



Joint Polar Satellite System (JPSS)

JPSS UPDATE AND PROVING GROUND

Mitch Goldberg
JPSS Program Scientist

NOAA Satellite Aerosol Product Workshop
September, 2017

National Environmental Satellite, Data, and Information Service
U.S. National Oceanic and Atmospheric Administration
U.S. Department of Commerce



Launch is November 10, 2017 and JPSS Provides...

...

the most critical data for numerical weather prediction to enable accurate 3–7 day forecasts.

...

operational weather and environment satellite observations for Alaska and Polar regions operational forecasting.

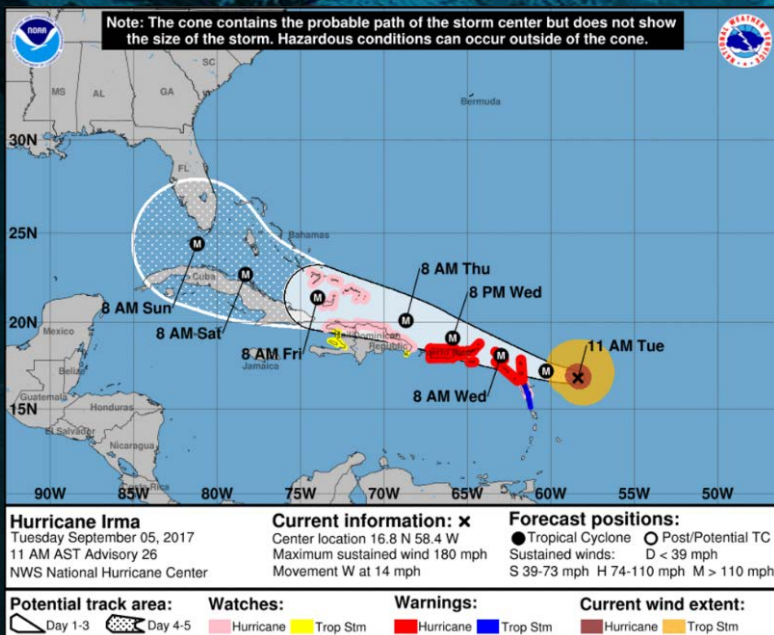
...

global coverage and unique day and night imaging capabilities in support of broad environmental monitoring and forecasting.

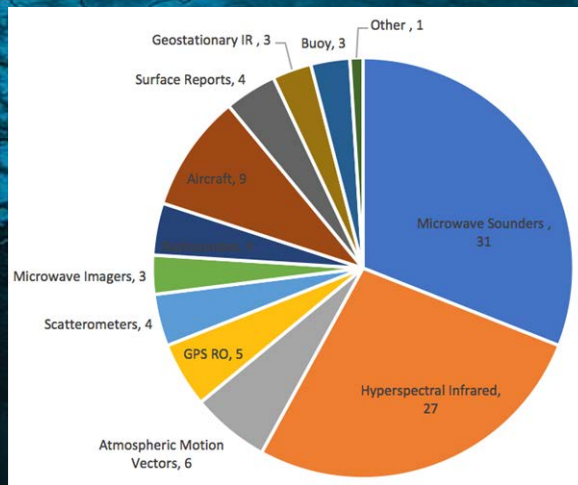


JPSS is a Core Component of the Weather Forecast Enterprise

85% of all data used in forecast models are from polar-orbiting satellites and attribute to nearly 60% of the reduction in forecast error.



Observation type attributed to forecast error reduction





JPSS-1 (NOAA-20) will be 50 minutes ahead of SNPP



Low Earth Orbit—512 miles

14x

Orbits Earth 14 times
pole-to-pole

2x

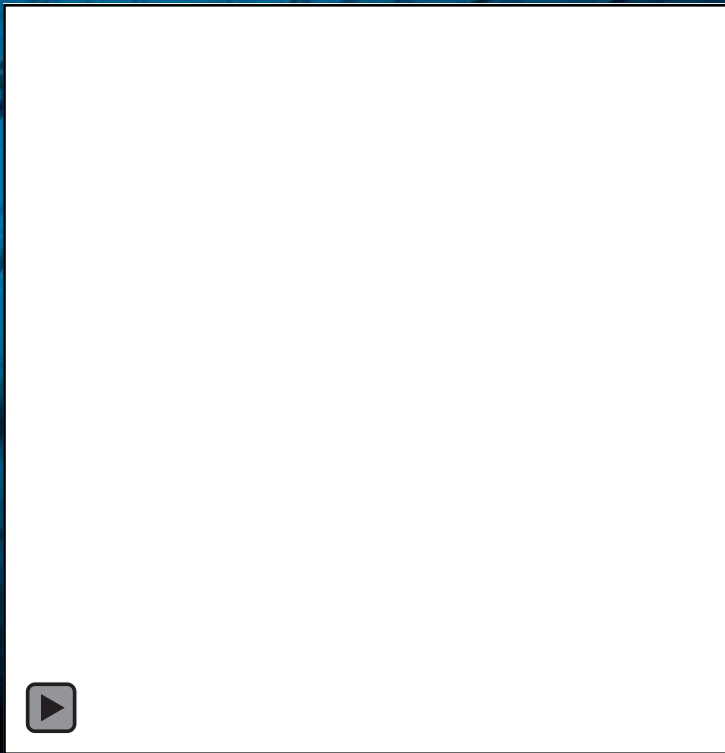
Images entire globe
twice a day



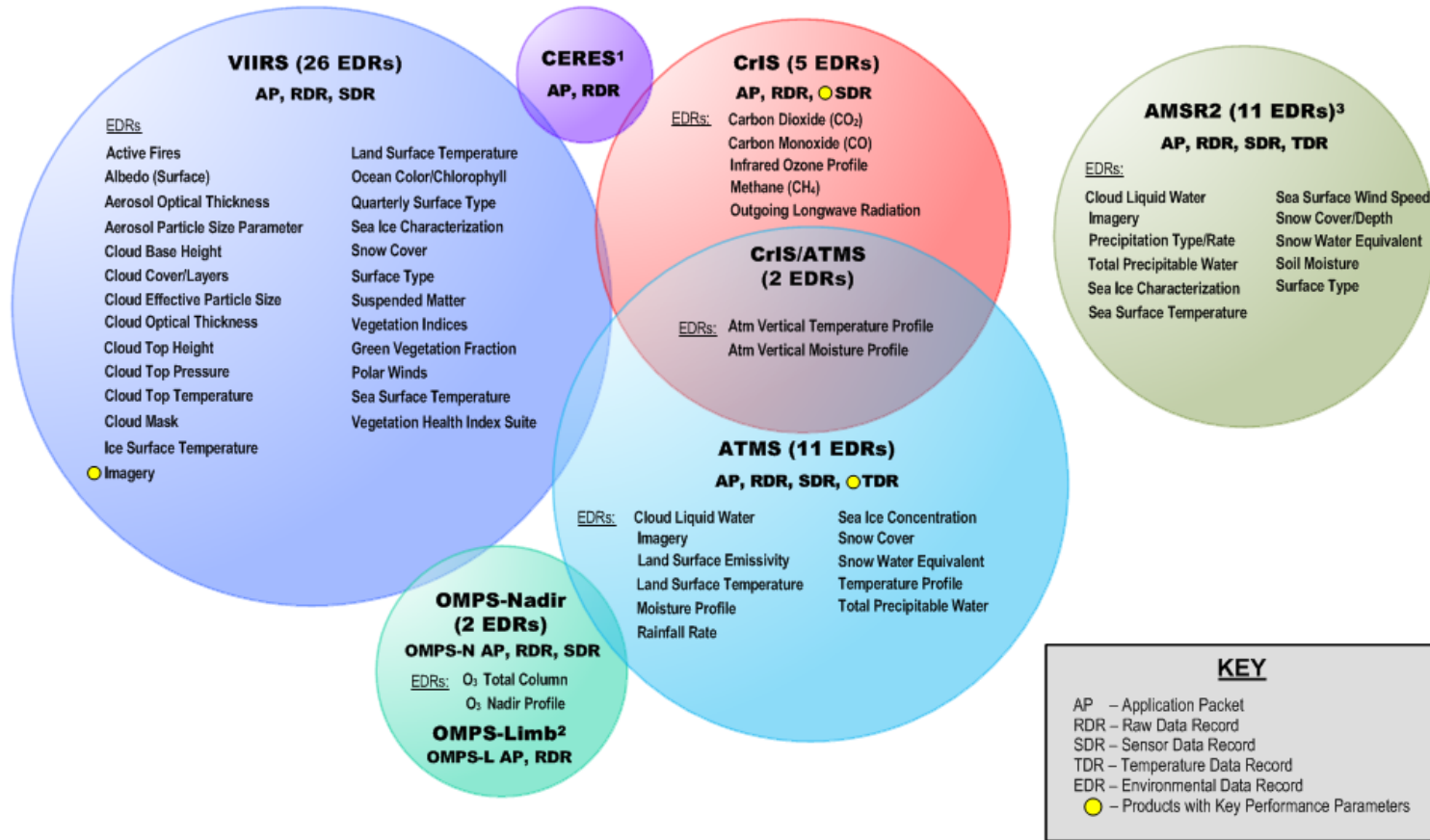
Unique instrumentation
to measure moisture
and temperature profiles
throughout the atmosphere



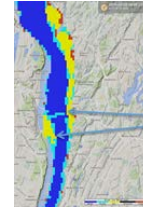
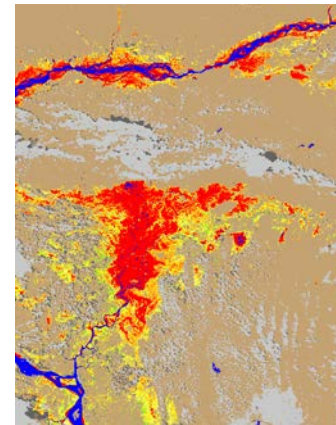
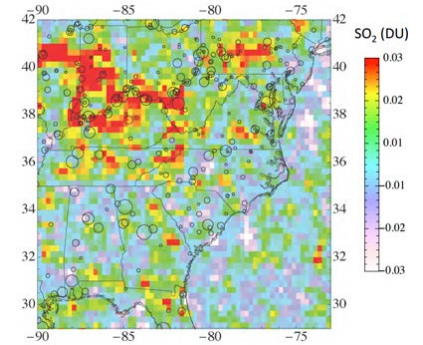
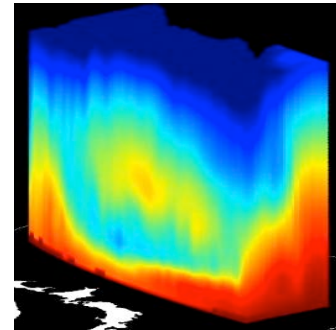
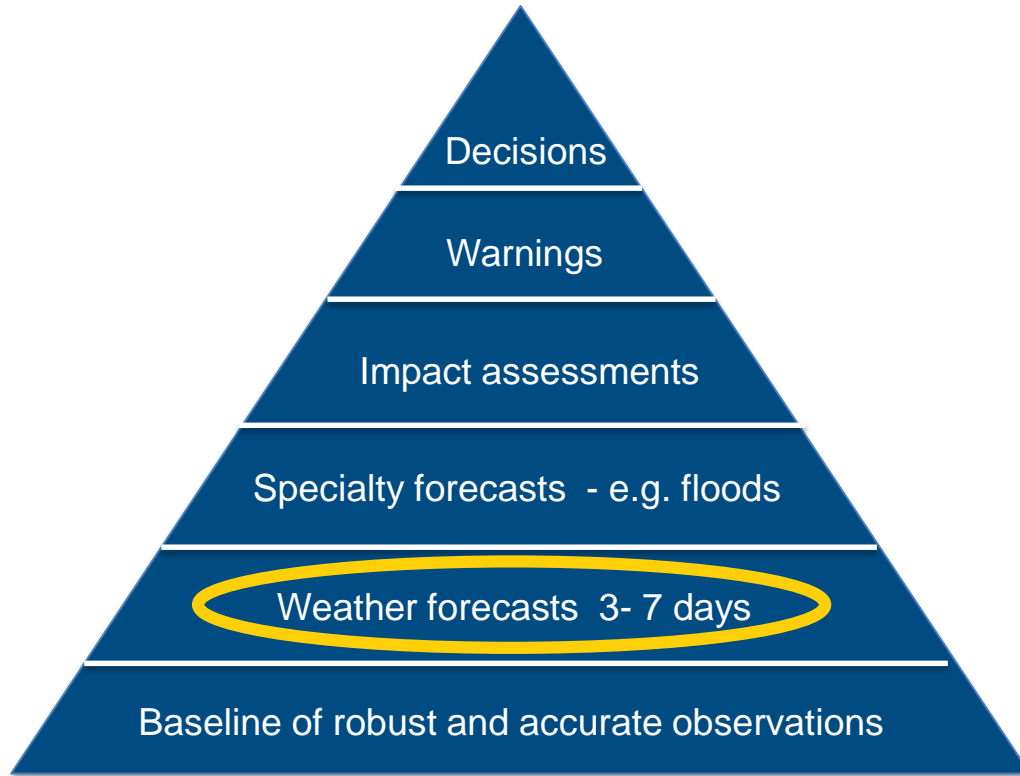
Provide 85% of data
used in numerical
weather prediction



JPSS Program Data Products



NESDIS Science User Engagement Proving Ground Program focuses on Applications and Decision Support for NOAA Service Areas and Partners





JPSS PGRR Scope

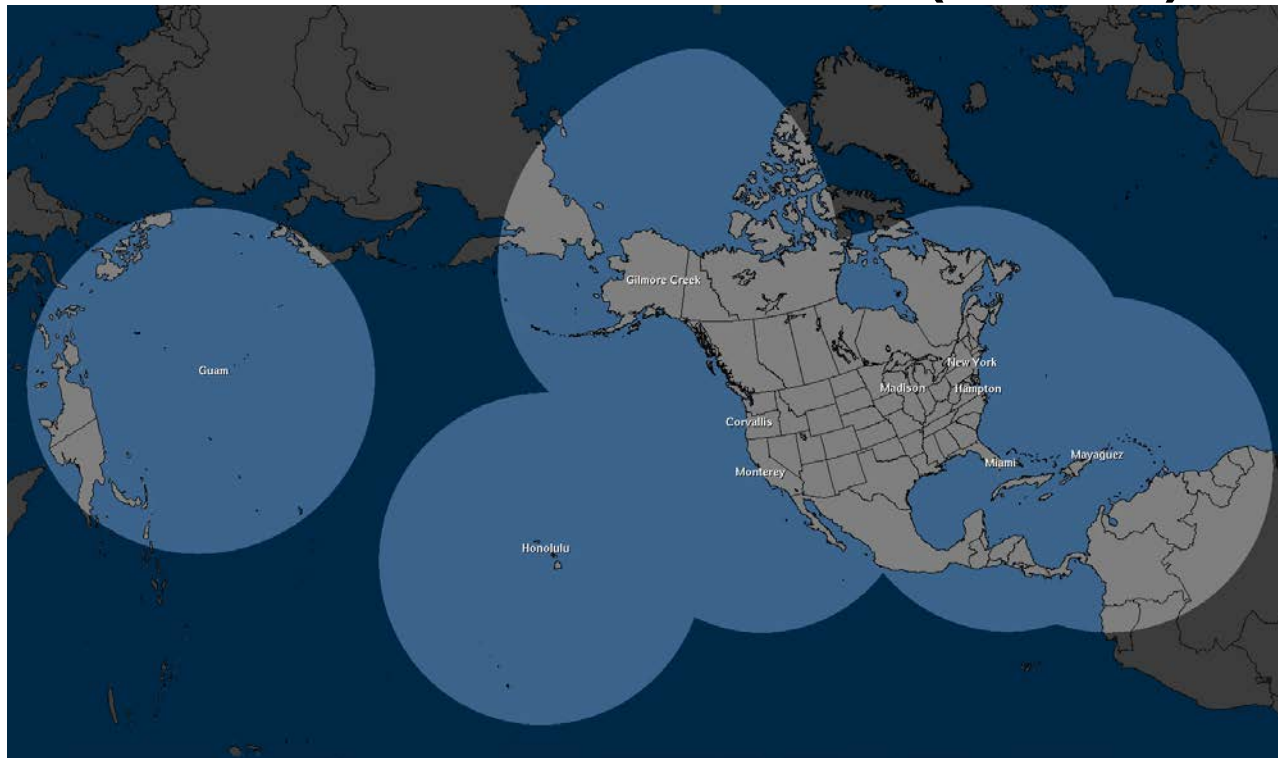
•Proving Ground

- Demonstration and utilization of data products by the end-user operational unit, such as at NWS, NOS, NMFS
- Promote outreach and coordination of new products with the end users, incorporating their feedback for product improvements

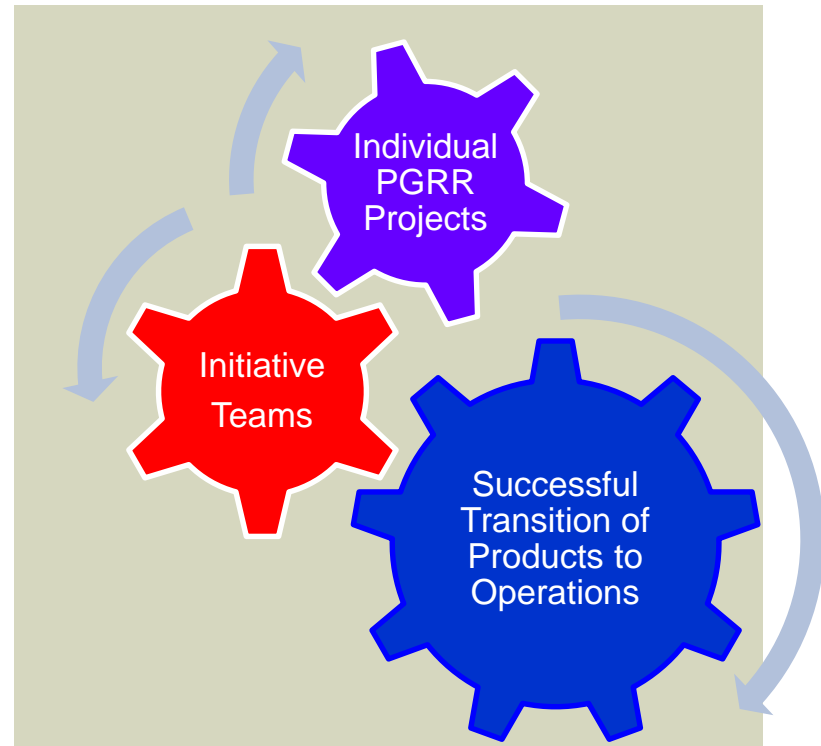
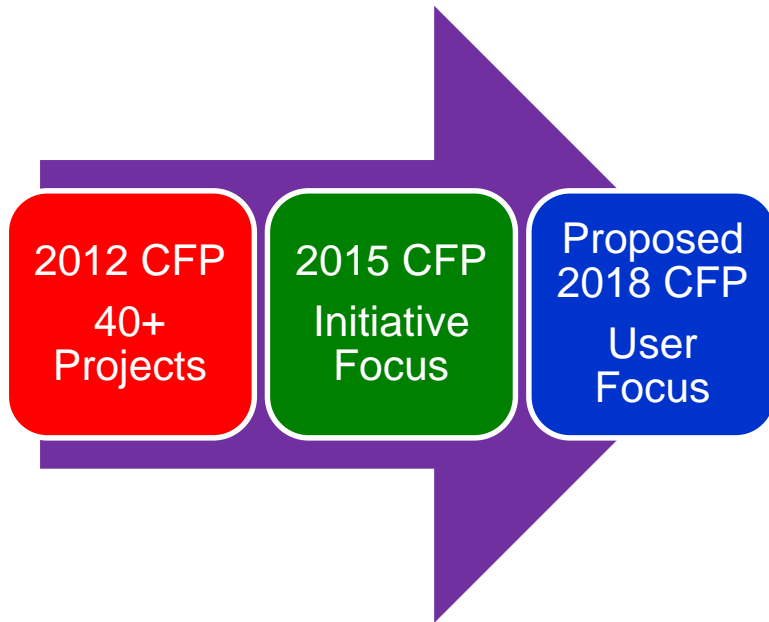
•Risk Reduction

- Development of new research and applications to maximize the benefits of JPSS satellite data
 - Example - enhancing the HRRR model to incorporate VIIRS FRP to improve smoke forecasts
- Encourages fusion of data/information from multiple satellite, models and in-situ data
- Address potential risk in algorithms and data products/processing by testing alternative algorithms and approaches.

PGRR - Direct Broadcast Real-Time Network (DBRTN) Antenna Sites



JPSS PGRR EVOLUTION





Proving Ground Initiatives

- What is an initiative? An interagency group of developers, service area providers, and stakeholders that frequently interact in a structured forum to address challenges in NOAA and partner service areas.
- Initiative activities
 - Products/capabilities are evaluated to ensure their optimal use in these focus areas.
 - Based on user feedback, changes to these capabilities are considered to increase their effectiveness
 - Actions to transition these capabilities to user operations are identified and implemented
- Why are initiatives successful?
 - Well defined objectives established and specific actions worked
 - Stakeholders are actively participating with engagement of the user advocate.
 - Products and capabilities are evaluated in operational environments
 - Monthly and bi-monthly meetings ensure proposed improvements can be worked on and then implemented quickly



User Engagement: PGRR

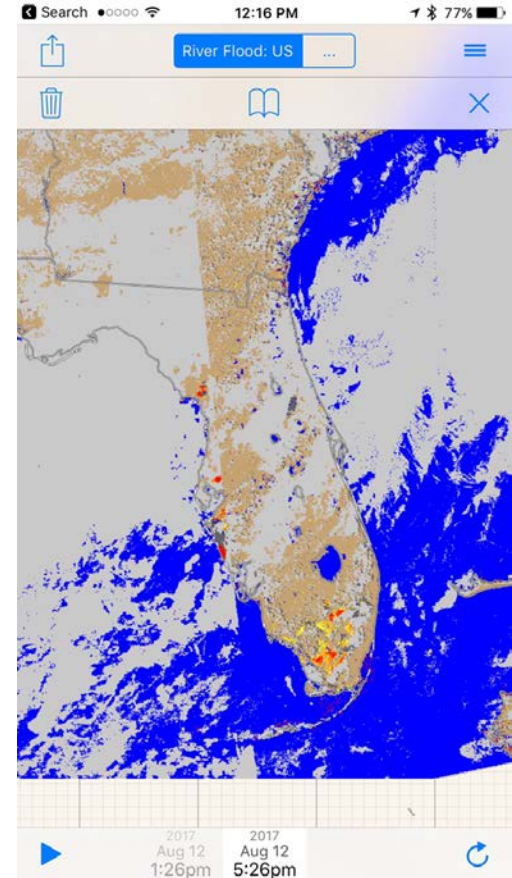
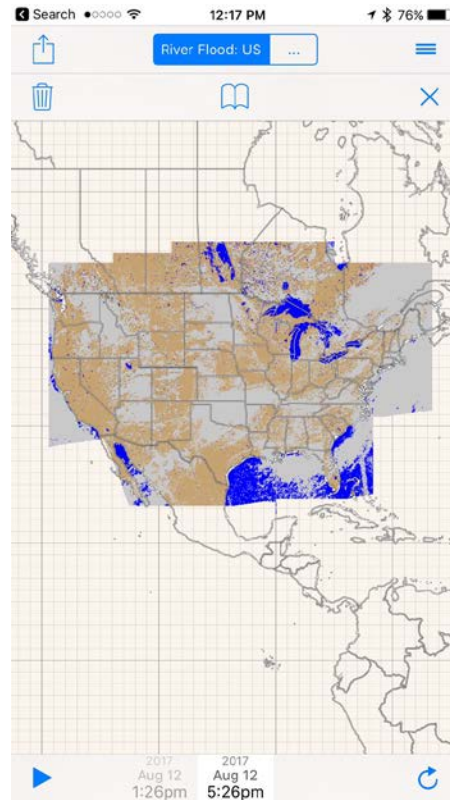
The Proving Ground and Risk Reduction program enhances user applications of JPSS data, algorithms and products by stimulating interactions between technical experts and key user stakeholders.

Current Initiatives include:

- River Ice and Flooding (Sjoberg)
- Fire and Smoke (Sjoberg)
- Sounding Applications /NUCAPS (Barnet)
- Hydrology (Ferraro)
- Ocean and Coastal (Lance)
- Severe Weather/NWP/Data Assimilation (Dunlap/Chowdhury)
- Innovation
- Training (UCAR – Stevermer NWS – Torres, WMO VLAB – Connell)
- OCONUS and NCEP Service Centers—AWIPS (Satellite Liaisons)

River Ice and Flooding Successes

- Generated routinely using Direct Broadcast at CIMSS
- Provided on RealEarth Application
 - Iphone/Android
- Provide to AWIPS using Local Data Manager (LDM)
- Used routinely by NWS River Forecast Centers
- Used by FEMA
- Experimental Global Processing for International Charter on Disasters
- Developing capabilities for GOES-R series.
- Next step - operational development





River Ice and Flooding Team – (April 2017 telecon)

Name	Organization	Name	Organization
Paul Alabi	CCNY	Paul McKee	WGRFC
Aaron Bisig	NIC	Julie Price	JPSS
Ed Capone	NERFC	Fernado Salas	NWC
Jessica Cherry	APRFC	Bill Sjoberg	JPSS
Reggina Cabrera	SERFC	Donglian Sun	GMU
Gene Derner	MBRFC	Tim Szeliga	NWC
Mitch Goldberg	JPSS	Marouane Temimi	CCNY
Andy Heidinger	STAR	Jonathan Thornburg	NCRFC
Jay Hoffman	CIMSS	Jorel Torres	CIRA
Eric Holloway	APRFC	David Vallee	NERFC
Sanmei Li	GMU	John Walker	NOAA UAS
Yinghui Liu	SSEC		

VIIRS Flood Maps in Response to International Charter Activation from Venezuela

International Charter
SPACE & MAJOR DISASTERS

About the Charter ▾ Activations ▾ Media Gallery ▾ News ▾

You are here: [Home](#) > [Activations](#) Need Help? | Contact

- Latest Activation

Flood in Venezuela

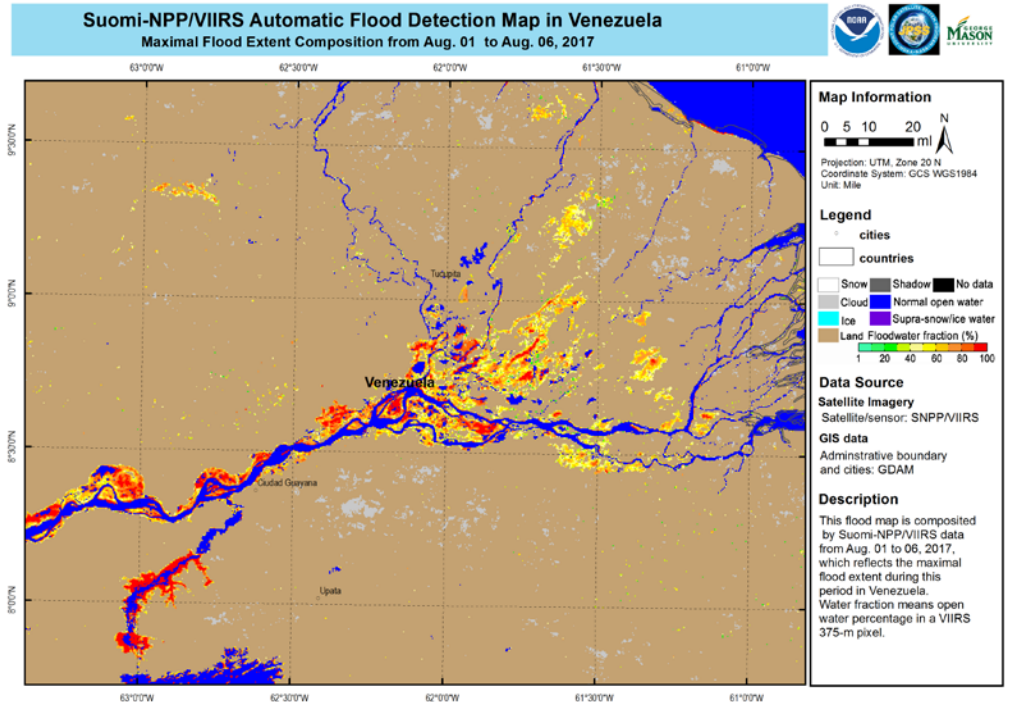
Sunday, 06 August 2017

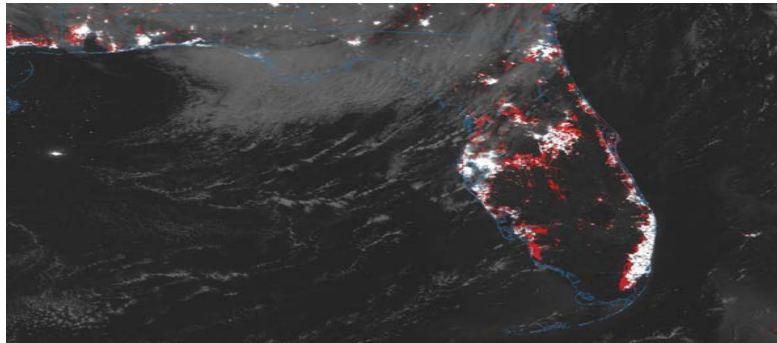
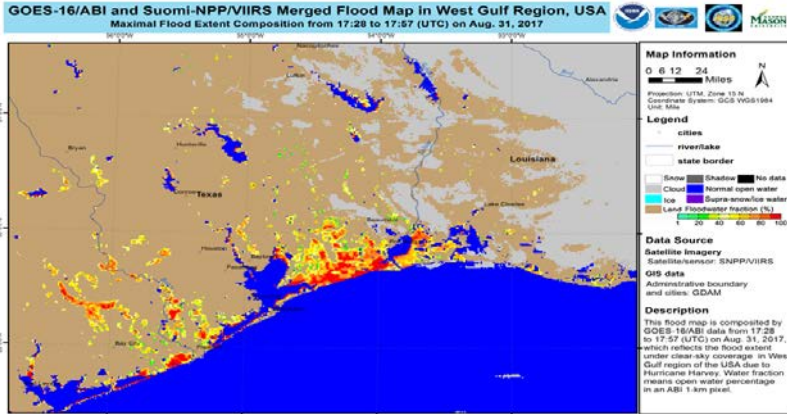


Location of Event:	Venezuela
Date of Charter Activation:	6 August 2017
Time of Charter Activation:	22:04:00
Time zone of Charter Activation:	UTC-04:00
Charter Requestor:	ABAE on behalf of Civil Protection of Venezuela
Activation ID:	541

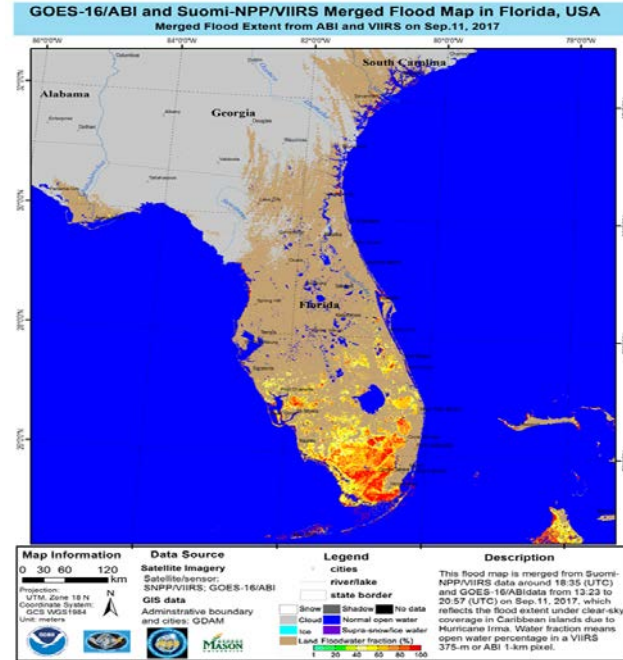
Description of the event

Heavy rains fell for several days across eastern parts of Venezuela causing widespread flooding. Largely affected areas are the states of Delta Amacuro, Bolivar and Merida. The Civil Protection Agency of Venezuela raised alert levels to the highest level and provided support to people in the worst affected areas.





9/12/17 early morning power outage in red from SNPP Day Night Band – courtesy of Devin A. White, PhD
Geographic Information Science and Technology Group
Oak Ridge National Laboratory

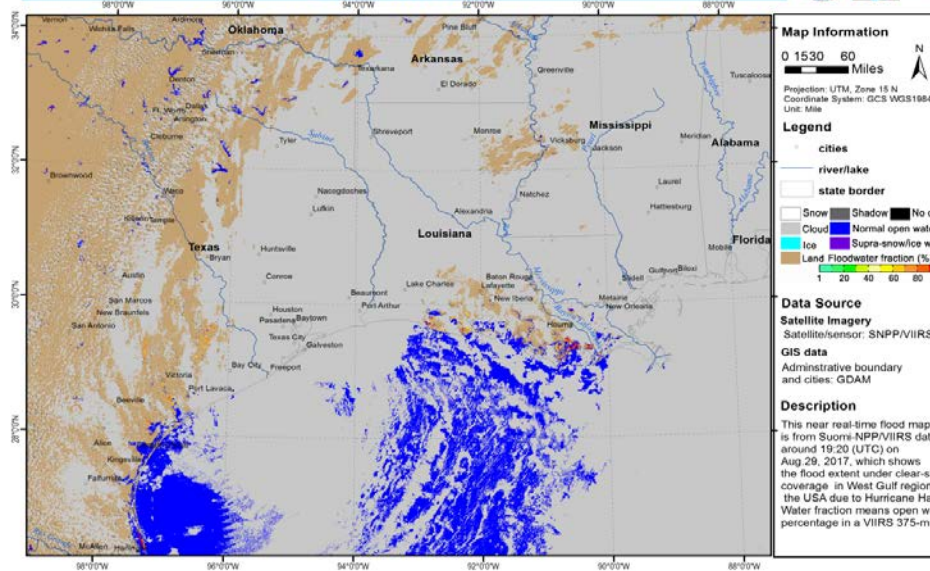


From Chris Vaughn, FEMA to Mitch Goldberg

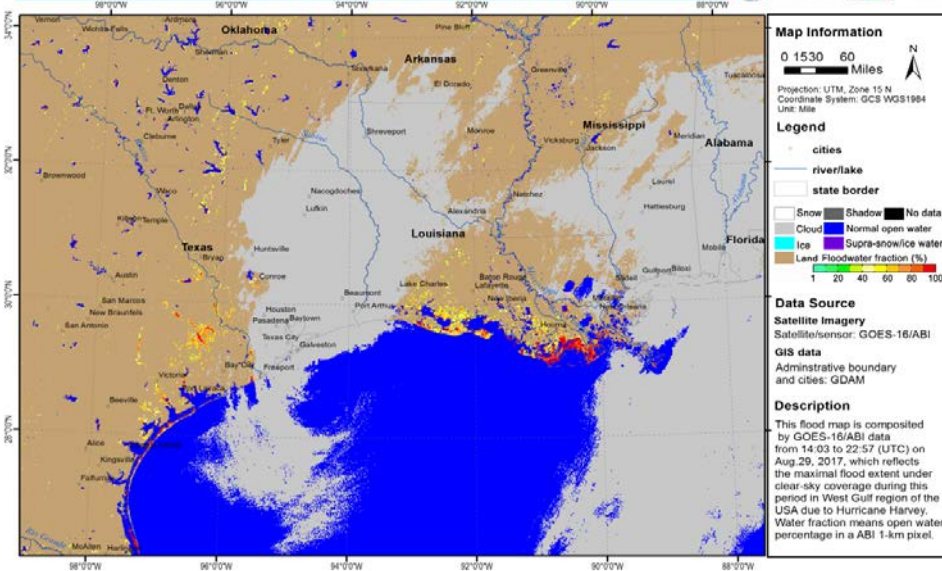
“This is some of the best/most comprehensive data I've seen to date for this event!” “Thank you all! Very grateful for the quick turn on these products”

Impact of compositing nearly 108 ABI images over a 9 hour period to mitigate clouds vs. 1 VIIRS image: Advantage ABI August 29, 2017

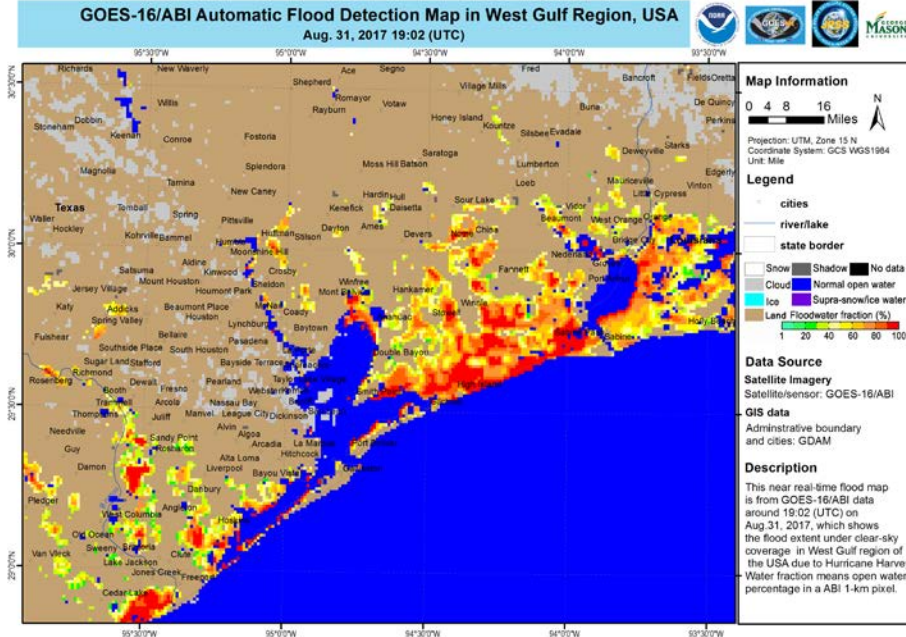
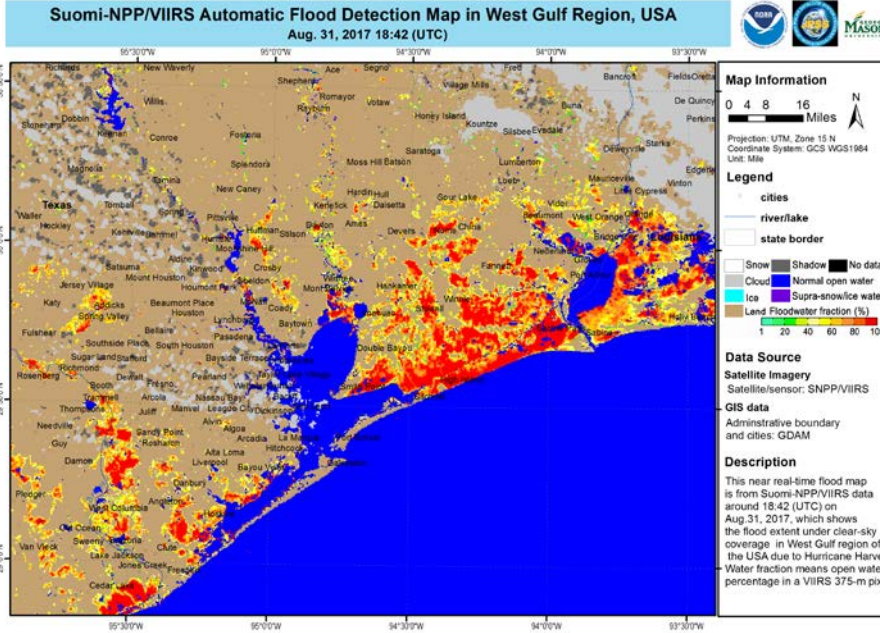
**Suomi-NPP/VIIRS Automatic Flood Detection Map in West Gulf Region, USA
Aug. 29, 2017 19:20 (UTC)**



**GOES-16/ABI Experimental Flood Detection Map in West Gulf Region, USA
Maximal Flood Extent Composition from 14:03 to 22:57 (UTC) on Aug. 29, 2017**



On August 31, 2017 Predominately Clear – Advantage VIIRS (375 meters vs 1 km ABI)



VIIRS Flood Detection Map Quick Guide - Final Form -.pdf (page 1 of 5)

VIIRS Flood Detection Map Quick Guide

What is the VIIRS Flood Detection Map?

The VIIRS Flood Detection Map, which is called VIIRS NOAA&GMU Flood Version 1.0 (VNG Flood V1.0), is a satellite-based flood extent product derived from daytime Suomi-NPP/VIIRS imagery with solar zenith angles less than 85 degrees. Its spatial resolution is 375 meters. Flood extent is represented in floodwater fractions (water fraction means percentage of water extent in a VIIRS 375-m pixel).

What is the VIIRS Flood Detection Map algorithm?

VIIRS Flood Detection includes a series of algorithms: a water detection algorithm based on decision-tree approach, a geometry-based cloud shadow removal algorithm, an object-based terrain shadow removal algorithm, a minor flood detection based on change detection algorithm and a water fraction retrieval algorithm with dynamic nearest neighboring searching method. Floodwater is determined by comparing the detected water against a water reference map derived from MODIS global 250-m water mask (MOD44W) and water layer in the 30-m National Land Cover Dataset.

Which spectral bands make up the algorithm?

The spectral bands used in the algorithms are Suomi-NPP/VIIRS imager bands 1 (600–680 nm), 2 (850–880 nm), 3 (1180–1640 nm) and 5 (1050–1240 nm) with 375-m nominal resolution and 1-band terrain-corrected geolocation data (i.e. GITCO) including longitude, latitude, solar zenith angles, solar azimuth angles, sensor zenith angles and sensor azimuth angles.

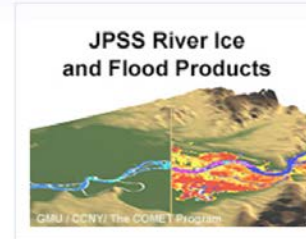
Data latency of VIIRS Flood Detection Map data?

The VIIRS flood detection system is running routinely at SSEC/UW-Madison and GINA/JAF using direct broadcasting VIIRS data. VIIRS near real-time flood maps have about a 1-hour latency after VIIRS daytime overpasses are received. Generally, VIIRS flood maps are available around 13:30pm local time in the lower 48 states - more frequent coverage is achieved in Alaska.

Available in AWIPS-II for National Weather Service Forecasters

Near real-time flood maps are distributed via the Unidata Local Data Manager (LDM) in AWIPS-II. The instruction document is here: https://drive.google.com/open?id=1mEDFEK2IXCTEGXfb_c0LGM2fKQNdSP9G0hj7yS2AYM
Please contact Jay Hoffman (jay.hoffman@ssec.wisc.edu) for any questions related to AWIPS-II. Additionally, the latest 30-day flood maps are also available in SSEC's Real Earth:
CONUS: <http://realearth.ssec.wisc.edu/?products=RIVER-FLDall-US>
NERFC: <http://realearth.ssec.wisc.edu/?products=RIVER-FLDall-NE>
NCRFC: <http://realearth.ssec.wisc.edu/?products=RIVER-FLDall-NC>
MBRFC: <http://realearth.ssec.wisc.edu/?products=RIVER-FLDall-MB>

JPSS River Ice and Flood Products



Languages: English
Publish Date: 2016-03-16

Skill Level: 2
Completion Time: .75 - 1.00 h
Includes Audio: no
Required Plugins: none

Topics:
Hydrology/Flooding, Satellite Meteorology
Included in Courses:
JPSS Satellites: Capabilities and Applications Course

BEGIN LESSON

Add to Queue Your Queue

Take the quiz?

Begin Quiz

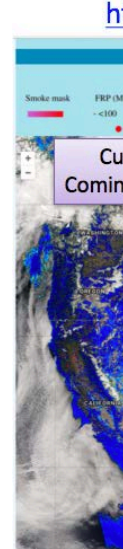
Share this resource:



Fire and Smoke Successes

- Providing easy access for fire and smoke imagery use eIDEA website
- Boots on the ground efforts – working with NWS IMETS and US Forest Service on providing real-time products using direct broadcast - both I-band and M-band fire products - Applications for Fire Management
- Inclusion of VIIRS FRP into the HRRR model for smoke forecasts
- Use of CrIS CO products to better characterize vertical height of smoke.
- Case Studies, Training and Educations
- Research on the use of the DNB for fire detection

eIDEA



ALASKA FIRE SCIENCE CONSORTIUM

Wednesday, July 13

Remote Sensing Products and Tools for Fire Science

Evan Ellicott, University of Maryland

1300-1400 AKDT • Akasofu 417

In this presentation I will provide a brief introduction to our efforts at the University of Maryland and the Joint (NASA and NOAA) Polar Science System (JPSS) Proving Ground and Risk Reduction (PGR) program. The goal of the PGR project is to leverage the VIIRS AF products for active and post-fire management and NOAA operations to improve research and decision making. We will achieve this goal by continuing our successful efforts to engage the end-user wildland fire community from both the research and operations sides while also participating in product evaluation and validation. The introduction will offer insight into the programs mission, past and current research and outreach, and plans for the future.

My talk will then transition to demonstrating available tools, products, and sources of data from remote sensing assets that are applicable to fire science. While I will primarily focus on polar-orbiting platforms, and Visible Infrared Imaging Radiometer Suite (VIIRS) and the Moderate Resolution Imaging Spectroradiometer (MODIS) in particular, I will also address other assets and sensors and sources to find these products.

akfireconsortium.uaf.edu

VIIRS Imager (I-bands) false-color RGB of the Pt. McMurray fire on May 16th at 1940 UTC along with lat/lon graticules. I-band RGB corresponding wavelengths 3, 2, 1; centroids 1.61µm, 0.861µm, and 0.640µm, respectively.

VIIRS Near-Constant Contrast (NCC) product derived from the Day-Night band (DNB), over the Pt. McMurray fire on May 17th at 0930 UTC.

UAF is an AA/EQ employer and educational institution

ative

nations and internal links

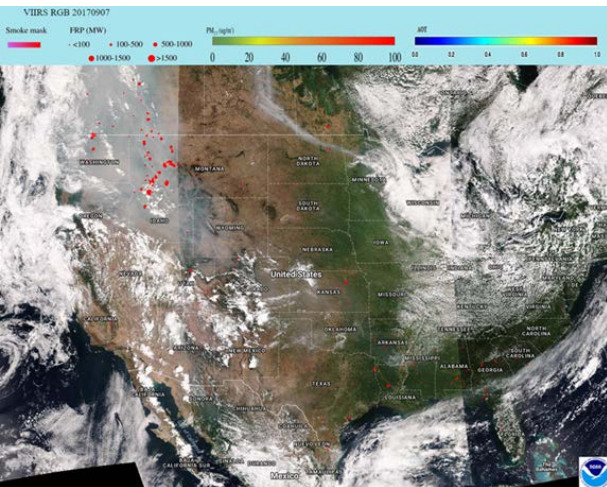
main product overlay actions



F&S Team (May 17 2017 telecon)

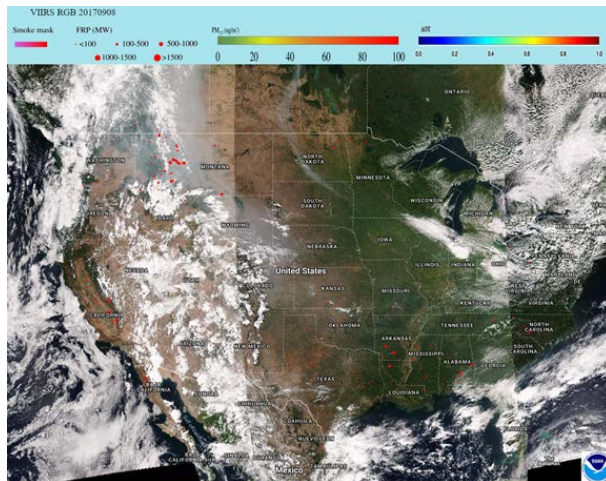
Name	Organization	Name	Organization
Ravan Ahmadov	CIRES	Jan Mandel	Univ of CO-Denver
Tianfeng Chai	CICS	Jeff McQueen	NCEP
Ivan Csiszar	STAR	Brian Motta	NWS
Russ Dengel	CIMSS	Li Pan	ARL
Andy Edman	NWS	Julie Price	JPSS
Evan Ellicott	U of MD	Brad Pierce	STAR
Greg Frost	STAR	Katherine Rowden	NWS
Robyn Heffernan	NWS	Scott Rudlosky	CICS
Amy Huff	PSU	Curtis Seaman	CIRA
Eric James	ESRL/GSD	Bill Sjoberg	JPSS
Hyun Kim	ARL(?)	Eric Stevens	GINA
Adam Kochanski	Univ of UT	Jebb Stewart	ESRL
Scott Lindstrom	CIMSS	Jorel Torres	JPSS Training Liaison
Mark Loeffelbein	NWS		

September 7, 2017



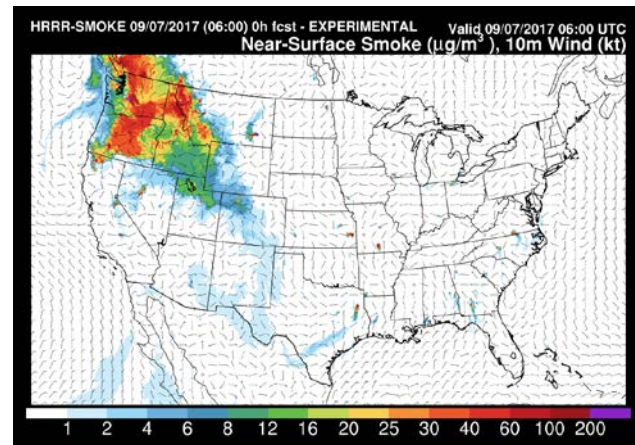
More Smoke – Washington State

September 8, 2017



Less Smoke

36 hour forecast starting from 9/7/17



Forecast matches the observations

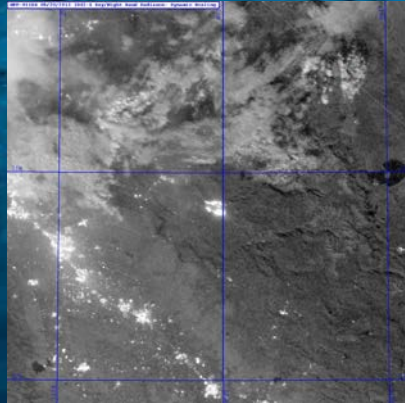
<https://rapidrefresh.noaa.gov/hrrr/HRRRsmoke/>



NOAA missions are very broad, comprehensive and evolving as society increases their demand on information. Innovation is critical to keep NOAA science fresh and cutting edge. The JPSS PGRR is designed to capture these innovations and apply them toward societal benefits. The information content from the JPSS sensors holds the potential to develop new applications that were not envisioned as part of the original scope of any particular sensor. The innovation initiative is for “out-of-the-box” ideas and concepts to keep NOAA science fresh. New algorithms and products to reduce risk in the current products from not being used effectively in downstream user applications can also be considered.

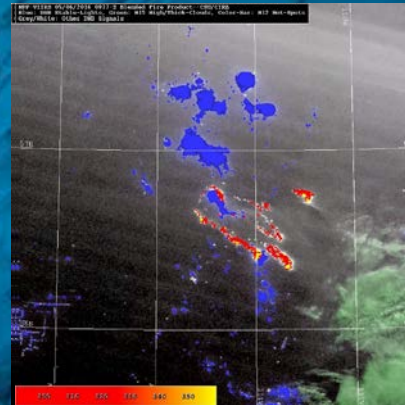
New capabilities for fire detection

Rim Fire: ~Aug 2013



Help firefighters monitor the status of nocturnal fire lines,

Ft. McMurray Fire: 4-6 May 2016



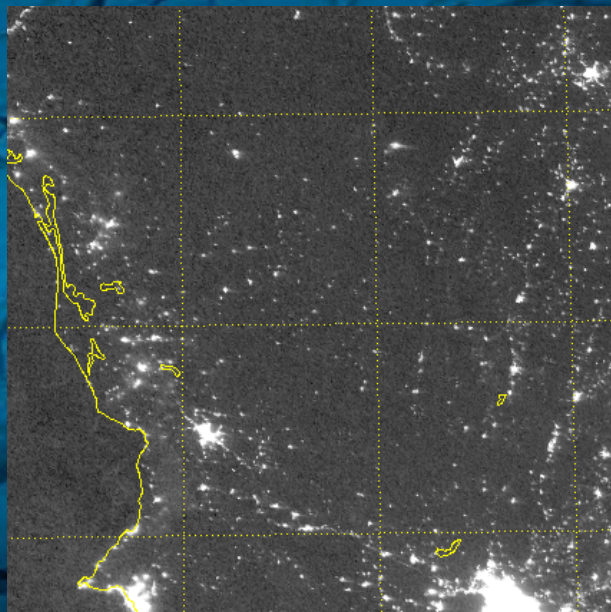
Detection of lights from small/nascent fires (e.g., lightning triggered) initially undetected by thermal infrared bands.



VIIRS Day Night Band - Incredible Light detection

08:43 UTC
23 May 2017

- VIIRS 4.0 μm fire detection band (M-13) shows small fires in the Sierra Madre Occidental (Durango, Mexico).
- The Day/Night Band better highlights these fires at night, improving fire detection.
- VIIRS Day/Night Band image from 08:10 UTC 28 April 2017



VIIRS User Testimonials

INPE Fire Detection Program

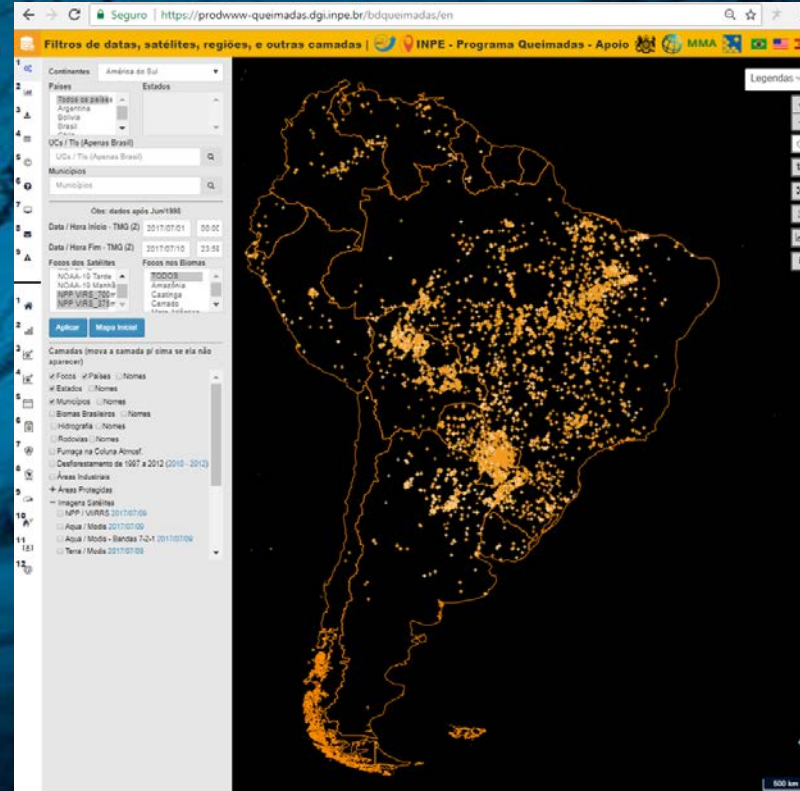


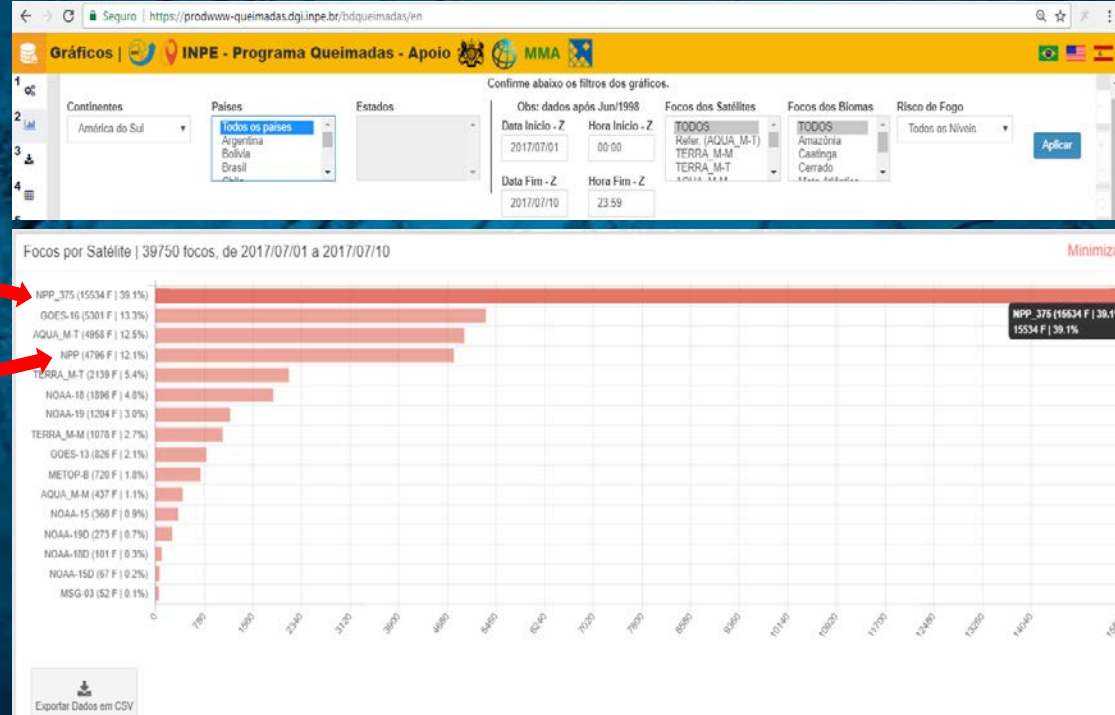
INPE's Program for the Monitoring of Vegetation Fires depends heavily on VIIRS data – 750 m and 375 m resolution.

INPE was the first institution to use the 375 m resolution data, with direct support of Dr. Wilfrid Schroeder from NOAA & University of Maryland.

First 9 days of July/2017, So.America:
17,639 fire pixels with VIIRS 375 m resol.
5,352 fire pixels with VIIRS 750 m resol.

*For current data and Program description, see www.inpe.br/queimadas
Alberto Setzer Program PI*





Comparing the ten satellites used by INPE's Fire Program, VIIRS-375m accounts for 39% of all fire pixels and VIIRS-700 m for 12%: by far, the most accurate products!

GOES-16, with images every 15 minutes detects 1/3rd ...

Atmospheric Composition (Frost, Pierce, Kondragunta)

- Expand user community for JPSS trace gas and aerosol products
- Demonstrate improvements to model forecasts of atmospheric composition using JPSS data products
- Carry out deep-dive validation of JPSS products with research observations and models
- Collaborate with ESA on Sentinel 5P (Kondragunta)

S-5p and S-NPP Loose Formation Flight

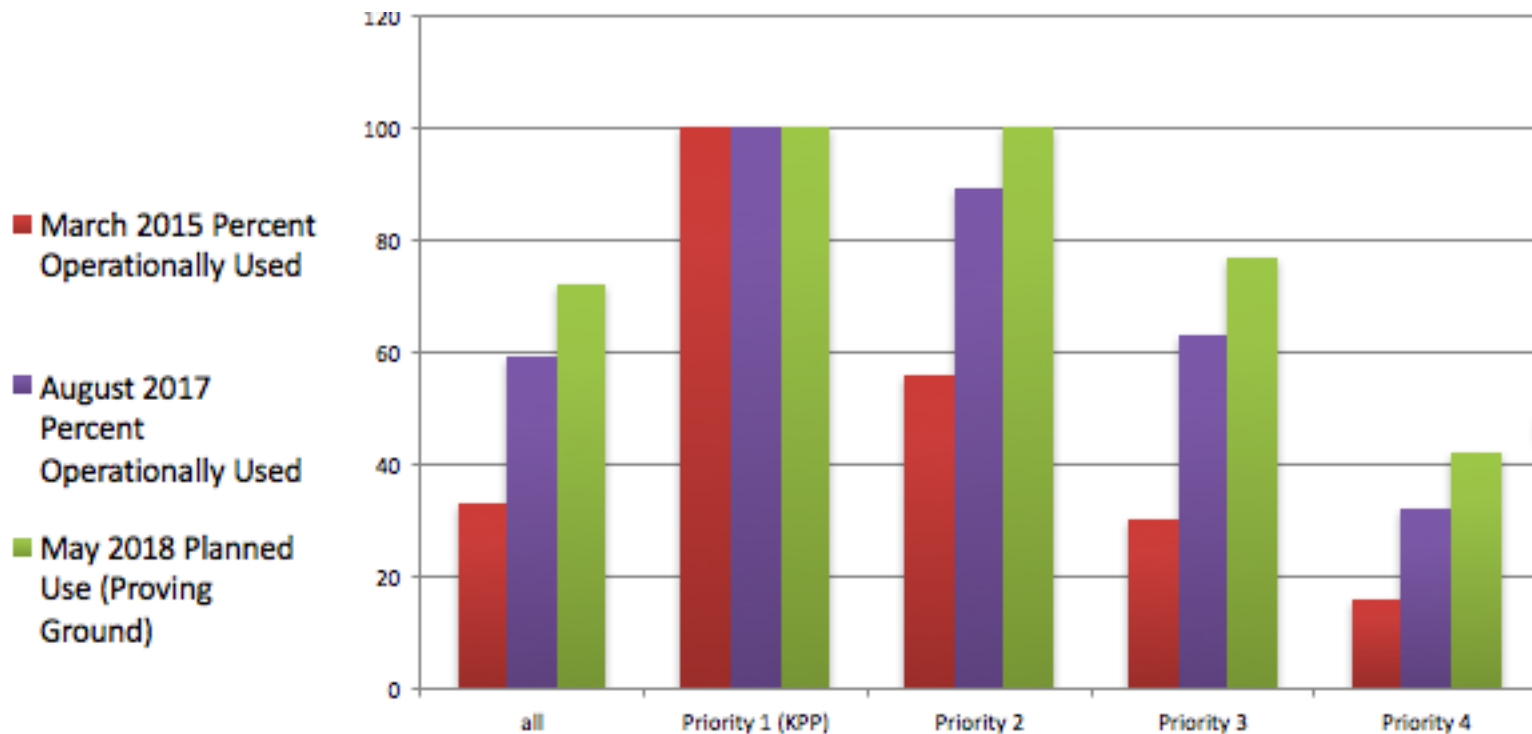


- In particular Methane requires a very reliable cloud clearing of optically thin layers (e.g. cirrus)
- Synergistic use SNPP & S-5p products improve the SSP only cloud information
- “Loose formation” with separation 5 min +/- 5 min
- Routine delivery of S-NPP/VIIRS products to the S-5p Ground Segment
- Tailored VIIRS cloud products for SSP
- Close cooperation between ESA and NOAA/NASA on technical level





Score Card



Thank You!



www.jpss.noaa.gov