- Algorithm Delivery Standards, Integration, and Test (DAP document acts as ICD)
- Configuration management of DAP

4 Office of Satellite and Product Operations (OSPO) performs software code review

5 Integrate DAP into NDE DEV Environment
- Configuration management
- Production rules
- Unit testing

6 System Test Algorithm in NDE TEST Environment
- Full contention, live data flow
- Performance testing

Develop Algorithm Enhancements, Bug Fixes, and Updates
- Redeliver DAP

7 Satellite Products and Services Review Board (SPSRB) approves product for operations

8 Generate Operational Product in NDE Production Environment
- Operations
- 24/7 Monitoring

Product Quality Validation

KEY
- STAR
- OSGS
- OSPO

NOAA Product Generation Algorithms

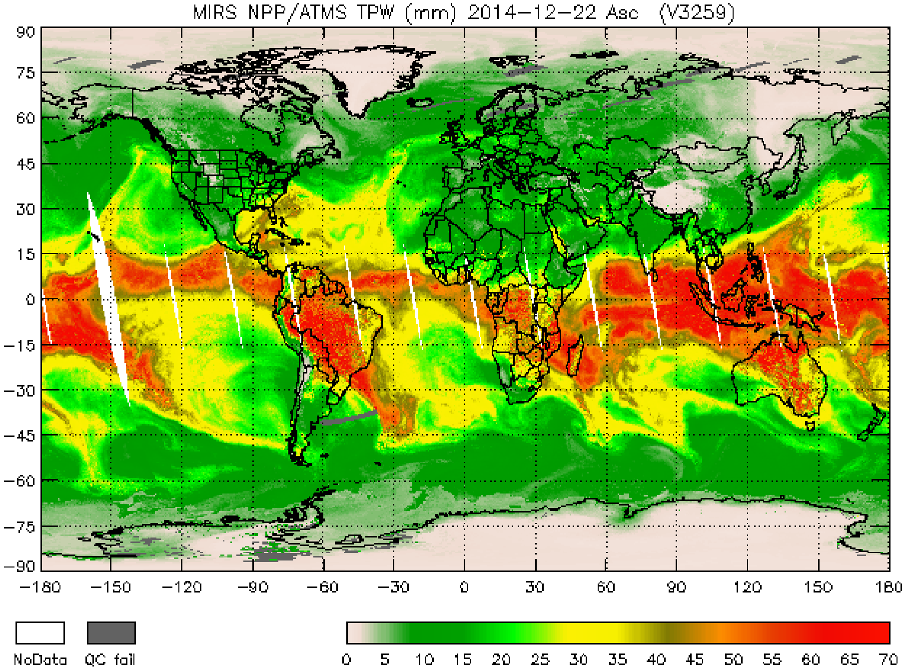
Algorithm	Platform/Primary Instrument	NDE 1.0 Operations Status	ESPDS PG (NDE 2.0) Operations Status
Microwave Integrated Retrieval System (MiRS)	S-NPP/ATMS	Operational 2014	Operational 2016
Advanced Clear-Sky Processor for Oceans (ACSPO)	S-NPP/VIIRS	Operational 2014	Operational 2016
NOAA Unique CrIS/ATMS Processing System (NUCAPS)	S-NPP/CrIS	Operational 2014	Operational 2016
VIIRS Polar Winds (VPW)	S-NPP/VIIRS	Operational 2014	Operational 2016
Green Vegetation Fraction (GVF)	S-NPP/VIIRS	Operational 2014	Operational 2016
S-NPP Tropical Cyclone	S-NPP/ATMS	Operational 2015	Operational 2016
Vegetation Health (VH)	S-NPP/VIIRS	Operational 2015	Operational 2016
GCOM-W1 AMSR2 Algorithm Software Processor (GAASP)	GCOM-W1/AMSR2	Operational 2015	Operational 2016
Active Fires (AF)	S-NPP/VIIRS	Operational 2016	Operational 2016

ESPDS Product Generation Algorithms

Algorithm	Platform/Primary Instrument	NDE 1.0 Operations Status	ESPDS PG (NDE 2.0) Operations Status
OMPS-Limb Profiler SDR	S-NPP/OMPS-LP	N/A	Post ORR
OMPS-Limb Profiler EDR	S-NPP/OMPS-LP	N/A	Post ORR
JPSS Risk Reduction (Clouds, Aerosols, Cryosphere)	S-NPP/VIIRS	N/A	Operational 2016
GCOM-W1 AMSR2 SDR	GCOM-W1/AMSR2	N/A	Operational 2016

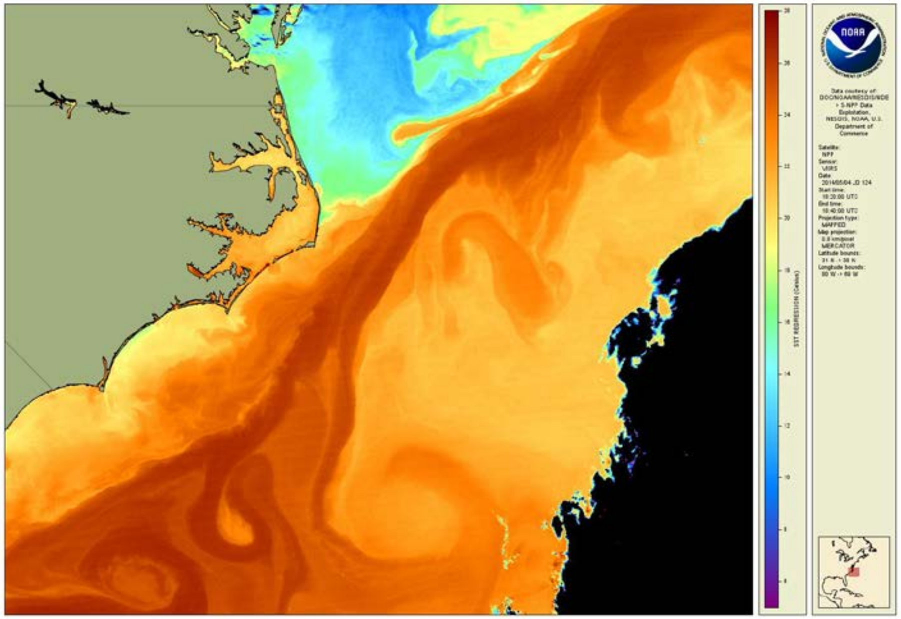
NDE Product Generation
Operational Science Applications

Total Precipitable Water

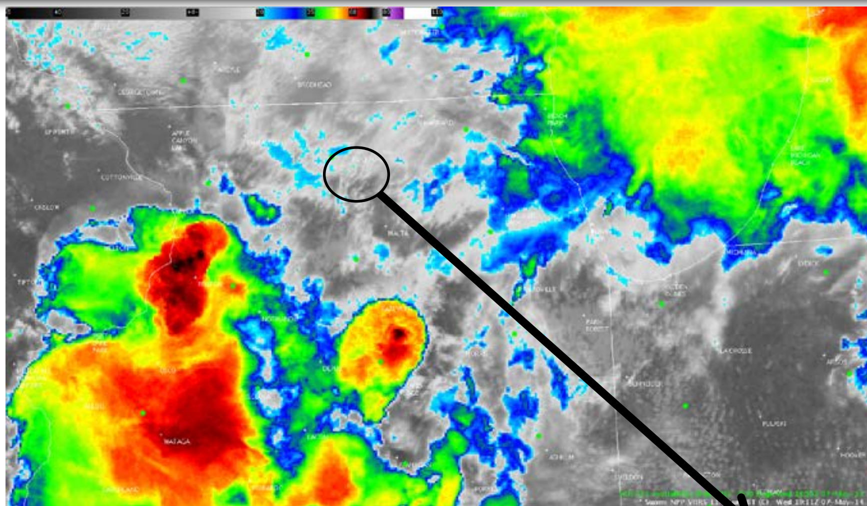


Microwave Integrated Retrieval System (MiRS)

Sea Surface Temperature

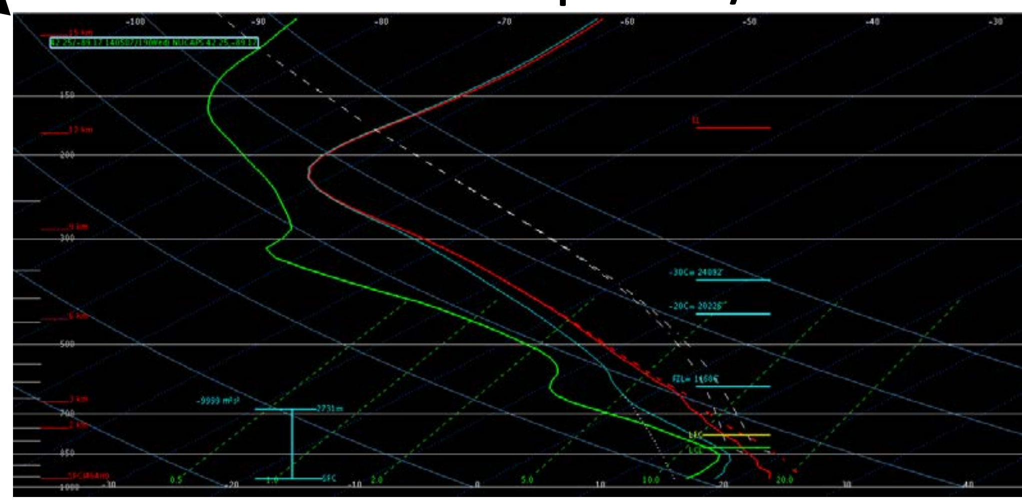


Advanced Clear-Sky Processor for Oceans (ACSPO)



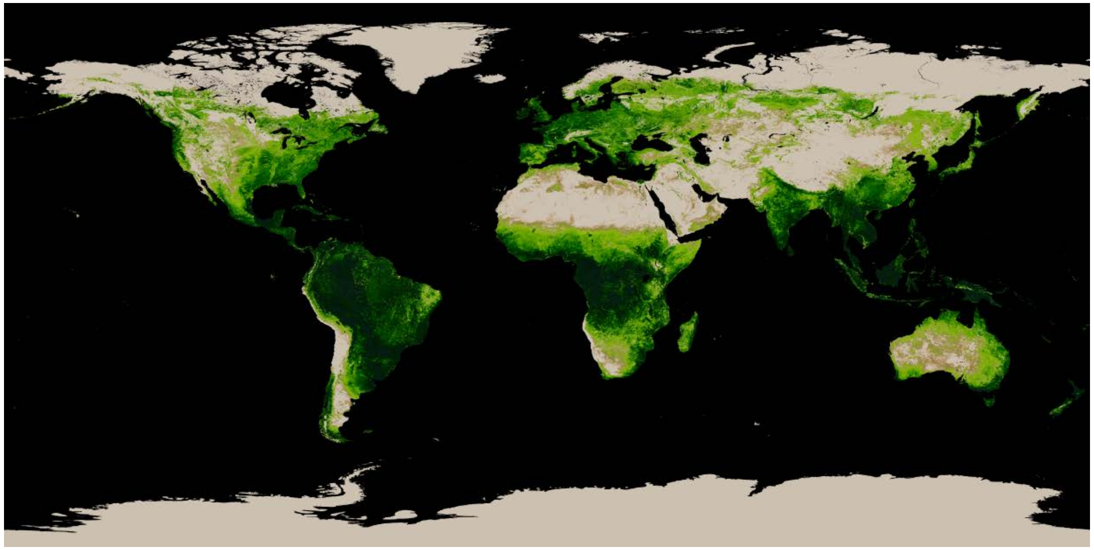
VIIRS IR Image

AWIPS2 NUCAPS Temperature/Moisture Profiles

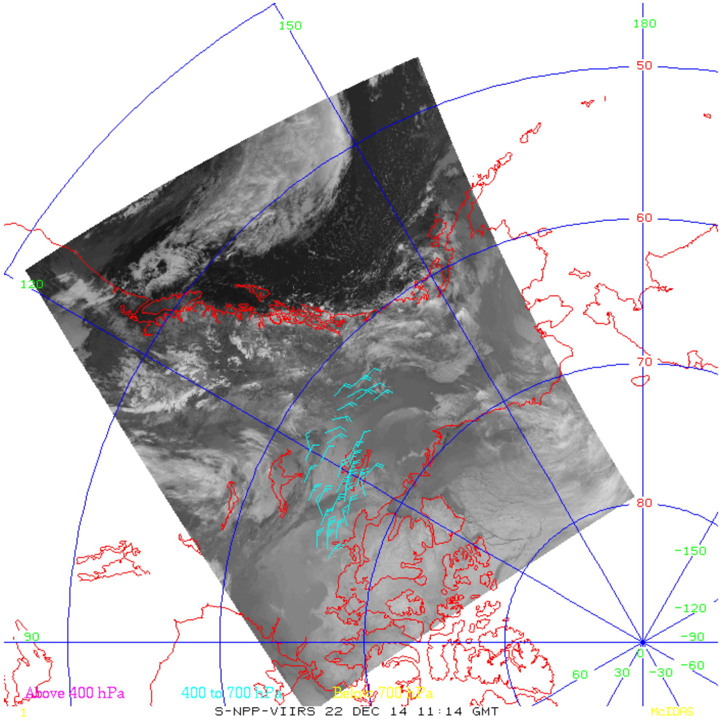


NOAA Unique CrIS/ATMS Processing System (NUCAPS)

NDE Product Generation
Operational Science Applications

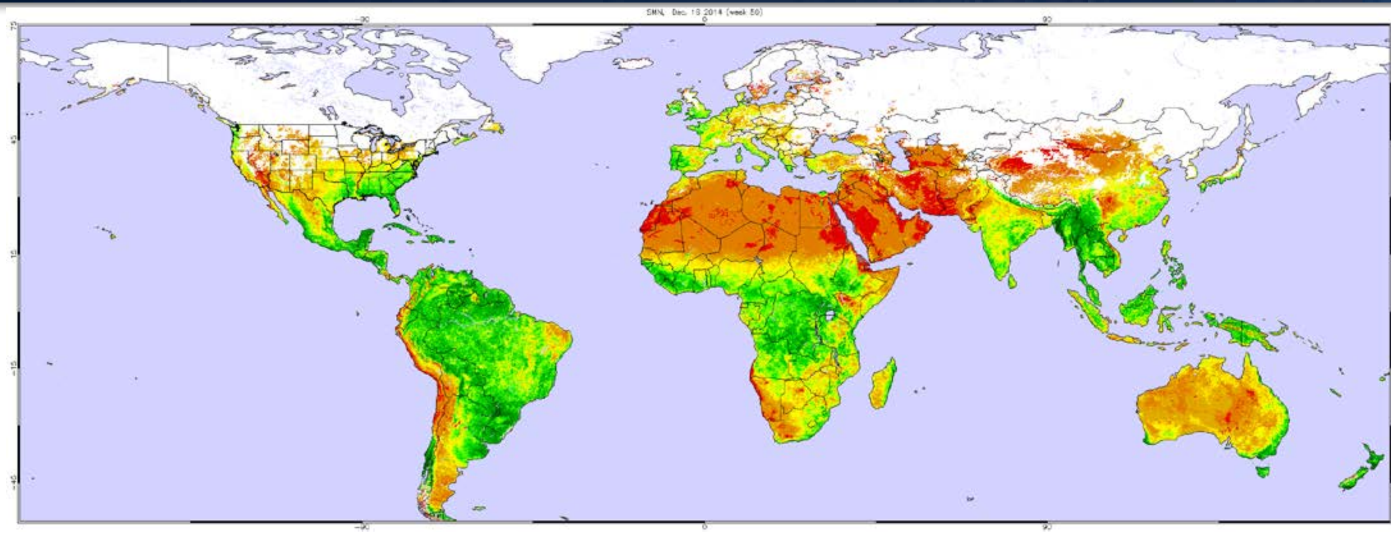


Green Vegetation Fraction (GVF)



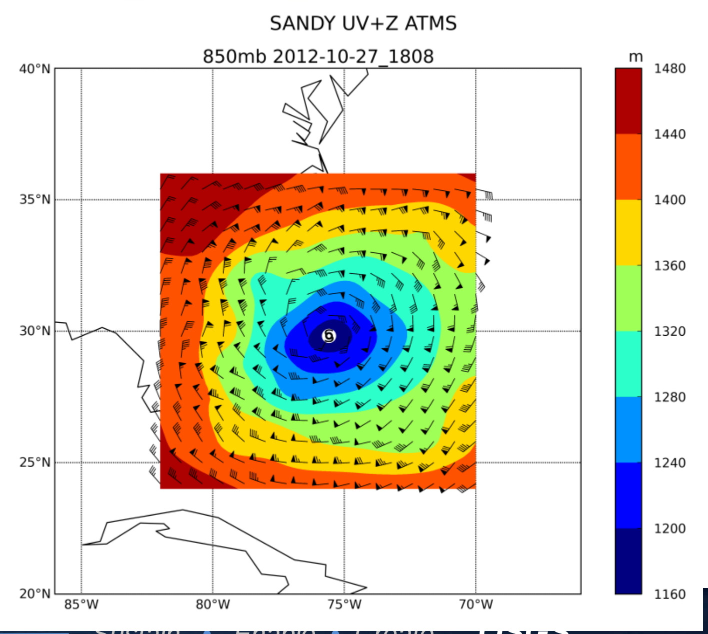
VIIRS Polar Winds (VPW)

NDE Product Generation
Operational Science Applications



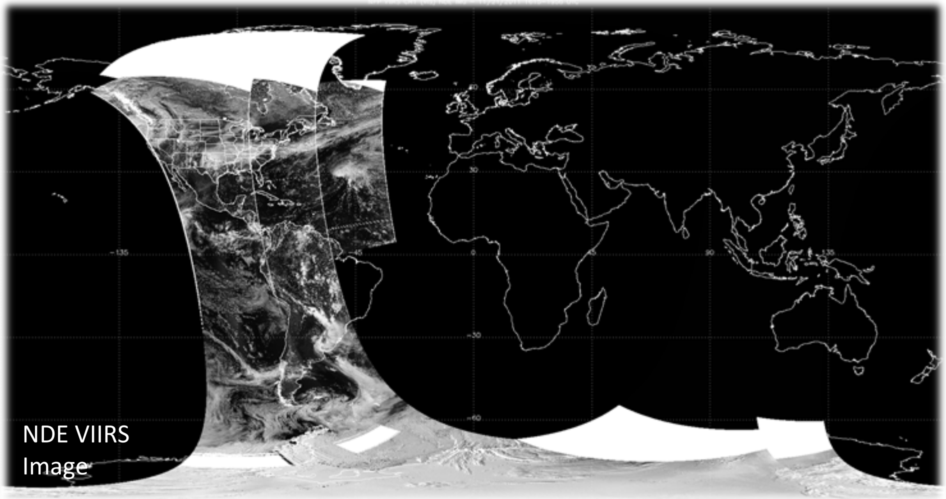
Vegetation Health (VH)

Tropical Cyclones (TC)

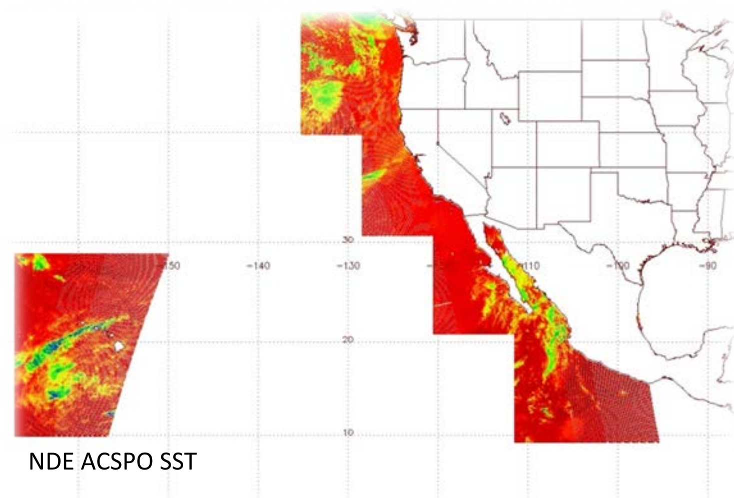


NDE Product Generation
Tailoring

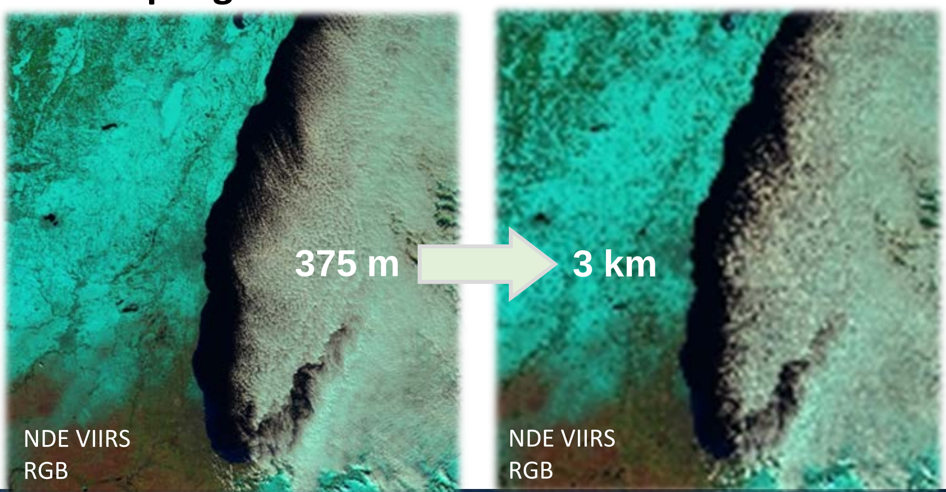
Aggregation



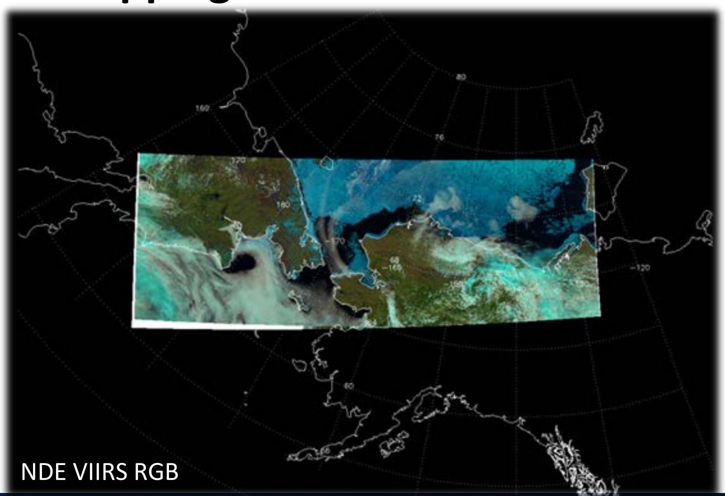
Filtering



Resampling

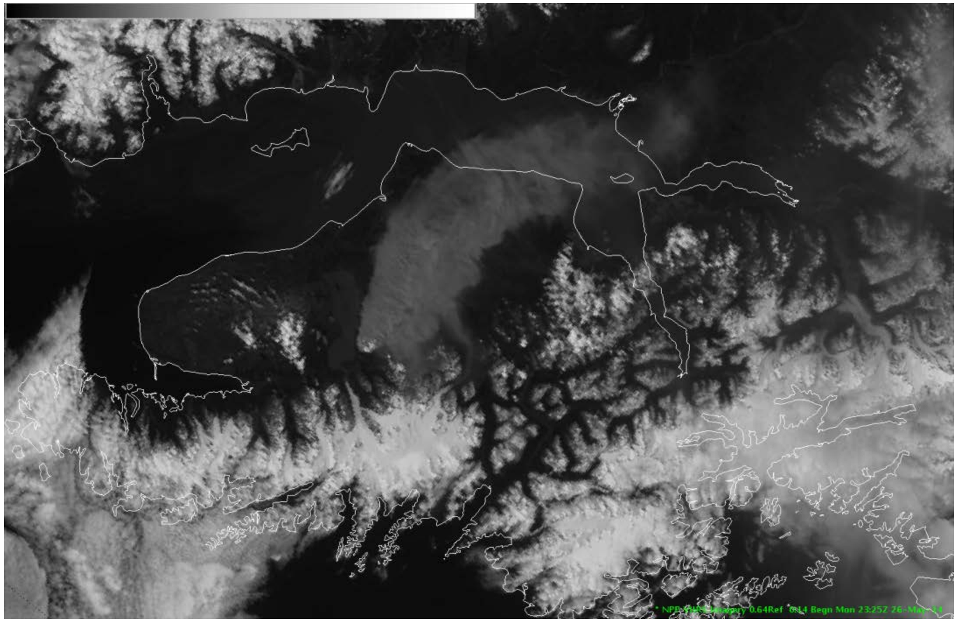


Remapping

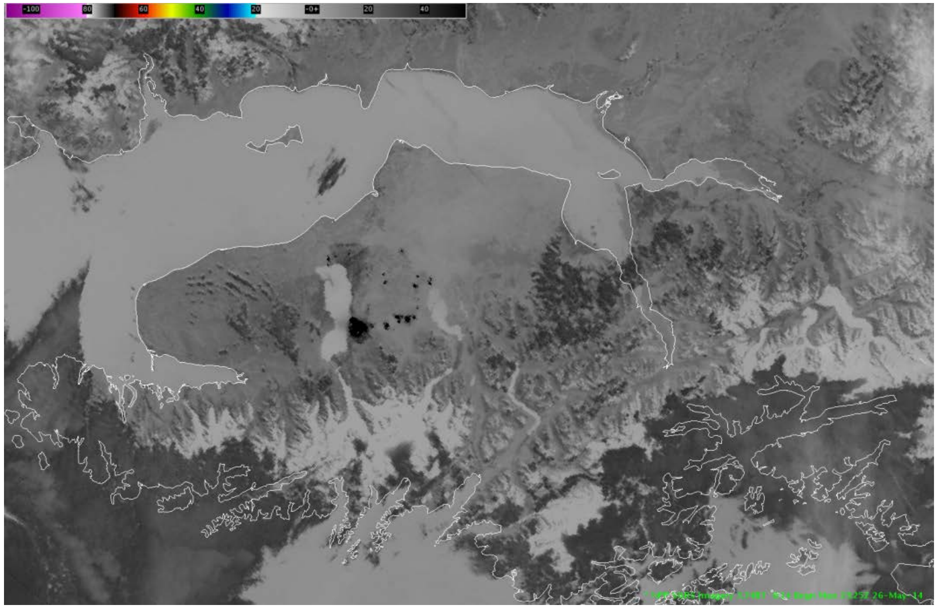


NDE Product Generation
Tailoring (NWS AWIPS Alaska Region)

Funny River Fire, Alaska
VIIRS I1 (Visible)

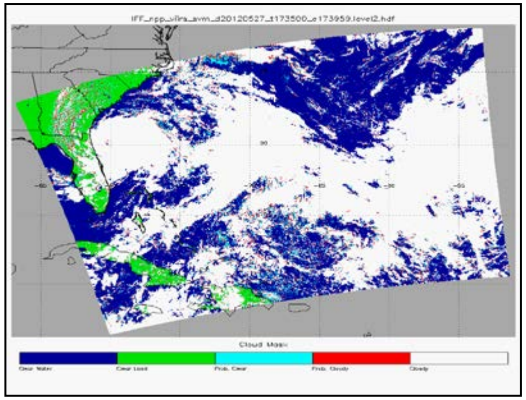


VIIRS I3 (Fire)

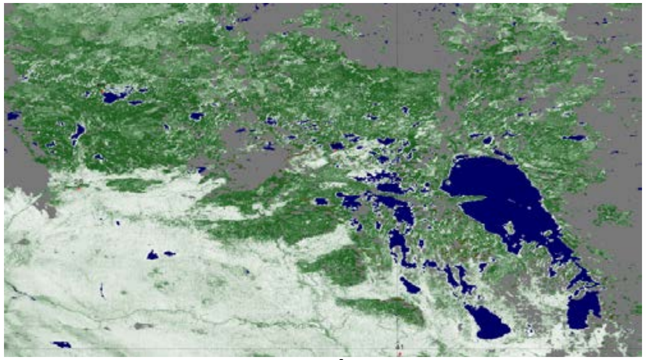


NDE 2.0 Product Generation
Operational Science Applications

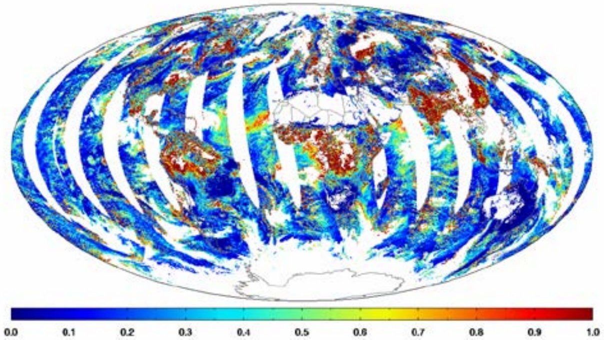
JPSS Risk Reduction Products



Clouds

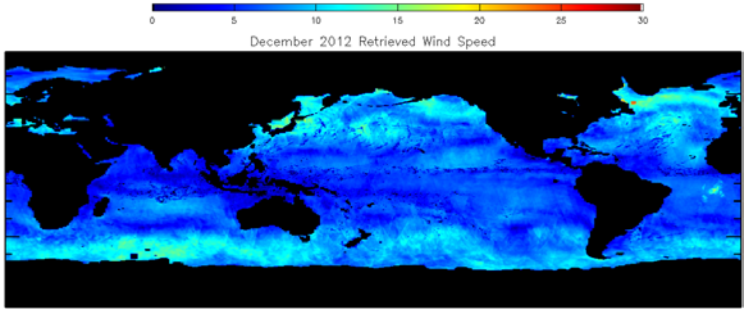


Snow/Ice

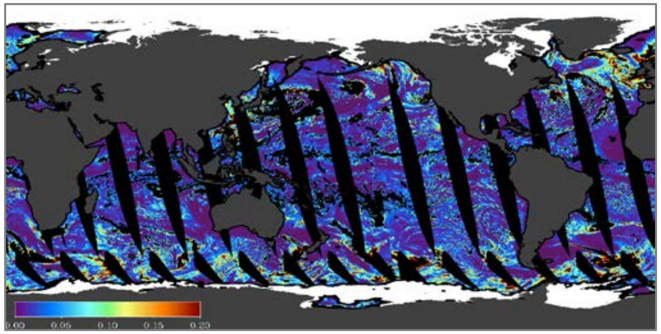


Aerosols

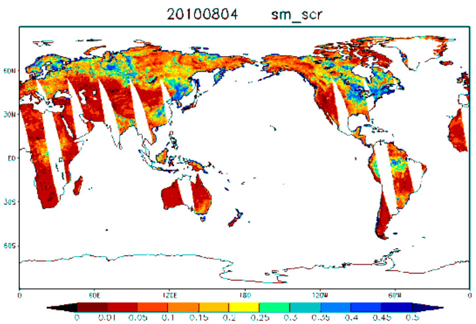
GCOM AMSR2 Day 2 Products



Winds



Clouds



Soil Moisture

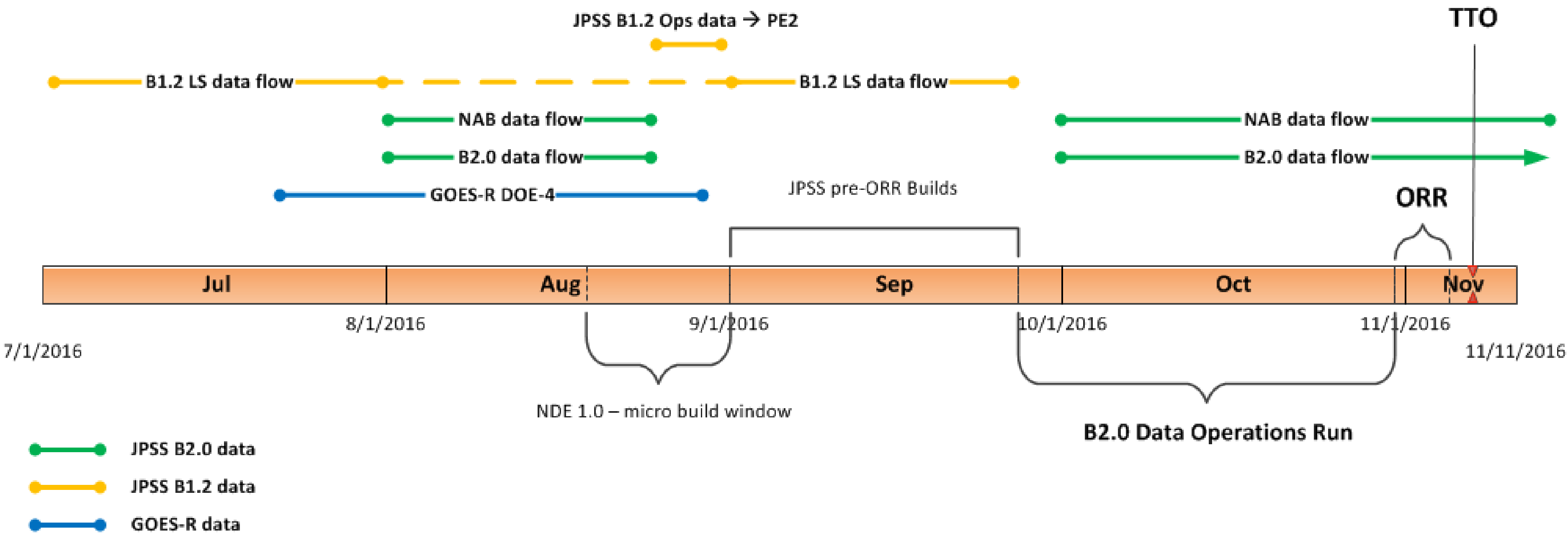
Product Distribution (PD)

- Product Distribution and Access (PDA) provides an Enterprise Product Distribution (PD) framework implemented within the ESPDS common infrastructure platform using virtual machines
- Initially supporting GOES-R, HRIT/EMWIN and JPSS Block 2.0, Legacy in planning.
- Obtains and distributes ancillary data for NESDIS product generation
- Implements specialized services for NWS Advanced Weather Interactive Processing System (AWIPS) use only
- Implements additional security features required by Government policy
    - X.509 certificate authentication via NOAA OCSP required for servers
    - In-line malware scanning
    - Secure file transfer protocols: ftps, sftp, https (NFSv4 with CLASS, GOES-R)
    - Backup PG/PD site (Fairmont, WV) for distribution of JPSS primary sensor products only to selected data consumers
- Web-based portal allows data consumer management of OSPO-approved data subscriptions

Data Access

- No change to the NESDIS data access request process
- Near Real-time
  - Subject to Office of Satellite and Product Operations (OSPO) review
  - Policy on Access and Distribution of Environmental Satellite Data and Products
    - http://www.ospo.noaa.gov/Organization/About/access.html
- Retrospective
  - Available through the National Centers for Environmental Information (formerly known as NOAA National Data Centers)
  - Subset of operational products are archived
  - Comprehensive Large Array-data Stewardship System
    - http://www.class.noaa.gov/
    - Caveat: CLASS delays delivery of xDRs by 4 hours for completeness. NUPs in CLASS are near real-time products that use initial delivery xDRs as input.

OSPO Timeline
(subject to change)



Questions?

ICVS SDR/EDR REPORT

Ninghai Sun and Lori Brown

NOAAA/STAR

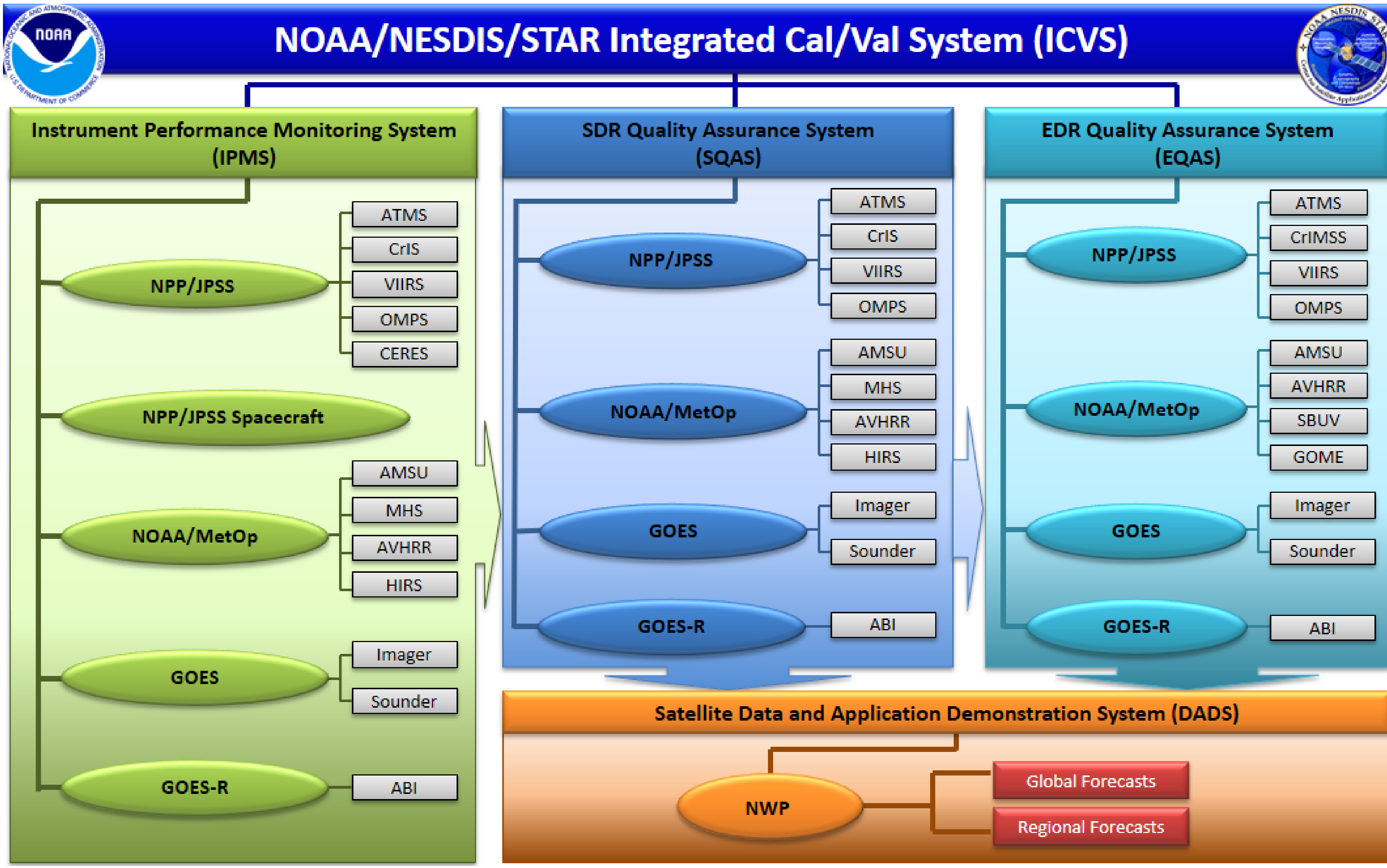
Outline

- ICVS Team Members
- ICVS System Overview
- ICVS Product Overview
- JPSS-1 Readiness
- Summary and Path Forward

ICVS SDR Team Members

Team Member	Organization	Roles and Responsibilities
Fuzhong Weng	NOAA/STAR	ICVS Lead: Budget and execution, strategic science direction, and oversight the ICVS team Cal/Val tasks, reprocessing
Ninghai Sun	NOAA/STAR	ICVS technical lead for system development, science coordination, research to operation transition, ATMS instrument status/performance and TDR/SDR quality monitoring, spacecraft health status monitoring
Jason Choi	ERT	VIIRS instrument status and performance monitoring and trending
Xin Jin Miao Tian Stanislav Kireev	ERT	CrIS instrument status and SDR quality monitoring and trending
Ding Liang	ERT	OMPS instrument status and performance monitoring and trending
Wanchun Chen	ERT	System integration, testing, and R2O transition. Suomi NPP SDR reprocessing
Pedro Vicente	ERT	System integration, optimization, and testing.
Lori Brown	NOAA/STAR	ICVS website development

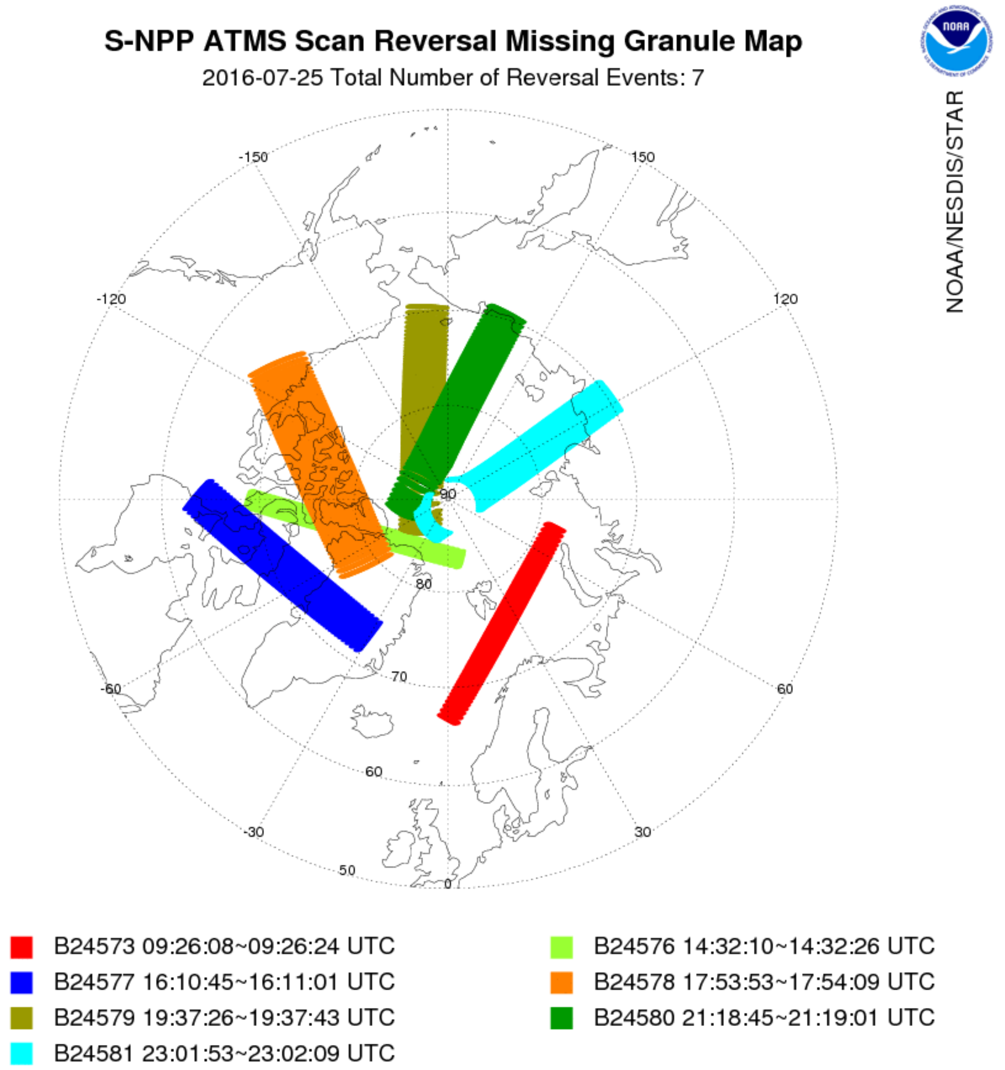
ICVS System Overview



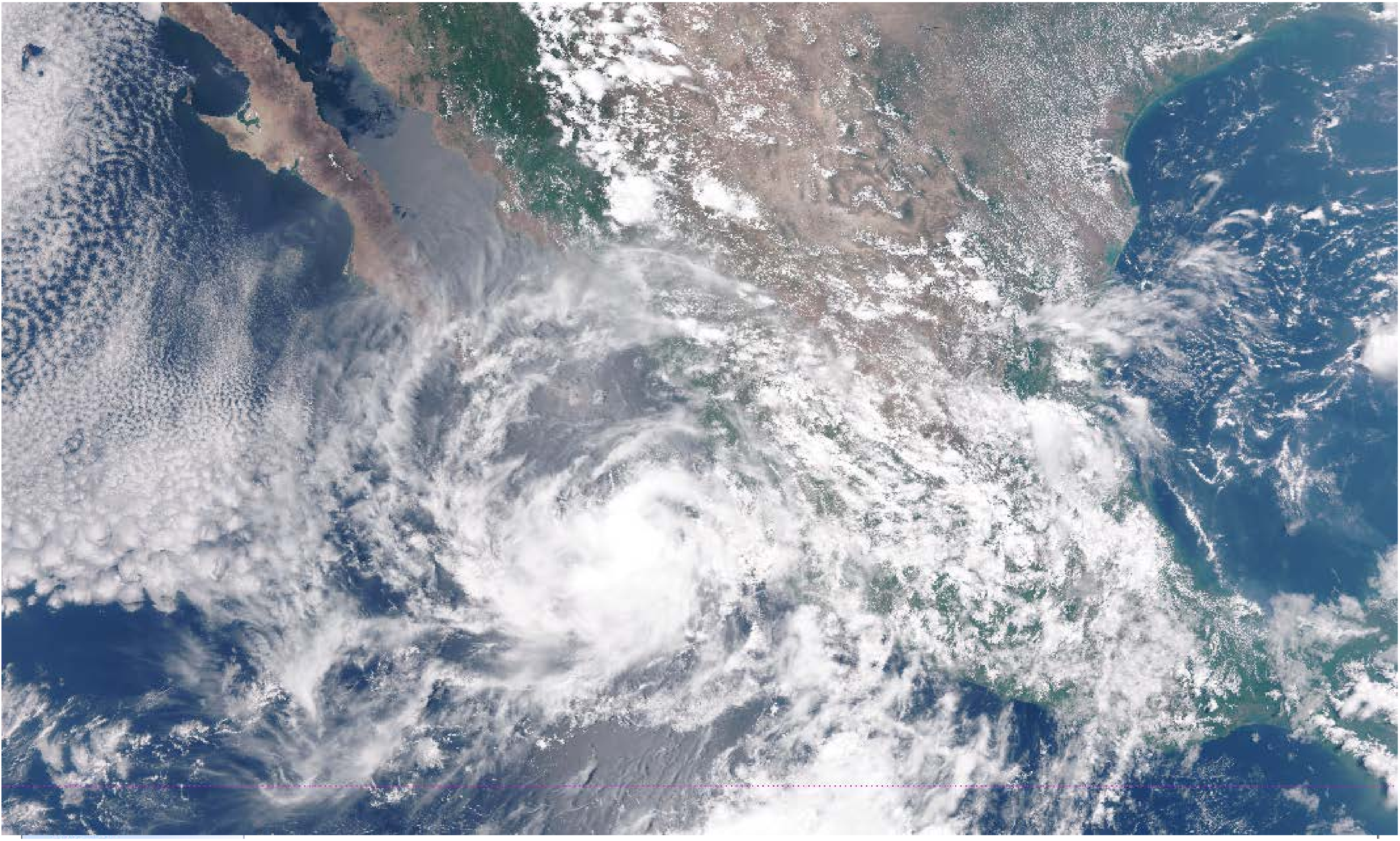
ICVS Product Overview

- NOAA ICVS provides the following services
  - Monitors over 400 parameters for 28 instruments onboard NOAA/METOP/SNPP satellites
  - Monitors and trends the SNPP spacecraft parameters , supporting NASA flight team
  - Monitors the instrument performance through trending the instrument house-keeping and telemetry parameters
  - Detects the anomaly events and automatically sends the warning messages to NOAA satellite operators, NASA instrument scientists, and senior program managers
  - Characterizes the sounder SDR data quality with respect to the numerical weather prediction model (NWP) simulations
  - Provides NWP users and remote sensing communities on the instrument noises for their real-time applications (e.g. error covariance in data assimilation)
  - Generates high resolution geostationary/polar-orbiting satellite images
  - 4246 all instrument status and data quality trending figures generated in near real time
  - Supports Suomi NPP life cycle reprocessing by operating SDR processing packages

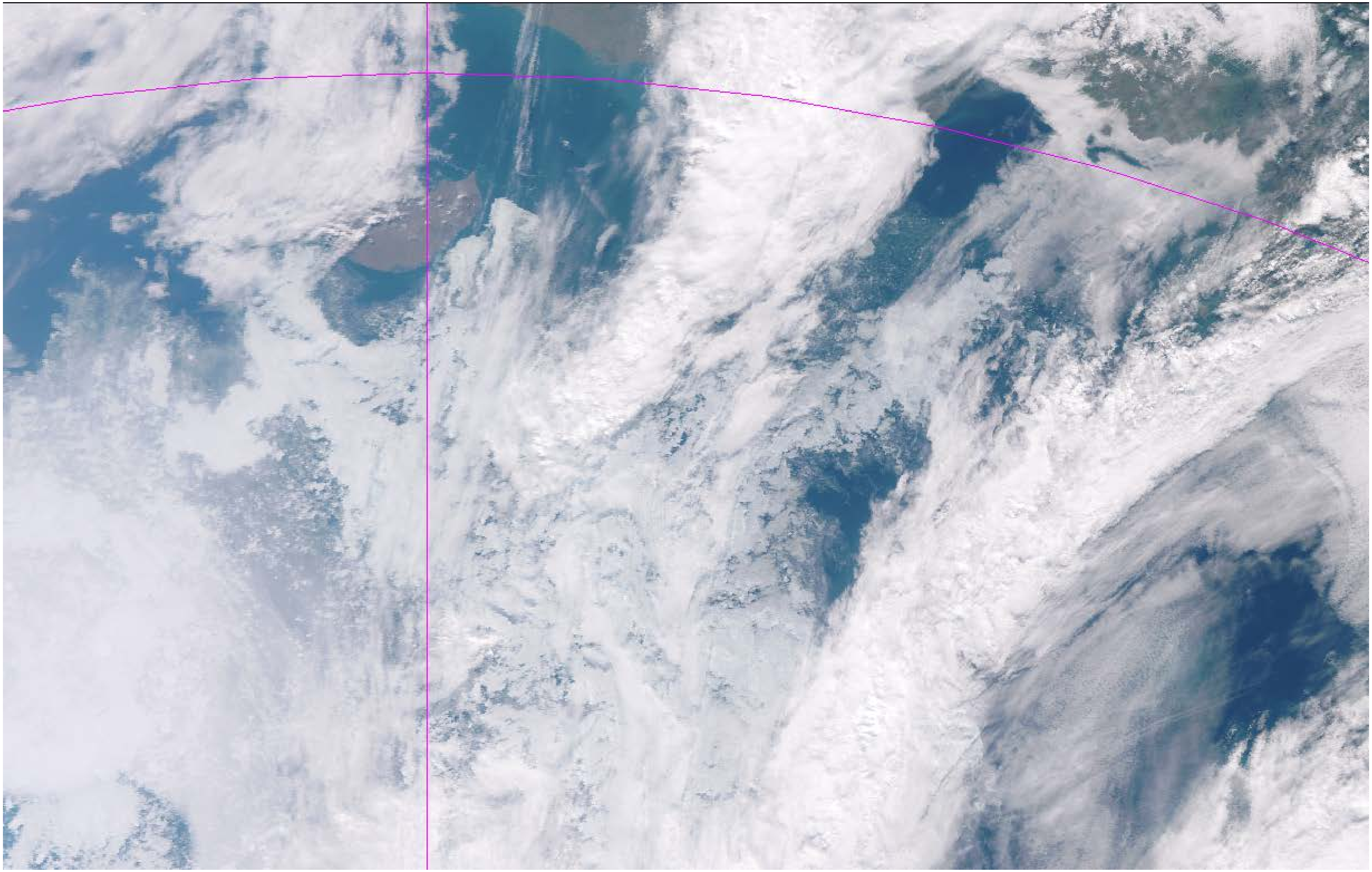
ICVS Product Overview



ICVS Product Overview

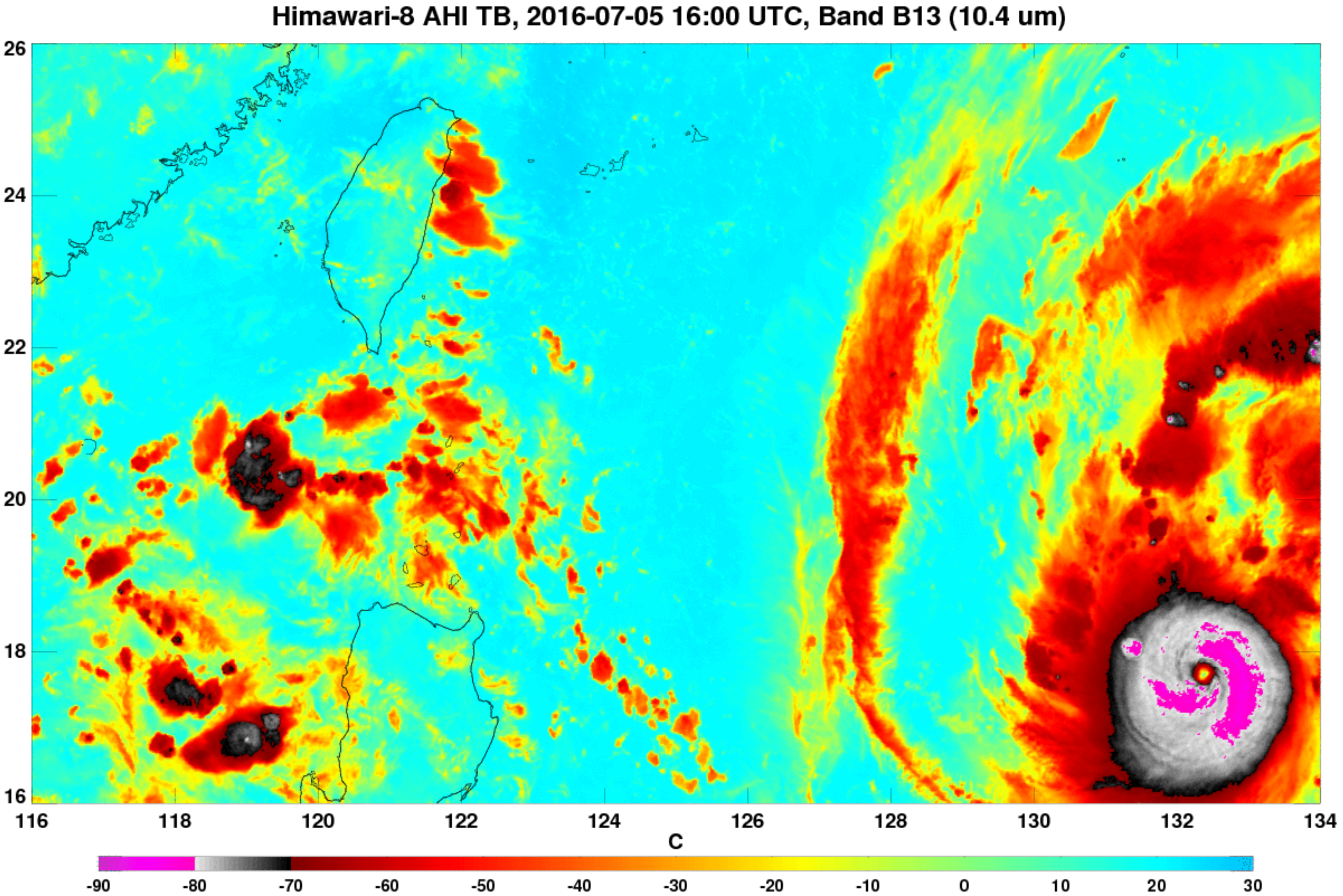


ICVS Product Overview

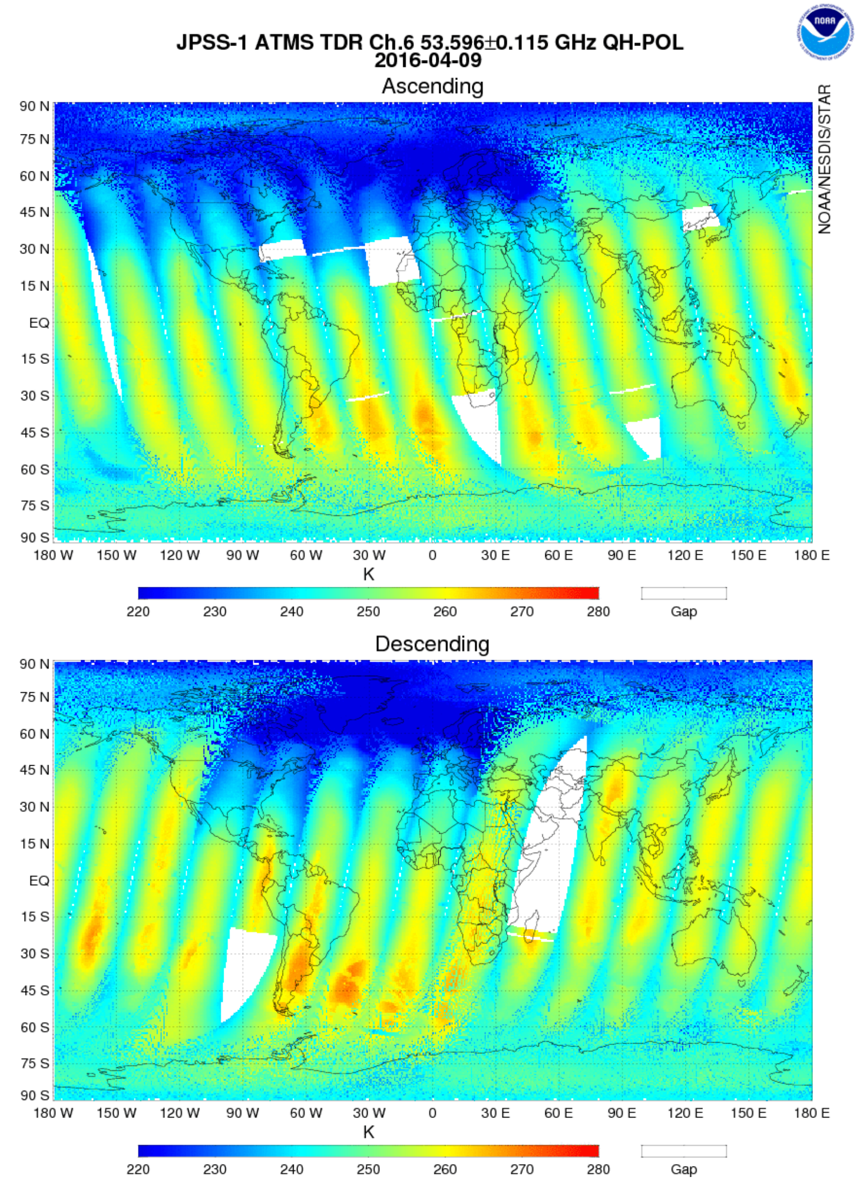


ICVS Product Overview

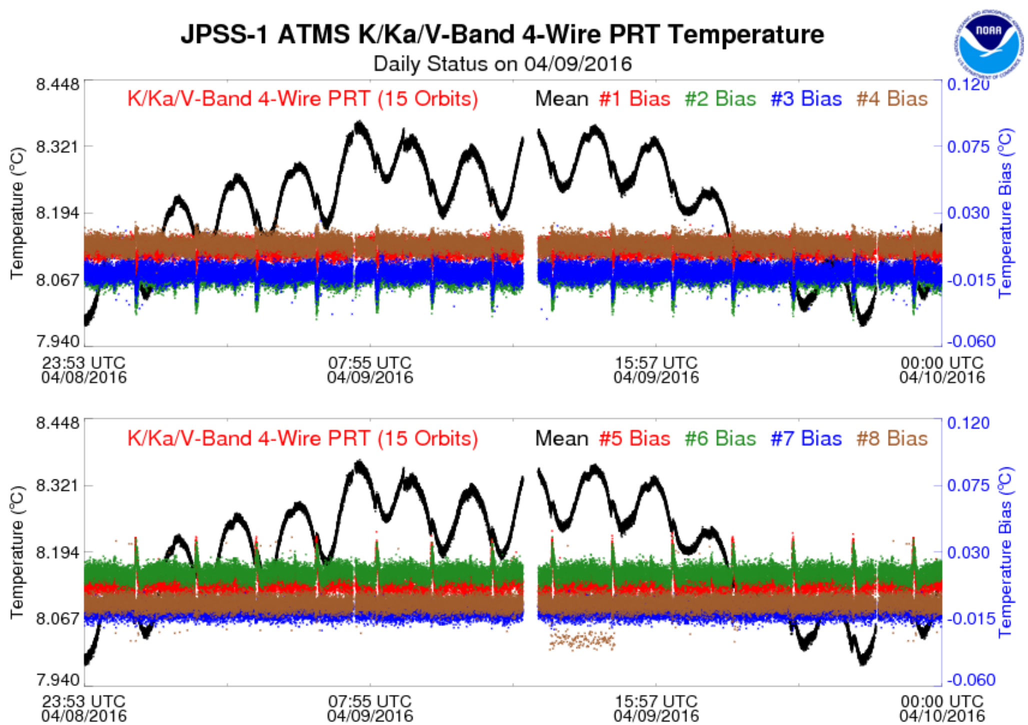
Super typhoon Nepartak from July 5 to 8, 2016 UTC



JPSS-1 Readiness



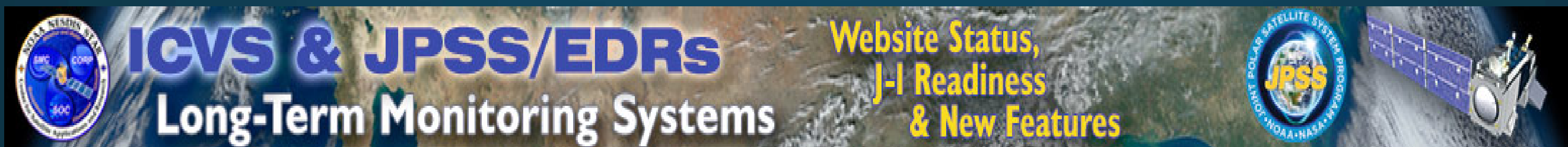
- LG2 data have been successfully tested by ICVS modules
- Sample images have been pushed to ICVS-beta website for seamless transition testing
- Spacecraft TVAC data will be used for additional JPSS-1 readiness testing



Summary & Path Forward

- Summary
  - ICVS keeps providing S-NPP spacecraft and aboard instrument health status and performance near real time monitoring
  - ICVS keeps supporting S-NPP SDR calibration/validation and EDR product generation tasks
  - ICVS has been upgraded and ready for JPSS-1 near real time monitoring
  - ICVS extends its capability to cover more user requested products to better
  - STAR ICVS for JPSS has been successfully transitioned to GRAVITE for 24/7 real time operations

- Path Forward
  - Support S-NPP life cycle SDR reprocessing
  - Provide more geostationary high resolution image products to support severe weather event monitoring



System Status and J-1 Readiness

ICVS & JPSS/EDRs Long Term Monitoring Systems

Lori K. Brown

StormCenter Communications at
NESDIS / STAR

2016 STAR JPSS Annual Science Meeting
Session 2 - 8 August 2016

What is the Long Term Monitoring System?

- A web application built with HTML, CSS, javascript/jquery, and PHP designed to organize, navigate and display a large set of images, cal-val metrics, and data produced daily and accumulated over the life of the S-NPP satellite
  - Originally developed for ICVS project
  - Went live in September 2013
  - Effort to extend and implement the LTM application for product monitoring (EDRs) started in fall 2014
- Designed to be 'content agnostic' so as to flexibly house any image, text, or data file, as long as content files conform to the system's naming and organization conventions
- ICVS: http://www.star.nesdis.noaa.gov/icvs/
- JPSS EDRs: http://www.star.nesdis.noaa.gov/jpss/EDRs/

ICVS LTM – Web Interface Architecture

S-NPP Cal/Val products

Spacecraft Cal/Val Products

VIIRS Cal/Val Products

ATMS Cal/Val Products

CrIS & CrIS FSR Cal/Val Products

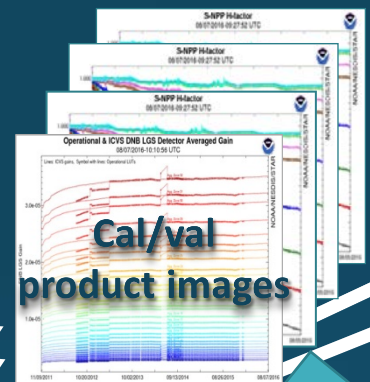
OMPS Cal/Val Products

ICVS instrument teams develop code to generate S-NPP cal/val metrics; code runs several times per day on STAR servers.

Products generated & copied to webserver several times daily

STAR Webserver

Product images organized by instrument, type, year & month. All images created to a common naming convention that makes the page coding and dynamic scripting portable and extensible across all instances of the LTM codebase

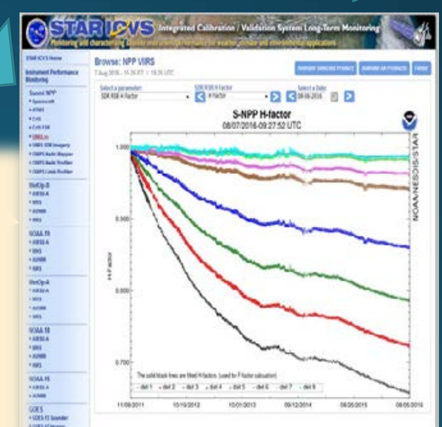


Cal/val product images

Instrument metric CSV file

Status page template PHP

Javascript, Jquery, PHP common code



The ICVS and EDR instances of the LTM System run on an IDENTICAL codebase; this focuses development efforts on extending and improving functionality instead of managing code.

Scale of JPSS monitoring effort - by the numbers

	ICVS – LTM System	JPSS EDRs LTM Site
Images generated per day	3,015	851
Total site users — last 12 months	25,599	5,779
# of team contributors	~15, varying	19 on product teams / 4 on system
Web pages	22	25
Time span monitored	5 years	2+ years
Total images generated / file size	3,334,550 files / 700 GB	412,751 files / 168 GB

All JPSS EDR Products now generated daily – Completion of Phase I

Products	# Daily Products	Start
Active Fires	1	1/1/2012
Active Fires - radiative power	3	3/16/2016
Aerosols - AOT	1	1/1/2013
Aerosols - Suspended Matter	1	1/1/2015
Albedo	1	1/1/2015
Clouds	4	1/1/2015
Cryosphere - Ice	4	2/5/2016
Cryosphere - Snow	15	1/1/2015
GCOM - AMSR2	40	1/1/2016
VIIRS Imagery - DNB	1	4/23/2016
Land Surface Temperature	4	4/7/2014

Products	# Daily Products	Start
Ocean Color	3	1/1/2015
OMPS / Ozone	3	1/1/2015
OMPS / IMOPO	2	12/18/2015
Polar Winds	2	7/20/2016
Sea Surface Temperature	2	12/7/2015
Surface Type	4	5/1/2015
Green Vegetation Fraction	1	8/1/2012
Vegetation Indices	3	5/19/2014
Veg. Health - weekly composites	6	1/1/2015
MiRS Soundings Products	166	2/18/2016
NUCAPS	584	1/1/2015

- The goal of this phase was to offer a global overview for users and downstream products to quickly assess availability and potential sources of error.
- This phase also allowed for the creation of a framework and a common set of presentation standards for all EDR teams to use.

Phase II – JPSS/EDRs LTM

- Starting: August 2016
  - Will focus on showing real time measures of product quality, such as maps of quality flags or percentage of the granules in a day that meet the specifications.
  - Comparisons to similar products from other satellite systems will be included.
  - The site will also show trending of these and other measures of product quality.
  - The full system will be in place for the Spring 2017 launch of JPSS-1 and will enable product developers and users to quickly identify and rectify potential errors in EDR products.
  - **JPSS-1 readiness:**
    - The EDR LTM Phase I is ready to replicate and stand up for JPSS-1
    - Phase II will be complete by launch of JPSS-1.

Recent LTM System Improvements –

available to both ICVS and JPSS-EDR product sites

- New since May 2015:
  - Users can animate any product across a user configured time span. (demo)
  - Pages with a large number of different products (all ICVS pages and the Soundings pages for EDRs) have in-page search – click 'Finder' button to search by product name instead of select box navigation.
  - Status pages include a configurable description popup. (demo in EDRs)
  - Performance rework in Feb. 2016 to ship code to GRAVITE included complete review of page loading performance to reduce server trips, simplify javascript and php includes

ICVS LTM System Status & JPSS-1 Readiness

- Addition of VIIRS high resolution SDR imagery page:
  - http://star.nesdis.noaa.gov/icvs/status_NPP_VIIRS_IMG.php
- Incorporated weekly updated Anomaly History for JPSS:
  - http://star.nesdis.noaa.gov/icvs/AnomalyHistory.php
  - Sortable, searchable, and includes a current downloadable bundle of change lists.
- **JPSS-1 readiness:**
  - The beta site for ICVS has had pages for all the JPSS-1 instruments live since Feb. 2016
    - Full set of J-1 images for test dates April 9, 2016

JPSS-SPARKS

Report on
JPSS Summer Internship Training -2016 for
Grooming the Next Generation Cadre of JPSS Scientists
(June 13-August 13, and Beyond)

By

Murty Divakarla and IMSG Team at NOAA/STAR
JPSS-STAR Science Teams Members

Shakila Merchant
City University of New York (CUNY)/CREST

JPSS – Students Professional and
Academic Readiness with Knowledge in Satellites (JPSS-SPARKS)

Many Thanks to Mitch Goldberg for his encouragement.

Inception to Action

JPSS --> CUNY --> IMSG

CUNY/IMSG

- CUNY-IMSG JPSS Education Outreach Collaboration Initiative
  - UMD-Eastern-shore, Princess Anne (2014), AMS (Jan 2015), March 2015.
  - Dr. Shakila Merchant (CUNY); Dr. Murty Divakarla and Dr. Le Jiang (IMSG)

IMSG

- Training/Workshop Design
  - Dr. Murty Divakarla, Dr. Mike Wilson, Tom King, Shanna Sampson, Dr. Valerie Mikles, and Dr. Bigyani Das

IMSG Implementation

- Technical Team Lead: Dr. Mike Wilson
  - Contributors: Dr. Mike Wilson, Tom King, Dr. Anil Kapahi, Claire McCaskill, Dr. Valerie Mikles, Yunhui Zhao, Dr. Murty Divakarla, Dr. Bigyani Das, Zhuo Zhang, and Shanna Sampson

CUNY

- CUNY- Graduate Students – Arrived to IMSG College Park, June 13, 2016.

CUNY/CREST-IMSG Training Program

- CUNY/CREST partnered with IMSG to provide internships to graduate students to become familiar with the JPSS program and research to operations process in STAR. IMSG organized the training program.
  - Phase 1: First 4 weeks.
    - IMSG teams with JPSS Program/STAR scientists to provide student training.
  - Phase 2: Week #5 and beyond.
    - Students focus on their research ideas with mentors.

Phase 1: JPSS Research < -- > R2O

Phase 1: Morning Workshop

Led primarily by

IMSG staff

- R2O Concepts
- Programming Languages, Standards
- Data Formats
- Industry-Govt. Liaison
- Requirements/Verification
- Enterprise Systems
- Configuration Control

- **Focused on the skills needed specifically for research-to-operations (R2O).**
  - How science and programming interact in the R2O environment.
  - How changes are integrated through the review process.
  - Opportunity to be part of a real working environment
  - Improve overall computer programming skills.
  - Show students how to write code to standards.

Phase 1: JPSS Research < -- > R2O

- JPSS Overview
- Suite of Instruments
- Geophysical Retrievals/Products
- Cal/Val Process
- User Applications
- ICVS/Long Term Monitoring
- NWP and (JPSS) data Assimilation

Phase 1: Afternoon Seminars

Led primarily by

NOAA JPSS/STAR Scientists

- Expose students to the JPSS mission, products, and pioneering research from the state-of-the-art instrument complements.
- Thanks to many JPSS STAR science team members and JPSS Program Office for their enthusiastic response and seminar presentations.

Phase 1: JPSS Research < -- > R2O

CUNY/IMSG
- CUNY-IMSG JPSS Education Outreach Collaboration Initiative
  - UMD-Eastern-shore, Prince Ann (2014), AMS (Jan 2015), March 2015.
  - Dr. Shakila Merchant (CUNY); Dr. Murty Divakarla and Dr. Le Jiang (IMSG)

IMSG
- Training/Workshop Design
  - Dr. Murty Divakarla, Dr. Mike Wilson, Tom King, Shanna Sampson, Dr. Valerie Mikles, and Dr. Bigyani Das

IMSG Implementation
- Technical Team Lead: Dr. Mike Wilson
  - Contributors: Dr. Mike Wilson, Tom King, Dr. Anil Kapahi, Claire McCaskill, Dr. Valerie Mikles, Yunhui Zhao, Dr. Murty Divakarla, Dr. Bigyani Das, Zhuo Zhang, and Shanna Sampson
  - Network, Computers: Patrick Binsol, Sean Lam (IMSG); Paul Alibi (CUNY)
  - Logistics: Kevin Palensky (IMSG), Debra Baker (CREST/CICS)

CUNY
- CUNY- Graduate Students – Arrived to IMSG College Park, June 13, 2016.
  - Cassandra Calderella, David Melecio-Vazquez, Elius Etienne, Ivan Valerio

Phase 1: Morning Workshop

June 13-July 13

10:00-12:00 PM

M-F

- R2O Concepts
- Programming Languages, Standards
- Data Formats
- Industry-Govt. Liaison
- Requirements/Verification
- Enterprise Systems
- Configuration Control

A Consortium of Academia Industry (IMSG) JPSS Program Govt.

- JPSS Overview
- Suite of Instruments
- Geophysical Retrievals/Products
- Cal/Val Process
- User Applications
- ICVS/Long Term Monitoring
- NWP and (JPSS) data Assimilation

Phase 1: Afternoon Seminars

June 13-July 13

2:00-3:00 PM

M-TR

Phase 1: IMSG-CUNY JPSS Summer 2016 Internship Training/Workshop

Grooming the Next Generation Cadre of JPSS Scientists

Good Luck to You All

Grooming the Next Generation Cadre of JPSS Scientists and Engineers

JPSS–STUDENTS PROFESSIONAL & ACADEMIC READINESS WITH KNOWLEDGE IN SATELLITES (SPARKS)

CREST JPSS OUTREACH AND EDUCATION

In Fall 2015 a team of Educators and Scientists from NOAA/JPSS, IM Systems Group, Inc. and NOAA-Cooperative Remote Sensing Science and Technology (CREST) Center partnered to create an initiative called JPSS SPARKS.

JPSS SPARKS is a pilot program created with an objective to recruit, train and graduate a world-class cadre of students, with core competency skills needed to join NOAA workforce, particularly from underrepresented and under-served minority population to join the nations diverse and competent STEM workforce in the fields of NOAA mission sciences.

The Mission of JPSS SPARKS aligns very well with the missions of NOAA CREST (noaacrest.org) of training students in NOAA mission sciences and build a competent and diverse STEM workforce to address NOAA's Diversity and Workforce Inclusion Initiative.

Employers want their potential employees to be JOB READY!!

JPSS-SPARKS is a Federal-Academic and Private Sector synergistic partnership built to help students gain JOB READY technical and foundational skills-sets

Four CREST Students spending their summer @NOAA, College Park, MD

Four NOAA CREST students - David Melecio-Vazquez, Elius Etienne, Cassandra Calderella, and Ivan Valerio began their summer JPSS SPARKS workforce training on June 13, 2016 through September 2016.

The students will learn Research to Operations concepts, programing languages, Standards, Data Formats, Industry-Govt. Liaison requirements/ verification; Enterprise Systems and Configurations.

They will be exposed to JPSS mission, products, pioneering research from the state-of-the-art instruments, and use of these products for Weather, Climate and Ocean applications.

David Melecio-Vazquez, PhD Candidate, Mech. Engineering

Cassandra Calderon, Masters Student, Earth & Atmospheric Sciences

Elius Etienne, PhD Candidate, Civil Engineering

Ivan Valerio, Masters Student, Electrical Engineering

IMSG-JPSS Training Participants

- Cassandra Calderella
- David Melecio-Vazquez
- Elius Etienne
- Ivan Valerio

STAR Interns and employees Benefited from the Training

- Steven Buckner
- Equisha Glenn
- Tracey Dorian (IMSG)

STAR Interns part of this presentation

- Carlos Luis Pérez Díaz

Poster Presentation: Tuesday (8/9)

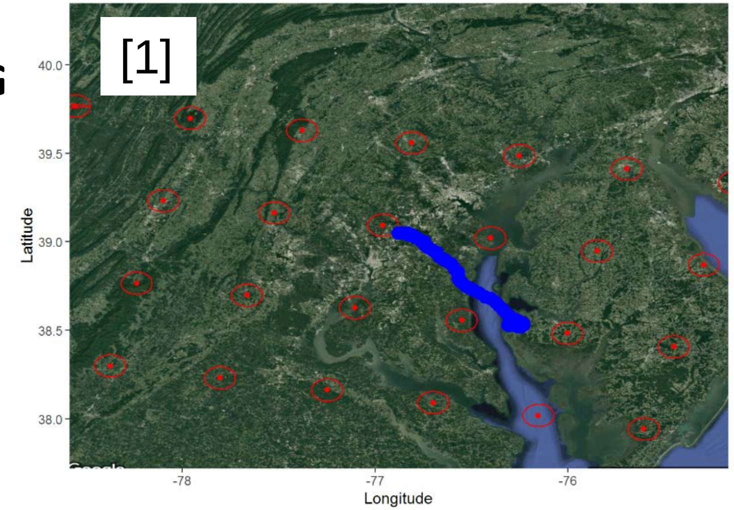
Thermal Boundary Layer Retrievals over the Washington D.C. Metro Area using NUCAPS-EDR

David Melecio-Vazquez

Mentor(s): Dr. Mark Liu, STAR & Dr. Nicholas Nalli, IMSG

Affiliation: IMSG-CUNY Student Training Program

dmeleci00@citymail.cuny.edu

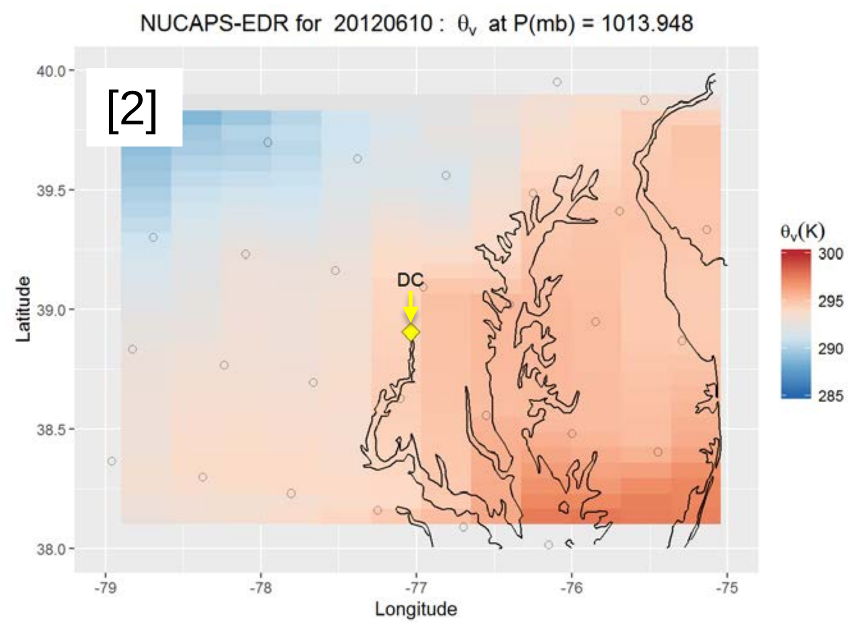


Objectives of this poster:

- Evaluation of Boundary Layer Retrievals.
- Observation of Vertical Profiles During Convective Boundary Layer Conditions.

Future/Ongoing Work:

- Observe urban-rural temperature differences in space: horizontal and vertical using NUCAPS-EDR profiles.



[1] NUCAPS-EDR Field-of-Views (red) and the RAOB launch path (blue) over the Washington D.C. Metro Area.

[2] Surface virtual potential temperature, θ_v, interpolated over the Washington D.C. metro area.

Poster Presentation: Tuesday (8/9)
Validation of Suomi NPP OMPS-LP Ozone Measurements

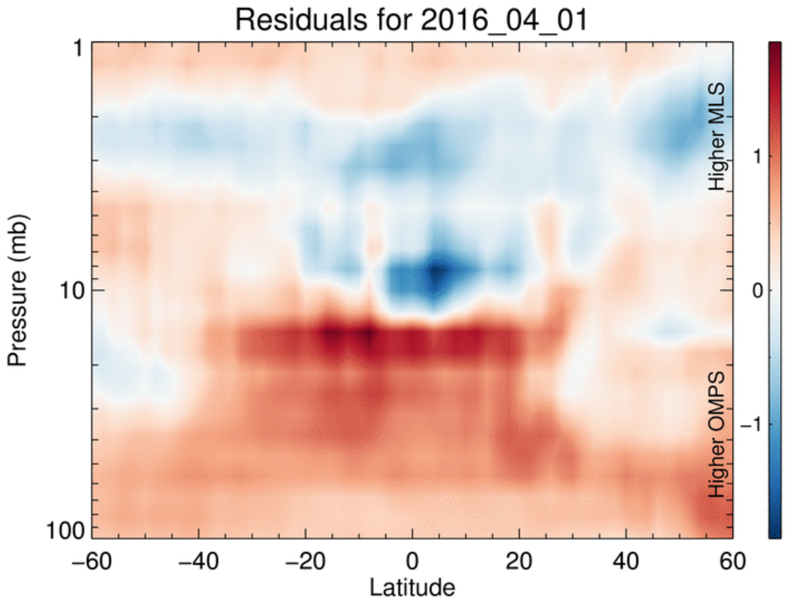
Steven Buckner
Mentor: Dr. Larry Flynn, STAR
Affiliation: NOAA-CREST/Hampton University SSIO
stevenb1@umbc.edu

Objectives of this poster:

- Show validation of OMPS Limb Profiler ozone volume mixing ratio measurements by comparing them to MLS
  - Daily Global Averages
  - Collocation Comparisons

Future/Ongoing Work:

- Long-term comparisons and statistics
- Using OMPS/MLS validation to later validate SAGE III ISS when it launches in November, 2016



Daily global average residual measurements for April, 2016

Poster Presentation: Thursday (8/11)

Validation of SMAP Soil Moisture Data using Field Measurements in New York

Cassandra Calderella

Mentor: Dr. Xiwu Zhan, STAR

Affiliation: IMSG-CUNY Student Training Program

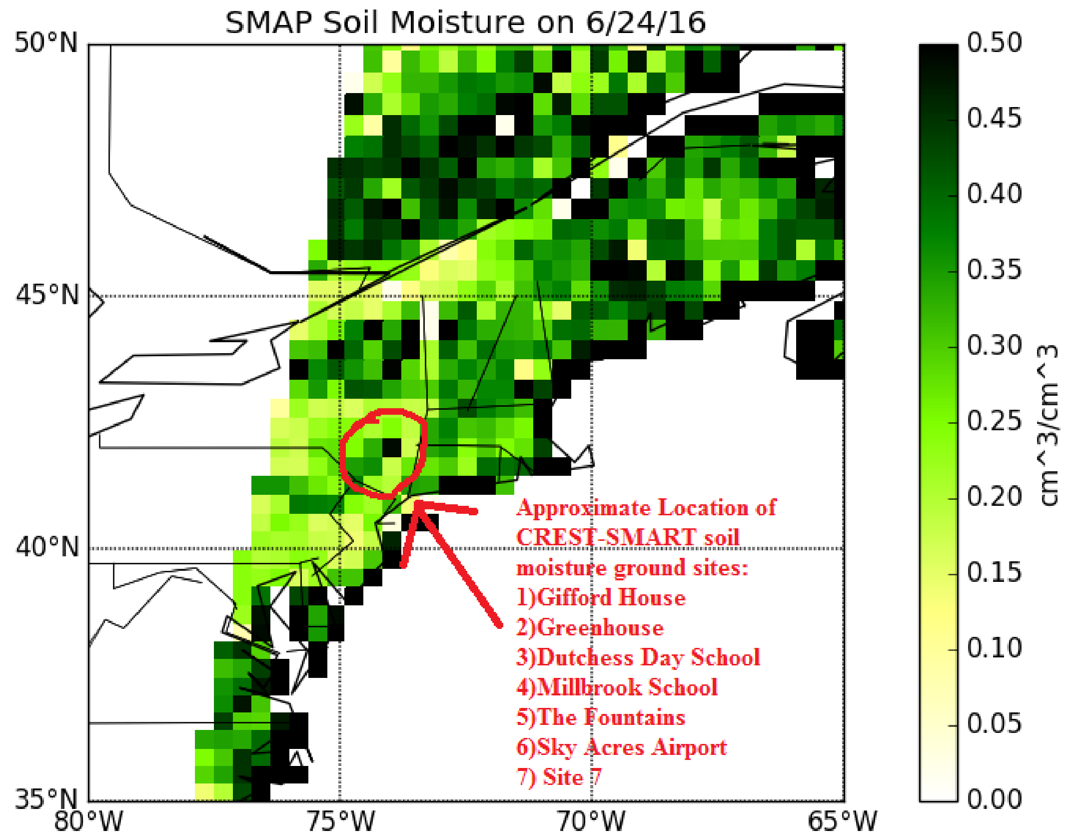
ccalder001@citymail.cuny.edu

Objectives of this poster:

- Collect in situ data from CREST-SMART ground stations.
- Collect soil moisture data from SMAP for the same latitudes and longitudes as the ground stations.
- Perform statistical analysis for data validation.

Future/Ongoing Work:

- Apply the same validation technique using field measurements in Puerto Rico (NRCS' SCAN Network)
- Repeat the process with other satellite instruments such as SMOS and GCOM-W1.



SMAP Level 3 Soil Moisture in the Northeast, showing the location of the CREST-SMART ground stations.

Detecting spatiotemporal changes in vegetation using polar orbiting satellite data for the past 35 years - Case study: Haiti.

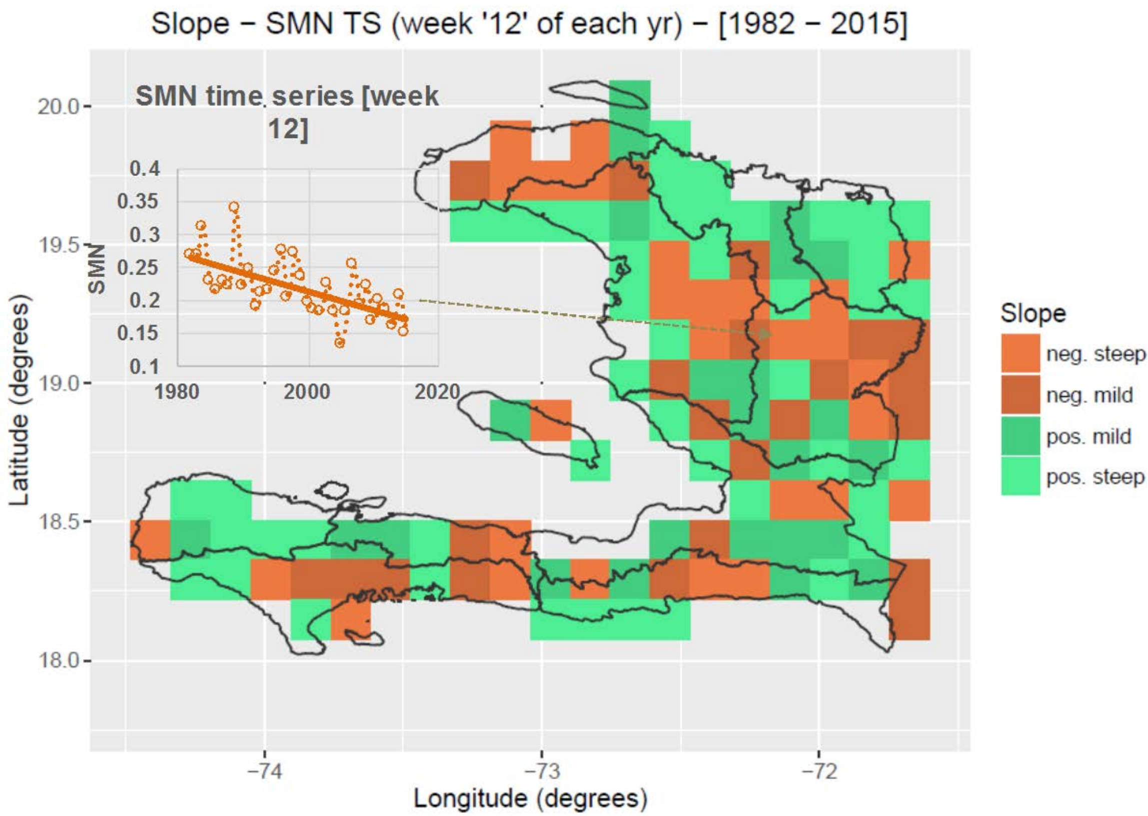
Elius Etienne
Mentor: Dr. Felix Kogan, STAR
Affiliation: IMSG-CUNY Student Training Program
eetienn000@citymail.cuny.edu

Objectives of this poster:

- Detecting the trend in vegetation for different period of the year
- Validate the findings with ground based data

Future/Ongoing Work:

- Expand the work to larger regions/countries and detect the trend in vegetation across latitudes (north-south transect).



An evaluation of the VIIRS radiative signal from the Fort McMurray fire

Ivan F. Valerio

Mentor: Dr. Ivan Csiszar, STAR

Affiliation: IMSG-CUNY Student Training Program

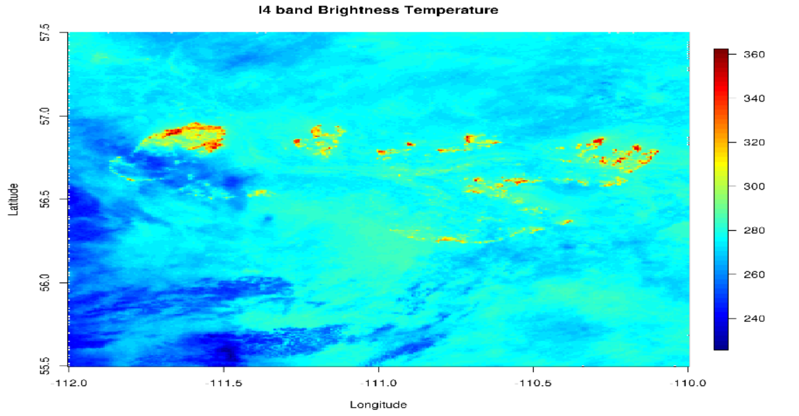
valerioif@gmail.com

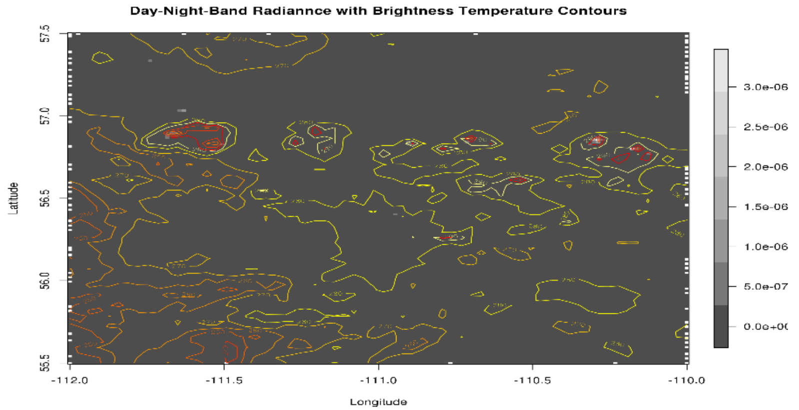
Objectives of this poster:

- Observe signals detected by VIIRS SDR
- Determine pixels with saturation
- Apply statistical analysis
- Comparison of various bands observing the same event

Future/Ongoing Work:

- Observe other possible cases of pixel saturation
- Generate more statistics to a wider set of events, and determine saturation level





Figures on brightness Temperature distribution on McMurray fire site

MiRS and HUT Snow Microwave Emissivity Comparison with In Situ Microwave Emissivity from CREST-SAFE and SSMIS retrievals

Carlos Luis Pérez Díaz

Mentors: Quanhua "Mark" Liu and Christopher Grassotti (STAR)

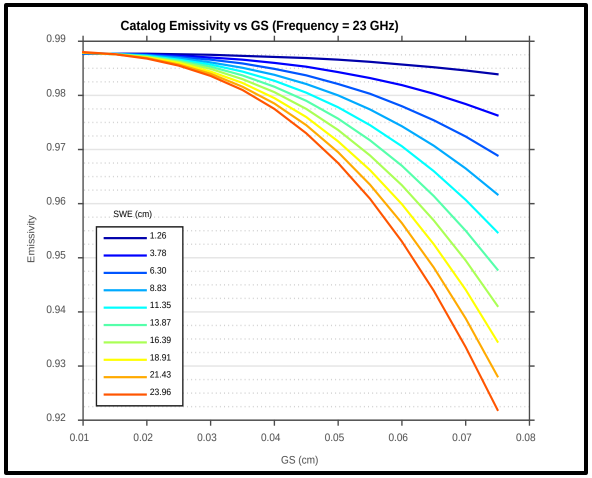
Graduate Research and Training Scholarship Program

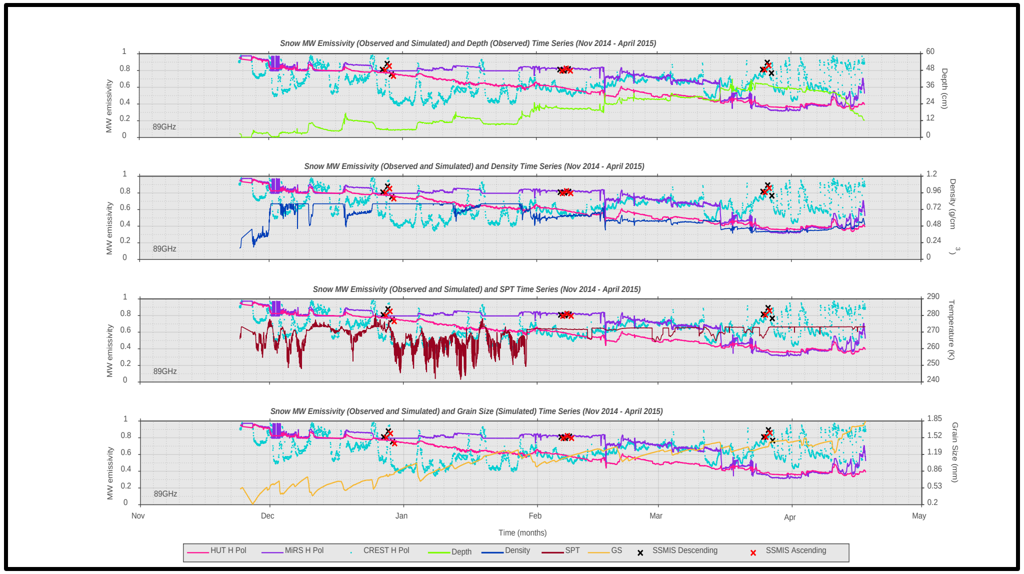
Objectives of this poster:

- Compare MiRS and HUT snow MW emission retrievals with in situ derived snow MW emission at CREST-SAFE for winter 2015
- Validate SSMIS analytic MW emission retrievals with in situ derived snow MW emission at CREST-SAFE for selected cases of the 2015 time series

Future/Ongoing work:

- Quantitative comparison between MiRS and HUT for winter 2015
- Integrating snow wetness onto MiRS for snow MW emission simulations





Evaluation Metrics

- Metrics were given during Week #1 and Week #5.
- Week #1 served as a baseline to adjust planned lectures, and Week #5 tested knowledge immediately after workshops ended.
- Students already showed knowledge of Linux and Python Programming
- We were able to build from the basic understanding to language-specific skills

Performance on the IMSG-CUNY Pre-Test & Post-Test

	Topics Covered	Week 1	Week 5
1	General Program Knowledge of the JPSS Mission	10%	100%
2	Coding in Fortran 90, C++, and PERL.	10%	75%
3	Coding Standards/Configuration Management	0	50%
4	Algorithm Change Process	0	25%

Knowledge increased across the board, especially in JPSS Program and coding ability.

Summary

- IMSG-CUNY put their best foot forward to strengthen the ability of the young generation towards
  - State-of-the art JPSS instruments, algorithms for Sensor and Environmental Data Records (SDR/EDRs) and product applications.
  - Programming languages used operationally and steps involved in putting research into operations.
- At the end of the program you will see how a small additional investment in time at the beginning of their career path provides enormous amount of returns in terms of time saving in learning required research and technical skills.
- We hope to include students from other universities next year; Explore similar outreach activity/training for other satellite programs (GOES-R), global modeling (NCEP/GFS), and Radiative Transfer.
- A website with links to presentations is in preparation

IMSG www.imsg.com

CUNY The City University of New York

NOAA CREST

JPSS Program Office, NCWCP Scientists who delivered talks on JPSS Science and Data Products, and Valuable Advice to Students	
Mitch Goldberg, JPSS Program	Fuzhong Weng, STAR
Arron Layns, JPSS Program	Denis Tremblay, (SDPI)
Lihang Zhou, STAR	Larry Flynn, STAR
Walter Wolf, STAR	Shobha Kondragunta, STAR
Jaime Daniels, STAR	Ivan Csizar, STAR
Corey Guastini, EMC	Jeff Key, STAR
Wesley Ebisuzaki, NCEP	Ralph Ferraro, STAR
Changyong Cao, STAR	Lori Brown, (SCI)
Many IMSG Scientists on Programming, Research, CM	Ninghai Sun, (STAR)

Thank You

JPSS Program Office, NCWCP Scientists who delivered talks on JPSS Science and Data Products