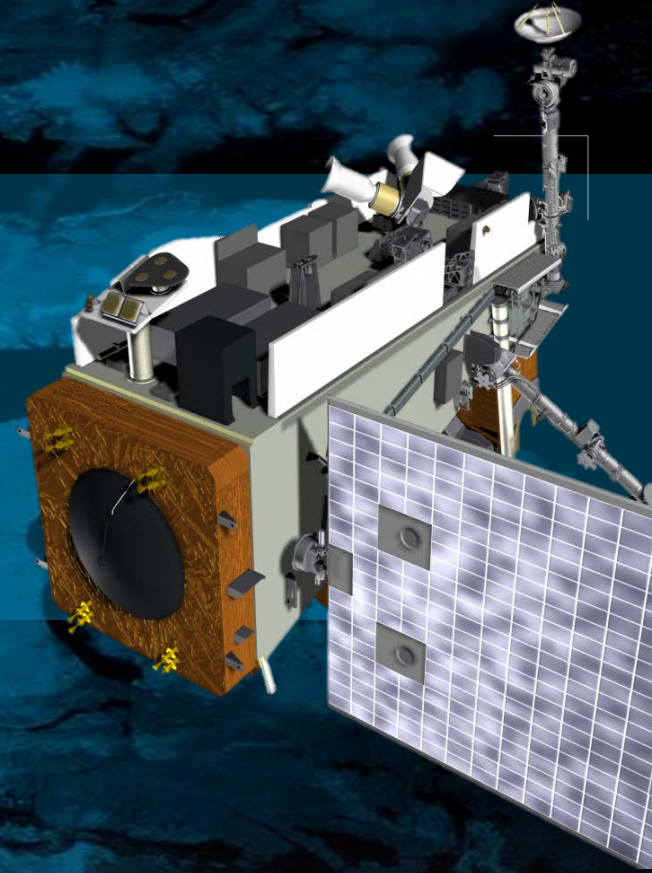


The Joint Polar Satellite System

NOAA Satellite Aerosol Products Workshop

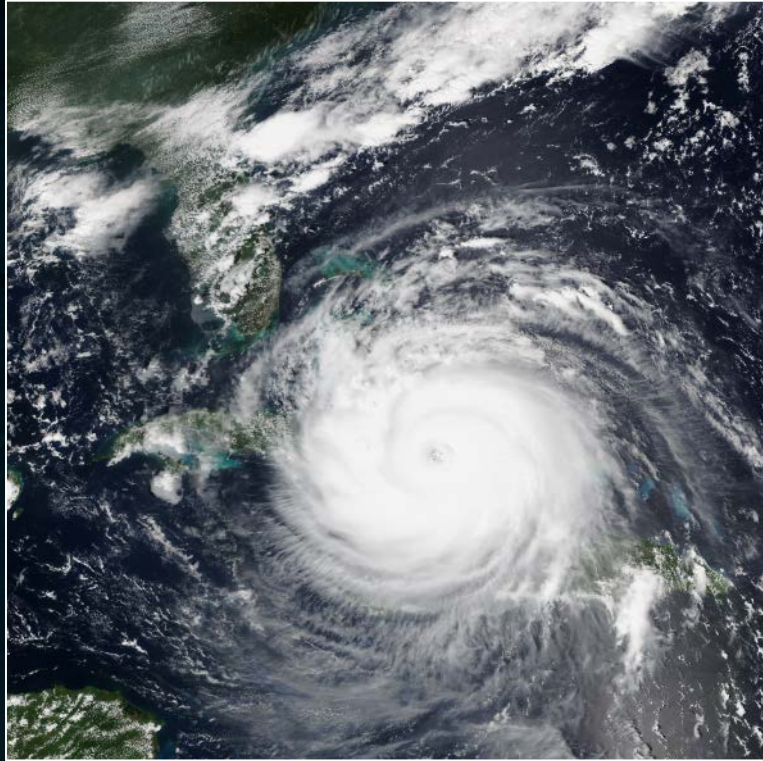


Arron L. Layns
JPSS Algorithm Management Project Leave

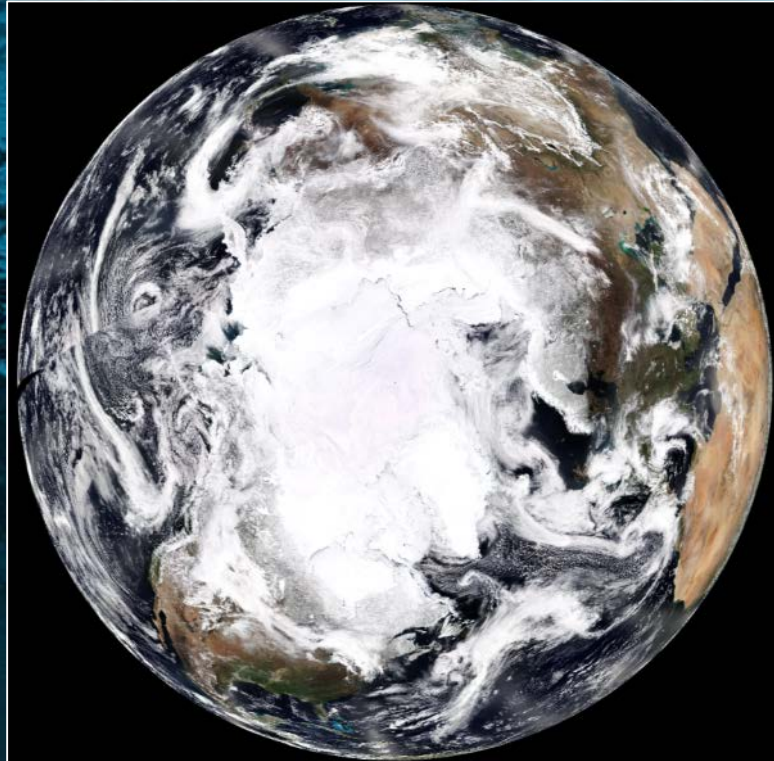
GLOBAL DATA.
LOCAL WEATHER.



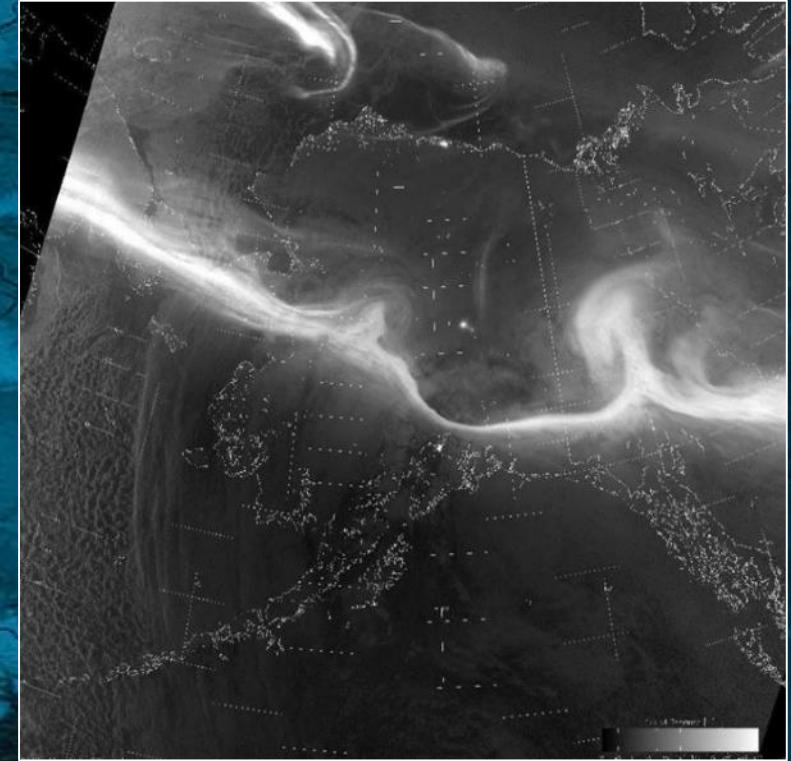
The Joint Polar Satellite System Provides...



Critical data for numerical weather prediction to enable accurate 3–7 day forecasts.



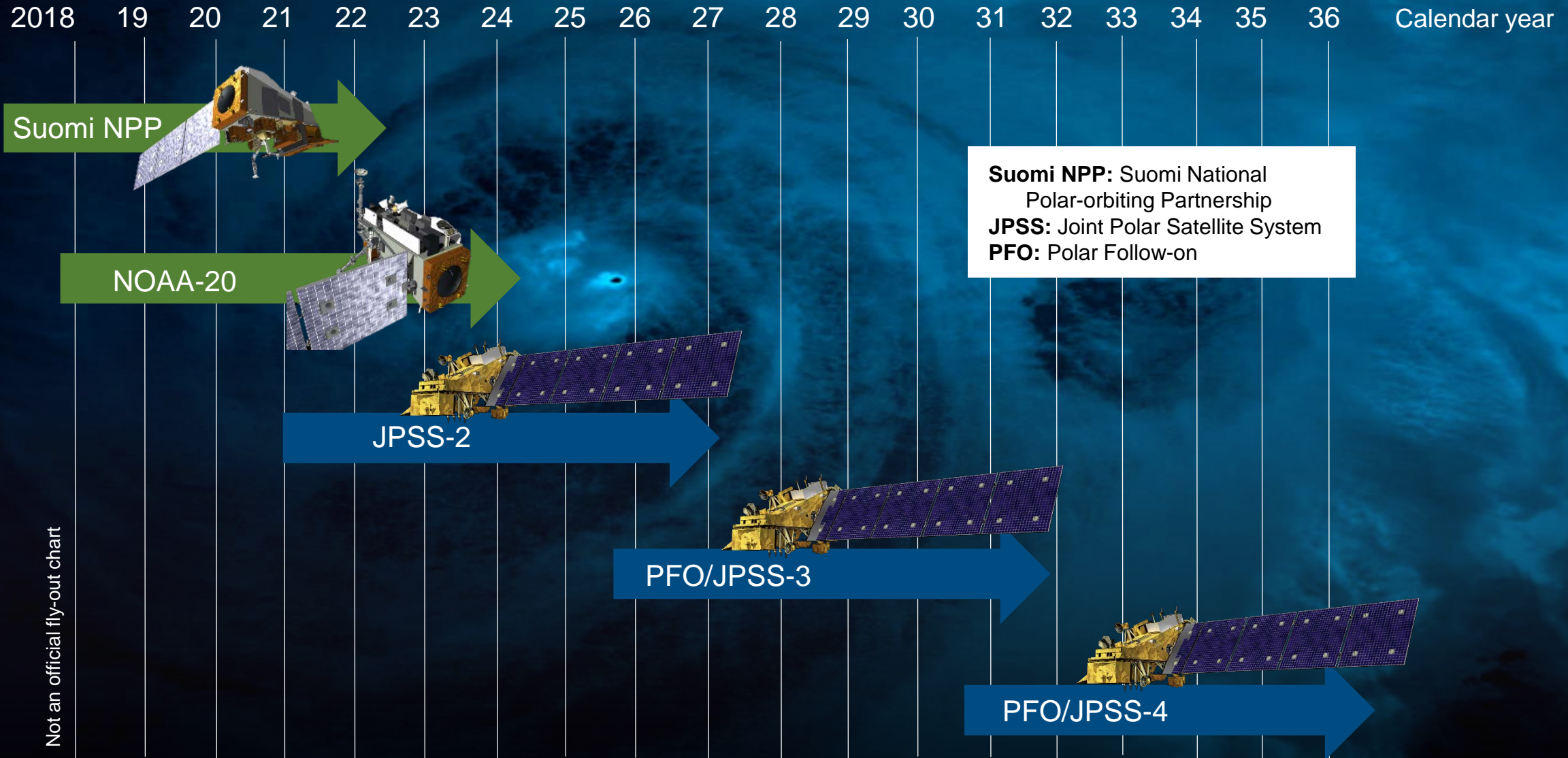
Operational weather and environment satellite observations for Alaska and the polar regions.



Global coverage and unique day and night imaging capabilities to support environmental monitoring and forecasting.



JPSS Continuity of Operations





JPSS Instruments

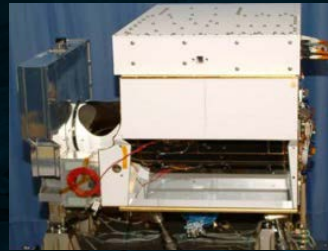
ATMS

Advanced Technology
Microwave Sounder



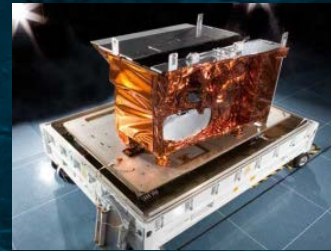
CrIS

Cross-track
Infrared Sounder



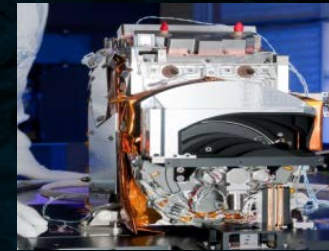
VIIRS

Visible Infrared Imaging
Radiometer Suite



OMPS

Ozone Mapping and
Profiler Suite



CERES

Clouds and the Earth's
Radiant Energy System



ATMS and CrIS together provide high vertical resolution temperature and water vapor information needed to maintain and improve forecast skill out to 5 to 7 days in advance for extreme weather events, including hurricanes and severe weather outbreaks.

VIIRS provides many critical imagery products including snow/ice cover, clouds, fog, aerosols, fire, smoke plumes, vegetation health, phytoplankton and chlorophyll abundance.

Ozone spectrometers for monitoring ozone hole and recovery of stratospheric ozone and for UV index forecasts.

Scanning radiometer which supports studies of the Earth Radiation Budget (ERB).

NORTHROP GRUMMAN

HARRIS

Raytheon



NORTHROP GRUMMAN



NOAA-20 is Now Operational!



Launched into Low Earth Orbit—512 miles

14x

Orbits Earth 14 times pole-to-pole with SNPP

2x

Images entire globe twice a day



State of the art instrumentation to collect data on Earth's atmosphere, lands, and oceans



Sends more than 2,000 gigabytes of data to Earth every day



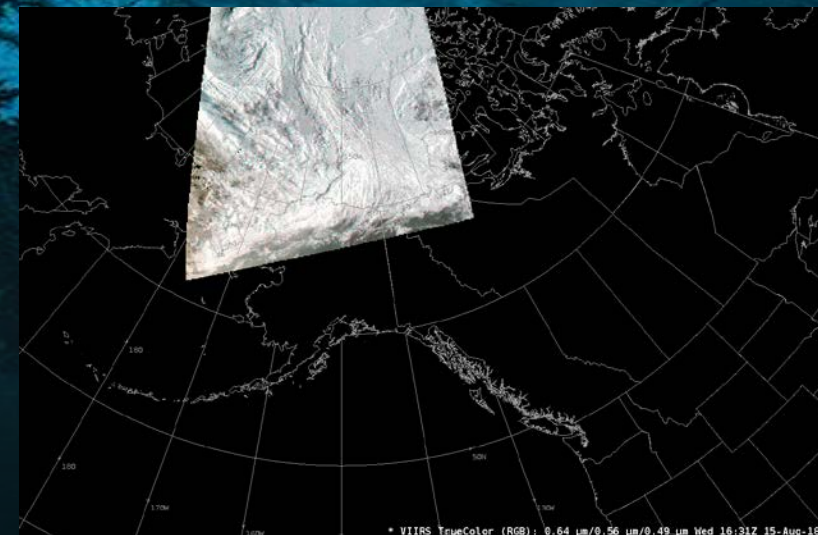
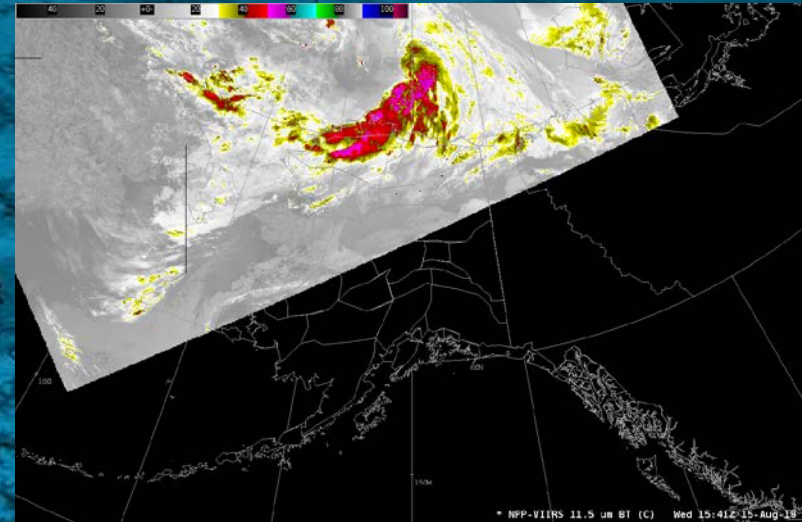
Flys in the same orbit as Suomi NPP, 50 minutes apart





NOAA-20 & SNPP – Working together

- NOAA-20 VIIRS KPPs incorporated into AWIPS
- Two satellite combination doubles image coverage over Alaska
- Northern Alaska - around 18 passes per day
- Southern Alaska - 3-4 early morning and 3-4 afternoon passes per day
- Negligible difference between SNPP and NOAA-20





Twice the VIIRS

2018-08-22
13:04:52 UTC

(H)ide

Play (space) < >

(L)oop (R)ock Re(v)

Speed

Zoom (+) Zoom (-) Max (Z)oom

(M)aps Lat/Lo(n) Slide(r)

(S)atellite JPSS

Se(c)tor Northern Hemis...

(P)roduct Day Night Band

Add (O)verlay M Band 14

of (I)mages 28

(T)ime Step 51 min

Day Night Band

Hide

(A)rchived Imagery

(B)egin D... Begin Ti...

End Date... End Tim...

Home (y) Share (U)RL Help (?)

Flow-Following

Mouse (D)raw Clear Drawin(g)s

[SLIDER by RAMMB / CIRA @ CSU](#)
[Experimental Products Disclaimer](#)

2018-08-22 13:04:52 UTC



International Collaboration for Global Forecasting

The international constellation of polar-orbiting satellites is called the 'weather for



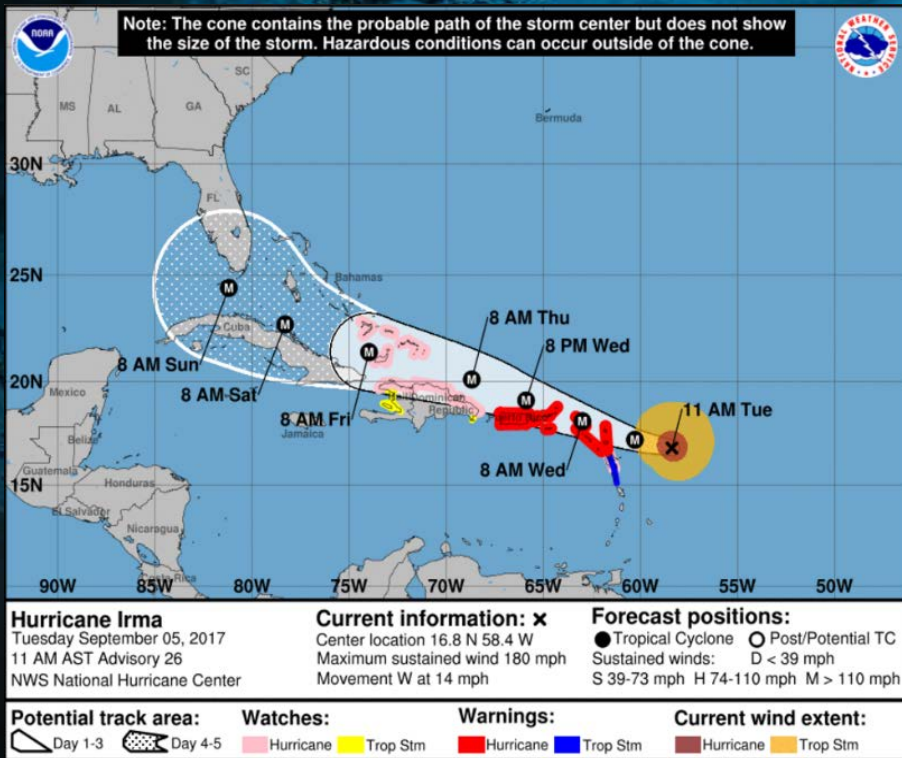
e data in
comes
ites.



Supporting NWS

▶ Suomi NPP remains healthy and continues to provide accurate atmospheric and environmental data.

🕒 NOAA-20 flies in the same orbit (50 minutes apart) collecting the same data as Suomi NPP.



Search LTE 11:37 AM 100%

Louis Uccellini
1,006 Tweets

Tweets Tweets & replies Media Likes

7 78 39

Louis Uccellini @NWSDire... · 5/30/18
Great news! Observations from the new NOAA-20 are now feeding into our weather models in a record 6 months after launch; helping NWS forecasters provide more accurate 3-7 day forecasts and advance notice of major storms. News release: [noaa.gov/media-release/...](http://noaa.gov/media-release/) @NOAASatellites

8 163 426

Louis Uccellini Retweeted

NWS Elko @NWSElko · 5/28/18
The upper level weather system that has been giving us multiple days of wet weather is slowly making its way east

🏠 🔍 🔔 20+ 📧 1



S-NPP Operational Enterprise Data Products

ATMS		CrIS	OMPS	VIIRS			AMSR-2
Cloud Liquid Water	Rainfall Rate	Carbon Dioxide	Limb SDR	Active Fires	Cloud Optical Depth	Land Surface Temperature	Calibrated Sensor Data
Ice Concentration	Snow Cover	Carbon Monoxide	Nadir Profile	Aerosol Detection	Cloud Particle Size Distribution	Ocean Color*	Cloud Liquid Water
Imagery	Snowfall Rate	Methane	Total Column	Aerosol Optical Depth	Cloud Phase	Polar Winds	Imagery
Land Surface Emissivity	Snow Water Equivalent	Infrared Ozone Profile	Limb Profile	Aerosol Particle Size	Cloud Top Pressure	Sea Surface Temperature	Rainfall (type/Rate)
Land Surface Temperature	Temperature Profile	Outgoing Longwave Radiation		Albedo (surface)	Cloud Top Temperature	Snow Cover	Sea Ice Characterization
Moisture Profile	Total Precipitable Water			Annual Surface Type	Green Vegetation Fraction	Surface Reflectance	Sea Surface Temperature
Atmospheric Vertical Temperature Profiles				Cloud Height (Top & Base)	Ice Age/Thickness	Vegetation Health Index Suite	Sea Surface Wind Speed
Atmospheric Vertical Moisture Profiles				Cloud cover/layers	Ice Concentration	Vegetation Indices	Snow Cover
				Cloud Mask	Ice Surface Temperature	Volcanic Ash Detection & Height	Snow Water Equivalent
							Soil Moisture
							Total Precipitable Water

Color Key

Green Shading = Enterprise version of these products have transitioned to ESPC from IDPS and declared operational

Orange Shading = Non-Enterprise versions of these products are operational; The Enterprise versions of these products are planned to be transitioned to ESPC from IDPS by the end of 2018



NOAA-20 Operational Enterprise Data Products

ATMS		CrIS	OMPS	VIIRS		
Cloud Liquid Water	Rainfall Rate	Carbon Dioxide	Limb SDR	Active Fires	Cloud Optical Depth	Land Surface Temperature
Ice Concentration	Snow Cover	Carbon Monoxide	Nadir Profile	Aerosol Detection	Cloud Particle Size Distribution	Ocean Color
Imagery	Snowfall Rate	Methane	Total Column	Aerosol Optical Depth	Cloud Phase	Polar Winds
Land Surface Emissivity	Snow Water Equivalent	Infrared Ozone Profile	Limb Profile	Aerosol Particle Size	Cloud Top Pressure	Sea Surface Temperature
Land Surface Temperature	Temperature Profile	Outgoing Longwave Radiation		Albedo (surface)	Cloud Top Temperature	Snow Cover
Moisture Profile	Total Precipitable Water			Annual Surface Type	Green Vegetation Fraction	Surface Reflectance
Atmospheric Vertical Temperature Profiles				Cloud Height (Top & Base)	Ice Age/Thickness	Vegetation Health Index Suite
Atmospheric Vertical Moisture Profiles				Cloud cover/layers	Ice Concentration	Vegetation Indices
				Cloud Mask	Ice Surface Temperature	Volcanic Ash Detection & Height

Color Key

Green Shading = Enterprise version of these products have been declared operational



NOAA-20 Science Product Validation & Readiness for Operations (1 of 2)

	Beta	Provisional	SPSRB Declared Ready for Operations	Validated
ATMS Level 1 Products				
Temperature Data Record (TDR)*	08-Dec-2017	23-Jan-2018	28-Feb-2018	14-Jun-2018
Sensor Data Record (SDR)	08-Dec-2017	23-Jan-2018	28-Feb-2018	14-Jun-2018
CrIS Level 1 Product				
SDR*	17-Jan-2018	16-Feb-2018	28-Feb-2018	Sept-2018
VIIRS Level 1 Product				
VIIRS SDR	1-Feb-2018	16-Feb-2018	28-Feb-2018	15-Jun-2018
OMPS Level 1 Products				
Total Column	5-Jan-2018	18-Apr-2018	Sept-2018	TBD
Nadir Profile	5-Jan-2018	2-Jul-2018	Sept-2018	TBD
VIIRS Level 2 Products(s)				
VIIRS Imagery*	1-Feb-2018	16-Feb-2018	28-Feb-2018	22-Aug-2018

Validation Maturity Levels	Not Validated	Beta Maturity	Provisional Maturity	Validated Maturity
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Ready for Operations	SPSRB Declaration
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*Key Performance Parameter (KPP)

Product quality documentation available: <https://www.star.nesdis.noaa.gov/jpss/AlgorithmMaturity.php>

Updated: Arron Layns; 9/4/18



NOAA-20 Science Product Validation & Readiness for Operations (2 of 2)

	Beta	Provisional	SPSRB Ready for Operations	Validated
VIIRS Level 2 Products				
Cloud Property Algorithms	23-Jul-2018	Sep-2018	Nov-2018	Mar-2019
Cloud Mask	18-Apr-2018	Sep-2018	Nov-2018	Mar-2019
Aerosol Optical Depth and Particle Size Parameter	18-Apr-2018 ¹	18-Apr-2018 ¹	Nov-2018	Mar-2019
Aerosol Detection	18-Apr-2018 ¹	18-Apr-2018 ¹	Nov-2018	Mar-2019
Ice Surface Temperature	15-Jun-2018	Sep-2018	Nov-2018	Mar-2019
Sea Ice Concentration and Ice Thickness	15-Jun-2018	Sep-2018	Nov-2018	Mar-2019
Snow Cover (Binary Map & Snow Cover Fraction)	15-Jun-2018	Sep-2018	Nov-2018	May-2019
Active Fire	18-Apr-2018	18-Apr-2018	13-Aug-2018	Dec-2019
Land Surface Temperature	23-Jul-2018	Dec-2018	Apr-2019	Nov-2019
Land Surface Albedo	23-Jul-2018	Dec-2018	Apr-2019	Nov-2019
GST (Global Gridded Surface Type)	Jul-2019	Sep-2019	--	Nov-2019
Land Surface Reflectance	15-Jun-2018	Nov-2018	Apr-2019	Nov-2019

	Beta	Provisional	SPSRB Ready for Operations	Validated
VIIRS Level 2 Products				
Green Vegetation Fraction (GVF)	22-Aug-2018	Feb-2019	Jun-2019	Feb-2020
Vegetation Index (VI)	22-Aug-2018	Feb-2019	May-2019	Feb-2020
Vegetation Health (VH)	22-Aug-2018	Feb-2019	May-2019	Jun-2020
Volcanic Ash	Sept-2018	Sept-2018	Apr-2019	Mar-2019
Ocean Color	Oct-2018	Mar-2019	Jun-2020	Jun-2020
Sea Surface Temperature	18-Apr-2018 ¹	18-Apr-2018 ¹	Oct-2018	Apr-2019
VIIRS Polar Winds	Sep-2018	Sep-2018	Feb-2019	Mar-2019
CRIS/ATMS Level 2 Products				
NUCAPS: AVTP, AVMP	15-Jun-2018 ¹	15-Jun-2018 ¹	Oct-2018	Sep-2019
NUCAPS: Ozone, Trace Gas (CO, CO2, CH4), OLR	15-Jun-2018 ¹	Sep-2018	Dec-2018	Sep-2019
ATMS Level 2 Products				
MiRS: AVTP, AVMP, TPW	18-Apr-2018 ¹	18-Apr-2018 ¹	Oct-2018	Sep-2019
MiRS: Snowfall Rate	18-Apr-2018	Mar-2019	Mar-2019	Jun-2020
MiRS: Other EDRs	18-Apr-2018 ¹	18-Apr-2018 ¹	Mar-2019	Sep-2019
OMPS Level 2 Products				
Ozone EDR: NP & TC	18-Apr-2018	Sept-2018	Sept-2018	Aug-2018

Validation Maturity Levels

Not Validated	Beta Maturity	Provisional Maturity	Validated Maturity
---------------	---------------	----------------------	--------------------

Ready for Operations

SPSRB Declaration

¹ Scientifically mature pending verification of NDE implementation.



EDR migration background

- The JPSS Proving Ground/Risk Reduction funded the adaptation of GOES-R algorithms to the JPSS/VIIRS sensors starting in FY2012.
- Product performance was overall better than the performance of the IDPS algorithms and provided an opportunity to move towards Enterprise Algorithms.
- The JPSS Program reallocated product processing responsibilities from the IDPS to NDE through a series of CCRs.
- This effort is tracking the completion of this migration for S-NPP.
- N20 Enterprise EDRs will be available to users via NDE/PDA, so no transition will be required.
- Even though IDPS is generating “non-enterprise” N20 EDRs, access through PDA and CLASS is restricted a very limited internal group.



User Notification

Topic: Terminate distribution of IDPS SNPP EDRs from PDA on December 31, 2018

Date/Time Issued: July 23, 2018 1854Z

Product(s) or Data Impacted: See a list of products at http://satepsanone.nesdis.noaa.gov/pub/product/nde/IDPS_EDRs.pdf

Date/Time of Initial Impact: December 31, 2018

Date/Time of Expected End: N/A

Length of Event: N/A

Details/Specifics of Change:

The processing of Environmental Data Records (EDRs) from SNPP and follow on satellites has been reallocated from IDPS to NDE.

Most replacement products have been operational in NDE, which includes VIIRS cloud, aerosol, cryosphere, SST, Active Fire, surface reflectance, CrIS/ATMS Soundings, OMPS Nadir Profiler and Total Column Ozone. VIIRS ocean color is produced in ESPC OKEANOS.

VIIRS vegetation indices and land surface temperature/land surface albedo will be available from NDE in summer 2018 and fall 2018 respectively.

The NDE enterprise products provide users with continuity of NOAA products between current and future NOAA operational satellites. It also demonstrates NOAA's goal of enterprise solutions by employing the same algorithms for POES and GOES. This brings scientific consistency between the current operational products, GOES-R products and VIIRS products.

The plan to discontinue the EDR production in IDPS is in process. Users are recommended to switch from IDPS EDRs to NDE Enterprise products on or before December 31, 2018.

Users that are currently only subscribe the IDPS EDRs from PDA should switch to the equivalent NDE Enterprise products. Users subscribe to both IDPS and NDE products are encouraged to discontinue their subscriptions to IDPS EDRs once they have concluded their evaluation and validation.

Contact Information: For information on the status of this work, please contact ESPC Operations at ESPCOperations@noaa.gov and 301-817-3880

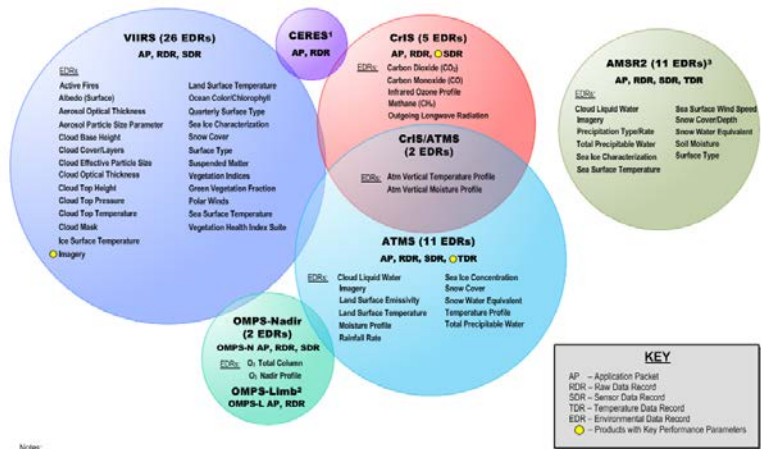
NOTE: Discontinuation of EDR products does NOT include VIIRS Imagery EDRs or any RDR/SDR/TDR products ("Mission-Unique Products," per L1RD).

Satellite Proving Ground: Goal is to improve NOAA Services through optimizing the use of satellite data along with other sources of data & information: Observations to Services to Stakeholders



JPSS Program Data Products

JPSS Level 1 Requirements Document, v1.8



Notes:
¹AP and RDR for the JPSS-3 Mission are contingent on NASA manifest of the Radiation Budget Instrument (RBI)
²Not applicable to JPSS-1, AP and RDR contingent on NASA manifest of OMPS-Limb on the JPSS-2 Mission
³All products dependent on the Global Change Observation Mission (GCOM) provided by the Japan Aerospace Exploration Agency

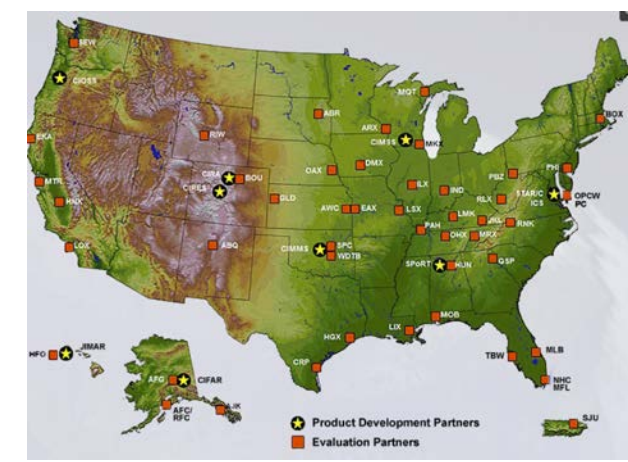
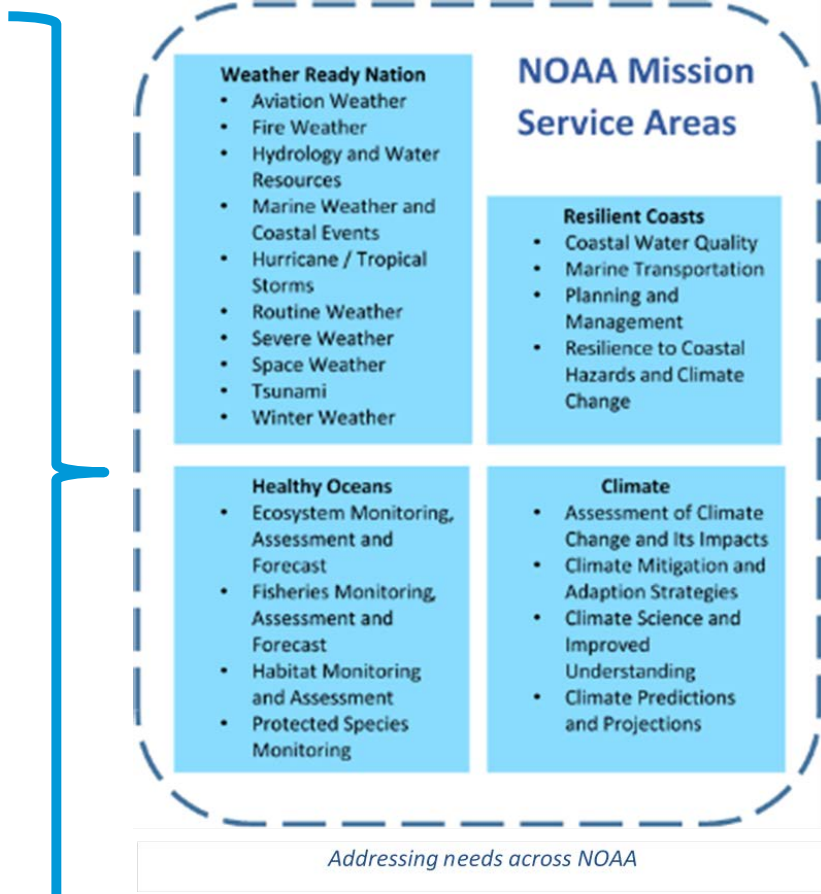
The JPSS Program includes Ground System Support for the Metop, DMAP, and GCOM Missions

April 3, 2015
 This chart is controlled by JPSS
 Program Systems Engineering

JPSS-P
 Rev C.1

ADVANCED BASELINE IMAGER (ABI) Aerosol Detection (Including Smoke and Dust) Aerosol Optical Depth (AOD) Clear Sky Masks Cloud and Moisture Imagery Cloud Optical Depth Cloud Particle Size Distribution Cloud Top Height Cloud Top Phase Cloud Top Pressure Cloud Top Temperature Derived Motion Winds Derived Stability Indices Downward Shortwave Radiation: Surface Fire/Hot Spot Characterization Hurricane Intensity Estimation Land Surface Temperature (Skin) Legacy Vertical Moisture Profile Legacy Vertical Temperature Profile Radiances Rainfall Rate / QPE Reflected Shortwave Radiation: TOA Sea Surface Temperature (Skin) Snow Cover Total Precipitable Water Volcanic Ash: Detection and Height	GEOSTATIONARY LIGHTNING MAPPER (GLM) Lightning Detection: Events, Groups & Flashes
SPACE ENVIRONMENT IN-SITU SUITE (SEISS) Energetic Heavy Ions Magnetospheric Electrons & Protons: Low Energy Magnetospheric Electrons & Protons: Med & High Energy Solar & Galactic Protons	MAGNETOMETER (MAG) Geomagnetic Field
EXTREME ULTRAVIOLET AND X-RAY IRRADIANCE SUITE (EXIS) Solar Flux: EUV Solar Flux: X-ray Irradiance	SOLAR ULTRAVIOLET IMAGER (SUVI) Solar EUV Imagery

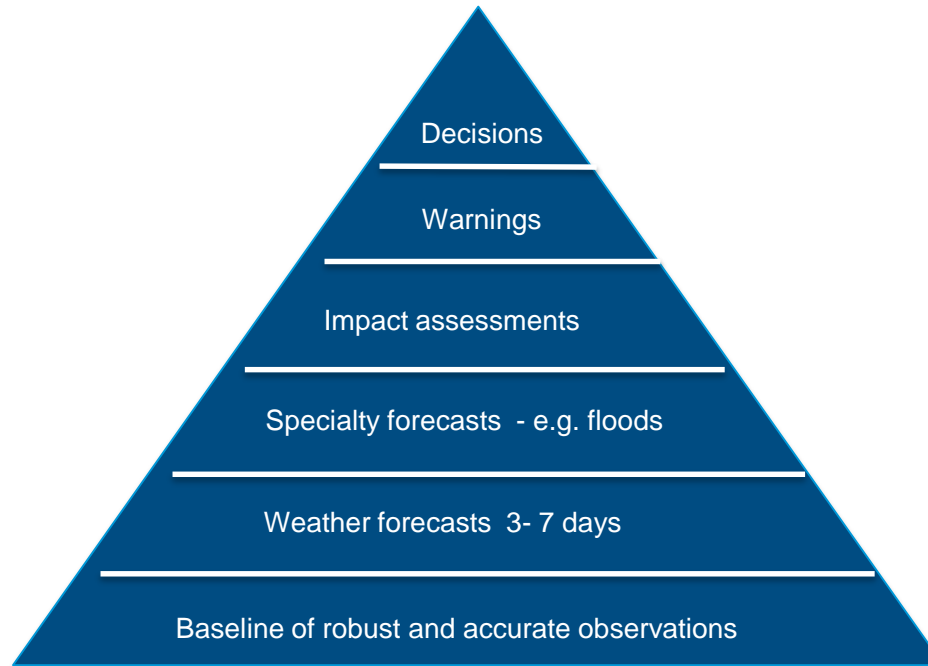
GOES-R Baseline Products



Proving Ground User Initiatives focus on Applications and Decision Support for NOAA Service Areas and Partners



Starting in 2014 we transitioned from individual projects to coordinated team initiatives



Climb the pyramid through:

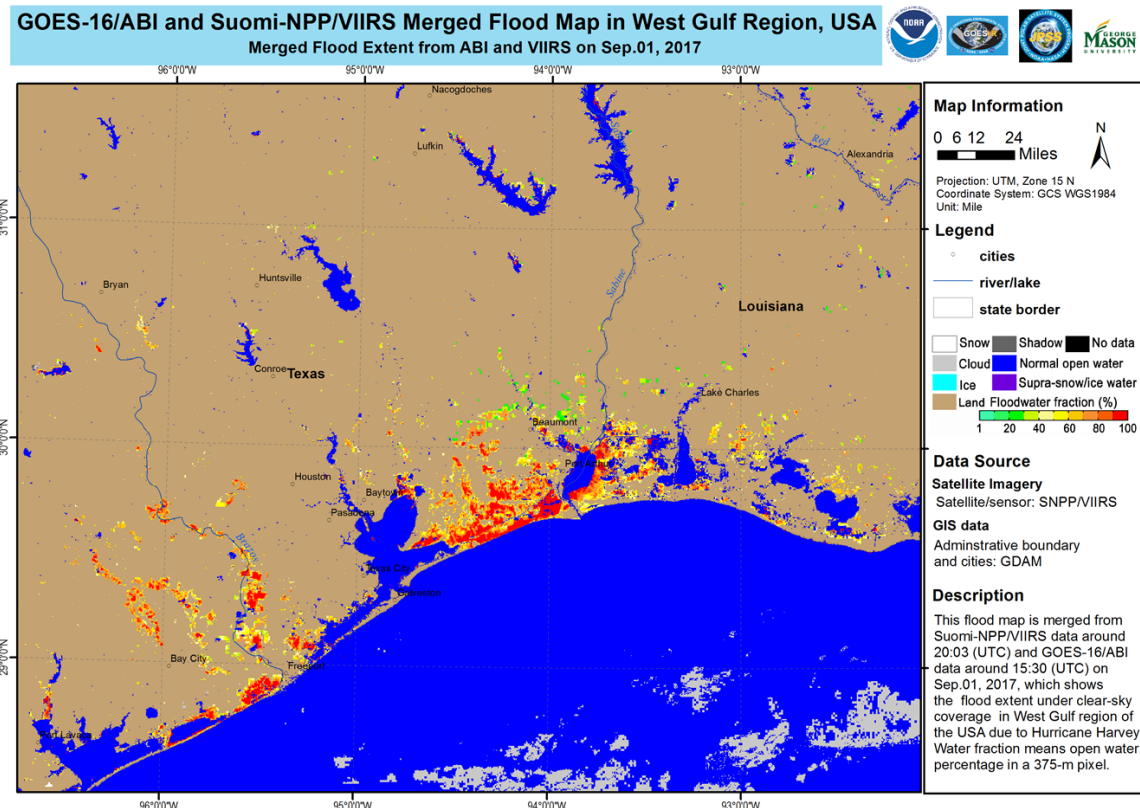
- Communicating our capabilities/needs
- Listening /understanding user needs and feedback
- Identifying user advocates/leaders
- Clearly stated objectives/deliverables
- Facilitators for managing meetings and milestones
- A very capable team

NESDIS Strategic Metric " The utilization of NESDIS developed science by internal and external partners and stakeholders through enhanced coordination with partners and the user community"

The Initiatives

The initiatives comprise of a team of developers and users working together to improve an application in a testbed environment providing assessments of utility from the users and feedback to the developers.

- Arctic
- Fire and Smoke - will include GOES-R in 2018
- Hurricanes and Tropical Storms
- Hydrology
- NWP
- Oceans and Coasts - includes Sentinel 3
- River Ice and Flooding - includes GOES-R since 2017
- Sounding - includes EUMETSAT MeTOP
- Volcanic Hazards - new and includes both JPSS and GOES-R



From Chris Vaughn, FEMA to Mitch Goldberg

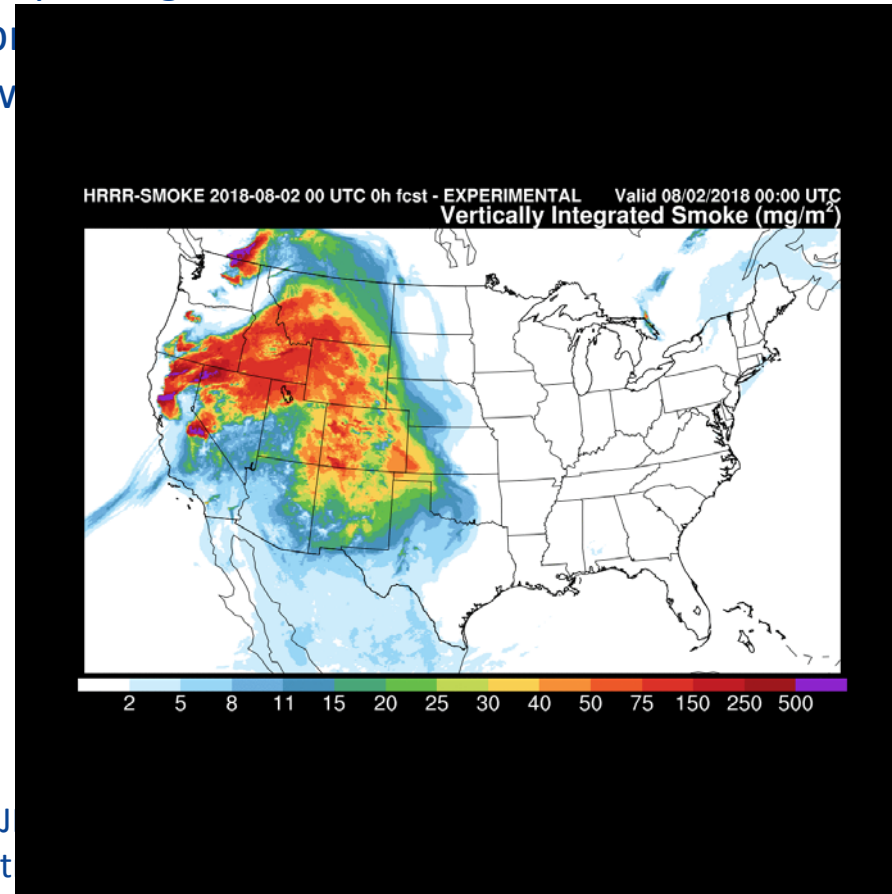
“This is some of the best/most comprehensive data I’ve seen to date for this event!” “Thank you all! Very grateful for the quick turn on these products”

Fire & Smoke



Funded Projects		
Principal Investigator	Title	Institution
Ahmadov, Ravan, Shoba Kondragunta, Ivan Csiszar	Rapidly updated high-resolution predictions of smoke, visibility and smoke-weather interactions using the VIIRS fire products within the Rapid Refresh and High-Resolution Rapid Refresh coupled with Smoke (RAP/HRRR-Smoke) modeling system	OAR/ESRL/CIRES, STAR
Batzil, Sam	Web-based Tool for Rapid Burn Intensity Estimates Using VIIRS NDVI	UW/CIMSS
Ellicott, Evan	Improving user understanding and application of the Visible Infrared Imager Radiometer Suite (VIIRS) Active Fire (AF) products through capacity building and product evaluation	University of Maryland/CICS
Elvidge, Christopher	Discrimination of flaming and smoldering biomass burning with VIIRS nighttime data	NESDIS/NCEI
Frost, Greg	Characterization and Application of JPSS Products to Biomass Burning Studies	OAR/ESRL
Kondragunta, Shobha	Improving VIIRS Fire Radiative Power (FRP) Retrieval Using NUCAPS Carbon Monoxide (CO/CO2) for High Resolution Rapid Refresh (HRRR) Model Applications	STAR

Improving use of satellite fire and aerosol



J... t... nd will be

Provide training to USFS and IMETS

Enhanced websites to display fire location, fire radiative power, aerosol optical thickness - Enhanced IDEA



Dissemination to NWS forecasters

- Getting the products to NESDIS operations is not enough. We are interested in helping users maximize the use of the data products.
- One issue identified by NWS: the size (data volume and file counts) of the products inhibits distribution to all the NWS field sites.
- As a result, we've been doing some analysis of bandwidth and other capacity needs. A near-term solution has been identified to facilitate the distribution of high priority products to NWS field sites. A longer-term solution is under analysis.

Product priorities for NWS forecasters / AWIPS

JPSS L1RD Product	NWS/OBS Priority	PDA Product Name	Instrument
Active Fires	Critical	AF_VIIRS_EDR	VIIRS
Sea Surface Wind Speed	Critical	AMSR2-OCEAN	GCOM AMSR2
Precipitation (Type/Rate)	Supplemental High		
Sea Surface Temperature	Supplemental High		
Total Precipitable Water	Supplemental High		
Cloud Liquid Water	Supplemental High		
Volcanic Ash Detection and Height	Critical		
Imagery	Supplemental High	AMSR2-MBT	GCOM AMSR2
Ice Concentration	Supplemental High	NPR-MIRS-IMG_33min_v11	ATMS
Rainfall Rate	Supplemental High		
Snow Water Equivalent	Supplemental High		
Total Precipitable Water	Supplemental High		
Snow Cover	Supplemental High		
Cloud Liquid Water	Supplemental High		
Ice Concentration	Supplemental High	JPSSRR_IceConcentration	VIIRS
Aerosol Detection	Supplemental High	JPSSRR_ADP	VIIRS
Aerosol Optical Depth	Supplemental High	JPSSRR_AOD	VIIRS
Aerosol Particle Size	Supplemental High		

AWIPS is evaluating these (8) products for decoder development

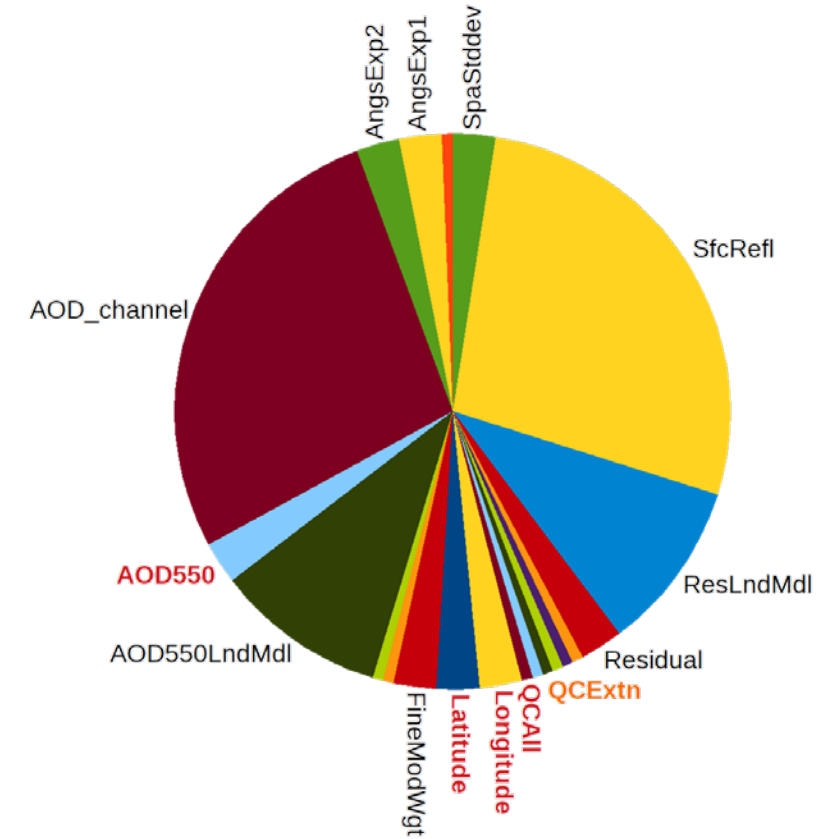
JPSS L1RD Product	NWS/OBS Priority	PDA Product Name	Instrument
Polar Winds	Supplemental High	VIIRS_WINDS_(NH SH)	VIIRS
Sea Surface Temperature	Supplemental High	ACSPO_SST_GHRSSST,	VIIRS
		ACSPO_SST_GHRSSST_L3	
Snow Water Equivalent	Supplemental High	AMSR2_SNOW	GCOM AMSR
Snow Cover	Supplemental High		
Snow Cover	Supplemental High	JPSSRR_SnowCover	VIIRS
Cloud [Top] Phase	Supplemental High	JPSSRR_CloudPhase	VIIRS
Cloud Optical Depth	Supplemental High	JPSSR-CloudNCOMP	VIIRS
Cloud Particle Size Distribution	Supplemental High	JPSSR-CloudDCOMP	
Ice Age / Thickness	Supplemental High	JPSSRR_IceAge	VIIRS
Cloud Top Pressure	Supplemental High	JPSSRR_CloudHeight	VIIRS
Cloud Top Temperature	Supplemental High		
Moisture Profile	Supplemental High	MIRS_SND_Products-LowRes_netCDF	ATMS
Temperature Profile	Supplemental High		
Sea Ice Characterization	Supplemental High	AMSR2-SEAICE	GCOM AMSR
Soil Moisture	Supplemental High	AMSR2-SOIL	GCOM AMSR
Atmospheric Vertical Moisture Profile	Supplemental High	NUCAPS-EDR	CrIS / ATMS
Atmospheric Vertical Temperature Profile	Supplemental High		



Dissemination to NWS forecasters: “thinned” products

To reduce the size of data going to AWIPS, NWS is working with JPSS, STAR, and ESPC to define NDE Production Rules for “thinned” versions of JPSS Enterprise EDR products intended for forecasters. For example:

- Aerosol Optical Depth (AOD): only 5 fields out of 26
 - max file size 14MB/granule instead of 160MB/granule
- Volcanic Ash: only 5 fields out of 49
 - 15-25% of data volume
 - max file size 25MB/granule instead of 132MB/granule
- Aerosol Detection (ADP): omit many scalar fields
 - 55% to 80% of data volume.



JPSS-RR Aerosol Optical Depth & Particle Size



Summary

S-NPP and NOAA-20 are operational and performing well. Users are taking advantage of the 2 satellites working together

JPSS-2/3/4 will carry the same suite of instruments out through the 2030's.

The JPSS Proving Ground and Risk Reduction Program focuses on user readiness and exploitation of the data.



THANK YOU!

For more information visit: www.jpss.noaa.gov

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