



NOAA JPSS Monthly Program Office

AMP/STAR FY24 TTA

Lihang Zhou, LEO Satellite Product Manager
Ingrid Guch, Acting JPSS STAR Program Manager

May 16, 2024

Highlights from the Science Teams (April, 2024)

Developing new additional ICVS NOAA-21 Spacecraft Health Status Monitoring Products in Support of NASA Flight JPSS Project

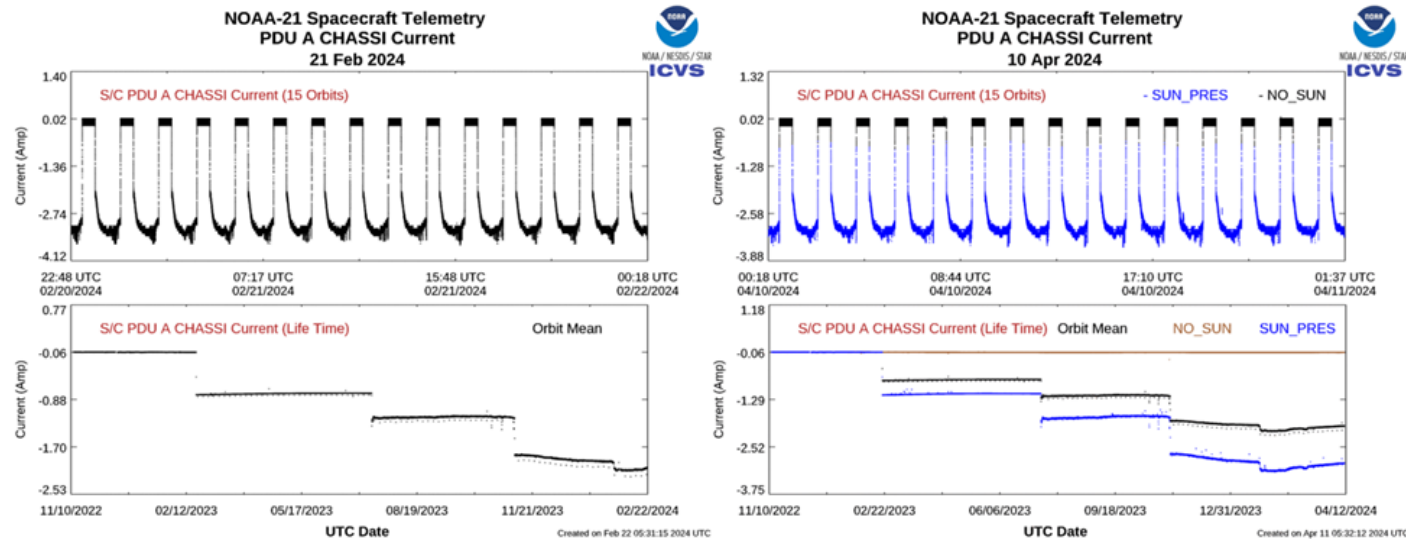


Figure. NOAA-21 spacecraft PDU A CHASSI current on February 21, 2024 before the separation of solar illumination (left) and on April 10, 2024 after the separation (right)

The STAR ICVS team has recently developed and implemented two new NOAA-21 spacecraft Power Delivery Unit (PDU) telemetry near real time (NRT) monitoring products according to the request from the NASA Flight Project. The follow up recommendations include the separation of newly developed CHASSI current with and without solar illumination, and two additional NOAA-21 spacecraft battery current telemetry parameters. The separation of CHASSI and battery current telemetries with and without solar illumination relies on the accurate matchup of the Sun Present quality flag and telemetry samples. The update of ICVS spacecraft telemetry RDR processing package successfully resolved the matchup question and produced improved monitoring plots for NASA Flight project users.

STAR Generated a 22-year Greenhouse Gas Emissions from Wildfires Data Record

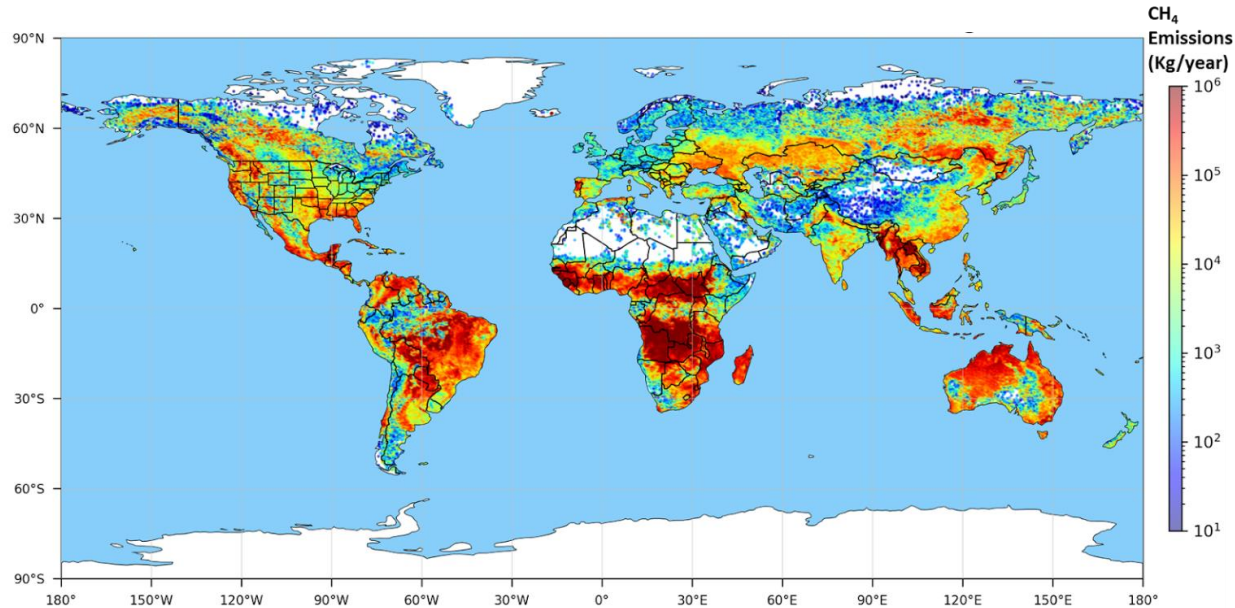


Figure. A 22-year (2000-2023) annual mean methane concentration from wildfires derived from NASA and NOAA satellites

As part of Infrastructure Investment and Jobs Act (IIJA)/Bipartisan Infrastructure Law (BIL) funded activities, STAR has undertaken the reprocessing effort to generate 22 years (2000 - 2023) of greenhouse gas (GHG) emissions from wildfires. This processing generated a consistent emissions data record from NASA’s Aqua and Terra MODIS, NASA-NOAA Suomi NPP, and NOAA-20 VIIRS. The purpose of the project was to document the contributions of different types of fires to air quality and climate in the United States along with an assessment of the role that fires play in enhancing each nation’s greenhouse gas emissions from anthropogenic sectors.



Accomplishments

Delivery Date	Delivery Algorithm Packages (DAPs) – Enterprise Products:	Recipient
4/2/2024	Delivery of the v2-2 patch CCAP for ACP SO JPSS SST. This is a patch delivery CCAP to NCCF for integration, intended to achieve provisional maturity for NOAA-21 (includes two LUT updates)	NCCF
4/4/2024	Patch delivery of the GBBEPx CCAP v2-1 to the NCCF S3 bucket. This patch fixes large flux values that are generated by calculations that include areas flagged as sun glint pixels. There is no change to the Production Rules.	NCCF
4/8/2024	Patch delivery of Ocean Color CCAP v1-1 to NCCF. This patch is for LUT update for N21 to meet provisional maturity.	NCCF
4/16/2024	VIIRS Radiance Cluster CCAP delivery to CSPP	NCCF
4/17/2024	Patch CCAP delivery of ACSPO SST L3S v2-1 for integration into the NCCF. With this patch, the "PM" unit of the L3S algorithm now takes the NOAA-21 VIIRS ACSPO L3U files as input, in addition to input data from SNPP and NOAA-20.	NCCF
4/19/2024	The EN-Fires v3-2 patch which resolves a potential failure of the VIIRS I-band unit caused when there are too many entries in the <sat>.PersistentWaterFireRef.txt file.	NCCF
04/25/2024	Delivery of the patch file (heap_application.py) to Enterprise HEAP CCAP (v4) (the final delivery) & Production Rules document for HEAP v4 CCAP	NCCF
4/24/2024	Delivery of the Toolkit v8 CCAP (algorithm version v6.0) algorithm package to CSPP. This package contains an update to include VIIRS Radiance Cluster NetCDF4 products to help enhance NUCAPS CrIS 0431 and 2211 BUFR products.	NCCF
04/29/2024	Patch Delivery for Ocean Color v1-2 to NCCF. This patch includes a destriping update for N21.	NCCF

NOAA-20/21/S-NPP Operational Calibration Support:

S-NPP	Weekly OMPS TC/NP Dark Table Updates	10/3/23, 10/11/23, 10/17/23, 10/24/23, 10/31/23, 11/7/23, 11/14/23, 11/21/23, 11/28/23, 12/5/23, 12/12/23, 12/19/23, 01/03/24, 01/10/24, 01/17/24, 01/23/24, 01/30/24, 02/06/24, 02/13/24, 02/21/24, 02/27/24, 03/05/24, 03/12/24, 03/19/24, 03/26/24, 04/02/24, 04/09/24, 04/16/24, 04/23/24, 04/30/24
NOAA-20	Weekly OMPS TC/NP Dark Table Updates	10/3/23, 10/11/23, 10/17/23, 10/24/23, 10/31/23, 11/7/23, 11/14/23, 11/21/23, 11/28/23, 12/5/23, 12/12/23, 12/19/23, 01/03/24, 01/10/24, 01/17/24, 01/23/24, 01/30/24, 02/06/24, 02/13/24, 02/21/24, 02/27/24, 03/05/24, 03/12/24, 03/19/24, 03/26/24, 04/02/24, 04/09/24, 04/16/24, 04/23/24, 04/30/24
NOAA-21	Weekly OMPS TC/NP Dark Table Updates	10/3/23, 10/11/23, 10/17/23, 10/24/23, 10/31/23, 11/7/23, 11/14/23, 11/21/23, 11/28/23, 12/5/23, 12/12/23, 12/19/23, 01/03/24, 01/10/24, 01/17/24, 01/23/24, 01/30/24, 02/06/24, 02/13/24, 02/21/24, 02/27/24, 03/05/24, 03/12/24, 03/19/24, 03/26/24, 04/02/24, 04/09/24, 04/16/24, 04/23/24, 04/30/24
S-NPP	Bi-Weekly OMPS NP Wavelength & Solar Flux Update	9/12/23, 9/26/23, 10/11/23, 10/24/23, 11/21/23, 12/05/23, 12/19/23, 01/03/24, 01/17/24, 01/30/24, 02/13/24, 02/27/24, 03/12/24, 03/26/24, 04/08/24, 04/23/24
NOAA-20	Bi-Weekly OMPS NP Wavelength & Solar Flux Update	10/3/23, 10/17/23, 10/31/23, 11/14/23, 11/28/23, 12/12/23, 01/03/24, 01/10/24, 01/23/24, 02/06/24, 02/21/24, 03/05/24, 03/19/24, 04/02/24, 04/16/24, 04/30/24
NOAA-21	Bi-Weekly OMPS NP Wavelength & Solar Flux Update	10/3/23, 10/17/23, 10/31/23, 11/14/23, 11/28/23, 12/12/23, 01/04/24, 01/10/24, 01/23/24, 02/06/24, 02/21/24, 03/05/24, 03/19/24, 04/02/24, 04/16/24, 04/30/24
S-NPP	Monthly VIIRS LUT Update of DNB Offsets and Gains	10/23/23, 11/21/23, 12/18/23, 01/22/24, 02/15/24, 03/18/24, 4/15/24
NOAA-20	Monthly VIIRS LUT Update of DNB Offsets and Gains	10/23/23, 11/21/23, 12/18/23, 01/22/24, 02/15/24, 03/18/24, 4/15/24
NOAA-21	Monthly VIIRS LUT Update of DNB Offsets and Gains	10/23/23, 11/21/23, 12/18/23, 01/22/24, 02/15/24, 03/18/24, 4/15/24
NOAA-21	Monthly VIIRS DNB Straylight correction update	10/23/23, 11/21/23, 12/18/23, 01/22/24, 02/15/24, 03/18/24, 4/15/24



NOAA-21 Cal/Val Maturity Reviews

April 2024 Maturity Reviews

Product	Maturity Review	Review Date	Review Panel Recommendations
OMPS LP (SDR & EDR)	Beta/Provisional	04/25/24	The review team found that OMPS-Limb Profiler SDR/EDR data are at Provisional Maturity level upon implementation of updated ephemeris handling software. The effective Provisional maturity date is upon implementation of the improved ephemeris handling software

May 2024 Maturity Reviews

Product	Maturity Review	Review Date	Review Panel Recommendations
No reviews scheduled for May 2024.			

June 2024 Maturity Reviews

Product	Maturity Review	Review Date	Review Panel Recommendations
OMPS TC Ozone EDR (V8TOz)	Validated	06/13/24	TBD
OMPS NP Ozone EDR (V8Pro)	Validated	06/13/24	TBD
VIIRS Annual Surface Type	Validated	06/13/24	TBD



JSTAR Code/LUT/Product Deliveries

4/9/2024	ADR 10825 (CCR 7105) - Assess calibration errors in NOAA-21 OMPS NM (TC) solar flux relative to SNPP ADR 10828 (CCR 7106) - Assess calibration errors in NOAA-21 OMPS NP solar flux relative to SNPP OMPS team delivered the package to ASSISTT on 4/8/2024 ASSISTT delivered the DAP on 4/9/2024
4/17/2024	ADR-10826/CCR-7108 NOAA-21 VIIRS RSBautoCal LUTs One-Year Update
4/29/2024	ADR-10830/CCR-7118 N21 VIIRS SDR LUT Update F-PREDICTED #10
4/26/2024	470-NEON-CCR-24-0013 NEON Program Review
05/02/2024	ATMS S/N 305 Pre-launch PCT (v001) update - ADR-10556 (Science team delivered to the ASSISTT)

Date	Remaining J2-Ready DAPs to NCCF
March, 2023 (Delayed to January 2024)	<p>Ancillary data preprocessing</p> <ul style="list-style-type: none"> • ASSISTT delivered LP preliminary pre-processor CCAP for SCR (Delivered to OSPO) on 9/29. • NDE Migration & J2 Provisional final CCAP for Ancillary Data Preprocessor (miniDAP) is scheduled for February 20, 2024. However, pushed to May 16, 2024 to align with RDR to L2 final CCAP. <p>RDR to L2 CCAP</p> <ul style="list-style-type: none"> • Science Team Deliveries <ul style="list-style-type: none"> ○ Science team V2.7LIMB for SNPP was delivered to ASSISTT on December 19, 2023 ○ Science team delivered for NOAA-21 (2.7LIMB N21 delivery to ASSISTT) March 18, 2024. • ASSISTT Deliveries <ul style="list-style-type: none"> ○ NDE Migration & J2 Provisional RDR to L2 CCAP Preliminary CCAP target date has been pushed to May 17, 2024. ○ Final CCAP target date is set for August 1, 2024



FY24 STAR JPSS TTA Milestones

Algorithm Updates DAPs/CCAPs	Original Date	Forecast Date	Actual Completion Date	Variance Explanation
OMPS-NP (J2 LUT Delivery)	Jan-24	Jan-24	Delivered on January 4, 2024.	
ACSPO SST_v2 release version + patch to CCAP for MetOP	Jan-24	Jan-24	Delivered on January 16, 2024	
GBBEPx (Enterprise Fires I-Band update)	Jan-24	Jan-24	Delivered on January 19, 2024	
RAVE (Science bug fix)	Jan-24	Jan-24	Delivered on January 29, 2024	
Vegetation Health	Jan-24	Jan-24	Delivered on January 30, 2024	
GCOM RDR to ASD Converter (GRAC) - includes JAXA executable (AMSR-3)	Feb-24	Feb-24	Delivered February 02, 2024	
LST EDR J2 Provisional (updates to LSE)	Dec-23	Feb-24	Delivered on February 12, 2024.	
Ozone Mapping and Profiler Suite (OMPS) - V8TOs	Mar-24	Feb-24	Delivered on February 13, 2024.	
Multi-platform Tropical Cyclone Surface Winds Algorithm (MTCSWA)	Feb-24	Feb-24	Delivered on February 16, 2024.	
Land Surface Albedo	Mar-24	Mar-24	Delivered on March 6, 2024.	
Hyperspectral Enterprise Algorithm Package (HEAP) updated to NOAA-21	Mar-24	Mar-24	Delivered on March 11, 2024.	
LAI Initial Delivery	Feb-24	Apr-24	Delivered on March 28, 2024	
VOLCAT (Phase 1) NCCF implementation	Dec-23	May-24	Moved to June 13, 2024	
Cloud Mask J2 Validated; Separate unit for Ancillary files to be included	Jan-24	Aug-24	Moved to September 20, 2024	



FY24 STAR JPSS Milestones

Milestones (Algorithm Cal/Val and LTM)	Original Date	Forecast Date	Actual Date of Completion	Variance Explanation
JPSS-3/JPSS-4 Data System Event	Jan-24	Jan-24 (early 2024)	JPSS-3 JCT1 Dry Run (11/2/2023); JCT1 Event (01/01/2024)	Science teams are not expected to process or perform analysis on this JPSS-3/JPSS-4 test data made from JPSS-2 (Mary Hunter)
FY24 Program Management Review (all teams)	Jun-24	Jun-24		
GOSAT-GW End to End	Aug-24	Aug-24		
AST-2023 (VIIRS Annual Surface Type)	Sep-24	Sep-24		Maturity Review planned in June 2024
Reprocessing and transfer of EDRs to CLASS	Sep-24	Sep-24		JSTAR Team is coordinating with the EDR teams
JPSS-3 pre-launch test data review/analyze (SDR teams); JPSS-3/JPSS-4 activities/reviews support	Sep-24	Sep-24	On-schedule and on-going following JPSS-3 and JCT schedules	
Maintain / Update ICVS (develop ICVS modules to support various activities: monitoring, inter-sensor comparison, ...)	Sep-24	Sep-24	On-schedule and additional improvements are on-going	ICVS has implemented modules for NRT monitoring of NOAA-21 ATMS, OMPS-NM, OMPS-NP, CrIS, and VIIRS. ICVS demonstrated basic functions for LP using SNPP data as a proxy and is waiting to receive NOAA-21 LP data.
Maintain / Expand (to include JPSS-2 products) JSTAR Mapper	Sep-24	Sep-24	On-schedule and on-going; will be completed based on NOAA-21 EDR Products Provisional Maturity (March-24)	Currently NOAA-21 AF (EFIRE), MiRS, VIIRS I5 and True Color images are in JSTAR Mapper. Some of the NOAA-21 EDRs are unavailable in the SCDR, and once available after Provisional Maturity, JSTAR Mapper will assimilate them
Images of the Month	Monthly	Monthly	On-schedule and on-going	



FY24 STAR JPSS Cal/Val Maturity Reviews

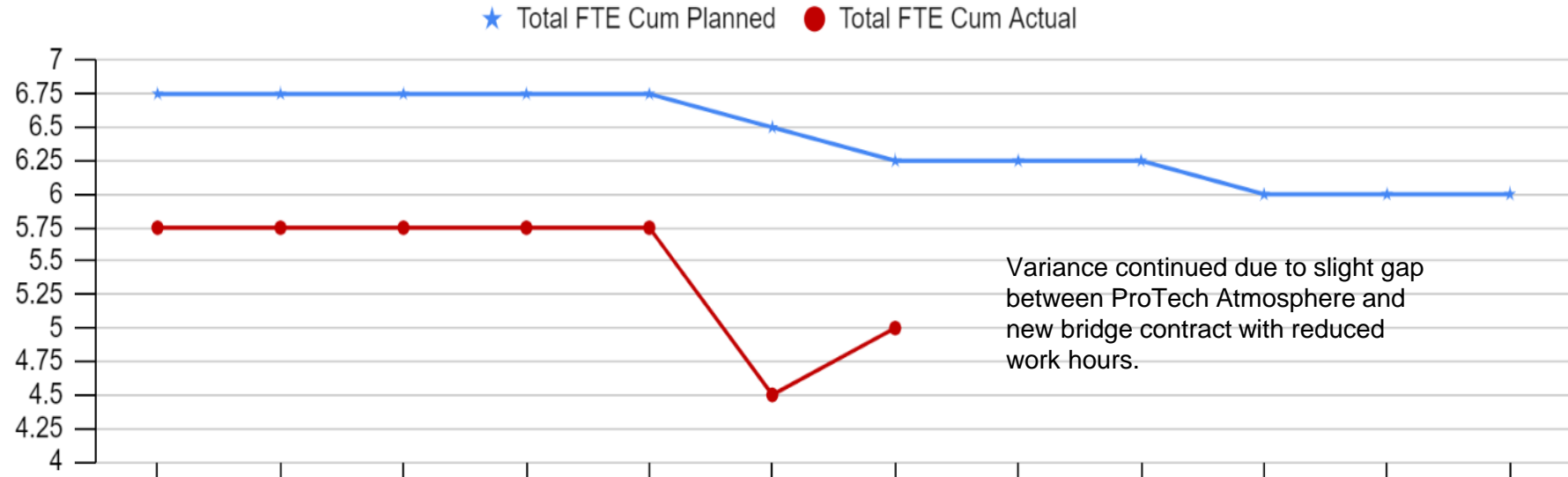
Milestones	Original Date	Forecast Date	Actual Date	Variance Explanation
OMPS SDR (NP & TC Validated)	Mar-24	Mar-24	Attained Validated status – effective date depends on ADR10825 Solar Flux implementation planned for April 2024	
Clouds (V: Mar-24)	Mar-24	Mar-24	Provisional Review held (except for DCOMP and NCOMP): October 26, 2023; Attained Provisional effective March 30. DCOMP and NCOMP Provisional Review occurred virtually on December 4, 2023, and attained Validated status effective March 30.	
Aerosol AOD (V: Jun-24)	Jun-24	Jun-24	Attained Validated status effective March 30, 2023	
Aerosol ADP (V: Jun-24)	Jun-24	Jun-24	Attained Validated status effective March 30, 2023	
Volcanic Ash (V: Mar-24)	Aug-23	Aug-23	Attained Validated status effective March 30, 2023	
Cryosphere (B: May-23; P: Aug-23 for Sea Ice & Binary Snow; V: Feb-24 (SI & Binary Snow); V (other) :Jul-24	Jul-24	Jul-24	Ice Thickness/Age: Attained Validated status effective May 1, 2023. Snow Cover & Fraction: Attained Validated status effective May 1, 2023. IST and Ice Concentration: Attained Validated status effective May 1, 2023.	
Active Fires (V: Jul-24)	Jul-24	Jul-24	Attained Validated status effective March 30,2023.	
LST/LSA/SR/GVF/VI (P: Jan-24; V: Jul-24 to Jan-25 FY25)	Sep-24	Sep-24	LST: Attained Validated status effective June 23, 2023. Surface Albedo: Attained Validated status effective August 30, 2023. Surface Reflectance: Attained Validated status effective Nov. 1, 2023. GVF, VI: Attained Validated status effective June 23, 2023.	
Vegetation Health (V: Apr-25 FY-25)	FY-25	FY-25	Attained Validated status effective March 30, 2023	
Ocean Color (B/P: Jan-24; V:Jul-25 FY25)	Jan-24	Sep-23	Attained Validated status effective March 1, 2024, to coincide with data availability from the NOAA CoastWatch program and MSL12 version 1.61 algorithm LUTs	
SST (V: Aug-24)	Aug-24	Aug-24	Attained Validated status effective March 20, 2023	
VPW (B/P: Jan-24; V: Mar-24)	Mar-24	Mar-24	Attained Validated status effective November 16, 2023.	
VFM (V: Jan-25)	FY-25	FY-25	Attained Validated status December 14, 2023.	
NUCAPS P: Jan-25; V: Mar-Jun-24)	Jun-24	Jun-24	Attained Validated status effective September 26, 2023.	
MIRS (V:Oct-24)	Oct-24	Oct-24	Attained Validated status effective May 12, 2023	
SFR (P: Feb-24; V: May-24)	May-24	May-24	Attained Provisional status- effective upon v2r0 algorithm currently planned for July 2024. Validated maturity moved to May 2025.	
OMPS NP EDR V8Pro & V8TOz & V8TOS (V: Mar-24)	Mar-24	Mar-24	OMPS NP EDR V8Pro Attained Provisional Effective June 20, 2023. OMPS NP EDR V8Toz Attained Provisional September 19, 2023. Validated review for V8TOz TC planned in May 2024. Validated review for OMPS NP V8Pro planned in June 2024.	
OMPS LP (B: Jan-24; P: Feb-24; V:Sep-24	Sep-24	Sep-24	Beta and Provisional Review held on 04/25/2024. The effective Provisional maturity date is upon implementation of the improved ephemeris handling software	



FY24 STAR JPSS Milestones

Operational/Program Support	Original Date	Forecast Date	Actual Completion Date
S-NPP: Weekly OMPS TC/NP Dark Table Updates	Weekly	Weekly	12/5/23, 12/12/23, 12/19/23, 01/03/24, 01/10/24, 01/17/24, 01/23/24, 01/30/24, 02/06/24, 02/13/24, 02/21/24, 02/27/24, 03/05/24, 03/12/24, 03/19/24, 03/26/24, 04/02/24, 04/09/24, 04/16/24, 04/23/24, 04/30/24
S-NPP: Bi-Weekly OMPS NP Wavelength & Solar Flux	Bi-Weekly	Bi-Weekly	12/05/23, 12/19/23, 01/03/24, 01/17/24, 01/30/24, 02/13/24, 02/27/24, 03/12/24, 03/26/24, 04/08/24, 04/23/24
S-NPP: Monthly VIIRS LUT update of DNB Offsets and Gains	Monthly	Monthly	12/18/23, 01/22/24, 02/15/24, 03/18/24, 4/15/24
NOAA-20: Weekly OMPS TC/NP Dark Table Updates	Weekly	Weekly	12/5/23, 12/12/23, 12/19/23, 01/03/24, 01/10/24, 01/17/24, 01/23/24, 01/30/24, 02/06/24, 02/13/24, 02/21/24, 02/27/24, 03/05/24, 03/12/24, 03/19/24, 03/26/24, 04/02/24, 04/09/24, 04/16/24, 04/23/24, 04/30/24
NOAA-20: Bi-Weekly OMPS NP Wavelength & Solar Flux	Bi-Weekly	Bi-Weekly	11/28/23, 12/12/23, 01/03/24, 01/10/24, 01/23/24, 02/06/24, 02/21/24, 03/05/24, 03/19/24, 04/02/24, 04/16/24, 04/30/24
NOAA-20: Monthly VIIRS LUT update of DNB Offsets and Gains,	Monthly	Monthly	12/18/23, 01/22/24, 02/15/24, 03/18/24, 4/15/24
NOAA-21: Weekly OMPS TC/NP Dark Table Updates	Weekly	Weekly	12/5/23, 12/12/23, 12/19/23, 01/03/24, 01/10/24, 01/23/24, 02/06/24, 02/13/24, 02/21/24, 02/27/24, 03/05/24, 03/12/24, 03/19/24, 03/26/24, 04/02/24, 04/09/24, 04/16/24, 04/23/24, 04/30/24
NOAA-21: Bi-Weekly OMPS NP Wavelength & Solar Flux	Bi-Weekly	Bi-Weekly	11/28/23, 12/12/23, 01/04/24, 01/10/24, 01/17/24, 01/23/24, 01/30/24, 02/06/24, 02/13/24, 02/21/24, 02/27/24, 03/05/24, 03/19/24, 04/02/24, 04/16/24, 04/30/24
NOAA-21: Monthly VIIRS LUT update of DNB Offsets and Gains	Monthly	Monthly	12/18/23, 01/22/24, 02/15/24, 03/18/24, 4/15/24
Mx builds deploy regression review/checkout (Mx9/MX10)			Mx10: STAR submitted SOL Report (4/4/24) MX10: I&T STAR submitted Report (4/30/24) Mx10: TTO Expected on May 23, 2024

J-STAR FY24 Planned Program Management Staffing Plan v Actuals



J-STAR FTEs	Oct'23	Nov '23	Dec '23	Jan '24	Feb '24	Mar'24	Apr'24	May'24	Jun'24	Jul '24	Aug '24	Sep '24
Cum Planned (CS)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	2.00	2.00	2.00
Cum Actual (CS)	0.00	0.00	0.00	0.00	0.00	0.00	0.00					
Cum Planned (WYE)	5.75	5.75	5.75	5.75	5.75	5.50	5.25	5.25	5.25	4.00	4.00	4.00
Cum Actual (WYE)	5.75	5.75	5.75	5.75	5.75	4.50	5.00					
Total FTE Cum Planned	6.75	6.75	6.75	6.75	6.75	6.50	6.25	6.25	6.25	6.00	6.00	6.00
Total FTE Cum Actual	5.75	5.75	5.75	5.75	5.75	4.50	5.00					

CS: Vacant (prev. Alisa Young)

WYE: Qingyuan Richard Zhang, Prasanjit Dash, Linden Wolf, Murty Divakarla, Tom Atkins, Jeffrey Weinrich, Wei W. Li, Tess Valenzuela

Due to financial system issues, we do not have charts for expenditures.

Backup/Additional milestones

Backup/quad charts

Color code:

Green: Completed Milestones

Gray: Ongoing FY24 Milestones

Accomplishments / Events:

- The team worked with the AWIPS team to clarify questions regarding the content of the eFire product file for granules that do not contain fire detections
- Previous feedback by internal and external users also suggested the need to include an empty sparse array for granules with no detections to simplify ingest of the files into downstream applications
- Wei Guo delivered eFire DAP v1r3.3, which includes an update for the output file format and algorithm change to detect corrupt input SDR data

Overall Status:

	Green ¹ (Completed)	Blue ² (On-Schedule)	Yellow ³ (Caution)	Red ⁴ (Critical)	Reason for Deviation
Cost / Budget		X			
Technical / Programmatic		X			
Schedule		X			

1. Project has completed.
2. Project is within budget, scope and on schedule.
3. Project has deviated slightly from the plan but should recover.
4. Project has fallen significantly behind schedule, and/or significantly over budget.

Issues/Risks:

Highlight:

NO HIGHLIGHT THIS MONTH

Milestones	Original Date	Forecast Date	Actual Completion Date	Variance Explanation
Baseline / eFire / NGFS cross verification and cal/val	Sep-24	Sep-24		
eFire NOAA-21 validated maturity analysis	Jul-24	Jul-24		
ASSIST, NCCF and DB I&T support	Dec-23	Dec-23	Dec-23	
Reactive maintenance of Suomi NPP, NOAA-20 and NOAA-21 I-band NDE and NCCF products	Sep-24	Sep-24		
Suomi NPP / NOAA-20 NOAA-21 data analysis and feedback	Sep-24	Sep-24		

Accomplishments / Events:

- Work done by STAR aerosol team is featured in NESDIS Impacts Briefings in the article entitled "Pollution". Team members Hai Zhang, Michael Cheeseman, and Pubu Ciren contributed to the work that is part of this article
- NOAA Greenhouse Gas (GHG) Team co-lead Kondragunta wrote the Impact Briefings article on GHGs. JPSS Program Scientist Kalluri and JSTAR manager Zhou and Jeff Privette (also NOAA GHG team co-lead) also contributed to the article on GHGs
- Team member Cheeseman has done a lot of analyses using reprocessed aerosol optical depth data to understand the Environmental Justice aspect of fine particle pollution. This work is informing that despite meeting the health standard, fine particle pollution disproportionately impacts racially and economically disadvantaged communities
- Team member Huff contributed to the writing of QuickGuide for VIIRS aerosol optical depth product. She also provided half-a-day training in Singapore on the use of JPSS fire and smoke products. JPSS Program Scientist Kalluri and AAC team lead Kondragunta also provided lectures on air quality products and their applications for Association of Southeast Nations (ASEAN).
- Team member Limbacher is developing a new aerosol optical depth algorithm that includes new aerosol models and numerical methods that is expected to speed up the enterprise algorithm and hopefully provide better retrievals as well.

Overall Status:

	Green ¹ (Completed)	Blue ² (On-Schedule)	Yellow ³ (Caution)	Red ⁴ (Critical)	Reason for Deviation
Cost / Budget		X			
Technical / Programmatic		X			
Schedule		X			

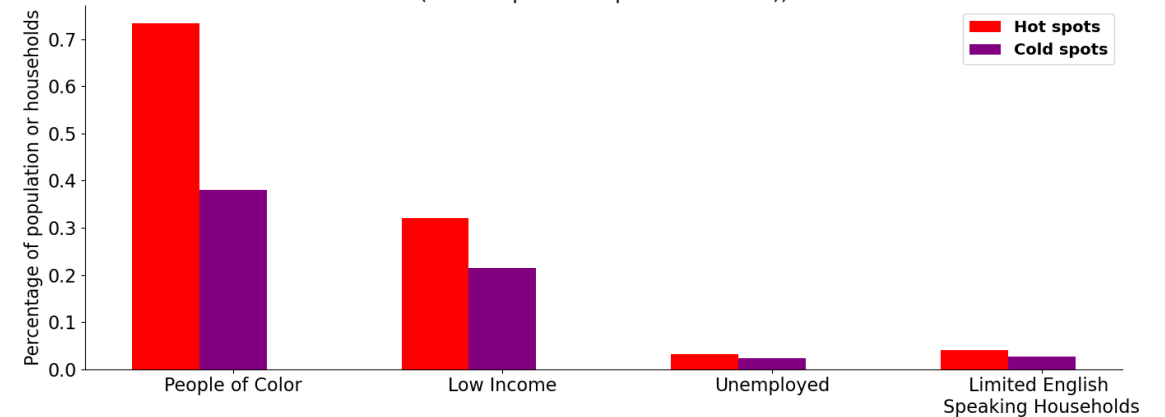
1. Project has completed.
2. Project is within budget, scope and on schedule.
3. Project has deviated slightly from the plan but should recover.
4. Project has fallen significantly behind schedule, and/or significantly over budget.

Issues/Risks:

No risks. Issue: Developer of the ML-SFRA has left the team; date of milestone is TBD.

Highlight:

Socioeconomic demographics in Cold vs Hot spots (Atlanta, 98th percentile PM_{2.5} (low sample count pixels removed))



Statistics in the figure show analysis for Atlanta where hot spots and cold spots are those areas with high and low fine particle pollution respectively based on Moran's I analysis

Milestones	Original Date	Forecast Date	Actual Completion Date	Variance Explanation
Test the impact of call back ADP retrievals on "smoke/non-smoke > PM2.5" product	6/30/2024	6/30/2024		
Evaluation of ADP using SPARTAN data	8/31/2024	8/31/2024		
Evaluation of ADP using SPARTAN data	3/31/2024	3/31/2024		

Accomplishments / Events:

- Evaluate NOAA-20 ATMS data quality impact after the rephasing activity. Report the ATMS science data metadata unusual satellite and instrument operational status settings during the whole rephasing period. Report the unusual calibration count jump phenomena before the end of rephasing. The similar behavior has been observed a few times since launch. **(Figure. 1)**
- Attend IEEE MicroRad 2024 conference. Several poster and oral presentations are presented in the conference. The title of the presentations are,
 - Estimating Uncertainties of Simulated MW Sounding Sensor Brightness Temperatures
 - Leveraging CRTM-Simulated Brightness Temperatures from GNSS RO Soundings and SNO Events to Assess NOAA-21 ATMS TDR Performance
- Verify the IDPS Mx10 I&T string NOAA-21/NOAA-20/S-NPP ATMS science data and prepare the data quality impact report to support OSPO Transition to operation activity
- Update the ATMS Operational Algorithm Document (OAD) to reflect the latest implementation update in IDPS for the scan level warm/cold NEdT calculation algorithm. Waiting for team member review and comments.
- Host ATMS SDR team meeting to discuss the S-NPP ATMS End Of Life (EOL) test recommendations following the NOAA-21 post-launch test (PLT) items. The S-NPP ATMS EOL test items will continue to be updated.

Overall Status:

	Green ¹ (Completed)	Blue ² (On-Schedule)	Yellow ³ (Caution)	Red ⁴ (Critical)	Reason for Deviation
Cost / Budget		X			
Technical / Programmatic		X			
Schedule		X			

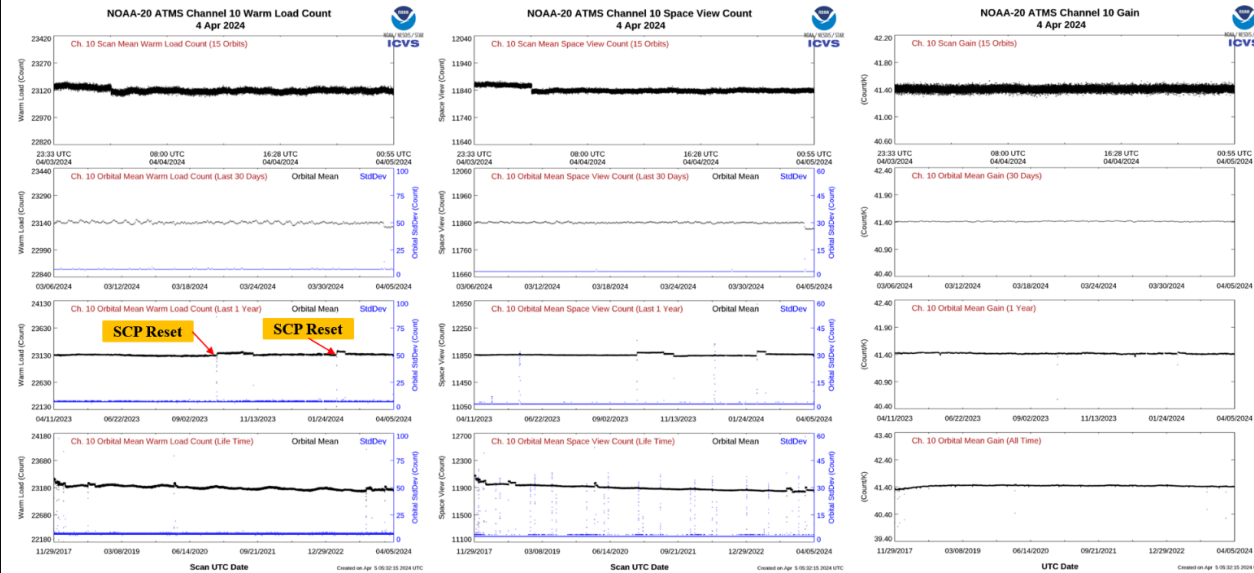
- Project has completed.
- Project is within budget, scope and on schedule.
- Project has deviated slightly from the plan but should recover.
- Project has fallen significantly behind schedule, and/or significantly over budget.

Issues/Risks: Retirement of several working servers will significantly affect the data processing capability. The STAR ATMS Cal/Val Team does not have a dedicated server. The formal request to purchase a dedicated server has been initiated.

Milestones	Original Date	Forecast Date	Actual Date	Variance Explanation
JPSS-3 ATMS preliminary analysis of calibration coefficients	Feb-24	Mar-24	Mar-24	
ATMS Spectral Response Function (SRF) evaluation report and dataset	Mar-24	May-24		
ATMS geolocation correction algorithm assessment	May-24			
Improvement for lunar intrusion correction model including LUT update	Jun-24			
ATMS cold bias dynamic correction assessment and algorithms update	Sep-24			
Review/Checkout of IDPS Mx Builds SOL and I&T Deploy Regression data	Sep-24			
Review of JPSS-3/4 ATMS pre-launch data to provide Ground support	Sep-24			
Conduct maintenance including anomaly resolution of on-orbit ATMS sensors	Sep-24			
Provide support to Metop-SG Joint Cal/Val Activities	Sep-24			

Highlights:

Figure 1. NOAA-20 ATMS channel 10 calibration count jump observed on April 4



Accomplishments / Events:

- The Cloud team continues to investigate the usage of the ACHA cloud optical depths as a replacement for NCOMP.
- Work on the updated ECM and NOAA-21 DCOMP LUTs is currently continuing. Part of the updates for the ECM include an adjustment to the 11 and 12um channel data due to the SRF differences between N21 and NPP/N20.

Overall Status:

	Green ¹ (Completed)	Blue ² (On-Schedule)	Yellow ³ (Caution)	Red ⁴ (Critical)	Reason for Deviation
Cost / Budget		X			
Technical / Programmatic		X			
Schedule		X			

- Project has completed.
- Project is within budget, scope and on schedule.
- Project has deviated slightly from the plan but should recover.
- Project has fallen significantly behind schedule, and/or significantly over budget.

Issues/Risks:

None

Milestones	Original Date	Forecast Date	Actual Completion Date	Variance Explanation

Highlights:

Cloud Product Trends

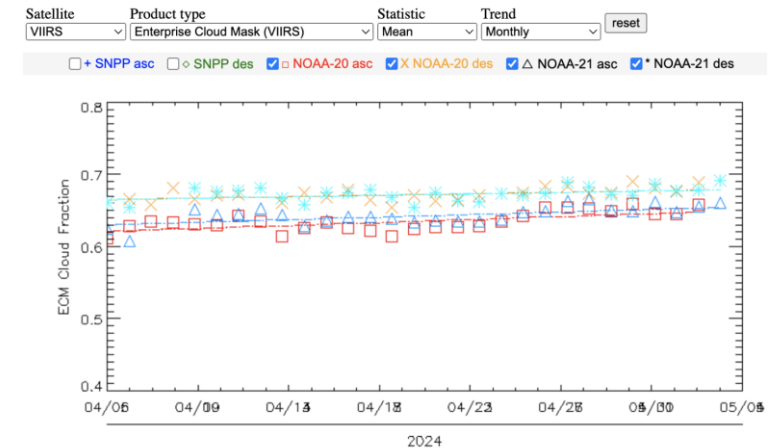


Figure 1. Example of the LTM of the NOAA-20 and NOAA-21 ECM trend. Visualization of the trends allows to see intersatellite consistency of the algorithms

Accomplishments / Events:

- Completed the Radiometric, Spectral, Noise (Fig. 1), Intercomparison, Geolocation, and telemetry assessment of the NOAA-20 CrIS data after the NOAA-20 Satellite Re-phasing Maneuver. All of the SDR data accuracy metrics are nominal.
- Supported the GOES ABI Team in troubleshooting questions related to the intercomparison between NOAA-20 CrIS and EWS-G2. Provided the intercomparison results for ABI channels 8 and 9 (Fig. 2) for further analysis.
- Presented the CrIS IASI intercomparison results on the CrIS SDR website (Fig. 3).
- Developed a diagnostic tool to extract scan-level ICT and DS spectral stability of specific FOVs for NOAA-21 CrIS, in order to precisely locate the scan index of peak imaginary artifact in orbits (Fig. 4).
- Investigated a recent synchronization loss of SNPP CrIS and ATMS (Fig. 5). Presented the results in the CrIS science Telecon and submitted a report to OSPO for further investigation.
- Investigated the NOAA-21 CrIS imaginary artifact through ADL by printing out DS and ICT magnitude and phase in the sliding window over the out-of-eclipse region of NOAA-21 spacecraft (Fig. 6).
- Completed the sections for the neon mitigation manuscript as well as the related portion of the NOAA-21 CrIS on-orbit performance paper (Fig. 7).
- Verified the NOAA-21 CrIS TVAC pre-processing data for the CO₂ gas cell test and gained deeper understanding of the data processing for CrIS spectral calibration (Fig. 8).

Overall Status:

	Green ¹ (Completed)	Blue ² (On-Schedule)	Yellow ³ (Caution)	Red ⁴ (Critical)	Reason for Deviation
Cost / Budget		X			
Technical / Programmatic			X		See Issues/Risks
Schedule			X		See Issues/Risks

- Project has completed.
- Project is within budget, scope and on schedule.
- Project has deviated slightly from the plan but should recover.
- Project has fallen significantly behind schedule, and/or significantly over budget.

Issues/Risks:

Yellow: There is a misalignment between the IDPS ground processing environment and NOAA-STAR. The IDPS ground processing is based on RHEL Centos version 8 (RHEL8) starting with Mx9 (TTO Feb 8, 2024). NOAA-STAR has migrated to RHEL Centos version 9. **There remains risks in delays to deliver ADL code updates depending on the need to make patch fixes to NOAA-STAR testing needed for future Mx builds to match the IDPS Processing System.** The ADL Mx9 with code modifications for compilation purposes can run on RHEL CENTOS version 9. The CrIS Team is still in need of hardware resources. Presently, there are only two servers dedicated to 6 CrIS Team members. Access to additional servers is still desirable. There is a risk for the CrIS SDR Team to continue on such a dual-server environment for the operational CrIS Cal/Val activities that include 5 CrIS sensors (SNPP, JPSS-1 to -4). This may affect the timely completion of deliverables and program milestones. The recommendation is to have one additional server as soon as possible (< 2 months) and add another server in the next months. Corresponding hardware quotations and SNO have been submitted. Corresponding JSTAR CrIS Risk/Issue on Hardware and Software have been submitted for JSTAR interval review on Jan. 6, 2023. UPDATE: The purchasing of the corresponding hardware is currently in progress, in coordination with STAR IT. A new MATLAB license has been delivered and installed properly.

Highlights:

(1) NOAA-20 CrIS Noise assessment (nominal) after the NOAA-20 Re-phasing Maneuver

(2) GOES-18 ABI vs NOAA-20 CrIS intercomparisons for ABI channels 8 and 9.

(3) Intercomparison of N21 and N20 CrIS using double difference via Metop B and Metop C as transfer targets.

(4) Time series of N21 CrIS SDR spectral stability of forward sweep at LW FOV3 for July 6, 2023.

(5) Deviation from ideal timing for SNPP CrIS and ATMS.

(6) State of CrIS calibration sliding window for ICT phase corresponding to peak spectral stability on July 6, 2023.

(7) Spectral accuracy before and after the change in N21 CrIS neon calibration interval from 109 minutes to 12.71 hours.

(8) Example of NOAA-21 CrIS TVAC test for the CO₂ gas cell.

Milestones	Category	Original Date	Actual Completion Date	Variance Explanation
New CrIS geolocation accuracy assessment using VIIRS terrain-corrected data	Sustain	Feb-24	Feb-24	
Participated in the JPSS-4 CrIS Pre-Ship Review (PSR)	Sustain	May-24		
Evaluate the long-term NOAA-21 CrIS spectral reference performance after increasing the calibration interval	Sustain	Jun-24		
Review and analysis of JPSS-3 and JPSS-4 CrIS pre-launch data to provide Flight and Ground support	Sustain	Aug-24		
Perform characterization and mitigation activities on elevated imaginary component of NOAA-21 CrIS radiance products	Sustain	Sep-24		
Review/Checkout of IDPS Mx Builds SOL and I&T Deploy Regression data	Maintain	Sep-24		
Perform the transition of Cal/Val activities to the Cloud environment	Maintain	Sep-24		
Conduct maintenance including investigation and anomaly resolution of on-orbit CrIS sensors	Maintain	Sep-24		
Provide Support to Metop-SG Joint Cal/Val Activities	Maintain	Sep-24		

Accomplishments / Events:

- **NOAA-21 VIIRS Winds Now Operational.**

NESDIS/OSPO successfully promoted the NOAA-21 VIIRS Polar Winds (VPW) into operations on March 6, 2024. The NOAA-21 VPWs are now available on the Product Distribution server PDA. OSPO is working with National Weather Service (NWS) to add NOAA-21 VPWs into the GTS.

Overall Status:

	Green ¹ (Completed)	Blue ² (On-Schedule)	Yellow ³ (Caution)	Red ⁴ (Critical)	Reason for Deviation
Cost / Budget		X			
Technical / Programmatic		X			
Schedule		X			

1. Project has completed.
2. Project is within budget, scope and on schedule.
3. Project has deviated slightly from the plan but should recover.
4. Project has fallen significantly behind schedule, and/or significantly over budget.

Issues/Risks:

None

Highlights:

Task Category	Task/Description	Start	Finish	Deliverable	Requirement (Dev Only)
Development (D)	Investigate the value added in including I-band product.	10/2023	9/2024	I-band ice products in ops	
Development (D)	Make improvements to blended VIIRS + AMSR2 SIC product in Marginal Ice Zone.	10/2023	9/2024	Daily blended Sea Ice Concentration Product	Same as VIIRS SIC EDR

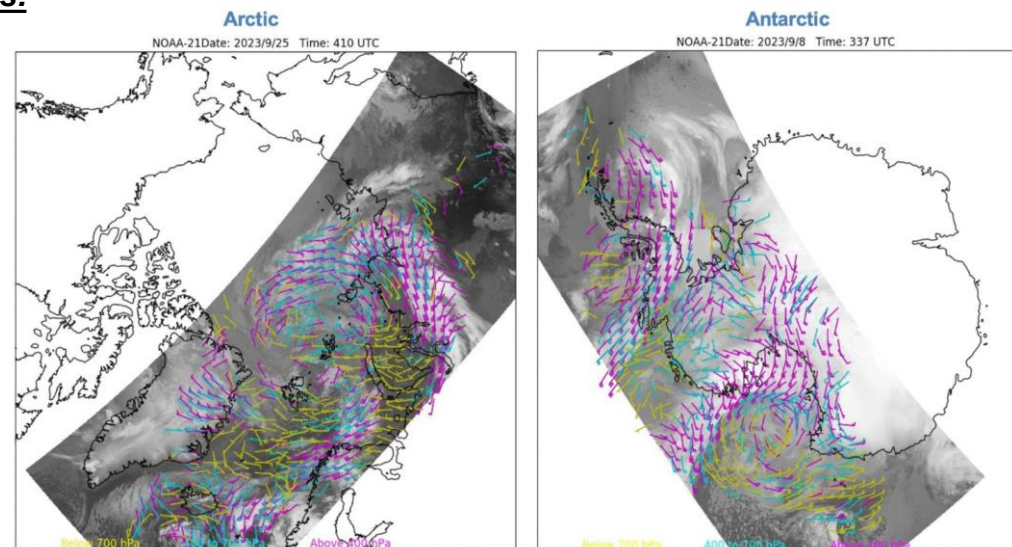


Figure 1. An example of NOAA-21 VIIRS polar winds over the Arctic (left) and Antarctic (right).

Accomplishments / Events:

- The RWG continues to work with UMD IT department on server access problems. Currently, the data transfer between ESSIC servers and STAR servers is resumed and the cloud EDR products of Aug. 2018~Jul. 2019 are being reprocessed.
- The RWG is developing collocation and comparison programs to assess the quality of reprocessed and operational EDR products against corresponding CloudSat products.
- The following figure shows the Cloud Top Height values achieved from the reprocessed EDR (dark red line), operational EDR (black dash line) and Cloudsat 2B-CLDCLASS-LIDAR product with vertical structure indicating different cloud classes.

Overall Status:

	Green ¹ (Completed)	Blue ² (On-Schedule)	Yellow ³ (Caution)	Red ⁴ (Critical)	Reason for Deviation
Cost / Budget		X			
Technical / Programmatic			X		
Schedule			X		

1. Project has completed.
2. Project is within budget, scope and on schedule.
3. Project has deviated slightly from the plan but should recover.
4. Project has fallen significantly behind schedule, and/or significantly over budget.

Issues/Risks:

The VIIRS EDR reprocessing is now relying on the UMD Bamboo system. The system will expire in July 2024. Mitigation plan is to use GMU Cluster System to continue the EDR reprocessing.

Execution delay is expected due to issues in STAR servers and UMD Bamboo system

Milestones	Original Date	Forecast Date	Actual Completion Date	Variance Explanation
Complete VIIRS EDR reprocessing for Clouds, polar wind, Ice Concentration; Ice Thickness; Snow Cover; and Ice Surface Temperature	02/2023	06/2024		3 month

Accomplishments / Events:

- AMSR2 vs Landsat sea ice concentration:** Comparison of Landsat sea ice concentration with AMSR2 concentration for spring and early summer scenes in 2014 shows a fair amount of scatter with AMSR2 generally overestimating concentration compared to Landsat. This appears to be due to the proximity of the scenes to the ice edge where Landsat is detecting more open water due to its higher spatial resolution. Also, AMSR2 concentrations tend to saturate at or near 100% concentration while Landsat shows more variability of lower concentrations. Still, the AMSR2 performance is reasonable with a correlation of ~0.8.

Overall Status:

	Green ¹ (Completed)	Blue ² (On-Schedule)	Yellow ³ (Caution)	Red ⁴ (Critical)	Reason for Deviation
Cost / Budget		X			
Technical / Programmatic		X			
Schedule		X			

- Project has completed.
- Project is within budget, scope and on schedule.
- Project has deviated slightly from the plan but should recover.
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Issues/Risks:

Highlights:

Milestones	Original Date	Forecast Date	Actual Completion Date	Variance Explanation
initiate and test processing changes in preparation for AMSR3 using AMSR3 proxy data	Sep-24	Sep-24		
Continue AMSR2 L1 monitoring; develop AMSR3 capabilities	Sep-24	Sep-24		

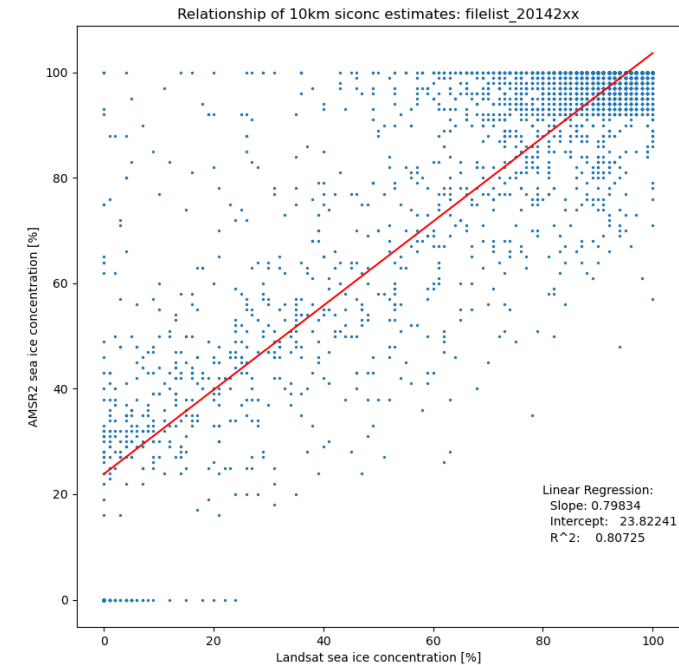


Figure: Scatterplot of Landsat (x-axis) and AMSR2 (y-axis) sea ice concentration (%) for Landsat scenes from April through June 2014. The red line is the linear regression fit and the regression coefficients (slope, intercept, and R²) are annotated in the image.

Accomplishments / Events:

- Continue to provide near real time NOAA-20 instrument performance and science data quality monitoring during the rephasing. The science data spacecraft and instrument operational status metadata setting is back to nominal after the final propulsive maneuver on April 4. It is also found that the LTAN has small variation since the start of rephasing. The same metadata in science data are set to maneuver status with the OverYaw maneuver on April 22 and continue the maneuver status after the OverYaw Maneuver.
- Reorganize the CrIS inter-sensor comparison web page in ICVS-beta and add new CrIS vs. IASI/ABI long term bias trending figures to provide advanced CrIS science data quality monitoring. An updated CrIS inter-sensor bias web page is under development in ICVS-beta internal site, which can significantly improve the users' experience by listing all monitoring figures in the same web page.
- Recover and reprocess VIIRS vs. GOES-18 ABI inter-sensor comparison product in VIIRS vs. ABI inter-comparison package to improve the VIIRS SDR data quality monitoring ability.
- Update the legacy instrument ICVS module execution reliability and trending product quality.
- Contacted by OCS PIB POC to arrange the introduction of NCCF transition procedure and requirements.

Overall Status:

	Green ¹ (Completed)	Blue ² (On-Schedule)	Yellow ³ (Caution)	Red ⁴ (Critical)	Reason for Deviation
Cost / Budget		X			
Technical / Programmatic		X			
Schedule		X			

- Project has completed.
- Project is within budget, scope and on schedule.
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Issues/Risks:

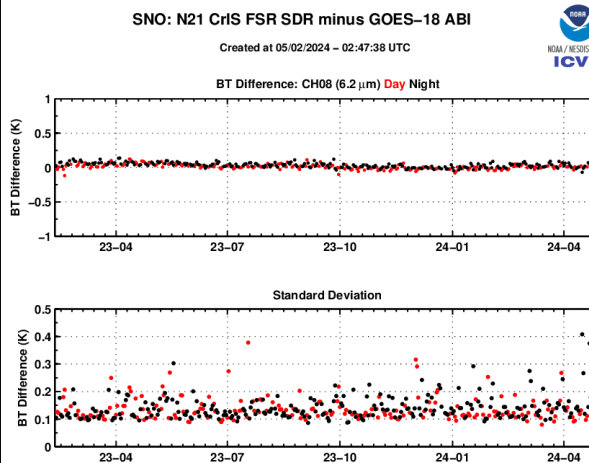
Retirement of three ICVS operational processing servers affects the refreshing rate

Milestones	Original Date	Actual Completion Date	Variance Explanation
Upgrade the 3D ATMS hurricane animation imagery package from Matlab to Python; initialize modules about NOAA21 NM DCC and comparison with VIIRS M1; Update the ICVS for N21 LP SDR monitoring (SNPP proxy data); fix the VIIRS-ABI inter-sensor processing package	Dec-23	Dec-23	
Promote the new ATMS inter-sensor web page to operational ICVS; Develop the processing code about NOAA21 NM DCC and NOAA-21 NM against VIIRS M1; support to the OMPS SDR team for verification of the OMPS-CRTM; Update the ICVS for N21 LP SDR monitoring to support the LP EDR review.	Feb-24	Feb-24	
Develop the new ICVS web page about NOAA21 NM DCC and NOAA-21 NM against VIIRS M1 and promote it to operational ICVS in support of N21 OMPS final review	Feb-24	Mar-24	
Initialize STAR2Cloud Initiative ICVS package transition discovery and assessment activities (preparation for JPSS ICVS website migration into the cloud environment)	Apr-24		
Develop new modules for monitoring of JPSS SDR data anomaly upon region or latitude	May-24		
Update ICVS vector modules (e.g., NOAA-21 dynamic visualization, data volume to support the cloud transition) and promote the web page to the operational ICVS; develop new modules in support to the J3/J4 testing by using N21 data as proxy data sets	Jun-24		
Promote the new ICVS CrIS and OMPS inter-sensor web page to public-accessible ICVS; Upgrade the ICVS ATMS inter-sensor CRTM double difference modules	Jul-24		
Upgrade ICVS user-friendly anomaly alert modules for more key parameters; update ICVS user manual	Aug-24		
Upgrade the ICVS Anomaly Watch portal with more monitoring analysis results to support OSPO and other users	Sep-24		
Initialize an ICVS core-function prototype in cloud environment	Sep-24		
Develop new ICVS modules to support J3/J4 prelaunch testing	Sep-24		
ICVS maintenance for SNPP/NOAA-20/NOAA-21 (including 3D-ATMD hurricane tool)	Sep-24		

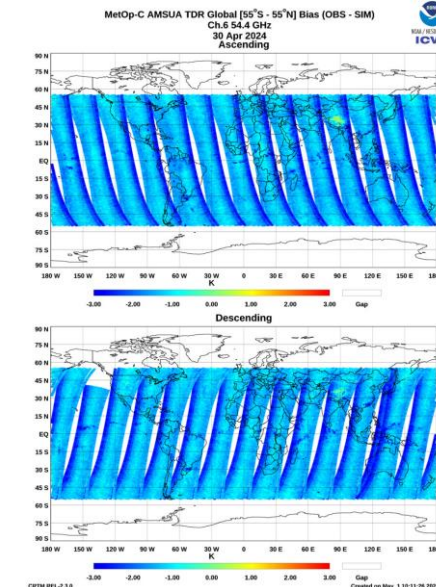
Highlights:

Significantly contribute to STAR SDR Teams

(a) NOAA-21 CrIS vs. G18 ABI daily mean SNO inter-sensor bias time series



(b) Metop-c AMSU-A channel 6 O-B w.r.t. ECMWF



Accomplishments / Events:

- Fixed a couple of software code issues in generating VIIRS I-band subset LST, which has now been set as a cron job for automatic processing.
- Prepared experimental granule VIIRS I-band LST over the Maryland State region, spanning from January 20 to April 20, 2024.
- Conducted validation of VIIRS I-band LST using multiple ground observations from SURFRAD, ARM, BSRN and NDBC for both SNPP and NOAA-20. Similar good agreements with ground observations were yielded from the validations. (slide 3-9)
- Downloaded GADM (the Database of Global Administrative Areas) data, and developed code to extract state shape file and to plot LST data within Maryland State region. (slide2)
- Continued work on a direct regression method for all weather LST generation. Prototype code has been completed and is under test.
- Continue to add more data to the training dataset and observed an issue in the new CLASS ftp site. The issue has been resolved.
- Provided LST threshold to NDE for PG monitoring based on the statistical analysis of ten year LST climatology data.
- Identified an issue with the solar zenith angle in MIRS data, confirmed the issue with MIRS data provider, and modified the code accordingly for MIRS day/night separation. (slide 10)

Overall Status:

	Green ¹ (Completed)	Blue ² (On-Schedule)	Yellow ³ (Caution)	Red ⁴ (Critical)	Reason for Deviation
Cost / Budget		X			
Technical / Programmatic			X		
Schedule		X			

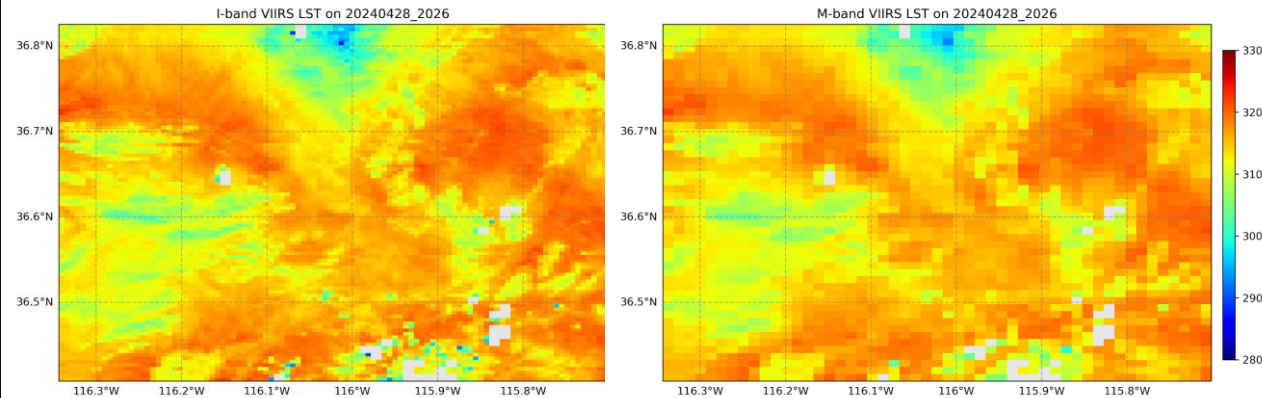
- Project has completed.
- Project is within budget, scope and on schedule.
- Project has deviated slightly from the plan but should recover.
- Project has fallen significantly behind schedule, and/or significantly over budget.

Issues/Risks:

None

Highlights:

I-band VIIRS LST on April 28, 2024



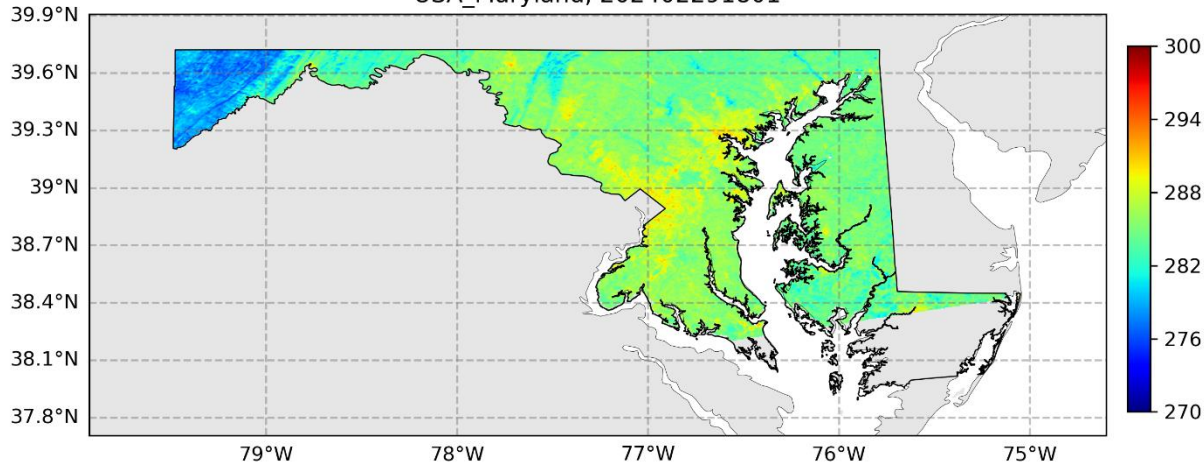
I-band VIIRS LST

M-band VIIRS LST

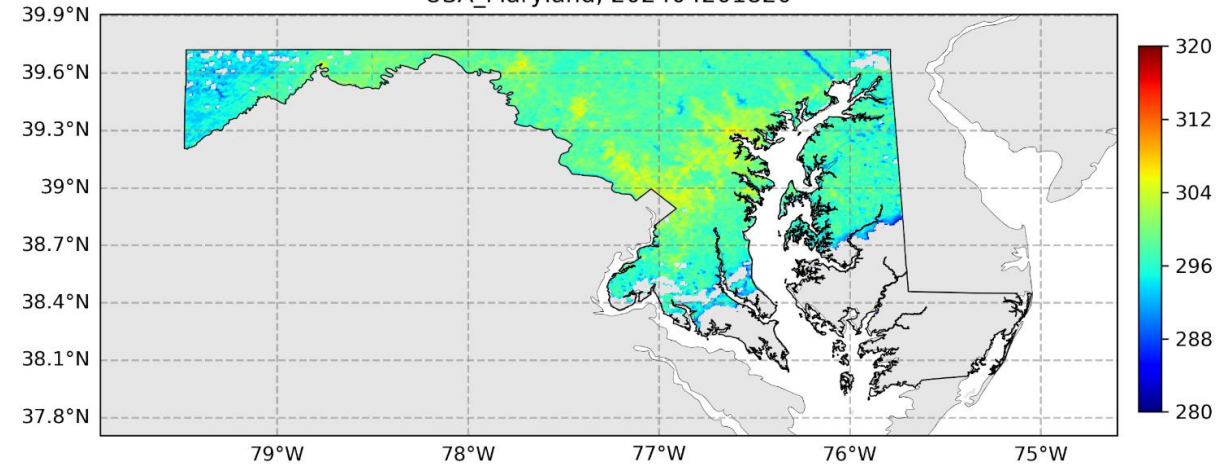
Milestones	Original Date	Forecast Date	Actual Completion Date	Variance Explanation
LSE update DAP delivery	Aug-23	Oct-23	Oct-23	
NOAA-21 data monitoring, evaluation and provisional maturity review	Oct-23	Jan-24	Jan-24	
CCAP Initial Delivery - All weather LST	Oct-23	Feb-24		deferred due to scientific R2O challenges
SDR and EDR Support to JPSS-3 Data System Test Event in early 2024	Feb-24	Apr-24		No testing is required this year. The JCT events for J3 don't start until next year.
Experimental Development of high spatial resolution LST	Oct-23	May-24		
SDR and EDR Enterprise Cal/Val Plan Initial Updates	Apr-24	Jun 28-24		
CCAP final delivery-All weather LST	Jan-24	Jul-24		
SDR and EDR Enterprise Cal/Val Plan and Algorithm Update Peer Review Meeting	Apr-24	Aug 30-24		
Monitoring and Anomaly watch, analysis and report	Oct-23	Sep-24		

I-band VIIRS LST Sample Image

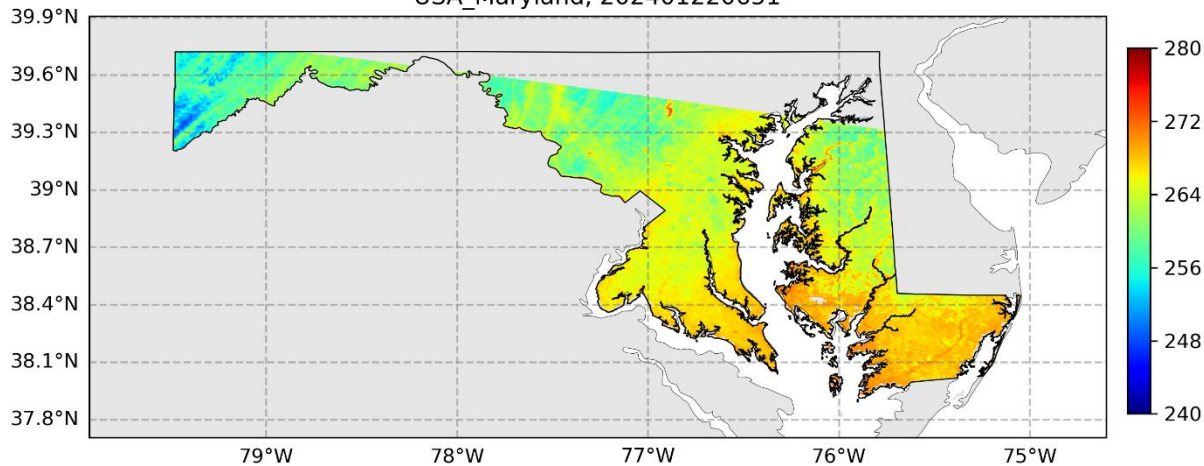
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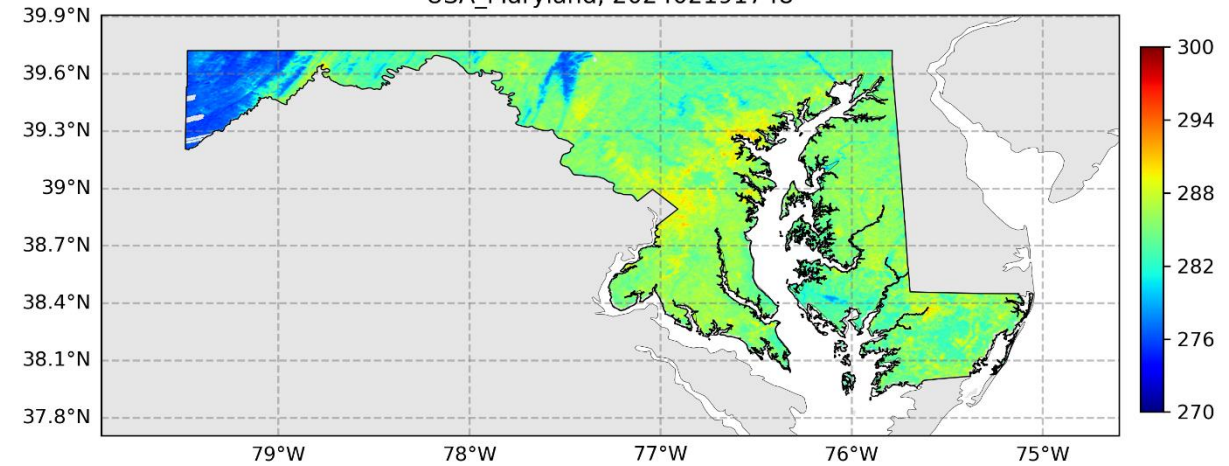
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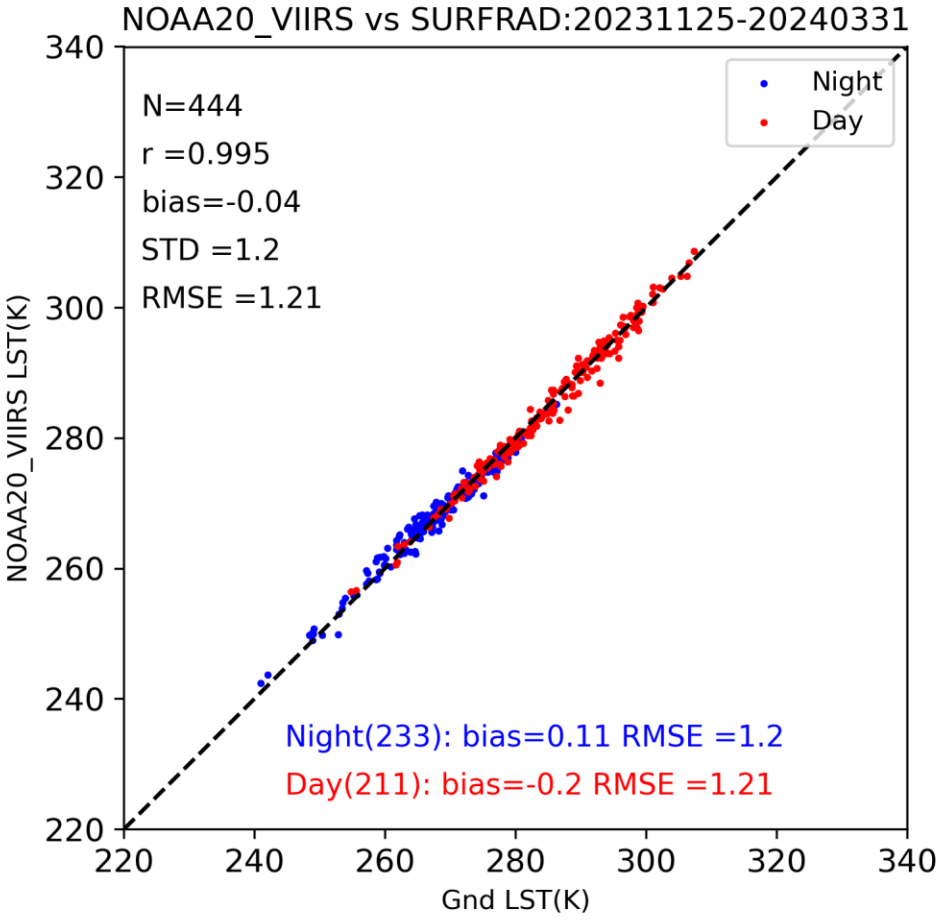
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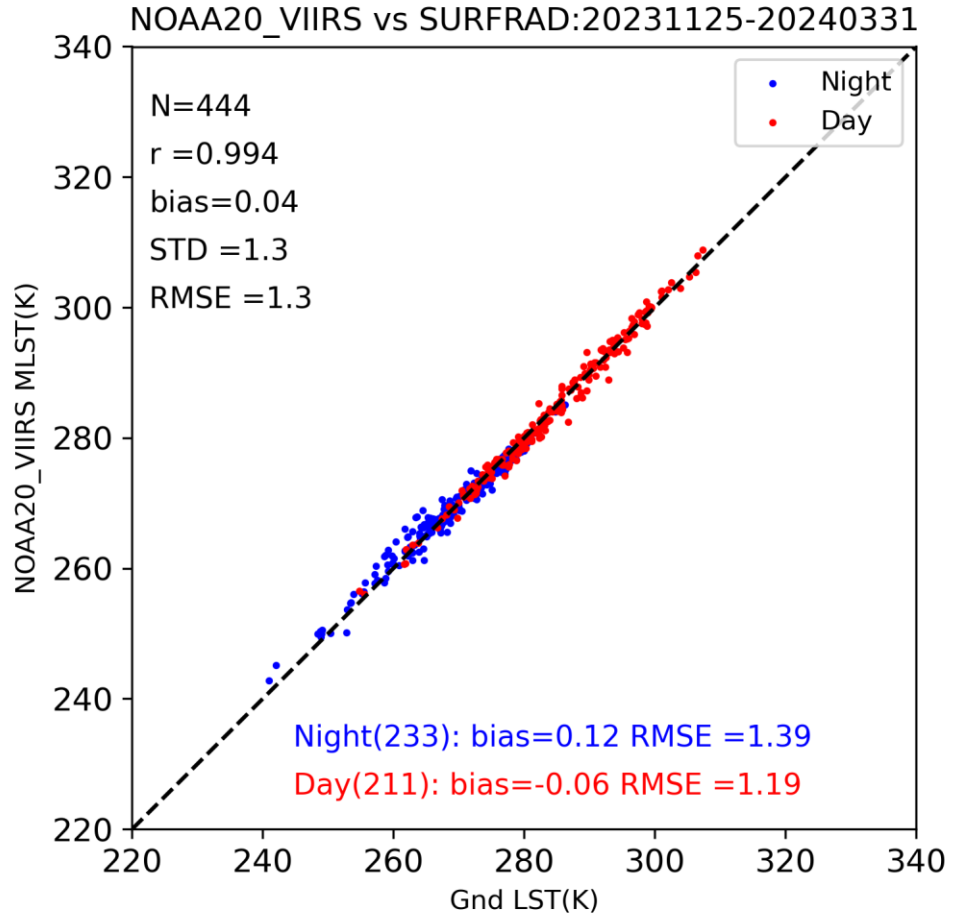
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NOAA-20 I-band LST Validation against SURFRAD



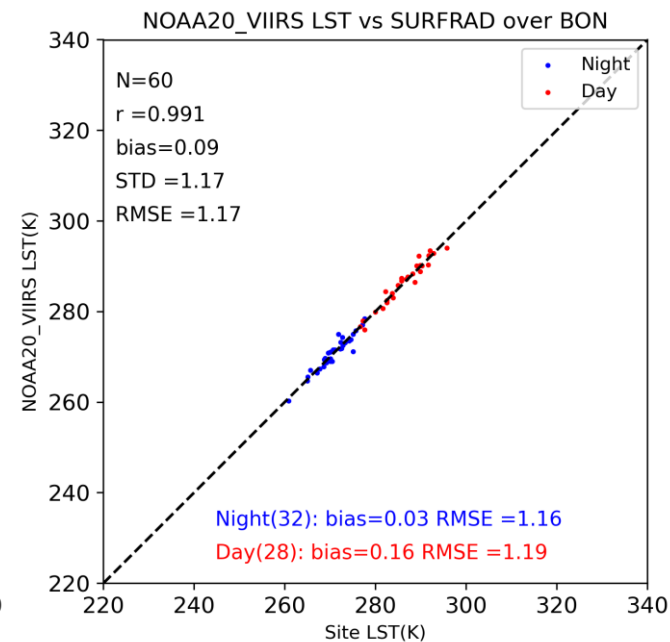
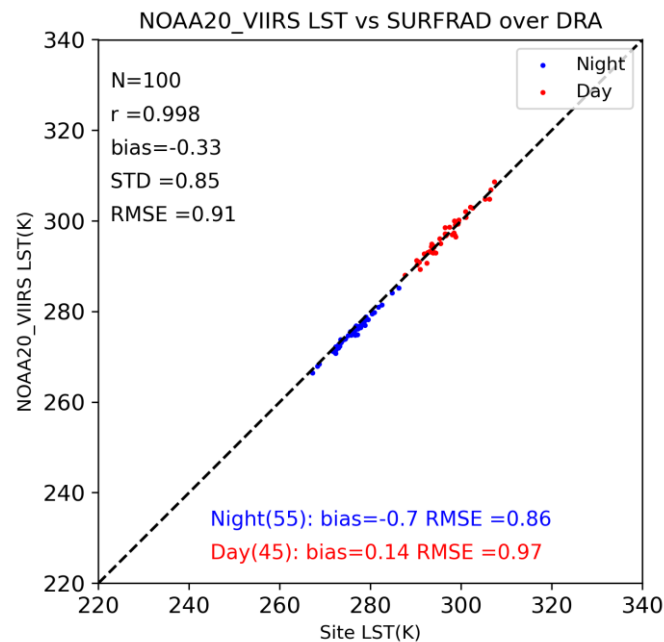
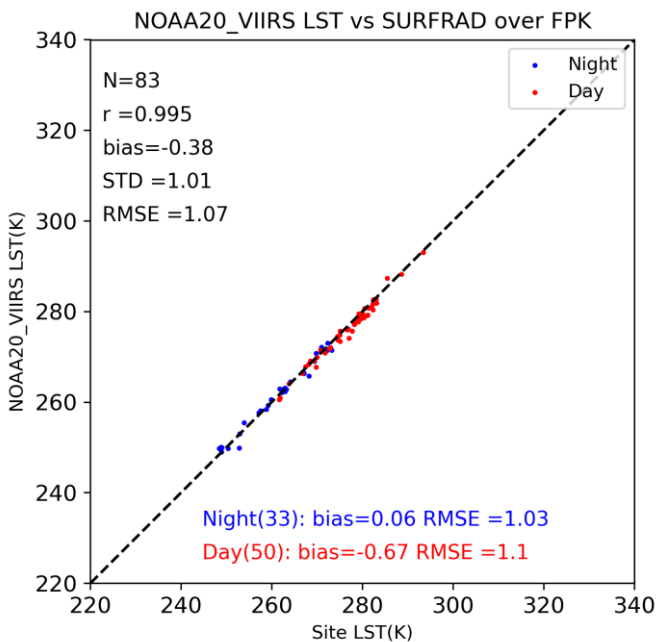
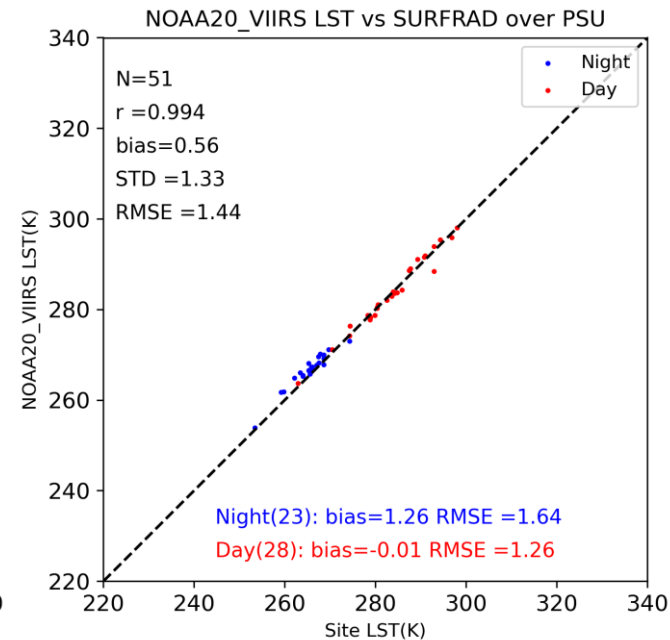
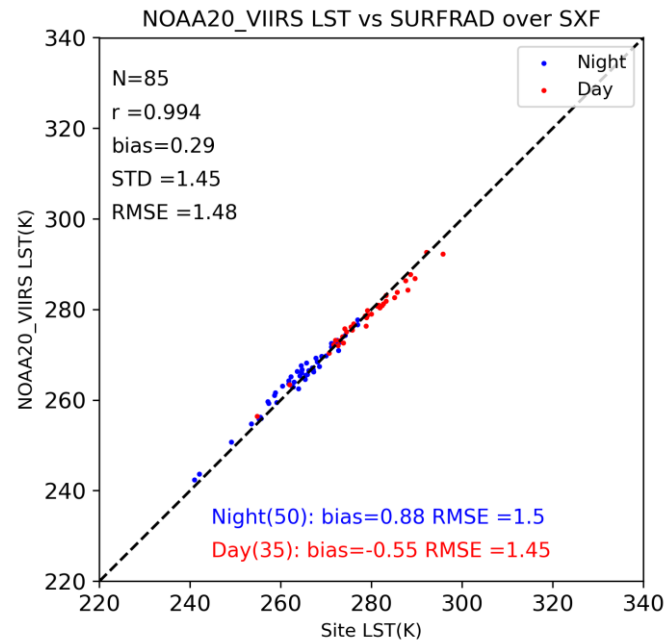
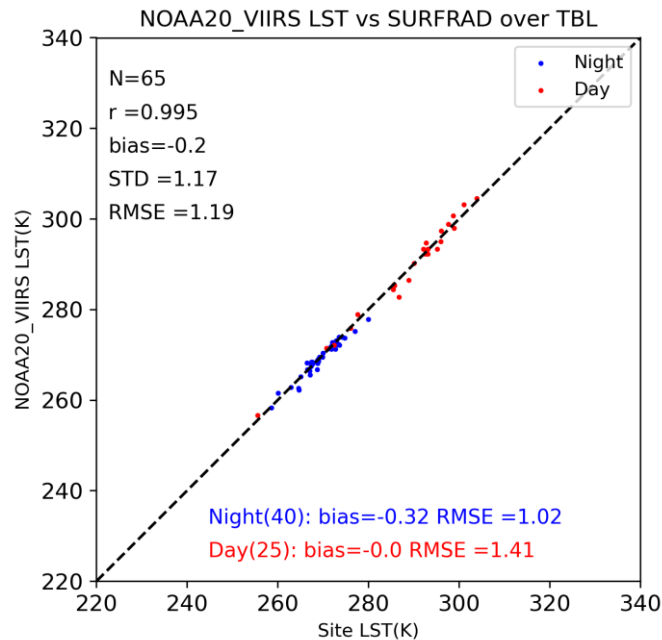
I-Band VIIRS LST



M-Band VIIRS LST

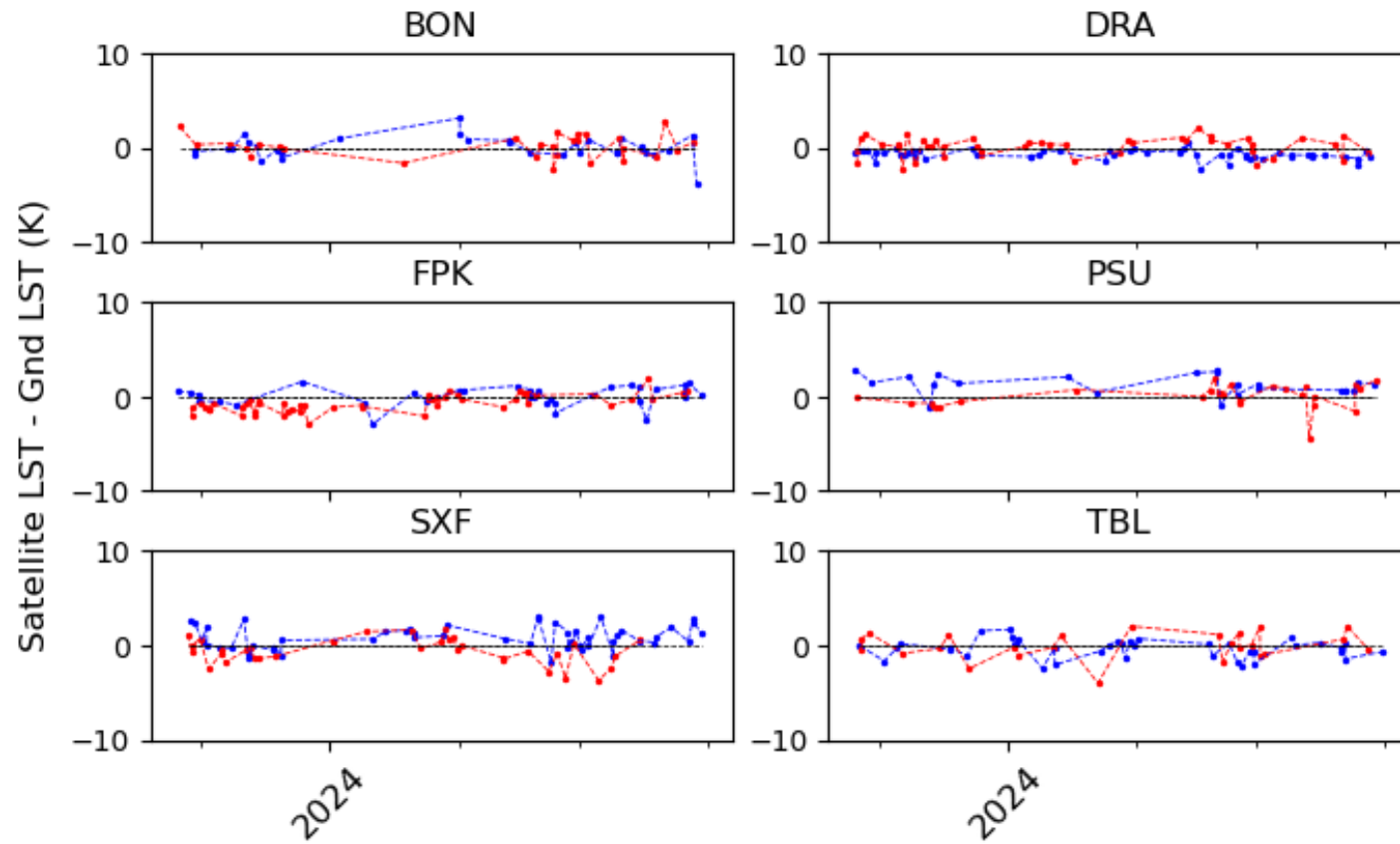
- The validation covers the time period from Nov. 25, 2023 to March 31, 2024.
- Overall it yields a good validation results with a bias close to 0 and a STD of 1.2 K. Both daytime and nighttime show small biases.
- The statistics for I-band LST and M-band LST are similar.

I-band LST Validation against SURFRAD

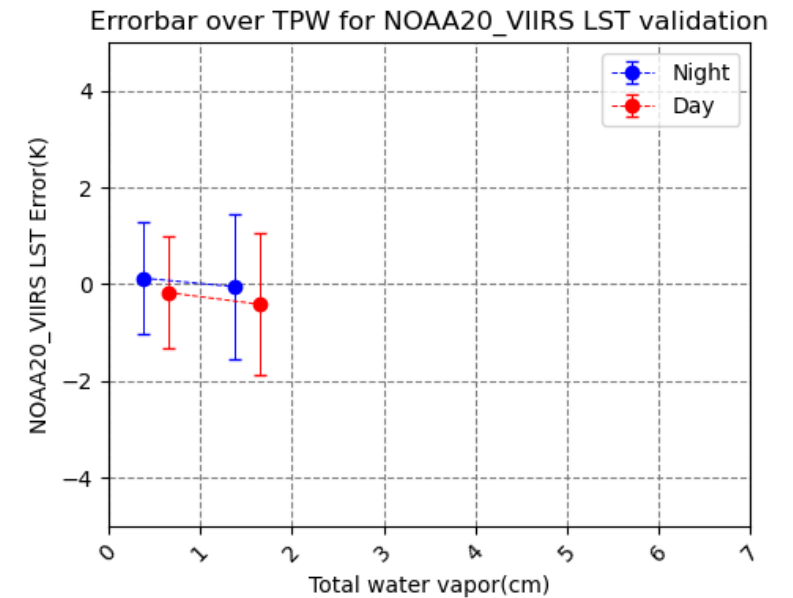
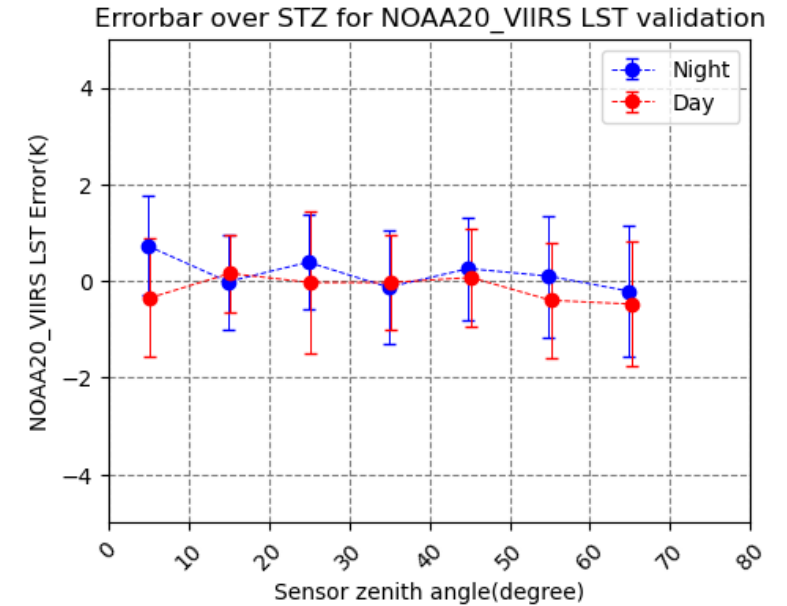


Sitewide LST validations show good results across all SURFRAD stations, both during the day and at night.

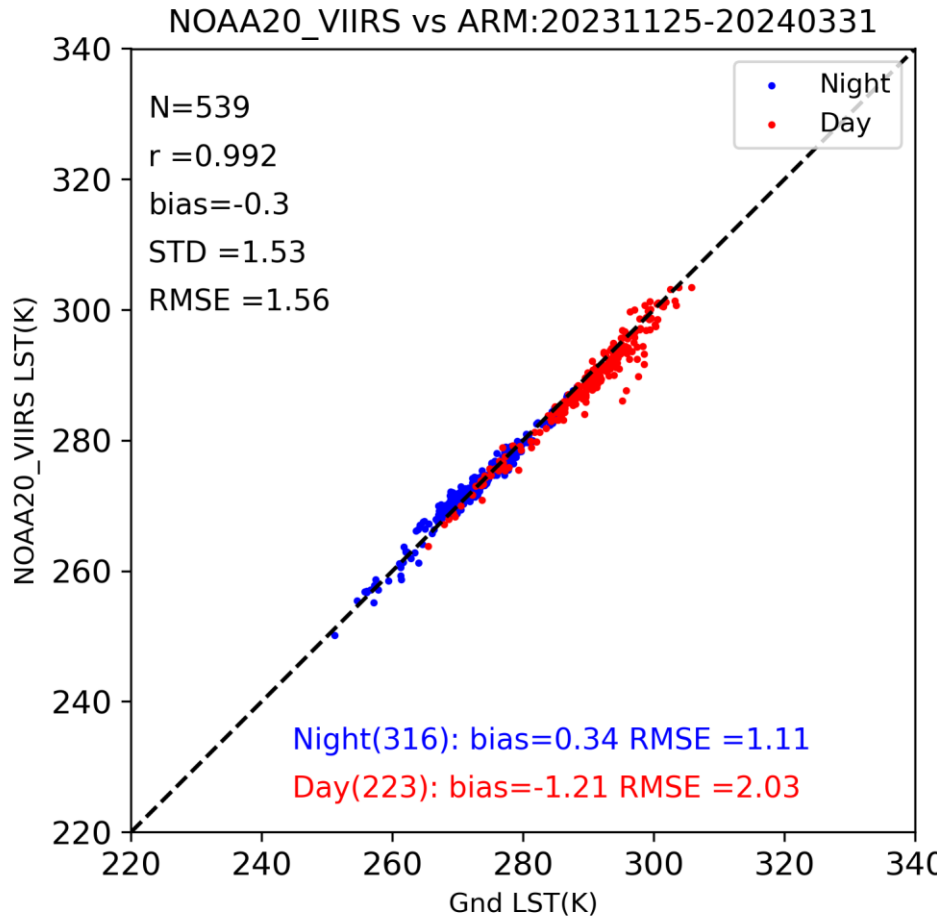
Time series Results



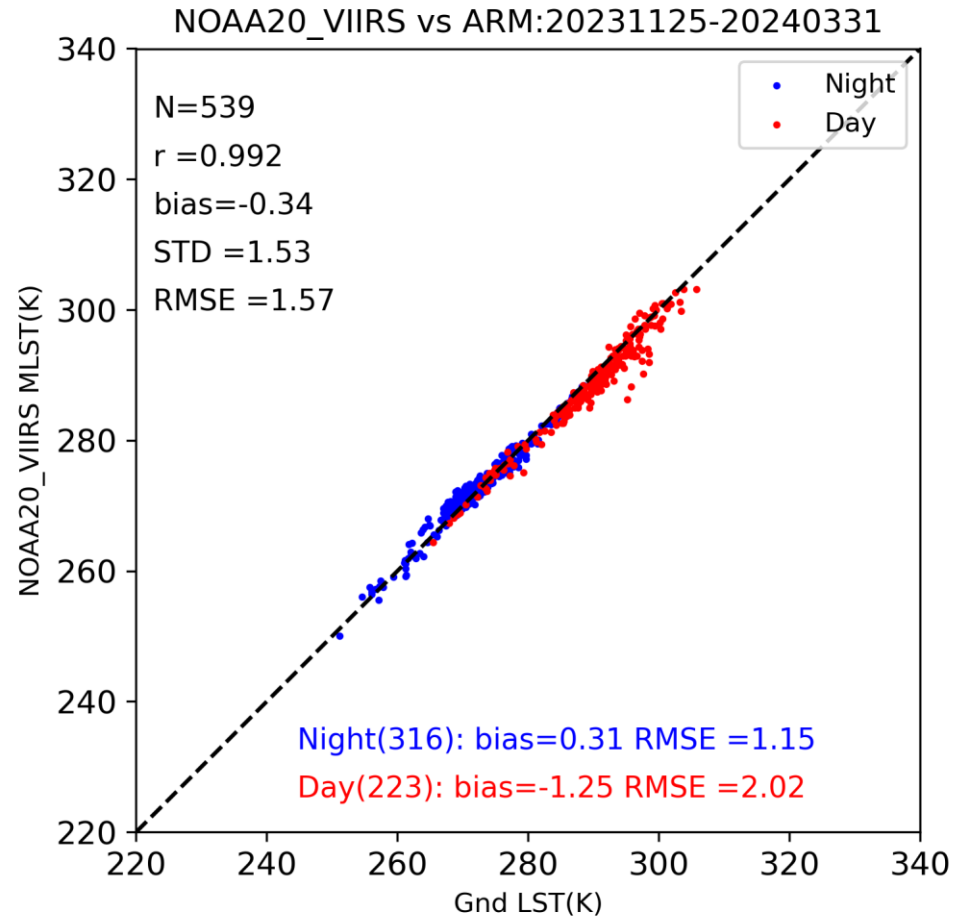
- The time series plots indicate stable performance, as well as good agreement with ground observations over all stations.
- Periodic relatively large negative bias are observed, possibly attributed to cloud contamination.



I-band LST Validation against ARM



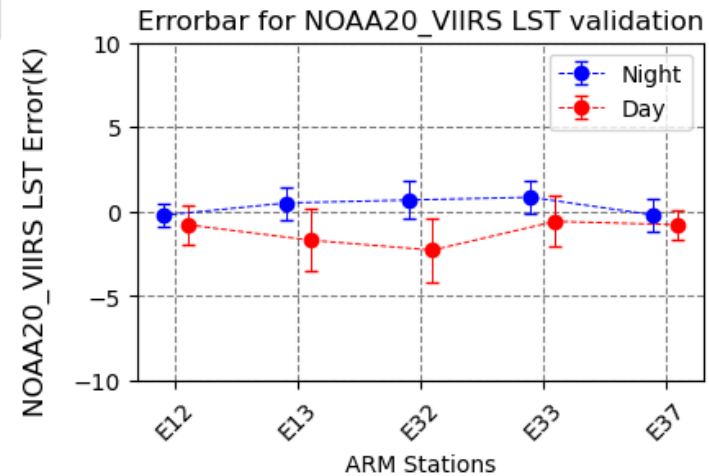
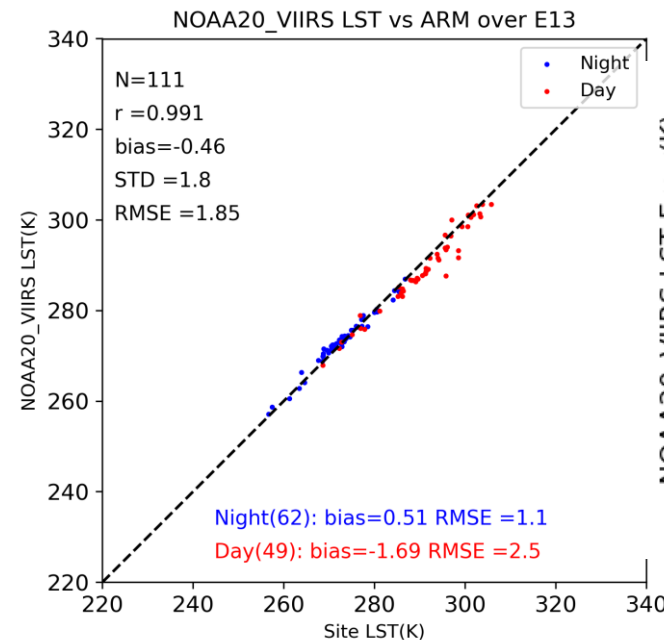
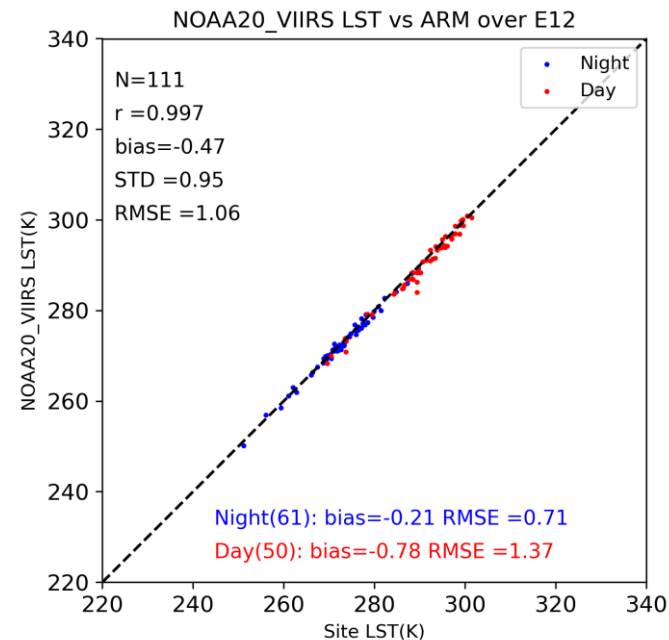
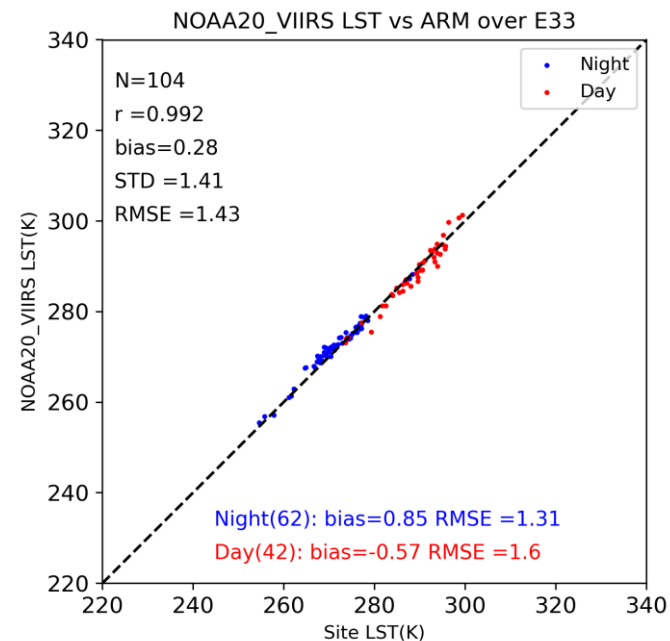
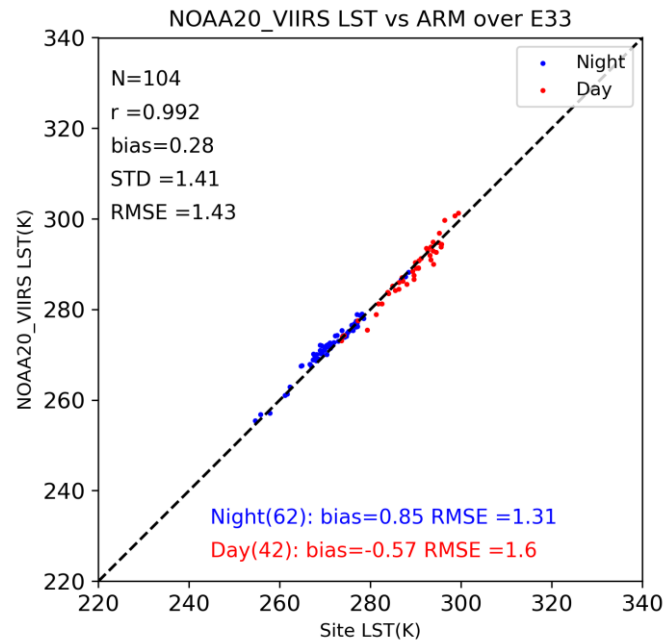
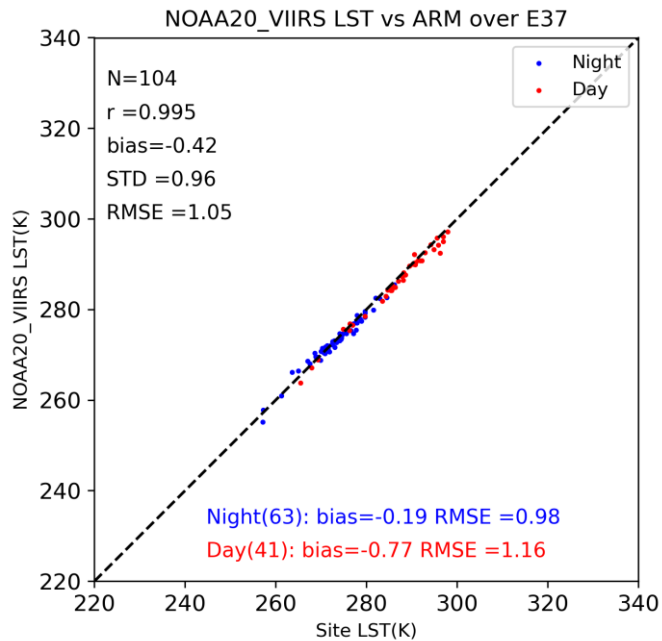
I-Band VIIRS LST



M-Band VIIRS LST

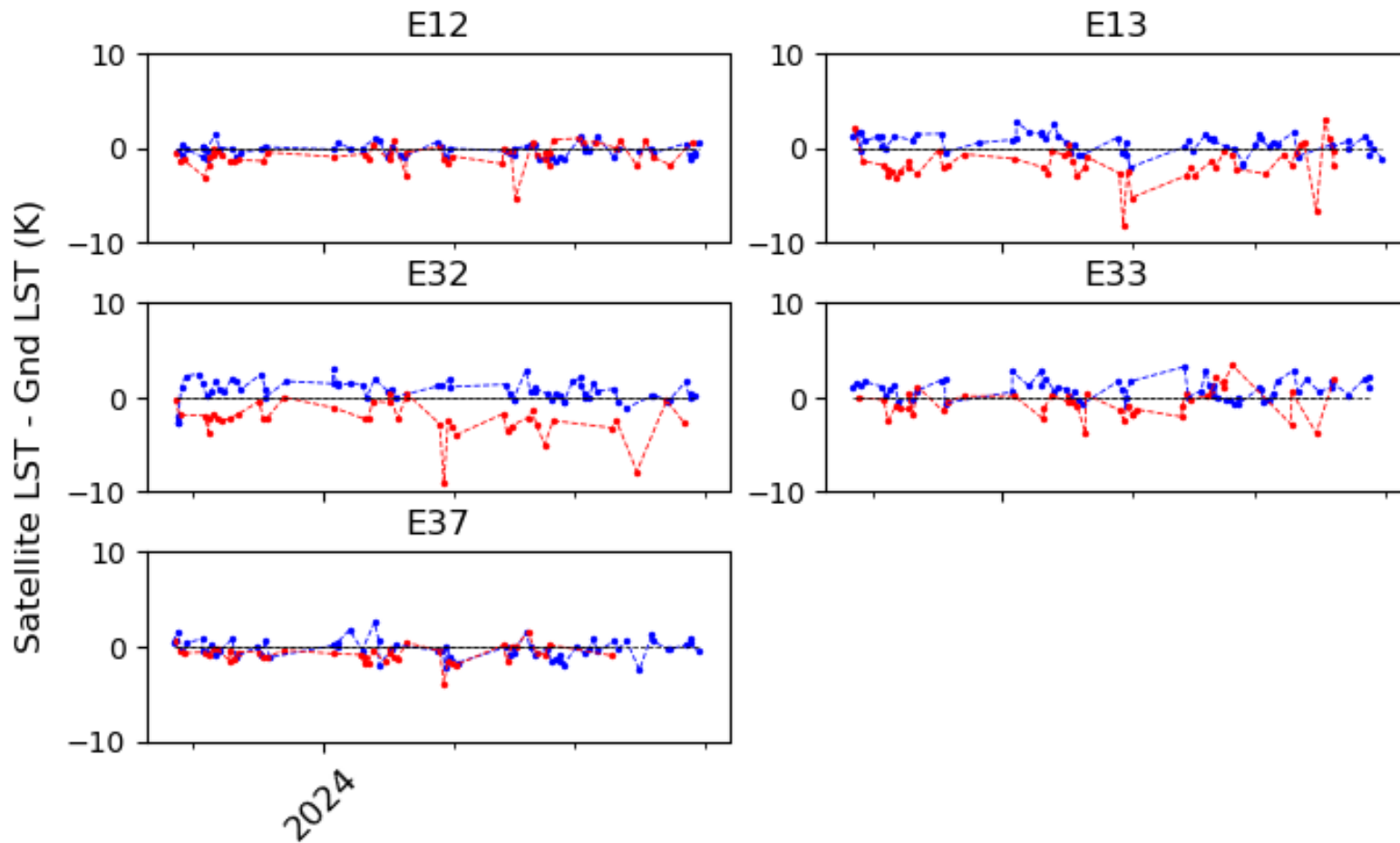
- The validation covers the time period from Nov. 25, 2023 to March 31, 2024.
- Overall it yields a good validation results with a bias close to -0.3 K and a STD of 1.56 K. Nighttime shows a bias of 0.3 K, while daytime shows a negative bias of 1.2 K.
- The statistics for I-band LST and M-band LST are very similar.

I-band LST Validation against ARM

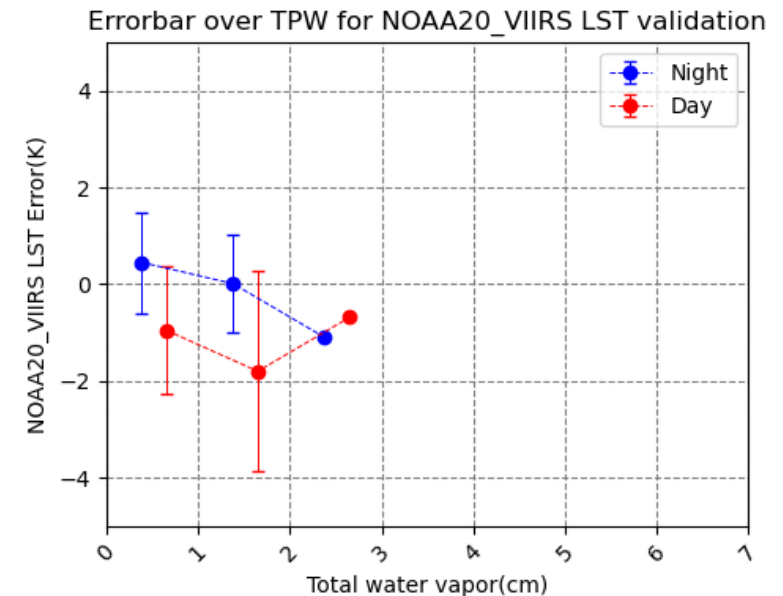
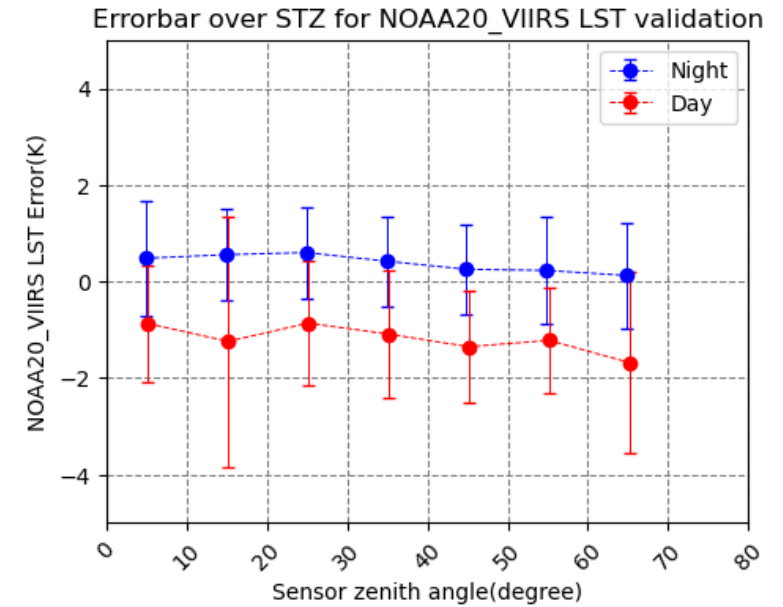


- Sitewide results indicate that two stations, E13 and E32 exhibit significant negative bias during daytime.
- The other three stations show negative bias but are insignificant.

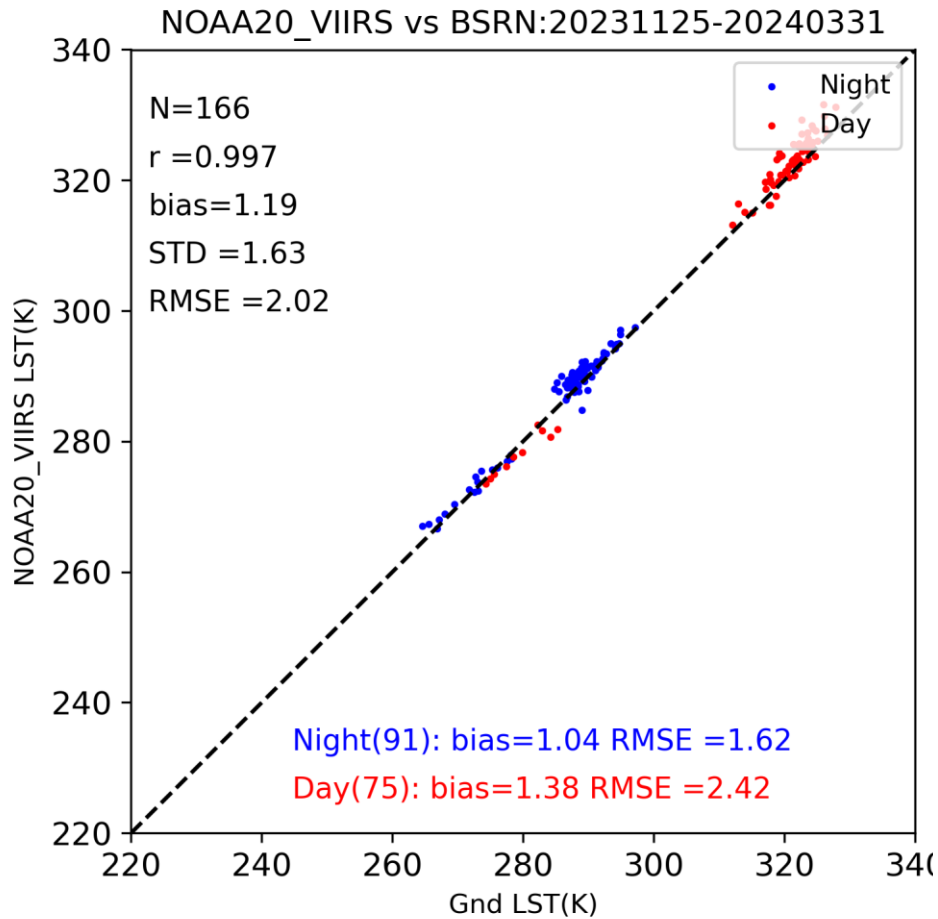
I-band LST Validation against ARM



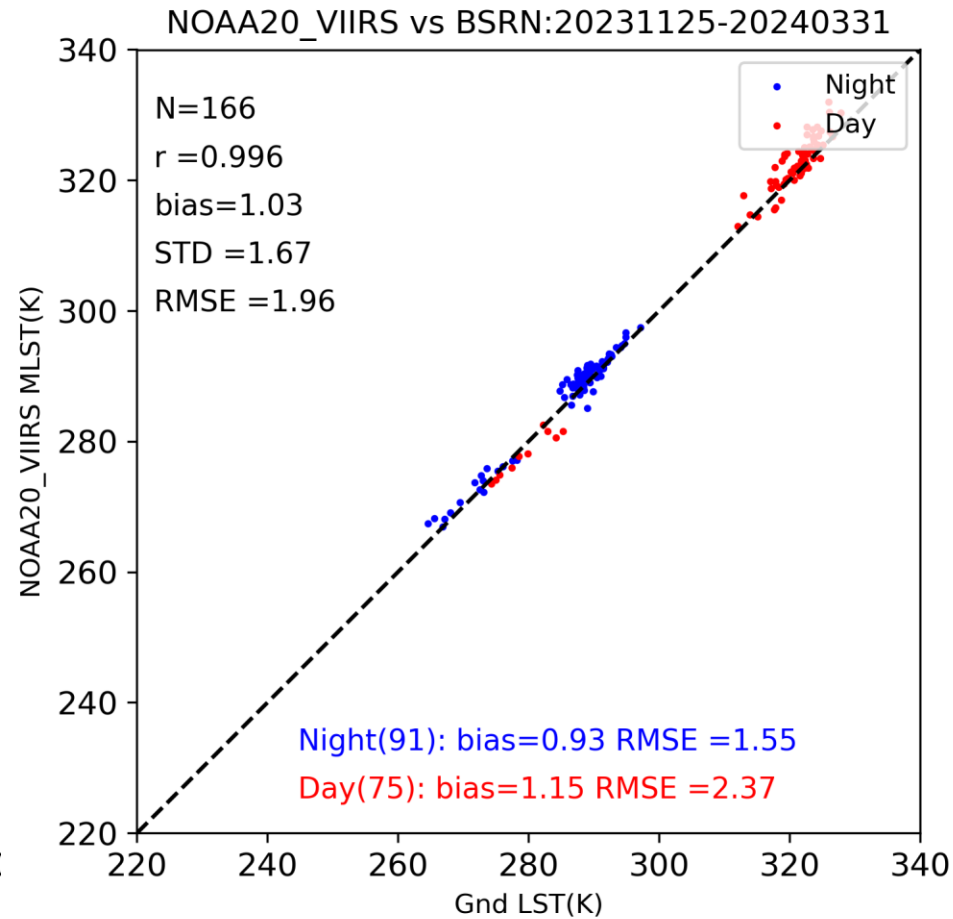
- It appears that the negative bias has been increasing since Feb. 2024 over E32 and E13 stations.
- The bias remains negative across the entire range of sensor zenith angle and tpw ranges during daytime, whereas it fluctuates between positive and negative during nighttime.



I-band LST Validation against BSRN



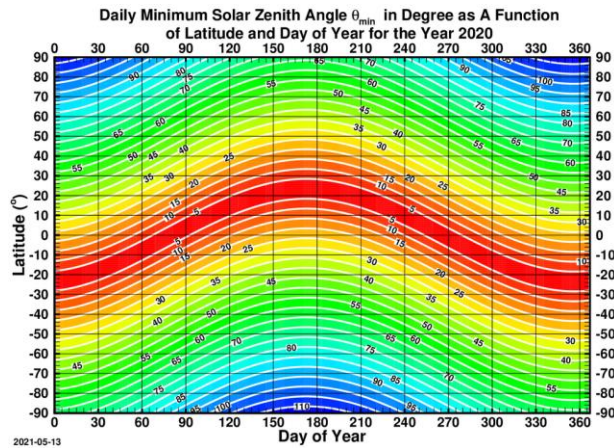
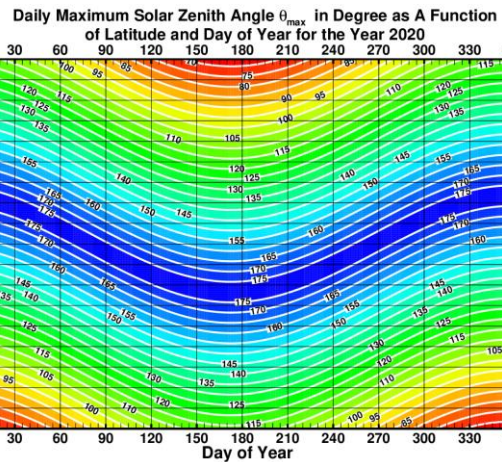
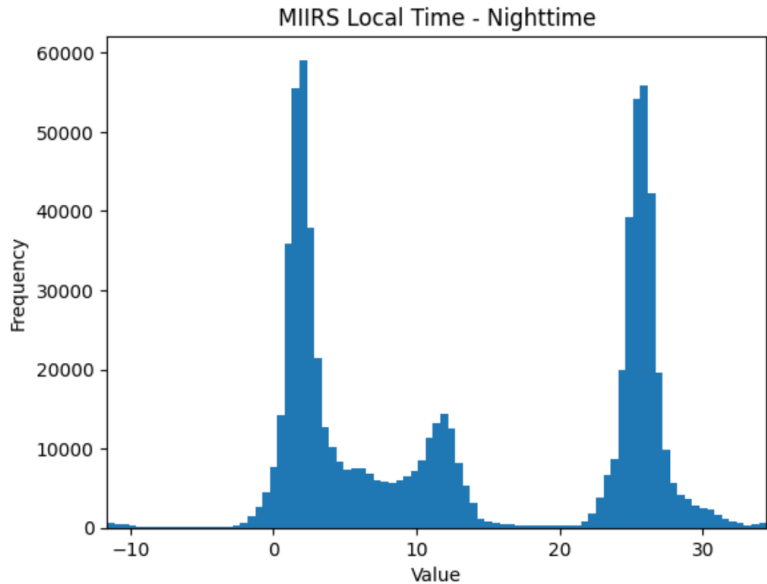
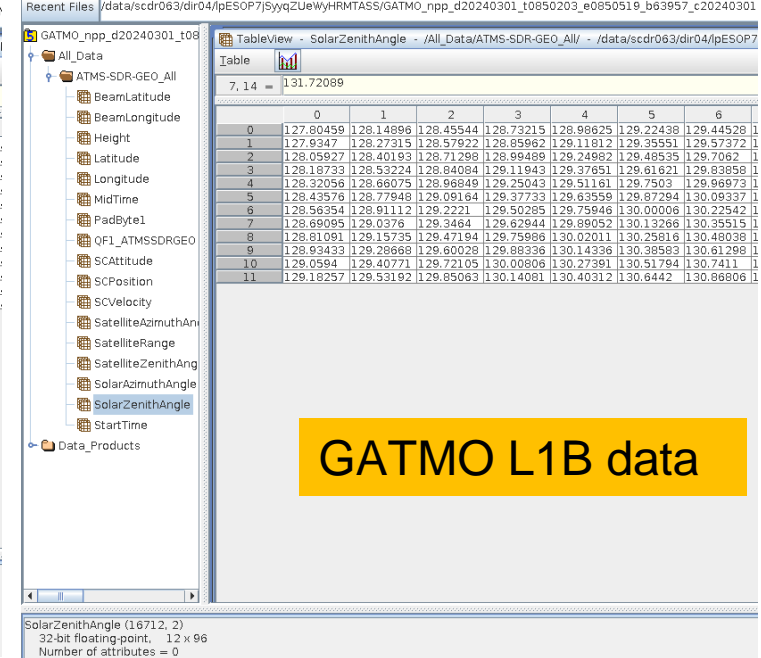
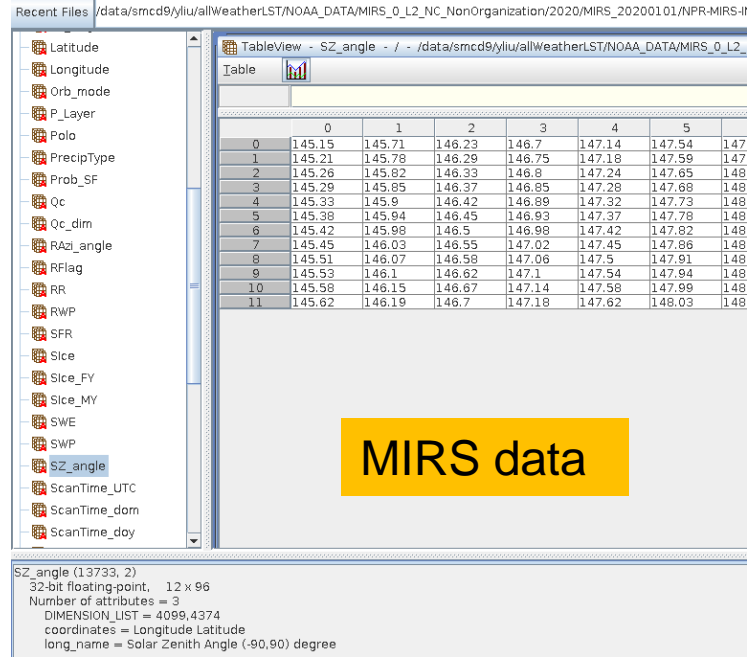
I-Band VIIRS LST



M-Band VIIRS LST

- The validation covers the time period from Nov. 25, 2023 to January 31, 2024.
- Overall it yields a positive bias of 1.19 K and a STD of 1.63 K.
- Daytime exhibits a significant positive bias of 1.38 K, while the nighttime shows a positive bias of 1.04 K.
- The statistics is slightly worse than the M-band LST

MIRS Data Issue



*From Christopher Grassotti, MIRS POC

- Reviewed the software code for the day/night condition determination and temporal information processing.
- Investigated the MIRS data and found that the solar zenith angle attributes are set to $[-90,90]$, but it has value over 90 degrees as well. Further investigated the associated L1B data and has confirmed the issue with solar zenith angle in MIRS.
- Updated the code for day/night condition identification.

Accomplishments / Events:

- Perform the verification and validation demo for LAI product, figure out the product monitoring methodology in operational stage.
- Keep working on the LAI validation, including the inter-comparison with existing product such as MODIS LAI, and the in-situ validation mainly using the NEON network measurements.
- Collect the feedback and concern from the EMC Noah-MP model team, mainly working on the annual LAI range in boreal forest, surface type consistency issue, and the vegetation fraction dataset which is used to derive vegetation coverage LAI from the pixel/grid average LAI.
- Work on the LAI temporal smoothing and gap filling algorithm improvement, will test the deep learning method feasibility in operational product.

Overall Status:

	Green ¹ (Completed)	Blue ² (On-Schedule)	Yellow ³ (Caution)	Red ⁴ (Critical)	Reason for Deviation
Cost / Budget		X			
Technical / Programmatic		X			
Schedule		X			

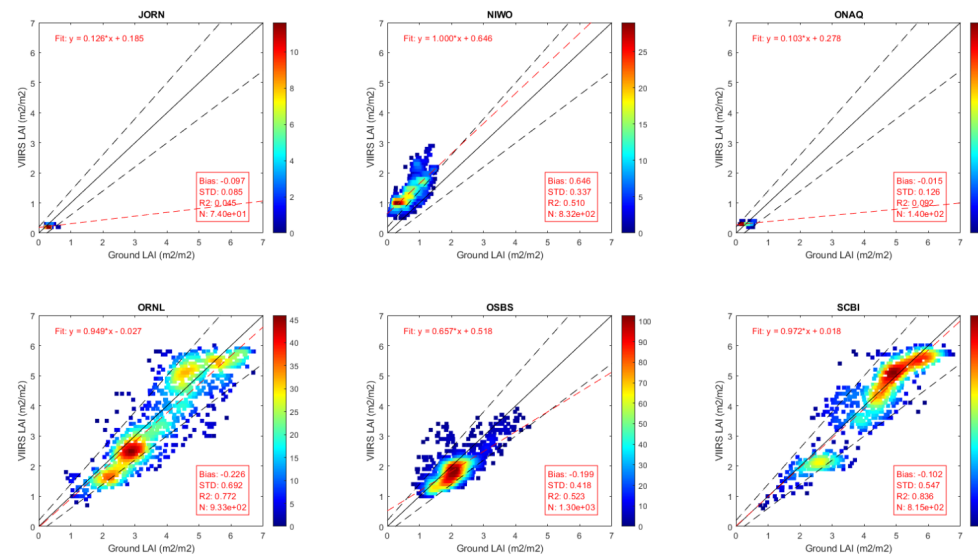
- Project has completed.
- Project is within budget, scope and on schedule.
- Project has deviated slightly from the plan but should recover.
- Project has fallen significantly behind schedule, and/or significantly over budget.

Issues/Risks:

None

Highlights:

Milestones	Original Date	Forecast Date	Actual Completion Date	Variance Explanation
CCAP Initial Delivery	Sep-23	Sep-23	Sep 26, 2023	
LAI product preliminary in-situ validation and inter-comparison	Nov-23	Nov-23	Nov 25, 2023	
CCAP final Delivery	Feb-24	Feb-24	Apr 1, 2024	
Incorporate the LAI test data into the LSM model to evaluate the performance in the model	May-24	May-24		
Operational readiness	Jul-24	Jul-24		
Develop LAI routine monitoring and validation tool	Sep-24	Sep-24		



- DHP Data Collection Protocol
 - Location: Global (47), CONUS(19)
 - Timing:
 - Annual: From onset to cessation, every two weeks (approximate), 3 measurements.
 - 3-Year: distributed & gradient analysis. 5-20 measurements.
 - Methodology:
 - Digital hemispheric photo (DHP), upward/downward photos
 - Image derived gap fraction, derive LAI based on its relationship with gap fraction.

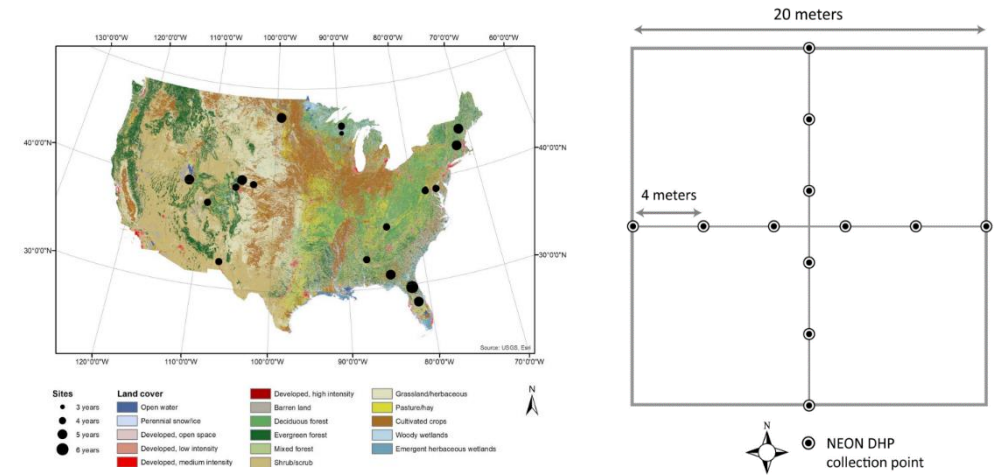


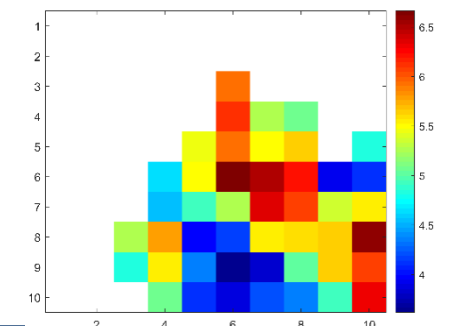
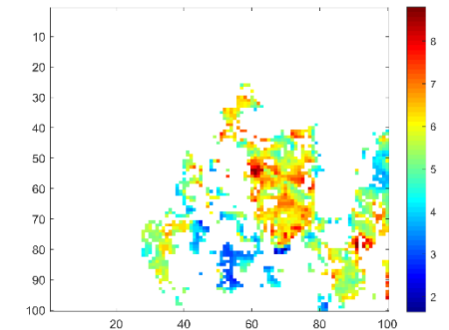
Figure: Brown, 2020

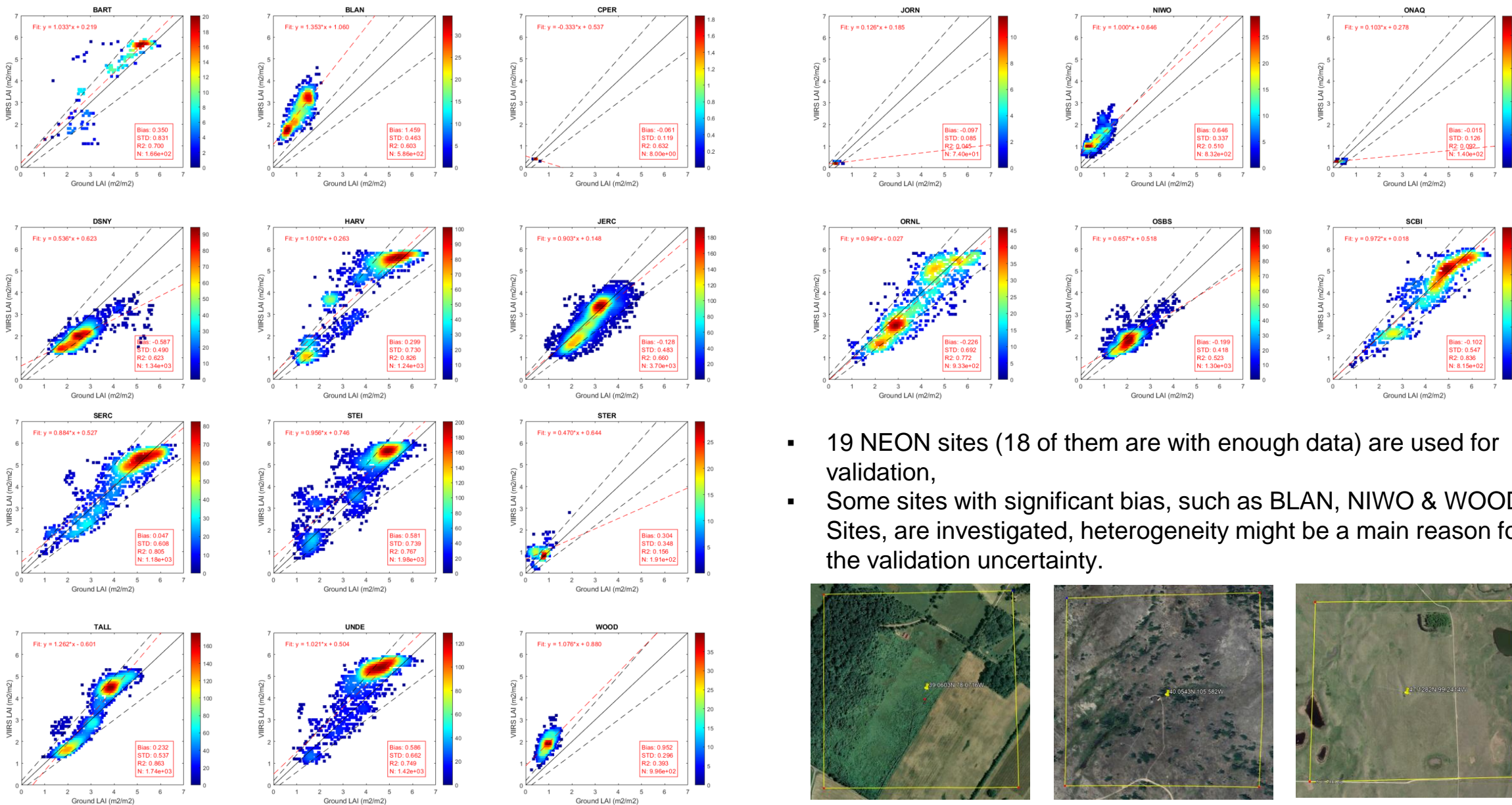
Derive LAI from DHP

$$PAI = -2 \overline{\ln P(\theta_{57.5^\circ})} \cos \theta_{57.5^\circ} = \frac{-\ln P(\theta_{57.5^\circ})}{0.93}$$

Nadir to 57.5 will be used, mean of natural logarithm of gap fraction values over all azimuth cells.

- Use PAI (leaf + woody) as a proxy for LAI.
- Clumping effect is corrected to get the true LAI rather than effective LAI.
- Understory LAI part in forest sites is included
- Scaling up from ground level (20*20m) to satellite scale
 - Using high resolution satellite data (Landsat 8, Sentinel-2) as a bridge
 - Derive high resolution (20/30m) LAI from L8/S2, calibrated using ground LAI.
 - Aggregation to coarse resolution for validation.



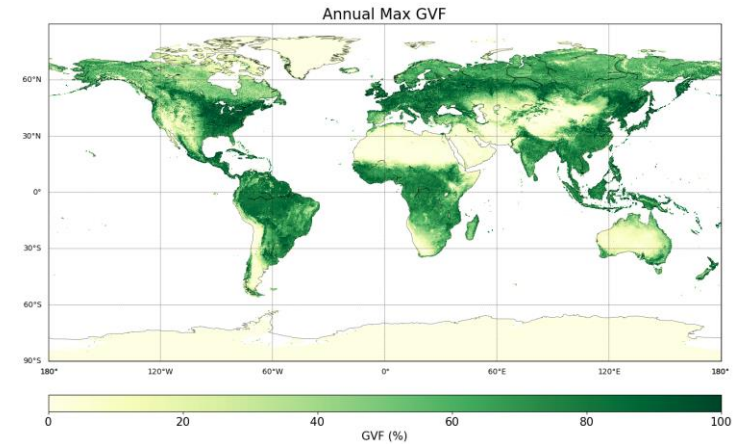


- 19 NEON sites (18 of them are with enough data) are used for validation,
- Some sites with significant bias, such as BLAN, NIWO & WOOD Sites, are investigated, heterogeneity might be a main reason for the validation uncertainty.



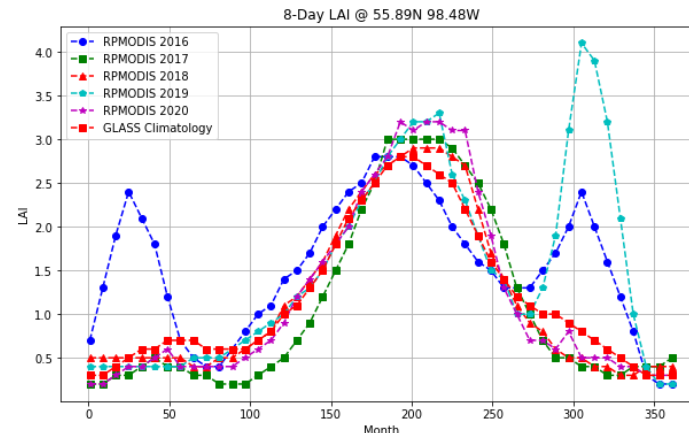
- Vegetation Fraction

- Vegetation Fraction (g) is required to convert Pixel/Grid LAI into Canopy LAI (LAI_0) in Noah-MP. As right figure shows.
- The vegetation fraction used as a static value and be consistent with LAI. A machine learning method is designed to retrieve the annual vegetation fraction from some input SR as LAI.



- Boreal Forest LAI Range

- Investigate how LAI is derived during the polar night (low sun condition)
- Evaluate the LAI annual range through inter-comparison between products and in-situ validation (summertime only)
- For the wintertime lower LAI, the possible reasons might be:
 - Understory vegetation vanish in winter.
 - Snow coverage could also reduce the LAI (algorithm improvement)



Boreal forest covered by snow

Boreal Forest Case: Canada

Accomplishments / Events:

- With the support of the JPSS Proving Ground Risk Reduction (PGRR) Hydrology Initiative the MiRS science team has now reprocessed SNPP ATMS data from 2012-2020, and NOAA-20 ATMS data from 2018-2020 using a single up-to-date version of the MiRS algorithm. Analysis of the reprocessed TPW trends from SNPP were previously reported on. This work has now been summarized in a manuscript by Yan Zhou (ESSIC) and co-authors titled "Evaluation of Total Precipitable Water Trends from Reprocessed MiRS SNPP ATMS Observations, 2012-2021", which was submitted to IEEE Journal of Select Topics in Earth Observations and Remote Sensing this month. In addition, preliminary analysis has begun on the reprocessed precipitation rates from SNPP for the same time period. Some of this work was presented by S. Liu at the recent MicroRad 2024 conference in Alexandria, Virginia ("Assessment of MiRS SNPP/ATMS Precipitation Retrievals During 2012-2020 Using the UMD/CISESS/NOAA Reprocessed Dataset"). The highlights show a comparison of mean 2012-2020 daily precipitation rate from the multisource Global Precipitation Climatology Project product and the reprocessed MiRS SNPP ATMS data. Good qualitative agreement is seen (correlation of 0.92), despite the fact that only a single satellite was used to derive the MiRS climatology.

Overall Status:

	Green ¹ (Completed)	Blue ² (On-Schedule)	Yellow ³ (Caution)	Red ⁴ (Critical)	Reason for Deviation
Cost / Budget	x				
Technical / Programmatic	x				
Schedule	x				

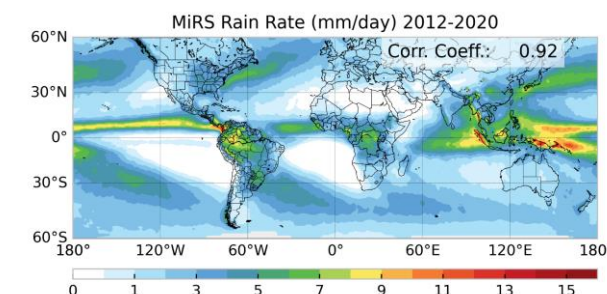
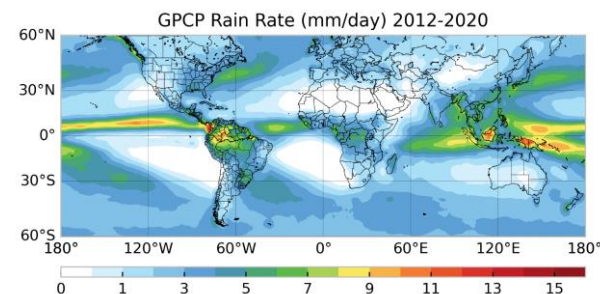
- Project has completed.
- Project is within budget, scope and on schedule.
- Project has deviated slightly from the plan but should recover.
- Project has fallen significantly behind schedule, and/or significantly over budget.

Issues/Risks:

None

Milestones	Original Date	Forecast Date	Actual Completion Date	Variance Explanation
NOAA-21 MiRS products from J2-Ready MiRS algorithm in support of ATMS TDR/SDR Beta Maturity	Nov-22	Nov-22	Nov-22	
NOAA-21 MiRS products from J2-Ready MiRS algorithm in support of ATMS TDR/SDR Provisional Maturity	Dec-22	Dec-22	Dec-22	
NOAA-21 MiRS product validations, Beta Maturity	Mar-23	May-23	Apr-23	Accelerated following JSTAR management request
NOAA-21 MiRS product validations, Provisional Maturity	Aug-23	Jun-23	Jun-23	Accelerated following JSTAR management request
MiRS DAP (v11.10): integrate SFR algorithm updates, code/science improvements, final J2 launch delivery	Feb-24	Feb-24	Mar-24	Delivered as per ASSISTT schedule.

Highlights:



Comparison of mean daily precipitation rate (mm/day) from 2012-2020 based on Global Precipitation Climatology Project (GPCP) and MiRS reprocessed SNPP ATMS data. The spatial correlation coefficient between the two datasets is 0.92.

Accomplishments / Events:

- The JSTAR Team added NOAA-21 VIIRS Granules, along with several other NOAA-21 products, to JSTAR Mapper starting at the end of April and is backfilling the granules for the past 3 months using STAR's SCDR data storage; the plan is to backfill the entire granule record for the lifetime of NOAA-21 using cloud based storage provided by Amazon Web Services as a testbed for cloud-based data retrieval system in STEMS. **HIGHLIGHT**
- NPROVS staff working with the NUCAPS and OSPO teams initiated the integration of NUCAPS NOAA-21 v3.2 sounding profile EDR's dating back to early April into NPROVS; the operational implementation of NOAA-21 v3.2 is scheduled for early May
- NPROVS staff reprocessed and eliminated extended "collocation" data gaps for the periods February 4-12 and March 5-18, 2024 in the NPROVS Radiosonde and Satellite Observation collocation data record
- The NPROVS team supporting NWS/NASA/JPL efforts to create "NUCAPS / Forecast" profiles verified the integration into NPROVS of a single day test data set of profiles for NOAA-20 and MetOp-C dated May 25, 2023; the transfer, integration and checkout of two months of 2023 data per satellite stored on google drive is now underway

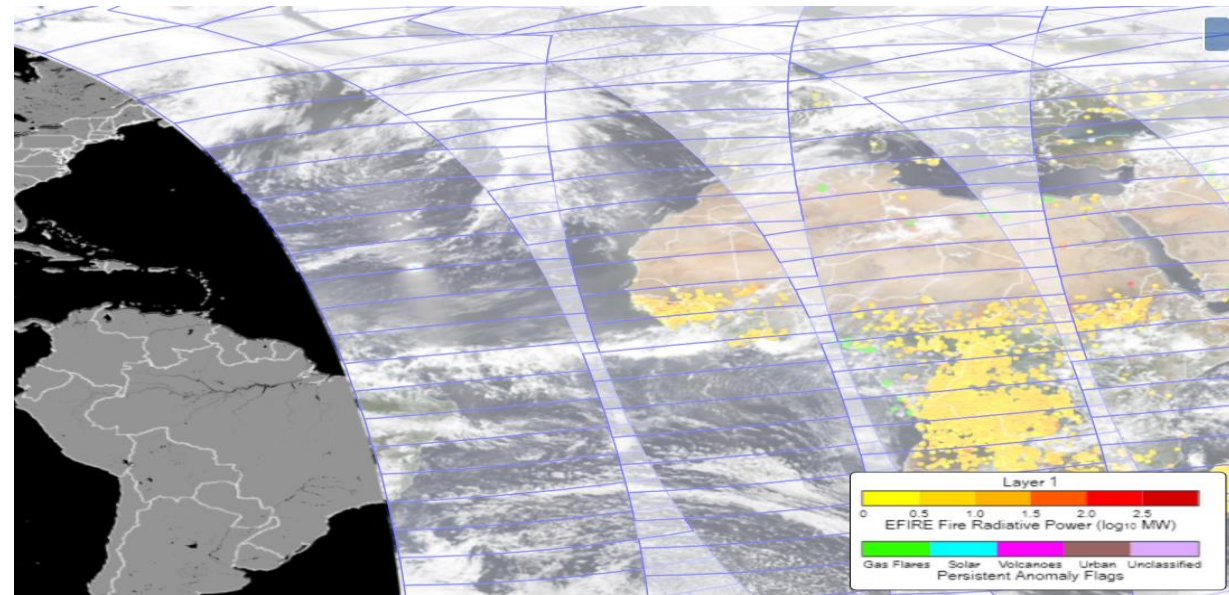
Overall Status:

	Green ¹ (Completed)	Blue ² (On-Schedule)	Yellow ³ (Caution)	Red ⁴ (Critical)	Reason for Deviation
Cost / Budget		X			
Technical / Programmatic		X			
Schedule		X			

- Project has completed.
- Project is within budget, scope and on schedule.
- Project has deviated slightly from the plan but should recover.
- Project has fallen significantly behind schedule, and/or significantly over budget.

Issues/Risks: None

Highlights



"VIIRS True Color imagery overlaid with NOAA-21 VIIRS Enterprise Fire (colored dots) and VIIRS granules (overlapping white rectangles) from 1600 UTC May 6, 2024.

Milestones	Original Date	Forecast Date	Actual Completion Date	Variance Explanation
CPC Morphing (CMORPH) technique transferred from JSTAR Mapper to STEMS	Q2	Q2		
NPROVS Special expanded to integrate advanced GRUAN CFH moisture radiosonde	Q4	Q4		
JPSS Dedicated Radiosonde Programs expanded to include new Bankhead National Forest (BNF) ARM site in northwest Louisiana	Q3	Q3		
NPROVS User Support expanded to integrate new NWS NUCAPS-Forecast Product	Q3	Q3		
NPROVS supports maturity review leading to operational NUCAPS for NOAA-21	Q2	Q2	Q2	

Accomplishments / Events

- Continued 'one-day a week' focus day data collection and processing of validation data sets for AVTP, AVMP, O3, OLR, CO, CH4, and CO2.
- Completed a 10 month-long bias study between NOAA-20 CERES and NOAA-21 CrIS OLR, NOAA-20 CERES and NOAA-20 CrIS OLR, and Terra CERES and MetOp-C IASI OLR. Results of evaluation show that the NUCAPS OLR products from both JPSS and MetOp series meet the requirements (Figure 1).
- Initiated efforts toward:
 - Mission-long reprocessing of S-NPP/NOAA-20 NUCAPS products on NCIS using the NUCAPS v3.2 that includes the addition of averaging kernels: Provided a work plan to initiate reprocessing using focus day data sets to estimate processing time for each day and to verify with the offline in-premises server runs for code and product integrity.
 - Revisiting MetOp-B retrievals: NUCAPS team initiated efforts to generate updated clear and cloudy regression LUTs removing some of the AMSU-A channels whose on-orbit noise exceeded specifications. Testing of the LUTs is in progress to eventually deliver these LUTs to NCCF to restore MetOp-B NUCAPS products.
 - AEROSE-2024 campaign data: Data sets acquired during the AEROSE-2024 campaign are being processed. Produced MATLAB scripts to load and quality control RAOBs. Evaluation of NUCAPS retrieval matches with the RAOBs show a good agreement.

Overall Status:

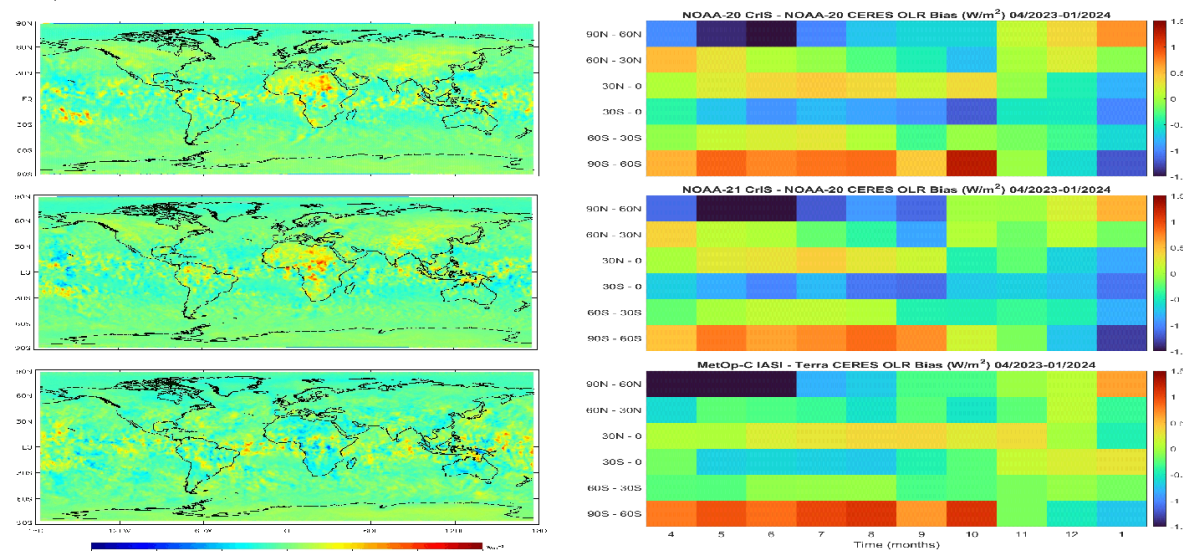
	Green ¹ (Completed)	Blue ² (On-Schedule)	Yellow ³ (Caution)	Red ⁴ (Critical)	Reason for Deviation
Cost / Budget		X			
Technical / Programmatic		X			
Schedule		X			

- Project has completed.
- Project is within budget, scope and on schedule.
- Project has deviated slightly from the plan but should recover.
- Project has fallen significantly behind schedule, and/or significantly over budget.

Issues/Risks:

None

Figure: Ongoing OLR validation using CERES shows good agreement between NOAA-20/21 and NOAA-20 CERES, and MetOp-C IASI and Terra CERES.



Milestones	Original Date	Forecast Date	Actual Completion Date	Variance Explanation
DAP Delivery with updates related damping factor, surface corrections, MetOp-B/C Averaging Kernels	Oct-22	Oct-22	11/04/22	
NOAA-21 Ready NUCAPS product evaluations with the upcoming CrIS first light data and ATMS TDRs, and user support for the CrIS Beta Maturity Review	Feb-23	Feb-23	02/23/23	NOAA-21 K-band transmitter swap
NOAA-21 NUCAPS Product Beta Maturity	May-23	May-23	6/1/23	Beta attained effective 3/23
NOAA-21 NUCAPS T(p), q(p), O3(p), OLR, CO, CH4 and CO2 Provisional Maturity	Nov-23	Dec-23	Jan-24	Attained Validated Maturity
Implementing Validation Archive (VALAR) and focus-day data collections for NOAA-21 NUCAPS product validations	May-23	May-23	Mar-24	Continued updates to the data set
Addition of CAMEL emissivity database for the emissivity first guess	Mar-24	Apr-24	On-schedule	
Mission-long reprocessing of NOAA-21 NUCAPS products: Reprocessing version and evaluation of reprocessed products	Jun-24	Jun-24	On-schedule	

Accomplishments / Events:

- Delivered the package of the MSL12 version 1.61 update 2 to the CoastWatch team on April 12, 2024. The update package includes new compiler for Linux CenOS 9 system, as well as update of the destripping parameter file for VIIRS-NOAA-21. The CoastWatch has also delivered the package to the ASSISTT team.
- Worked with the STAR IT team for the upgrade Linux to CenOS 9 for VIIRS global ocean color data processing.
- Routinely producing global VIIRS-NOAA-21 ocean color products, as well as those from VIIRS-SNPP and VIIRS-NOAA-20.

Overall Status:

	Green ¹ (Completed)	Blue ² (On-Schedule)	Yellow ³ (Caution)	Red ⁴ (Critical)	Reason for Deviation
Cost / Budget		X			
Technical / Programmatic		X			
Schedule		X			

1. Project has completed.
2. Project is within budget, scope and on schedule.
3. Project has deviated slightly from the plan but should recover.
4. Project has fallen significantly behind schedule, and/or significantly over budget.

Milestones	Original Date	Forecast Date	Actual Completion Date	Variance Explanation
Ocean Color J2 Provisional Code delivery to ASSIST	Apr-2024	Apr-2024		
Ocean Color Beta Maturity	Nov-2023	Mar-2023		
Ocean Color Provisional Maturity	Mar-2024	Mar-2024		
Ocean Color Validated Maturity	Jul-2025	Jul-2025		

Issues/Risks: None

Accomplishments / Events:

- Derived and delivered OMPS NM/NP weekly dark LUTs for SNPP, NOAA-20 and NOAA-21.
- Derived and delivered SNPP/NOAA-20/NOAA-21 OMPS NP solar bi-weekly LUTs.
- Continued analyzing Day-1 and synthetic solar spectra differences among 3 NMs and 3 NPs.
- Reached NOAA-21 OMPS NM and NP SDR validated maturity status. Two deliveries were made to IDPS to update the solar flux tables. The fast-track deliveries were ADR10825 and ADR10828.
- Derived updated macropixel bandpass files for radiative transfer and synthetic irradiance applications for the OMPS nadir instruments on S-NPP, NOAA-20, and NOAA-21.

Overall Status:

	Green ¹ (Completed)	Blue ² (On-Schedule)	Yellow ³ (Caution)	Red ⁴ (Critical)	Reason for Deviation
Cost / Budget		X			
Technical / Programmatic		X			
Schedule			X		

1. Project has completed.
2. Project is within budget, scope and on schedule.
3. Project has deviated slightly from the plan but should recover.
4. Project has fallen significantly behind schedule, and/or significantly over budget.

Issues/Risks:

None

Milestones	Original Date	Forecast Date	Actual Completion Date	Variance Explanation
Solar intrusion impact correction on NOAA-21 OMPS NP; OMPS solar activity impact analysis Note: The solar intrusion correction work is completed as far as deliveries and code changes go	Nov-23		Nov-23	
Investigation of the dark over-correction problem and an initial analysis of OMPS out-of-range of SL correction	Dec-23		Dec-23	
NOAA-21 solar day-1 improvement with solar activity impact correction; develop the out-of-range of SL table for N21 NM SDR; update the N21 NP ST LUT; compare with NASA datasets for NOAA-21 OMPS NM and NP SDR data (code is ready)	Jan-24	Feb-24		Day-1 improvements on-going analysis
Improve latitude dependency of inter-sensor biases; reprocess (limited) N21 OMPS NM/NP SDR data sets (new dark LUTs); assess the consistency of N21 OMPS NM and NP at the dichroic range; conduct the inter-sensor comparison with Tropomi	Feb-24	Feb-24		
Finalize the NOAA-21 solar day-1 towards validated maturity; validate NOAA-21 OMPS SDR data quality using multiple ways (e.g., RTM, DCC, inter-sensor comparison with VIIRS); prepare NOAA-21 OMPS NM/NP SDR validated maturity review	Mar-24		Mar-24	
Reprocess the (SNPP, NOAA-20 and NOAA-21) OMPS NP SDR data by using the new dark, OSOL and SL tables; Initialize the OMPS and GEMS inter-sensor comparison analysis	May-24			
Document the technical reports (e.g., SL correction, solar intrusion correction, solar activity impact correction, NM along-track wavelength shift correction; update OMPS NM/NP SDR ATBD	Jul-24			
Develop new algorithm or code to support J3/J4 prelaunch testing and verification; analyze the pre-launch test data sets for J3 or J4 upon the availability of the data sets	Aug-24			
Pre-launch sensor characterization report upon available pre-launch instrument test data sets; reprocess SNPP, N20, and N21 OMPS NM SDR data using the updated LUTs; OMPS SDR enterprise Cal/Val plan updates	Sep-24			
Develop and deliver dark and OSOL LUTs for SNPP/NOAA-20/NOAA-21	Sep-24			
Maintain SNPP/NOAA-20/NOAA-21 OMPS SDR data quality	Sep-24			

NOAA-21 OMPS Solar Flux updated in IDPS for Validated Maturity Status

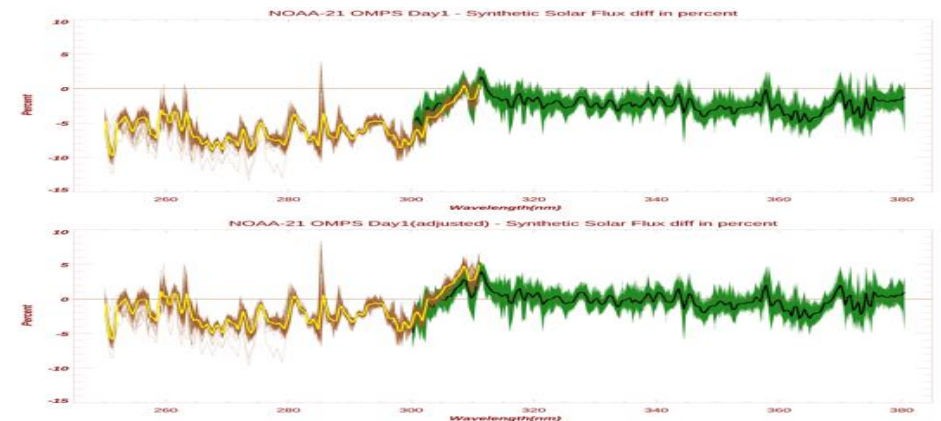
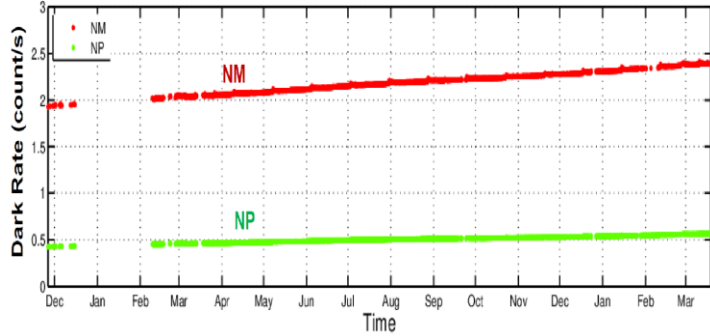


Figure: NOAA-21 OMPS NP (brown) and NM (green) percent differences between Day-1 and synthetic solar flux. The top image shows the current operational version of the data, while the bottom image shows the results after the day-1 values have been corrected by 4.3% for NP and 2.2% for NM. DR10825 and 10828 delivered the updated files to IDPS. This marks the beginning of NOAA-21 OMPS validated maturity on April 12 at 17:12 UTC.

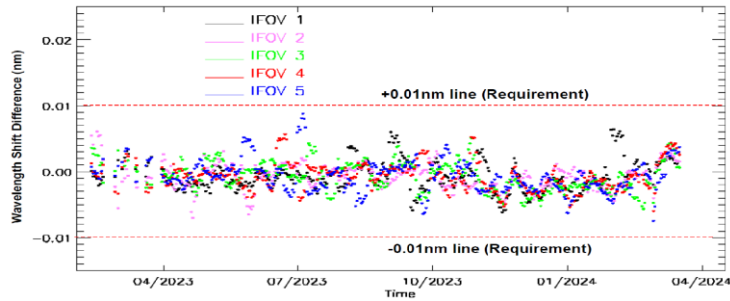
NOAA-21 OMPS NM and NP Validated Maturity Highlights

Dark, Wavelength shift and SNR performance

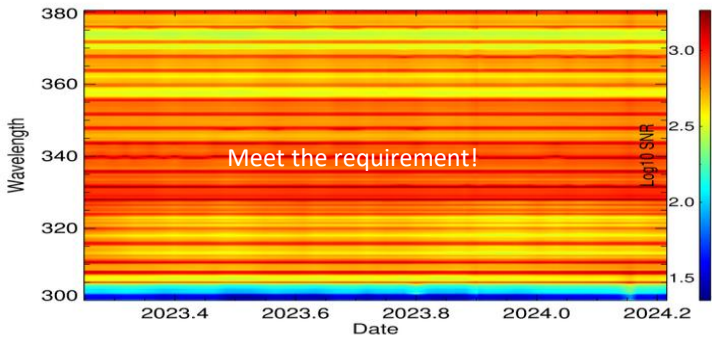
(a) NM and NP dark rate time series



(b) Diff Percent between Solar Flux- and Radiance Relative Wavelength Shifts

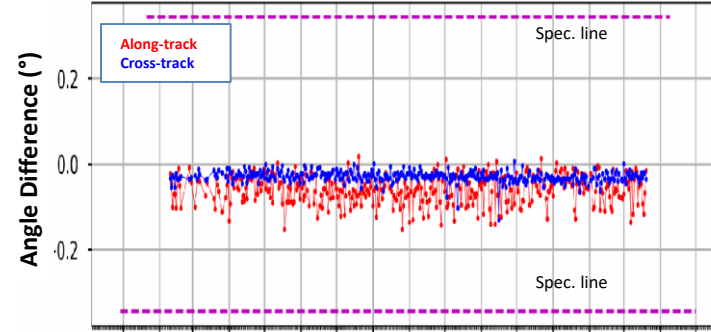


(c) NM Log10 SNR Time Series

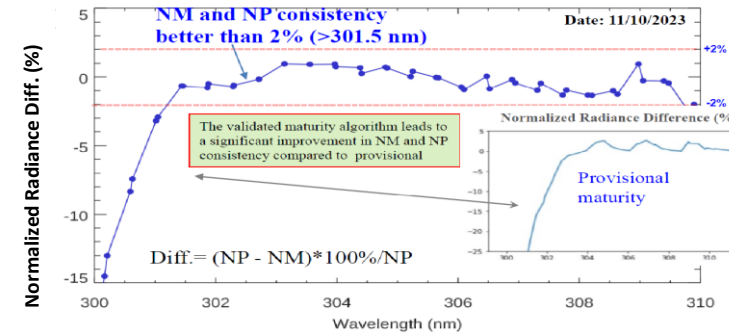


Geolocation and Radiance (& NR) Performance

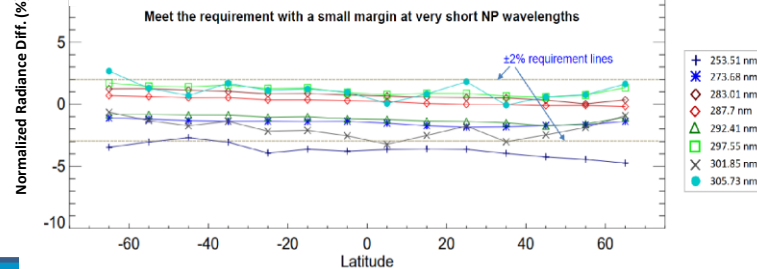
(a) NM Geolocation Error Time Series (against VIIRS)



(b) NOAA-21 NP and NM NR Consistency (Validated Maturity)

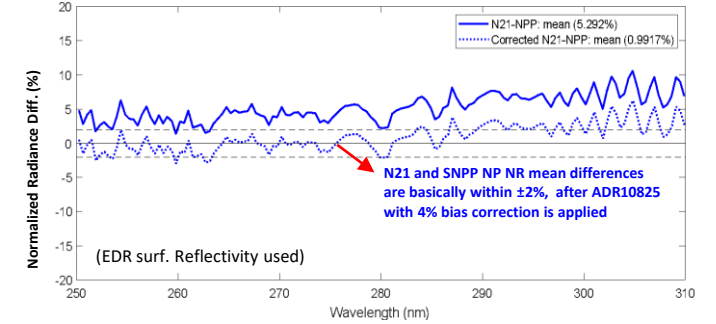


(c) 32-Day Averaged NP NR Diff. (%) between NOAA-21 and SNPP

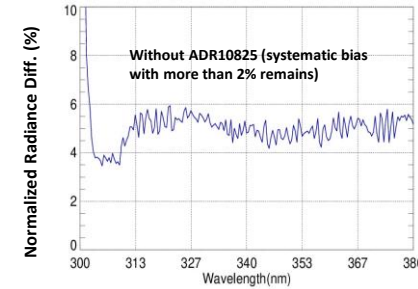


NR Performance Cont. & User Feedback

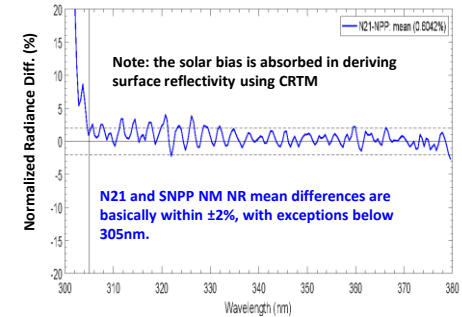
(a) 16-Day Averaged OMPS-NP NR Diff. (%) between NOAA-21 and SNPP via CRTM



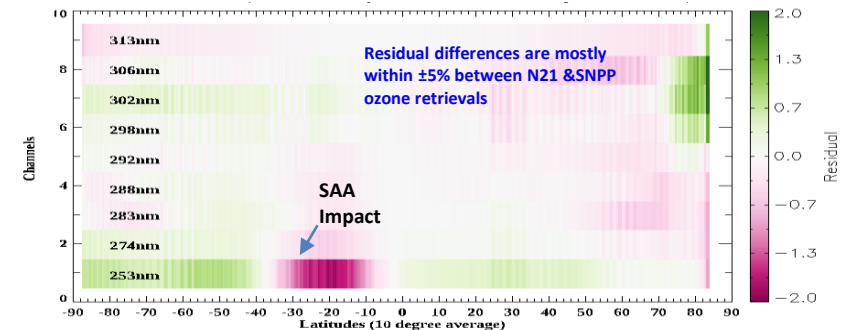
(b) Averaged NM NR Diff. (%) between NOAA-21 and SNPP via DCC



(c) 16-Day Average OMPS-NM NR Diff. (%) between NOAA-21 and SNPP via CRTM



(d) Residual Difference (%) in OMPS Ozone Retrieval (%) between NOAA-21 and SNPP



Accomplishments / Events:

- The Ozone Team provided evaluation of the NOAA-21 OMPS NM & NP SDRs for the Validated Maturity Review. The N21 SDR changes to reach validated maturity will require the development new V8TOz and V8Pro soft calibration adjustment tables. We are working with the SDR Team to obtain reprocessed data to make those changes.
- The NOAA-21 V2Limb Level 1 and Level 2 codes were delivered to ASSISTT as Beta Maturity codes. The Level 1 part of the codes will need some small revisions to correct the processing of the first of four scan for half of the granules. The other 7/8ths of the scans are processed correctly. There will also be a table update in April as NASA implements a planned change to the instrument sample table.
- The Ozone Team has provided detailed project and spending plans for FY24 support for JPSS and Metop funding.
- The Team supported the implementation of V8Pro at the provisionally validated status on the operational NCCF system effective March 21, 2024.
- The Team provided updates to the old operational TOAST codes following failures with the new NUCAPS algorithm implementation. These updates are already in the NCCF version. We had expected it to take over operational processing well before this NUCAPS update.

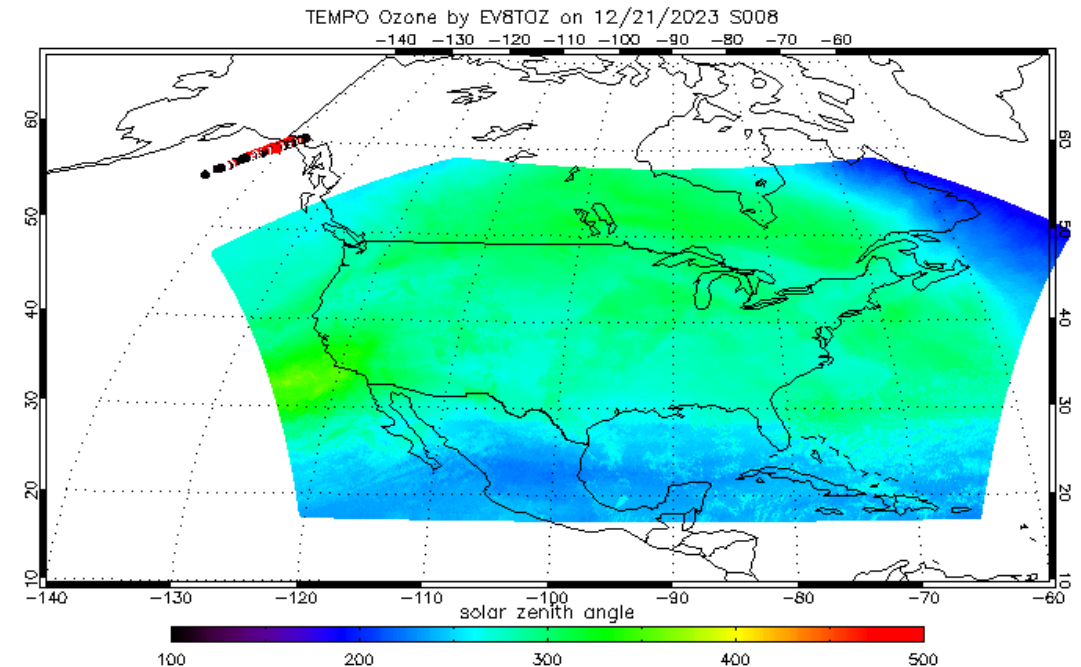
Milestones	Original / Current Date	Forecast Date	Actual Completion Date	Variance Explanation
Successfully complete GOME-2 NCCF ORR	Aug-23		Nov-23	
Provide new Level 1a, 1b & 1g for S-NPP OMPS V2Limb	Dec-22		Dec-23	NASA R&D
Provide Level 1a, 1b, 1g & 2 (aerosol and ozone) for NOAA-21 OMPS V2Limb to ASSISTT	Jan-23		Mar-24	NASA R&D
Update V8TOz and V8Pro tables for NOAA-21 Provisional	Feb-23 Mar-23		Aug-23 Dec-23	SDR Instability
Update V8TOz tables for Metop-B & -C	Apr-24	May-24		
N21 V2.7Limb to Beta	Jan-24	Apr-24		Timing Pattern
N21 V2.7Limb to Provisional	Feb-24	May-24		
N21 V2.7Limb to Fully Validated	Sep-24	Aug-24		
V8Pro to Fully Validated	Mar-24	Apr-24		SDR Progress
V8TOz & V8TOS to Fully Validated	Mar-24	Apr-24		SDR Progress
Reprocess NPP V8Pro for 2023	Apr-24		Mar-24	Dark Table
Reprocess N20 V8Pro for full record	Jun-24	TBD		SDR
J4 / N22 Revised Cal/Val Plan	Sep-24			

Overall Status:

	Green ¹ (Completed)	Blue ² (On-Schedule)	Yellow ³ (Caution)	Red ⁴ (Critical)	Reason for Deviation
Cost / Budget		X			
Technical / Programmatic		X			
Schedule			X		ProTech Follow-on, SDR instability, Limb Development

- Project has completed.
- Project is within budget, scope and on schedule.
- Project has deviated slightly from the plan but should recover.
- Project has fallen significantly behind schedule, and/or significantly over budget.

Issues/Risks: IMSG ProTech Contract follow-on is still not in place.



Enterprise V8TOz Applied to TEMPO

Accomplishments / Events:

- On April 27 we formally released ACSPO V3.00 beta 1 and incorporated it into our development dataflow. This is the first beta version of ACSPO V3.00 (scheduled for Dec 2024 release). What this means is that our experiment/internal websites are now being populated by ACSPO VIIRS V3.00B01 data which we compare to the current stable release (V2.80) SST data which is visible on public-facing monitoring websites. The figure in the lower right shows comparison of validation statistics between ACSPO V3.00B01 and V2.80. The main message is that the most important validation statistics (mean and standard deviation) are comparable (or improved) while the clear-sky ratio (fraction of clear ocean pixels) is improved by ~9% (relative).
- The main updates in V3.00B01 compared to previous version (V2.80) is complete revision of the clear-sky mask (cloud mask). We have added various new texture- and spectral-based cloud filters. The goal is to reduce reliance of the clear-sky mask on comparison of retrieved SST to "first guess SST" (typically from L4 SST products) which often causes over screening of fine SST features not captured in lower resolution L4 SST products.

Overall Status:

	Green ¹ (Completed)	Blue ² (On-Schedule)	Yellow ³ (Caution)	Red ⁴ (Critical)	Reason for Deviation
Cost / Budget		X			
Technical / Programmatic		X			
Schedule		X			

- Project has completed.
- Project is within budget, scope and on schedule.
- Project has deviated slightly from the plan but should recover.
- Project has fallen significantly behind schedule, and/or significantly over budget.

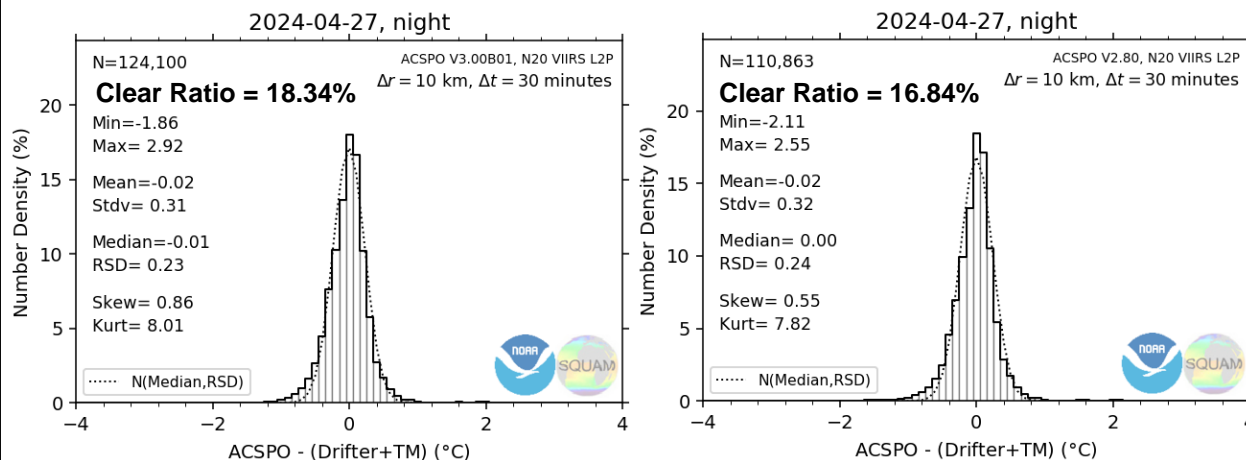
Issues/Risks:

NOAA STAR migration to the CentOS 9 Stream operating system will cause reduction in our capability to do full-mission VIIRS SST reprocessing. We are attempting mitigate the issue by purchasing Red Hat Enterprise licenses.

Discontinuation of funding for non-NOAA mission SST work will severely degrade STAR SST products used operationally across NOAA and very popular externally such as LEO L3S SST.

Milestones	Original Date	Forecast Date	Actual Completion Date	Variance Explanation
SST EDR support to SDR team on Warm up - Cool down anomalies	Feb-24	Feb-24	Jan-22	
SST EDR Support to JPSS-3 Data System Test Event (Dependency on JPSS)	Apr-24	Apr-24		Delayed due to dependency on JPSS test event; new timeline unknown
SST EDR Enterprise Cal/Val and ACSPO Algorithm "Agency Report" Presentation to GHRSSST science community	Jun-24	Jun-24		
SST EDR Enterprise Cal/Val Plan Initial Updates	Jul-24	Jul-24		
Promote experimental iQuam updates to live access	Aug-24	Aug-24		
SST EDR Validated Maturity Review	22-Aug-24	22-Aug-24	Feb-20	

Highlights: ACSPO V3.00B01 performance vs V2.80



Figures shows comparison of ACSPO V3.00B01 (right) and V2.80 (left) global N20 VIIRS nighttime validation statistics vs in situ SST from drifting buoys and tropical moorings. The considered tie period is the entire day of 27 Apr 2024.

Accomplishments / Events:

- Conducted cross validation study for NOAA-21, NOAA-20, and S-NPP SFR products.
- Updated the SFR ATBD for NOAA-21 and GPM and other product changes. Delivered the document to ASSISTT for the upcoming SFR CCAP.
- The SFR team supported ASSISTT in the testing and integration of the SFR update package which includes the Provisional NOAA-21 and GPM SFR.

Milestones	Original Date	Forecast Date	Actual Completion Date	Variance Explanation
Enhance the machine learning snowfall detection model using N21 observations	Jan-24	Jan-24	Jan-24	
Enhance the machine learning models for 1DVAR initialization and SFR bias correction using N21 observations	Jan-24	Jan-24	Jan-24	
Validation of NOAA-21 snowfall detection and rate estimation algorithms	Feb-24	Feb-24	Feb-24	
NOAA-21 SFR provisional maturity review	Feb-24	Feb-24	Feb-24	
Enterprise SFR science code delivery to ASSISTT including N21 provisional maturity SFR	Feb-24	Feb-24	Feb-24	
Cross validation among NOAA-21, NOAA-20, and S-NPP SFR products	April-24	April-24	April-24	

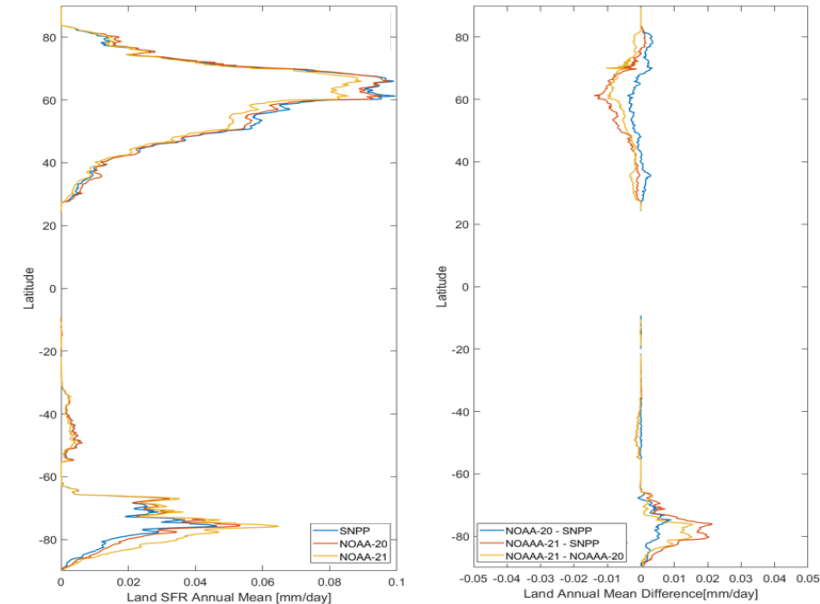
Overall Status:

	Green ¹ (Completed)	Blue ² (On-Schedule)	Yellow ³ (Caution)	Red ⁴ (Critical)	Reason for Deviation
Cost / Budget		X			
Technical / Programmatic		X			
Schedule		X			

1. Project has completed.
2. Project is within budget, scope and on schedule.
3. Project has deviated slightly from the plan but should recover.
4. Project has fallen significantly behind schedule, and/or significantly over budget.

Issues/Risks: None

Highlights:



SFR zonal mean (March – December 2023) from S-NPP, NOAA-20, and NOAA-21 (left), and zonal mean differences between the 3 satellites (right). They generally agree with each other with some regional variations.

Accomplishments / Events:

- Updated the VIIRS Enterprise albedo ATBD from v1.3 to v2
- Keep integrating the JPSS-2 VIIRS observations into VIIRS BRDF package and planned to test
- Finished the protocol algorithm for detecting heatwave from daily LST anomaly data, which will consider the impact on human life and support the online real-time heatwave/coldwave monitoring system

Overall Status:

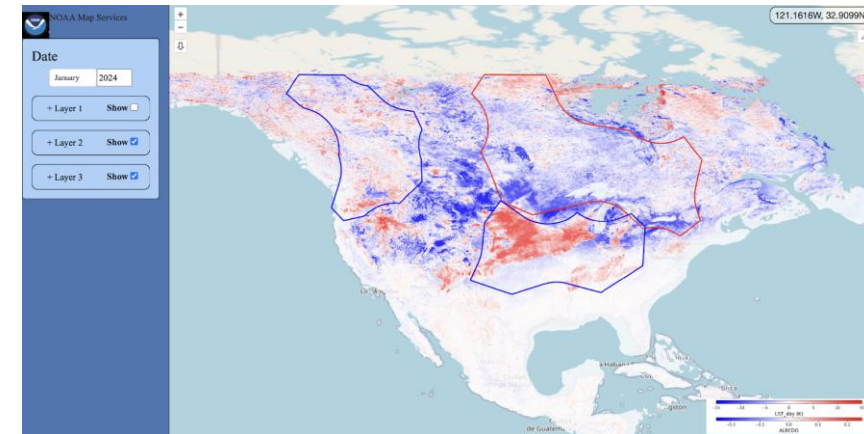
	Green ¹ (Completed)	Blue ² (On-Schedule)	Yellow ³ (Caution)	Red ⁴ (Critical)	Reason for Deviation
Cost / Budget		X			
Technical / Programmatic		X			
Schedule		X			

1. Project has completed.
2. Project is within budget, scope and on schedule.
3. Project has deviated slightly from the plan but should recover.
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Issues/Risks:

Highlights:

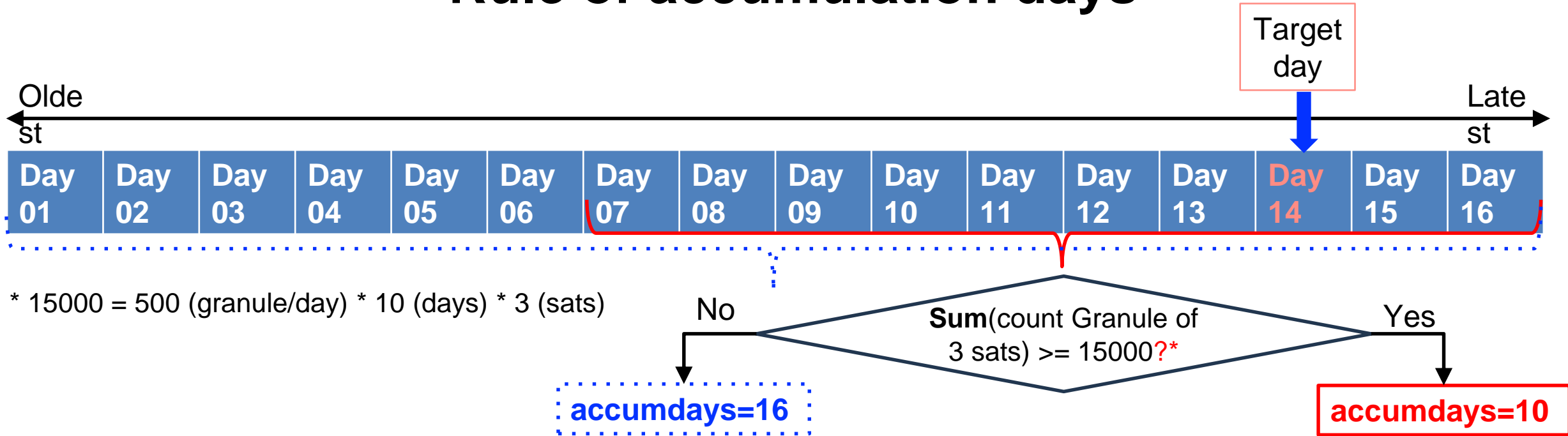
Monthly Anomaly Analysis



Albedo anomaly demonstrates opposite variation with LST anomaly in winter-time (January 2024 case)

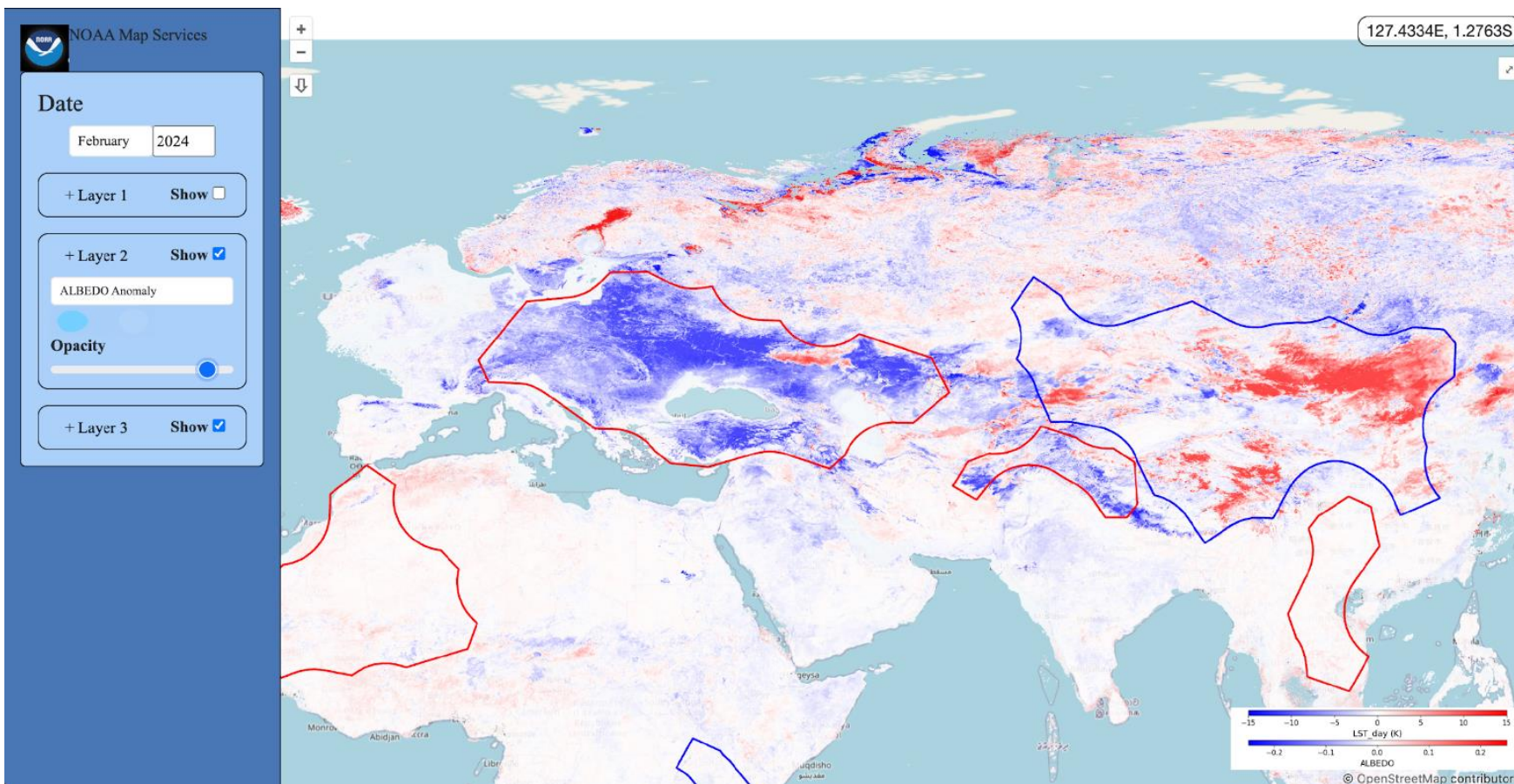
Milestones	Original Date	Forecast Date	Actual Completion	Variance Explanation
Share the soil albedo dataset with model users	Dec-2023	Dec-2023	Dec-2023	
Multi-parameter anomaly analysis report	Jan-2024	Jan-2024	Oct-2023	
Provisional maturity of NOAA-21 Albedo	Feb-2024	Jan-2024	Jan-2024	
VIIRS BRDF/Albedo/NBAR Dataset to User	Oct-2023	May-2024	Oct-2023	
BRDF evaluation (manuscript)	Dec-2023	Jun-2024		
Enterprise Cal/Val Plan Initial Updates	Jun-2024	Jun-2024		
*NCCF Integration of BRDF/BSA/WSA/NBAR	May-2024	Jun-2024		
Enterprise Cal/Val Plan and Algorithm Update Peer Review Meeting	Aug-2028	Aug-2028		
Software package ready of blended SURFALB from all VIIRS sensors	Jun-2024	Aug-2024		
NOAA-21 validated maturity review	May-24	Sep-24	Jan-2024	

Rule of accumulation days



We will have three VIIRS sensors providing us with valuable multi-angle observational data for BRDF inversion. This will reduce the multi-angle collection cycle and enhance the timeliness of the product. However, we may also face situations where 1-2 of the satellites are not functioning properly. This requires us to configure our input data to be flexible and adjustable. Therefore, we have implemented a new data input threshold mechanism that searches for data from the most recent days backwards. If data from all three satellites is available within ten days, we will use that ten-day data set. If the data from the last ten days is insufficient, we will use data from the last sixteen days.

Albedo Monthly Anomaly Analysis



The direction of the albedo anomaly is opposite to that of the LST anomaly. In the diagram, if the border is red, it indicates a positive temperature anomaly; if it is blue, it indicates a negative temperature anomaly.

In February in Eurasia, the directions of anomalies for these two parameters are opposite, which is related to the impact of temperature on vegetation or snow.

Accomplishments / Events:

- Work on the BRDF correction algorithm which is based on the updated BRDF coefficients from NASA SR science team, generate the 5km SR and corresponding NBAR data for inter-satellite comparison.
- Keep working on the inconsistency issue between SNPP and NOAA20, develop the software package to generate recalibrated SR using the reprocessed SDR data.
- Evaluated the inconsistency issue impact on the downstream products such as Vegetation index, Leaf Area Index, BRDF, work with the SR users to generate new recalibrated SR test data for the blended products.
- Maintain the SR monitoring and validation system, response to the users' concern and feedback, tracking the validation issues.

Overall Status:

	Green ¹ (Completed)	Blue ² (On-Schedule)	Yellow ³ (Caution)	Red ⁴ (Critical)	Reason for Deviation
Cost / Budget		X			
Technical / Programmatic		X			
Schedule		X			

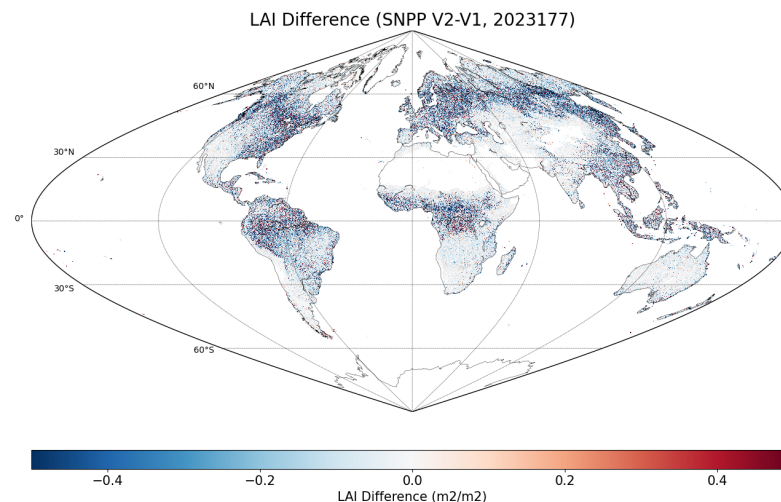
- Project has completed.
- Project is within budget, scope and on schedule.
- Project has deviated slightly from the plan but should recover.
- Project has fallen significantly behind schedule, and/or significantly over budget.

Issues/Risks:

None

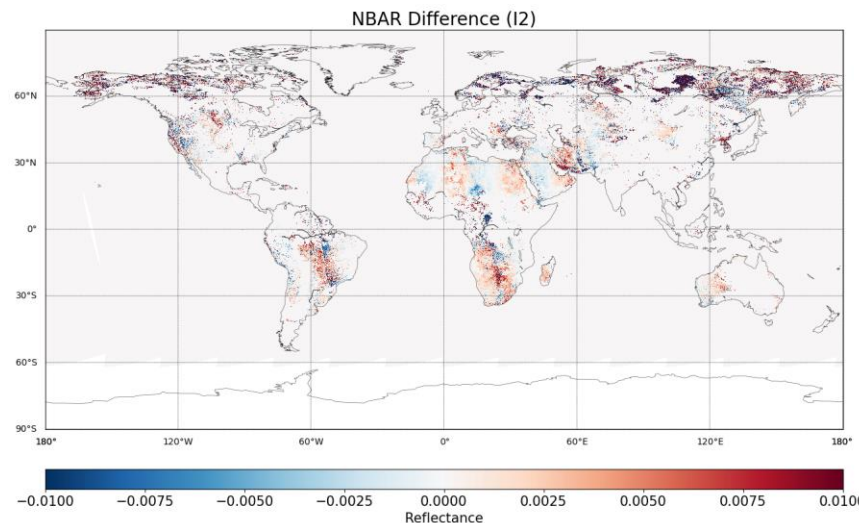
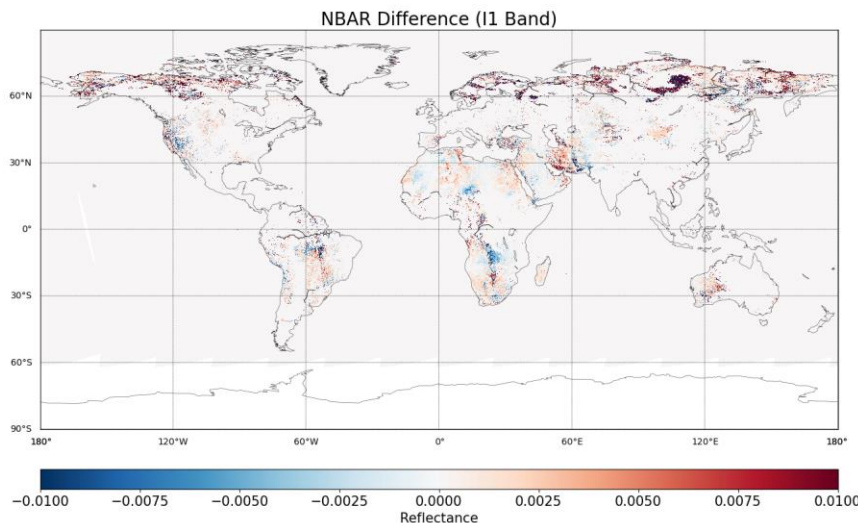
Milestones	Original Date	Forecast Date	Actual Completion Date	Variance Explanation
NCCF SR DAP redelivery and verification	Sep-23	Sep-23	Sep 20, 2023	
Mitigation algorithm development for the dust aerosol model	Dec-23	Dec-23	Dec 19, 2023	
Provisional Maturity of NOAA-21	Feb-24	Feb-24	Jan 25, 2024	
The JPSS (SNPP, N20, N21) SR consistency evaluation and correction	Mar-24	Mar-24	Mar 28, 2024	
GOES-R enterprise SR algorithm development and experimental product	Jun-24	Jun-24		
Operational Readiness Review (ORR) for NDE Migration to NCCF	Aug-24	Aug-24		

Highlights:

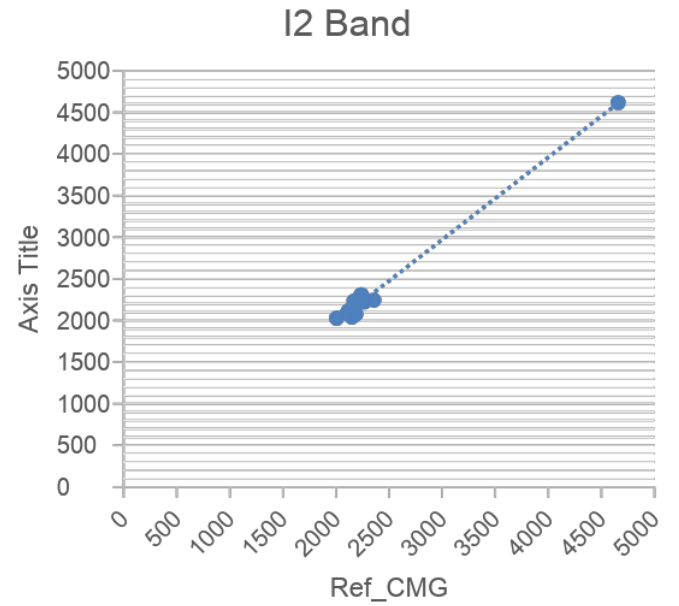
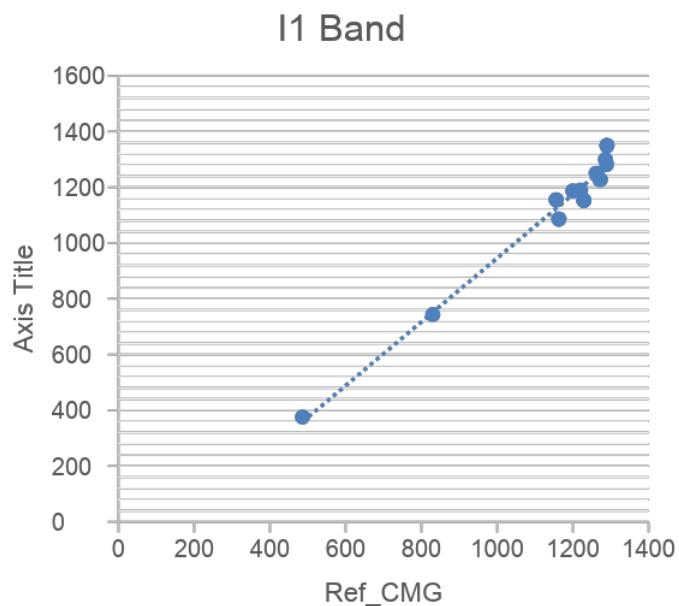


The recalibrated SNPP SR impact on the LAI product, the new LAI overall with lower value, and the mean difference could be around 5%.

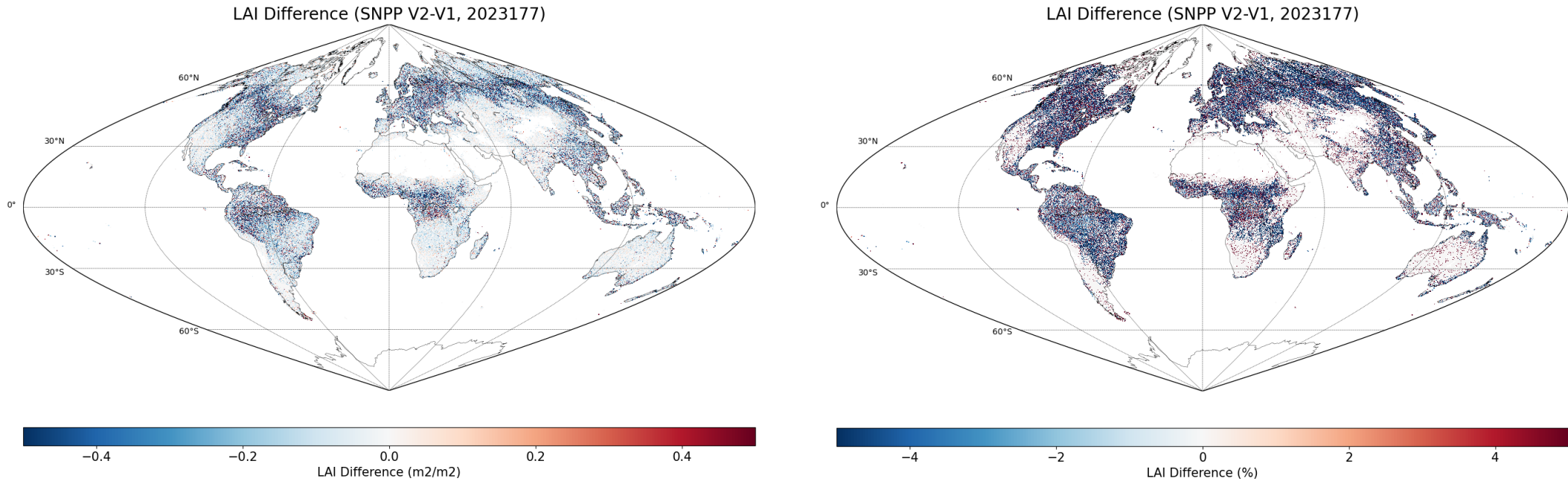
- BRDF correction update:
 - SNPP SR from CLASS, Date: 2023182, CMG version.
 - NBAR: solar zenith angle = 45.
 - Difference: Local result (using previous BRDF coef.) minus reference NBAR using updated coefficients.



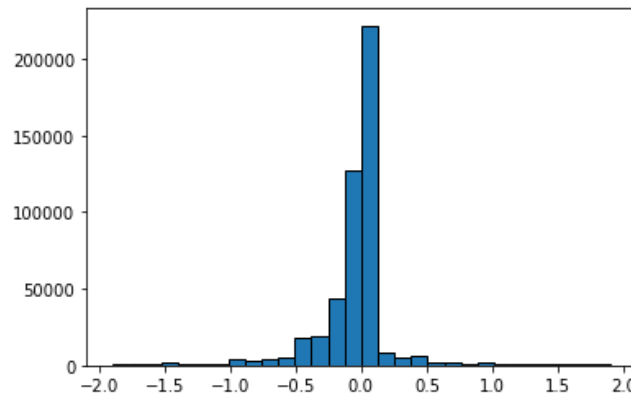
- 5km SR difference
 - Current aggregation method: only use the pixels with confidently clear condition, no cloud shadow, no high AOD, no snow.
 - Updated; using all the available VIIRS pixels from one granule for average, select the best granule for the final 5km SR.
 - Using the cloud pixels count to select the best grid for the BRDF correction



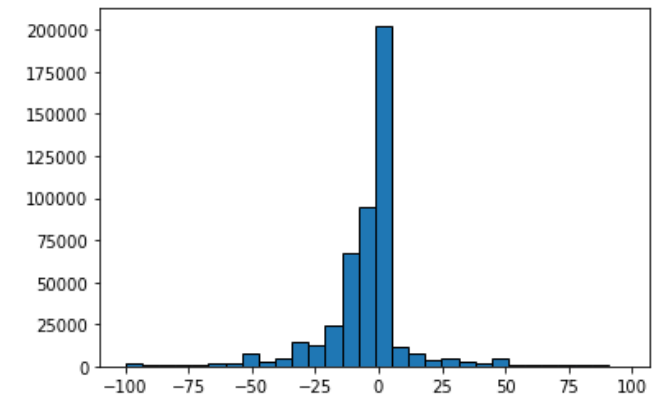
- The SNPP LAI difference using the original SR and recalibrated SR



- For SNPP, the recalibrated SR (v2) with lower NIR value (~2%) and slight lower Red value (~0.1%)
- The v2 LAI with lower LAI compared with v1, histogram in right figure shows.
- The difference could up to 5%.



LAI value difference between V2 and v1



LAI relative difference (%) between V2 and v1

Accomplishments / Events:

- STAR-UMD VIIRS Surface Type team has downloaded and processed S-NPP, NOAA-20, and NOAA-21 VIIRS daily granule surface reflectance data acquired in April of 2024 for the production of AST-2024.
- The team is examining VIIRS observations acquired by NOAA-21 as compared to those acquired by NOAA-20 and S-NPP, and evaluating the synergy of these observations for improved monitoring of earth surface dynamics
 - The April 8th total solar eclipse greatly darkened NOAA-20's observations over central and eastern US, and to lesser degrees, those acquired by S-NPP. Leading NOAA-20 by ~50 minutes, NOAA-21 was barely affected by this rare phenomenon (see highlights).
- The team has completed initial runs of SVM classification of VIIRS surface reflectance data acquired in 2023. A preliminary global surface type map for 2023 has been produced, which is being post-processed to produce the final AST23.

Overall Status:

	Green ¹ (Completed)	Blue ² (On-Schedule)	Yellow ³ (Caution)	Red ⁴ (Critical)	Reason for Deviation
Cost / Budget		X			
Technical / Programmatic		X			
Schedule		X			

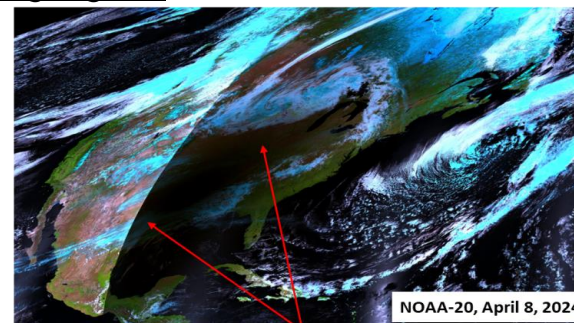
- Project has completed.
- Project is within budget, scope and on schedule.
- Project has deviated slightly from the plan but should recover.
- Project has fallen significantly behind schedule, and/or significantly over budget.

Issues/Risks:

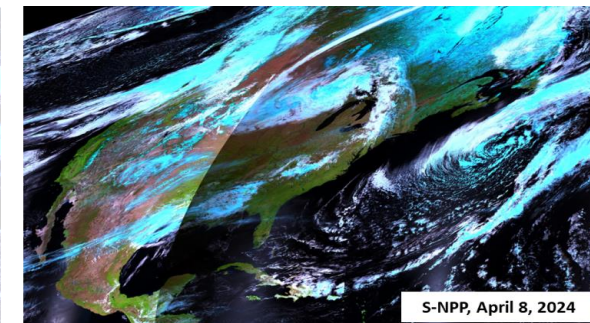
None

Highlights:

VIIRS Data Affected by Total Solar Eclipse



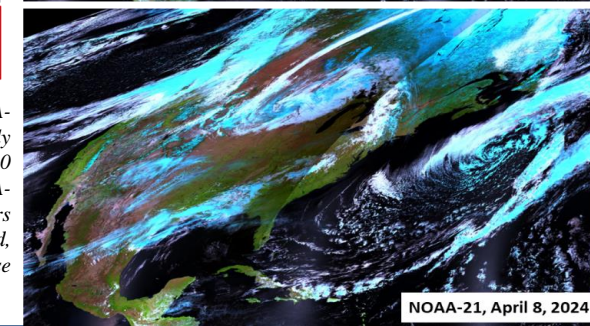
NOAA-20, April 8, 2024



S-NPP, April 8, 2024

A vast region from Texas to the upper mid-west were almost completely darkened by the total solar eclipse that coincided with NOAA-20's overpass in this region.

The April 8th total solar eclipse appeared to coincide with NOAA-20's overpass through central and eastern US, resulting in greatly darkened observations in that region (upper left). Leading NOAA-20 by ~25 and 50 minutes respectively, S-NPP (upper right) and NOAA-21 (lower right) were less affected by this "once in 20 years phenomenon". These images show VIIRS M10/7/5 bands in red, green, and blue. Water and areas shadowed by the total solar eclipse have dark tones.



NOAA-21, April 8, 2024

Milestones	Original Date	Forecast Date	Actual Completion Date	Variance Explanation
Monthly update of the 250m global water surface fraction product	Each M.	Each M.		
Complete global monthly composites for each of 2024 months	Each M.	Each M.		
Generate global annual classification metrics for 2023	May-24	May-24		
AST23 of IGBP 17 type map	Aug-24	Aug-24		
AST23 for EMC 20 type map	Aug-24	Aug-24		
AST23 Validation Statistics and delivery to JSTAR and users	Sept-24	Sept-24		

Accomplishments / Events:

- Continued monitoring of vegetation health as indicated by publications of weekly vegetation health products (VHP) from currently operational NOAA-20 VIIRS observations via STAR webpage at https://www.star.nesdis.noaa.gov/smcd/emb/vci/VH/vh_browse.php
- Continued the development of the new code for 500m NOAA-20/21 VIIRS VHPs production/operation;
- Investigated NDVI smoothing algorithms and explored the potential of improvements of the smoothed NDVI in order to obtain more reliable VHI data product
- Continued the examination of the weight coefficient (alpha) in VHI formula for the best correlation with crop yields for better crop yield capabilities. It's found that an zero (0) alpha value for corn in China enabled the best VHI correlation with the corn yield in that region (see lower right plot for details), which indicated that Temperature Condition Index (TCI) had a better capability for the forecast of corn yield in China

Overall Status:

	Green ¹ (Completed)	Blue ² (On-Schedule)	Yellow ³ (Caution)	Red ⁴ (Critical)	Reason for Deviation
Cost / Budget		X			
Technical / Programmatic		X			
Schedule		X			

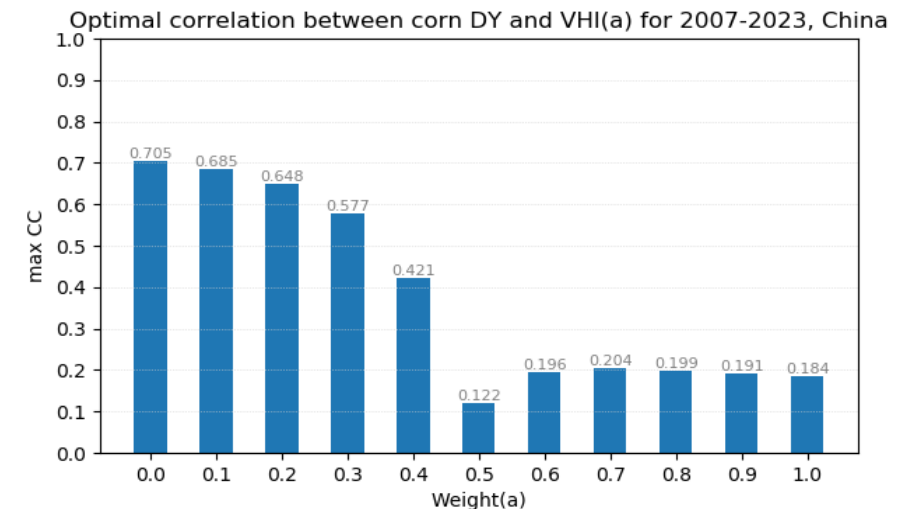
1. Project has completed.
2. Project is within budget, scope and on schedule.
3. Project has deviated slightly from the plan but should recover.
4. Project has fallen significantly behind schedule, and/or significantly over budget.

Issues/Risks:

None

Milestones	Original Date	Forecast Date	Actual Completion Date	Variance Explanation
NOAA-21 Vegetation Health Beta Maturity	Sep-23	Sep-23	Sept-23	
NOAA-21 Vegetation Health Provisional Maturity	Apr-24	Apr-24	Sept-23	Maturity reached before plan
NOAA-21 Vegetation Health Validated Maturity	Apr-24	Apr-24	Sept-23	All VIIRS EDRs declared Validated Maturity

Highlight: An zero value of alpha in VHI calculation resulted in the best VHI correlation with corn yield in China for the 2007-2023 time period



Accomplishments / Events:

- Preliminary work on validation of GVF using Google Earth Engine. Determined which pixels of Landsat scene were vegetated based on VI threshold, then aggregated and compared to GVF.
- Finalized VI/GVF NCCF verification and worked with OSPO to finish the Operational Readiness Review. Daily and weekly VI are 100% match. Biweekly VI and GVF mismatch can be explained by missing granules in 15 week historical data.
- Conducted inter-comparisons in VI among SNPP, NOAA-20 and NOAA-21; produced an example of multi-satellite blended VI

Overall Status:

	Green ¹ (Completed)	Blue ² (On-Schedule)	Yellow ³ (Caution)	Red ⁴ (Critical)	Reason for Deviation
Cost / Budget		X			
Technical / Programmatic		X			
Schedule		X			

1. Project has completed.
2. Project is within budget, scope and on schedule.
3. Project has deviated slightly from the plan but should recover.
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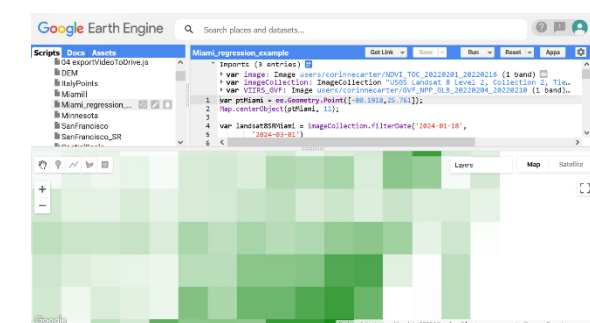
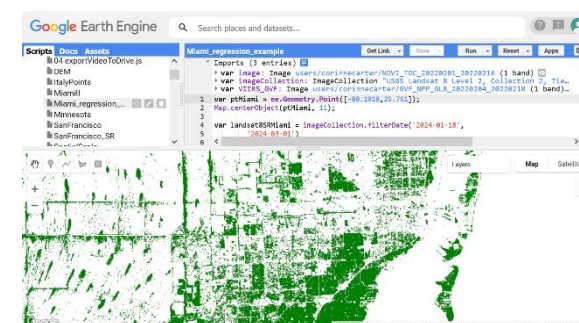
Issues/Risks:

None

Highlights:

Example of Google Earth Engine used for validation of VIIRS GVF

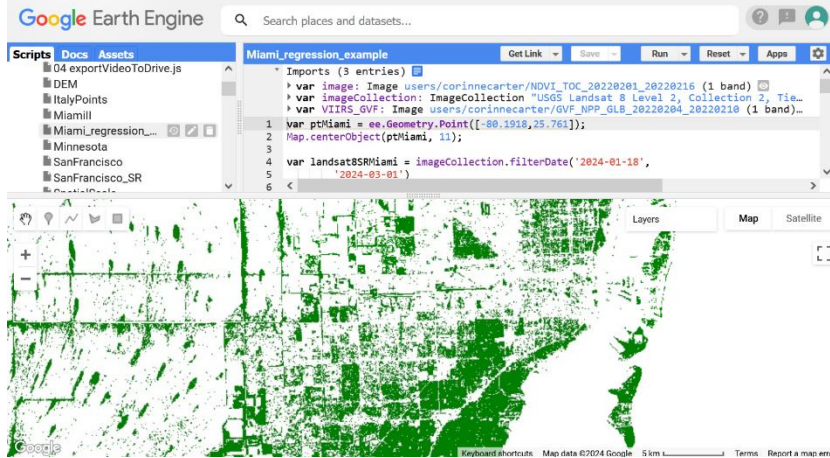
- Left: Landsat VI with threshold applied to distinguish vegetated from non-vegetated areas.
- Right: Landsat GVF on VIIRS 4km GVF pixels determined through aggregating thresholded VI. This can be compared to VIIRS GVF.



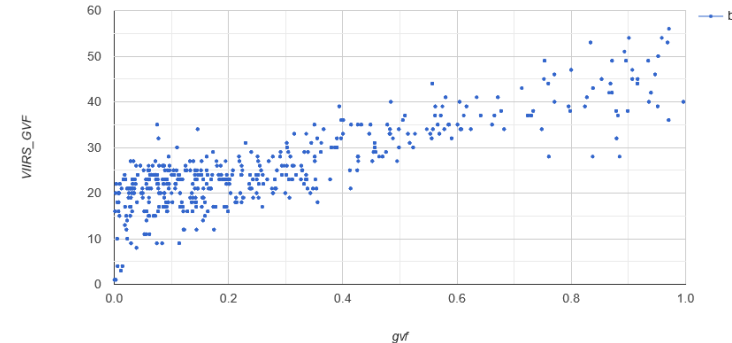
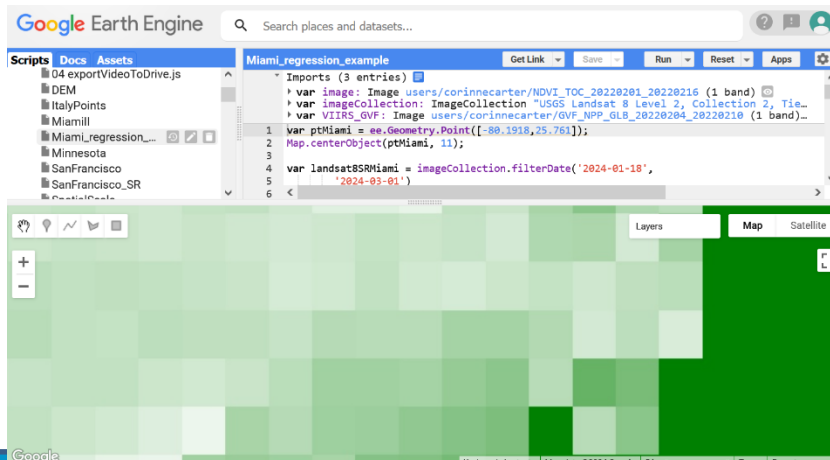
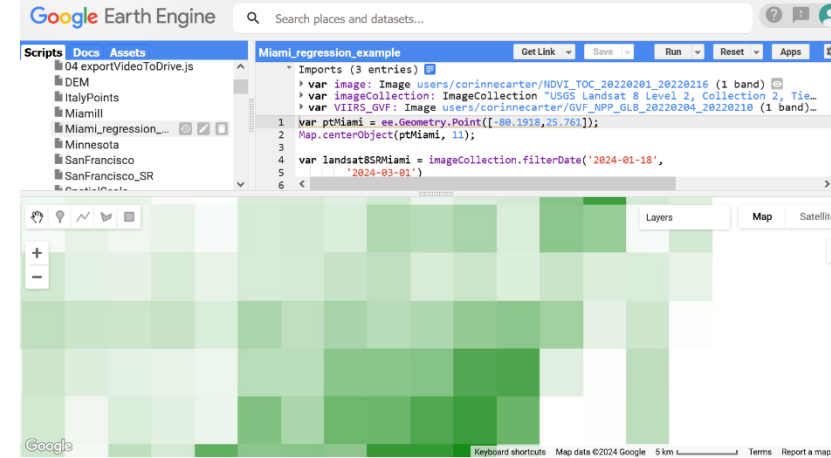
Milestones	Original Date	Forecast Date	Actual Completion Date	Variance Explanation
1km global VIIRS VI code and documentation ready for delivery	Oct-23	Nov-23	Nov-23	Personnel access to NOAA systems issues
NOAA-21 VI and GVF provisional maturity review	Jan-24	Jan-24	Jan-24	
Higher-resolution regional VI and GVF domain extended to global	Feb-24	Apr-24		On hold pending PCR
Experimental data test of blended VI and GVF products	Apr-24	May-24		Delays to previous milestone
Support to JPSS-3 Data System Test	Apr-24	Apr-24		No J03 test data will be available this year
Readiness for NCCF migration	Aug-24	Aug-24		
Annual algorithms/ products performance report	Aug-24	Aug-24		
Calibration/ Validation update for SNPP and NOAA20 VI and GVF products,	Sep-24	Sep-24		

Example of comparison of Landsat-derived and VIIRS GVF in Google Earth Engine

Landsat VI with threshold applied to distinguish vegetated from non-vegetated areas



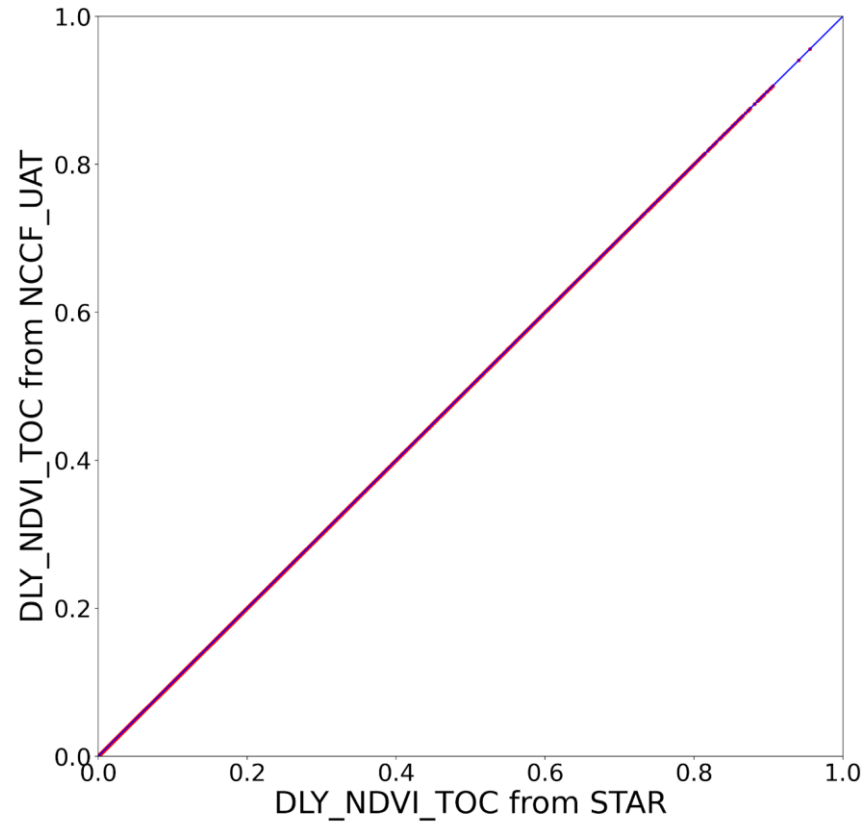
Landsat GVF on VIIRS 4km GVF pixels determined through aggregating thresholded VI



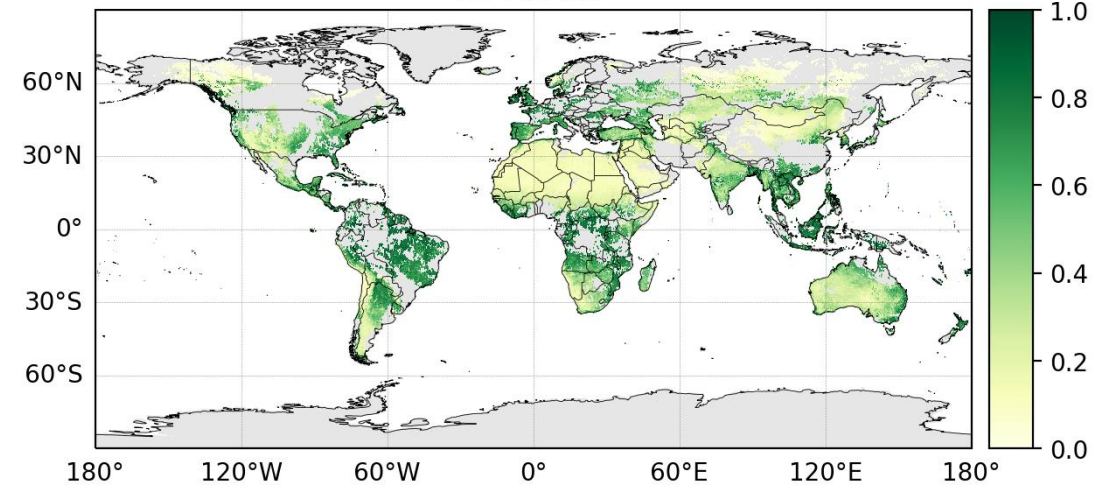
NCCF vs. current SNPP, Daily, NDVI_TOC

100% match

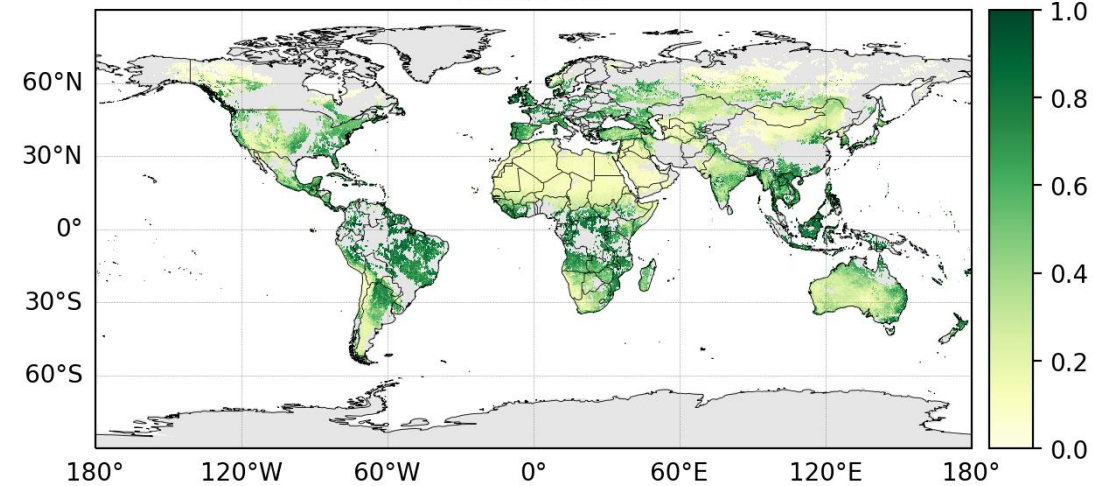
Comparison for SNPP DLY_NDVI_TOC between STAR and NCCF_UAT, 20240416



SNPP VIIRS DLY_NDVI_TOC from STAR
20240416

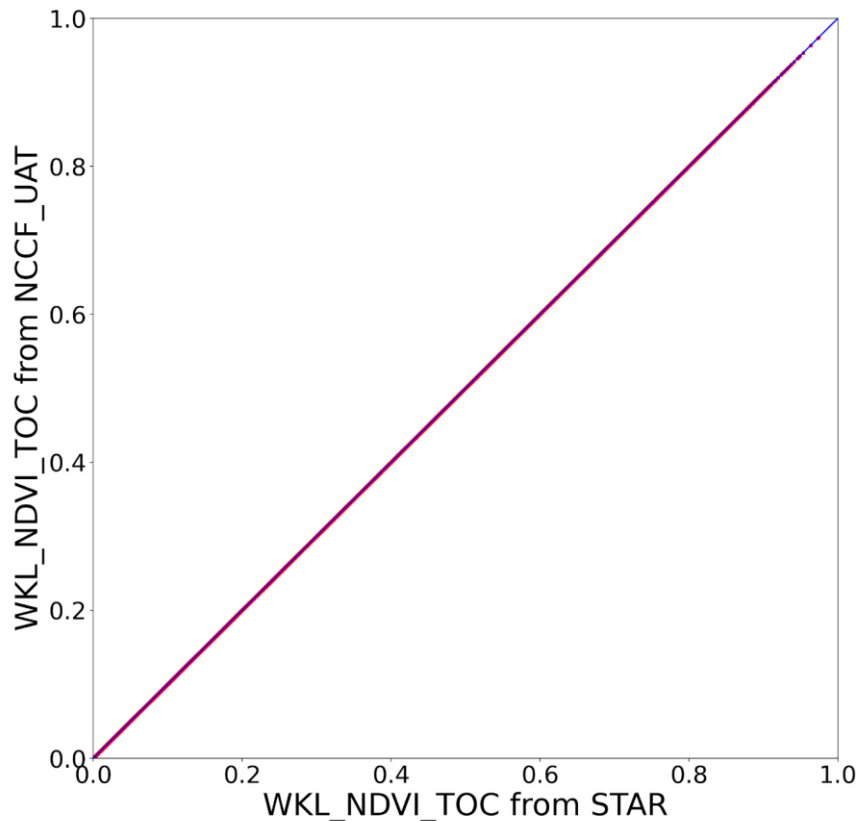


SNPP VIIRS DLY_NDVI_TOC from NCCF_UAT
20240416

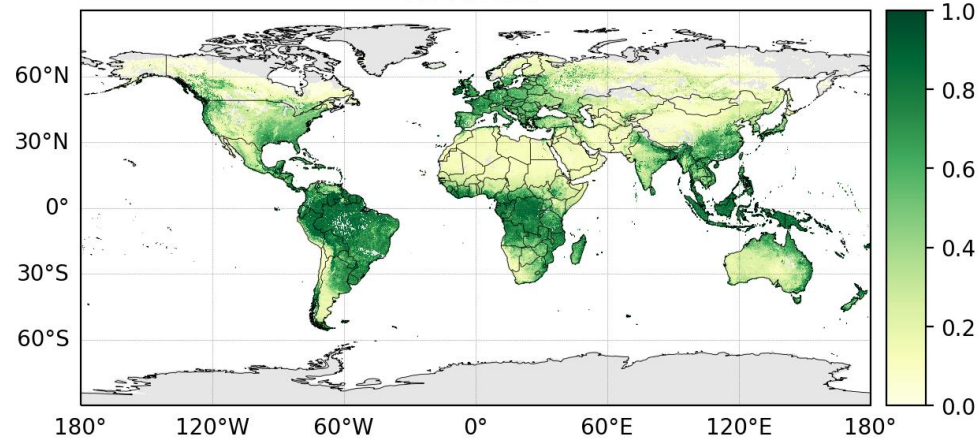


100% match

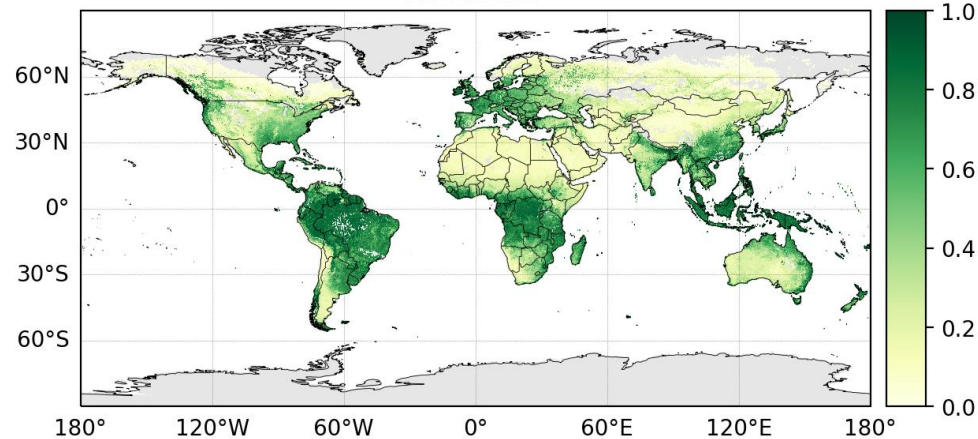
Comparison for NOAA-20 WKL_NDVI_TOC between STAR and NCCF_UAT, 20240330



NOAA-20 VIIRS WKL NDVI_TOC from STAR
20240330

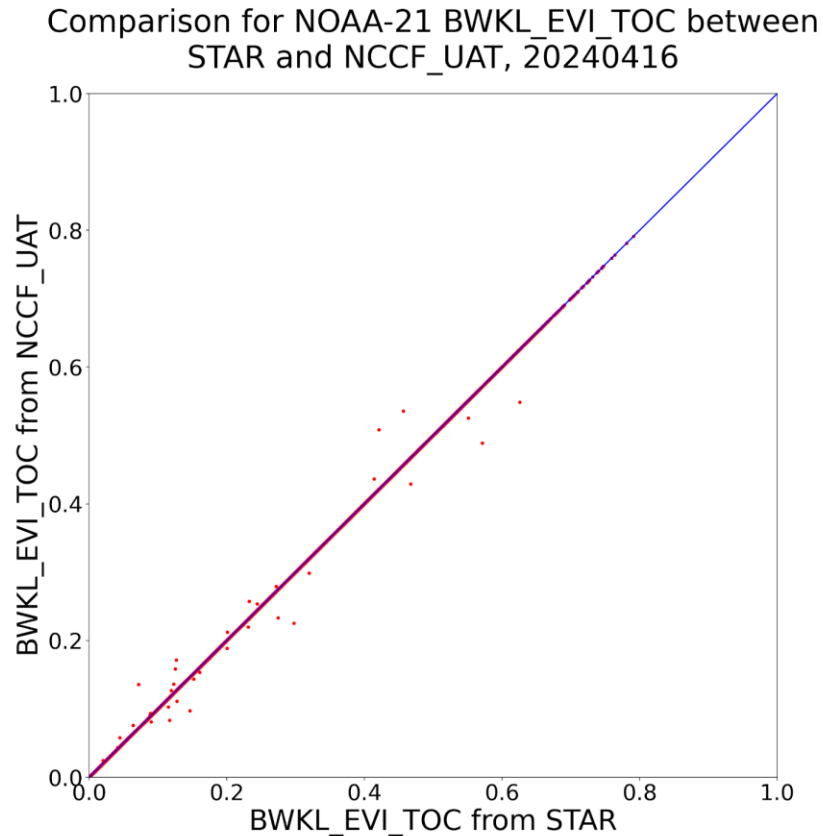


NOAA-20 VIIRS WKL NDVI_TOC from NCCF_UAT
20240330

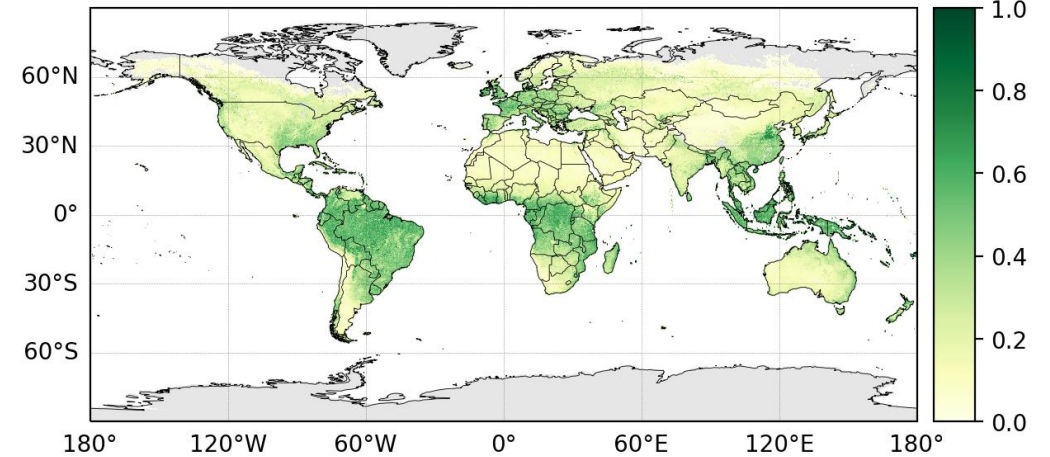


NCCF vs. current N21, Biweekly, EVI_TOC

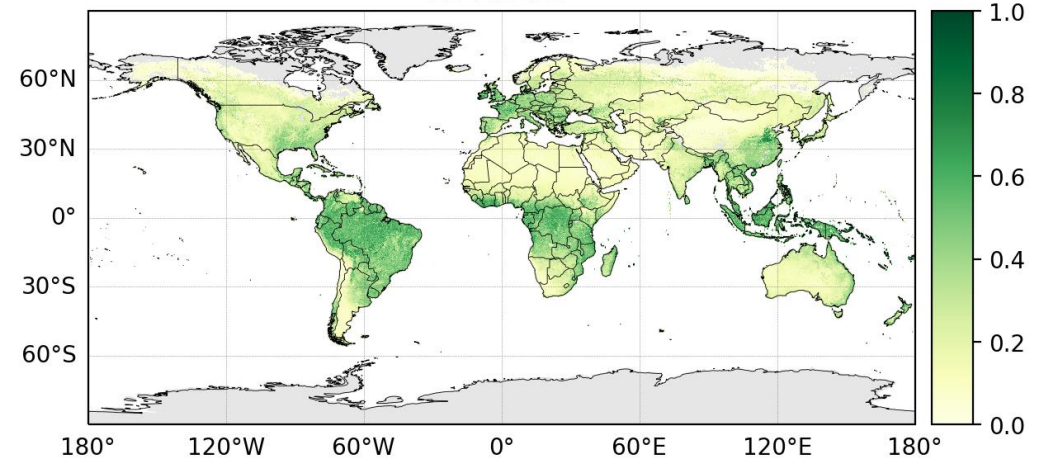
- 99.50 % match
- The slight difference only comes from missing granules during the 16-day compositing period.



NOAA-21 VIIRS BWKL EVI_TOC from STAR
20240416



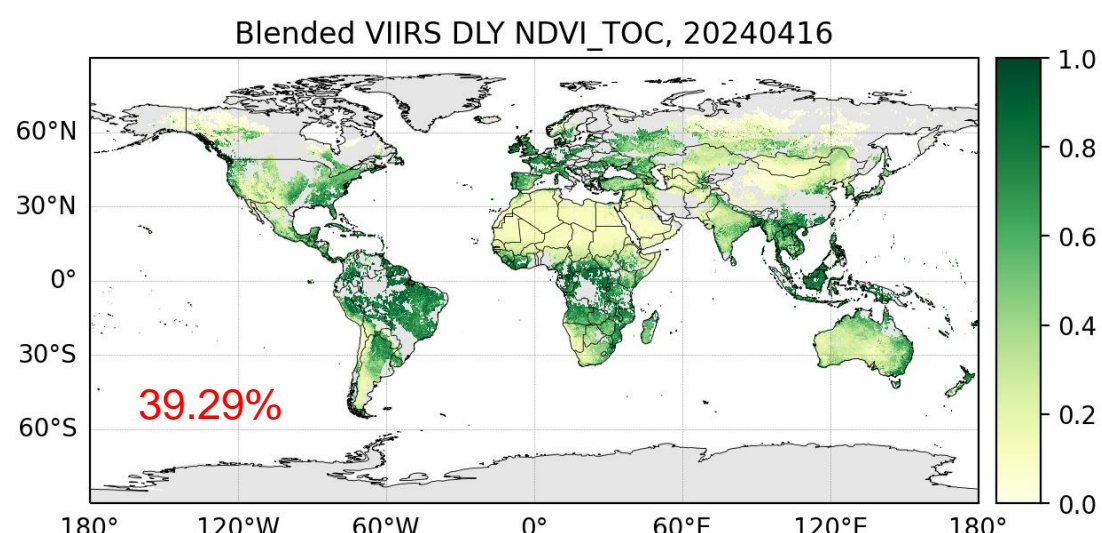
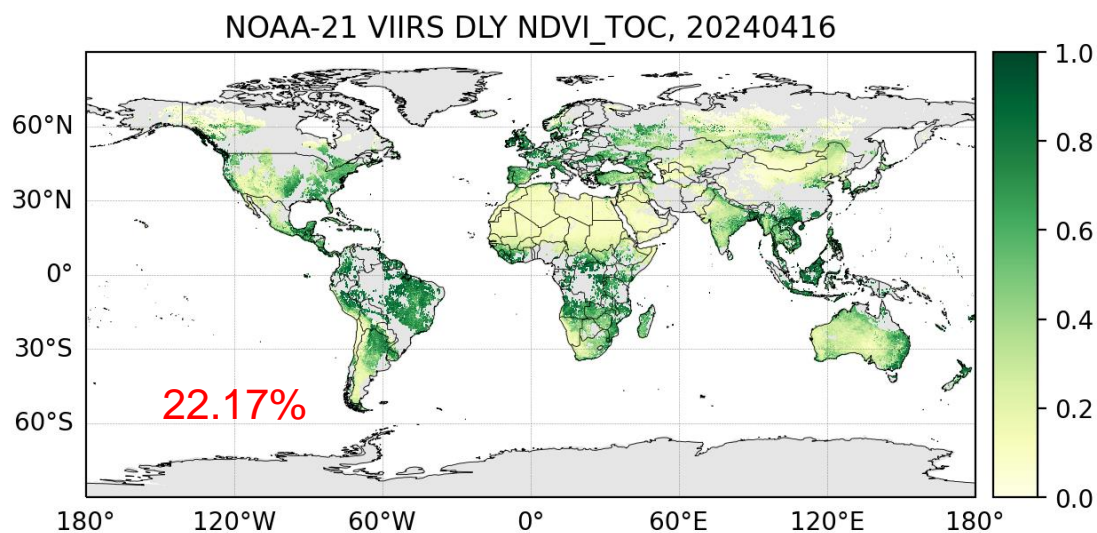
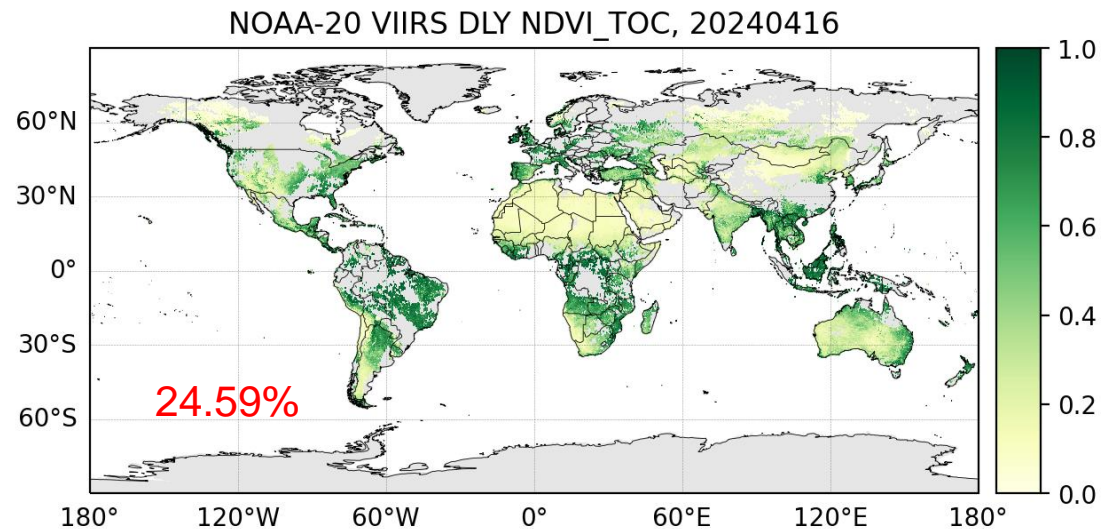
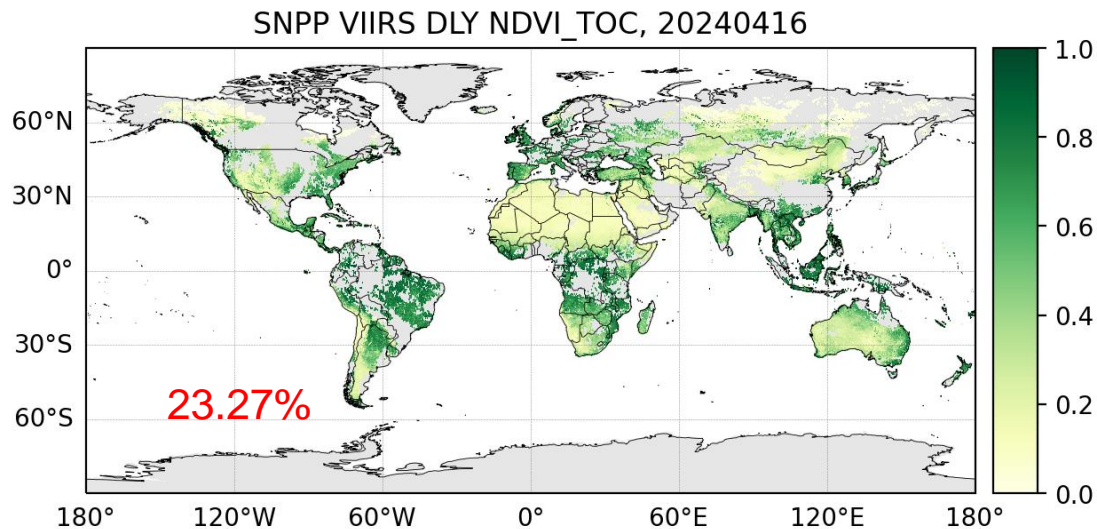
NOAA-21 VIIRS BWKL EVI_TOC from NCCF_UAT
20240416



SNPP/ NOAA-20/ NOAA-21 Blended VI

Sample of daily blended VI, marked with percentage of valid pixels.

Blended VI has more valid pixels.



Accomplishments / Events:

- Download, creation, and analysis of Imagery EDR for IDPS Block 2.3 Mx10 I&T Review/Checkout. Recommendation to proceed with T2O
- Team members visited NWS Boulder, CO and discussed satellite applications in NWS operations, including uses of VIIRS Imagery
- Polar SLIDER Upgrades: The installation of both new hardware and new software has improved Polar SLIDER imagery processing times and allowed for the inclusion of new products. All bands and products are now available in all sectors from all three VIIRS. New VIIRS Multispectral products added include: Blowing Snow RGB, Sea Spray RGB, CVD Dust RGB, Dust-Fire RGB, and NGFS Microphysics RGB. Visit: <https://col.st/GuYXk>
- VIIRS Imagery generated by the team were used in two NESDIS Earth from Orbit videos:
 - [Celebrating Earth Day with NOAA Satellites](#) and [NOAA Satellites View Total Solar Eclipse](#)
- Blog Posts with VIIRS Imagery
 - [Late March N Alaska Blowing Snow](#)
 - [2024 North American Solar Eclipse](#)
- 21 VIIRS Imagery Posts on CIRA Social Media this Month. A few posts:
 - [Day Land Cloud RGB Imagery of Solar Eclipse – 13K views](#)
 - [Visible Imagery of ice break-up in East Siberian Sea – 14K views](#)
 - [NCC Imagery of Mount Erebus lava lake and McMurdo Station – 6.6K views](#)

Overall Status:

	Green ¹ (Completed)	Blue ² (On-Schedule)	Yellow ³ (Caution)	Red ⁴ (Critical)	Reason for Deviation
Cost / Budget		X			
Technical / Programmatic		X			
Schedule		X			

1. Project has completed.
2. Project is within budget, scope and on schedule.
3. Project has deviated slightly from the plan but should recover.
4. Project has fallen significantly behind schedule, and/or significantly over budget.

Issues/Risks:

Milestones	Original Date	Forecast Date	Actual Completion Date	Variance Explanation
FY25 Program Management Review	Jun-24	Jun-24		
Blowing Dust Climatology Paper Submitted (Includes VIIRS Imagery)	Jul-24	Jul-24		
Prepare and deliver the initial updates for the Imagery Cal/Val plan (updated for JPSS-3), ahead of PStR	Aug-24	Aug-24		
New ASF Tool code and updated NCC LUT – Test for 3 VIIRS	Sep-24	Sep-24		
New Imagery products or product enhancements (display on SLIDER)	Sep-24	Sep-24	continuing	
Realtime Imagery monitoring and display systems (SLIDER, etc.)	Sep-24	Sep-24	continuing	
Interesting VIIRS Imagery to Social Media and Blogs	Sep-24	Sep-24	continuing	
McIDAS-X/V Enhancements for processing/display of VIIRS Imagery	Sep-24	Sep-24	continuing	
Block 2.3 Mx builds deploy regression review/checkout (Mx9, Mx10, ...)				Mx9: Jan-2024, Mx10: Apr-2024

Highlights: Image of the Month

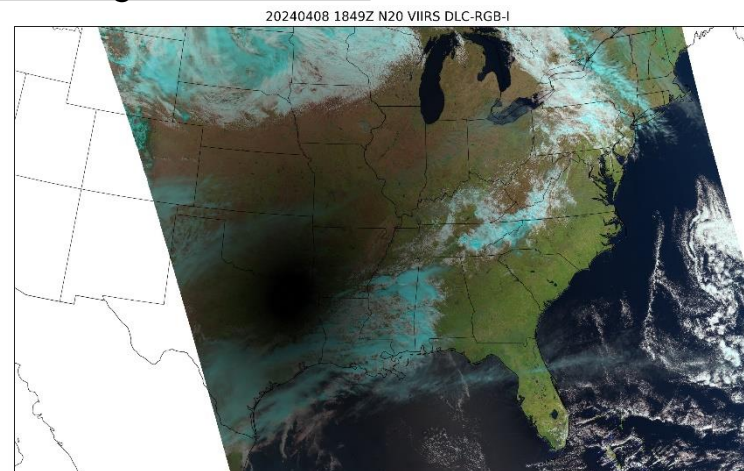


Figure: 08 April 2024 NOAA-20 VIIRS 375-m Day Land Cloud RGB Imagery captured the Total Solar Eclipse over the south-central US. See blog post [here](#).

Accomplishments / Events:

- Assisted OSPO in recovery from another Suomi NPP VIIRS SBC Lockup (computer freeze) anomaly (“petulant mode”) on 4/24/2024: reviewed engineering telemetry and onboard calibrator data; verified that all bands returned to nominal performance with exception of DNB that displays scan-edge striping (to be corrected after the next new moon DNB Calibration on 5/8/2024)
- Completed checkout of the IDPS Block 2.3 Release Mx10 software deployed on DP-TE: compared the N21 (NOAA-21), N20 (NOAA-20) and NPP radiometric and geolocation products from Mx10 and Mx9 without detecting any significant differences
- Generated and delivered for deployment in the IDPS operations the updated N21 VIIRS SDR DNB STRAY-LIGHT-CORRECTION LUT for April as well as the updated N21, N20 and NPP VIIRS SDR DNB DN0 and GAIN-RATIOS LUTs that were created based on data acquired around the new moon on 4/8/2024
- Assisted in scheduling and analyzed data from N21, N20, and NPP VIIRS lunar calibration on 4/19/2024: data aligns well with long-term trends and exhibits consistency

Overall Status:

	Green ¹ (Completed)	Blue ² (On-Schedule)	Yellow ³ (Caution)	Red ⁴ (Critical)	Reason for Deviation
Cost / Budget		X			
Technical / Programmatic		X			
Schedule		X			

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Issues/Risks:

J3/J4 VIIRS granule size change test data for IDPS

Highlights:



Suomi NPP VIIRS DNB re-projected image acquired after recovery from the SBC Lockup anomaly on 4/24/2024: striping visible along the edge on the right side

Milestones	Original Date	Forecast Date	Actual Completion Date	Variance Explanation
Complete SNPP VIIRS SDR 2012-2020 reprocessing delivery to CLASS	Dec-23	Dec-23	Oct-23	
SNPP and NOAA-20 VIIRS intermediate recalibration	Sep-24	Sep-24		
JPSS-3 VIIRS pre-launch characterization report	Apr-24	May-24		Unplanned JPSS ops
JPSS-3 VIIRS SDR initial pre-launch LUTs	Jun-24	Jun-24		
Monthly lunar calibration (predictions and analyses)	Jul-24	Jul-24		
Monthly delivery of VIIRS DNB calibration LUTs	Sep-24	Sep-24		
Monthly delivery of N21 VIIRS DNB straylight LUTs	May-24	May-24		
Geolocation monitoring using CPM (NPP, N20, N21)	Sep-24	Sep-24		
N21 on-orbit calibration LUT development	Sep-24	Sep-24		
Delivery of VIIRS SDR RSB and TEB calibration LUTs to mitigate degradation	Sep-24	Sep-24		

Accomplishments / Events:

- Quality/Oversight Continued to ensure high quality Volcanic Ash retrievals from EDR algorithms and VOLCAT. Routine validation of existing JPSS volcanic ash EDRs from current sensors will continue as needed, including support for ASSISTT/NDE evaluations. VOLCAT is long-term plan.
- VOLCAT VIIRS volcanic ash plume identification and extraction work is an enhancement to the VOLCAT methodology. The most recent research focus has been developing a web-page based tool to manually classify VOLCAT volcanic cloud objects by a science team expert (as yes (containing volcanic ash) or no (not containing volcanic ash)). This will enable a full training database to be generated for ash and non-ash clouds for training the AI/ML methodology, including both detected and missed volcanic clouds by the current VOLCAT algorithm. The included figure shows an example of a classified missed detection. One goal of this research to improve detection accuracy and detect missed volcanic clouds like the one shown.

Overall Status:

	Green ¹ (Completed)	Blue ² (On-Schedule)	Yellow ³ (Caution)	Red ⁴ (Critical)	Reason for Deviation
Cost / Budget		X			
Technical / Programmatic		X			
Schedule		x			

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Issues/Risks:

Milestones	Original Date	Forecast Date	Actual Completion Date	Variance Explanation
Develop updated user training material	May-23	May-23	May-23	
Improve VIIRS volcanic ash plume identification and extraction	Jun-23	Sep-24		
Improve near source VIIRS volcanic ash height information	Jul-23	Jul-23	Jul-23	
NOAA-21 Volcanic Ash Beta Maturity	Sept-23	Aug-23	Aug-23	
NOAA-21 Volcanic Ash Provisional Maturity	Oct-23	Aug-23	Aug-23	
Maintain and monitor quality of volcanic ash EDR and JPSS-based products in VOLCAT	Sep-23	Sep-23	Sep-23	
NOAA-21 Volcanic Ash Full Maturity	Mar-24	Mar-24	Feb-24	

Highlights: In preparation for improving VOLCAT ash plume detection, a database of cases is being created via semi-automated approach with human expert classifications. Below is an example of a volcanic ash plume emitted from the volcano Popocatepetl in Mexico as observed by NOAA-20 VIIRS on February 29, 2020 (magenta plume with label 1712). This plume was currently not detected by VOLCAT and cases like these must be identified so subsequent research can be done toward detection improvement.

