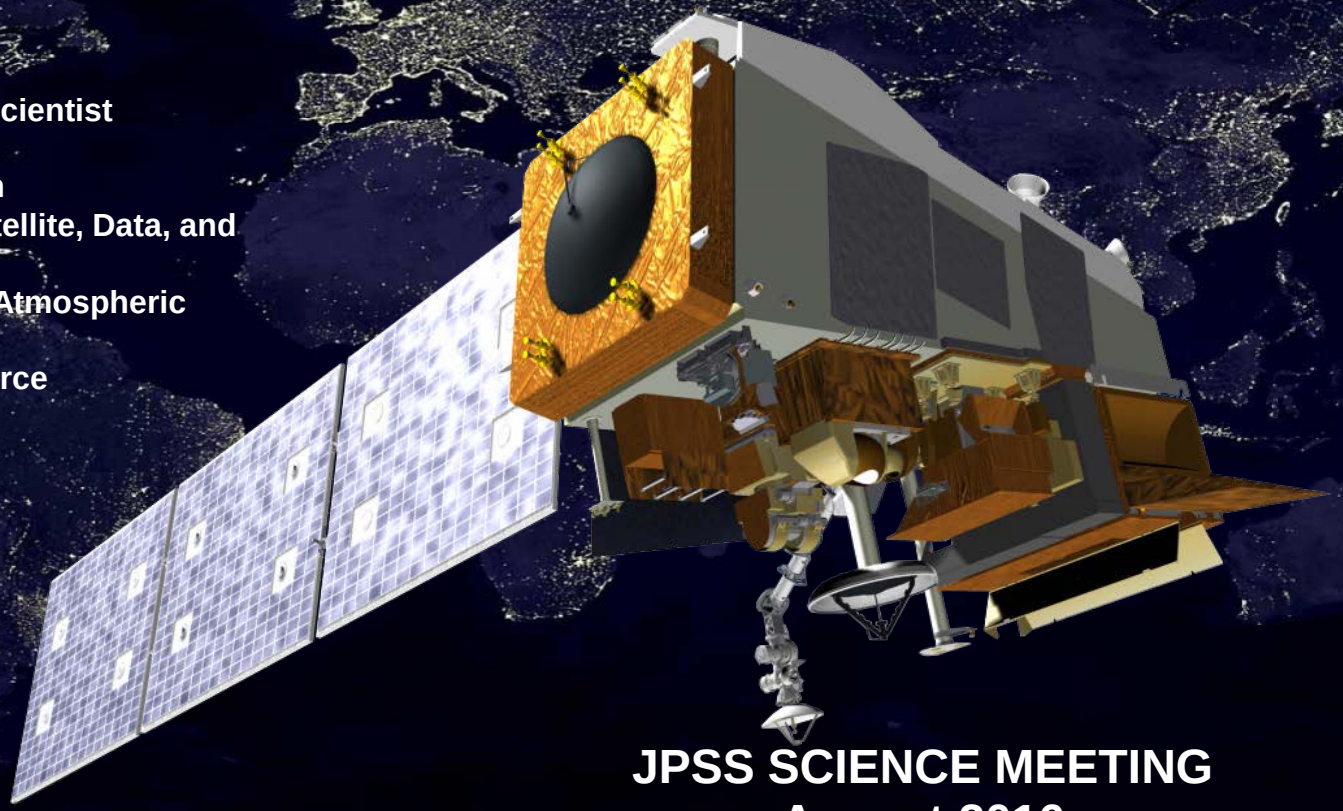
# Joint Polar Satellite System (JPSS)

## *JPSS Applications and User Engagements*

**Mitch Goldberg, Program Scientist**

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

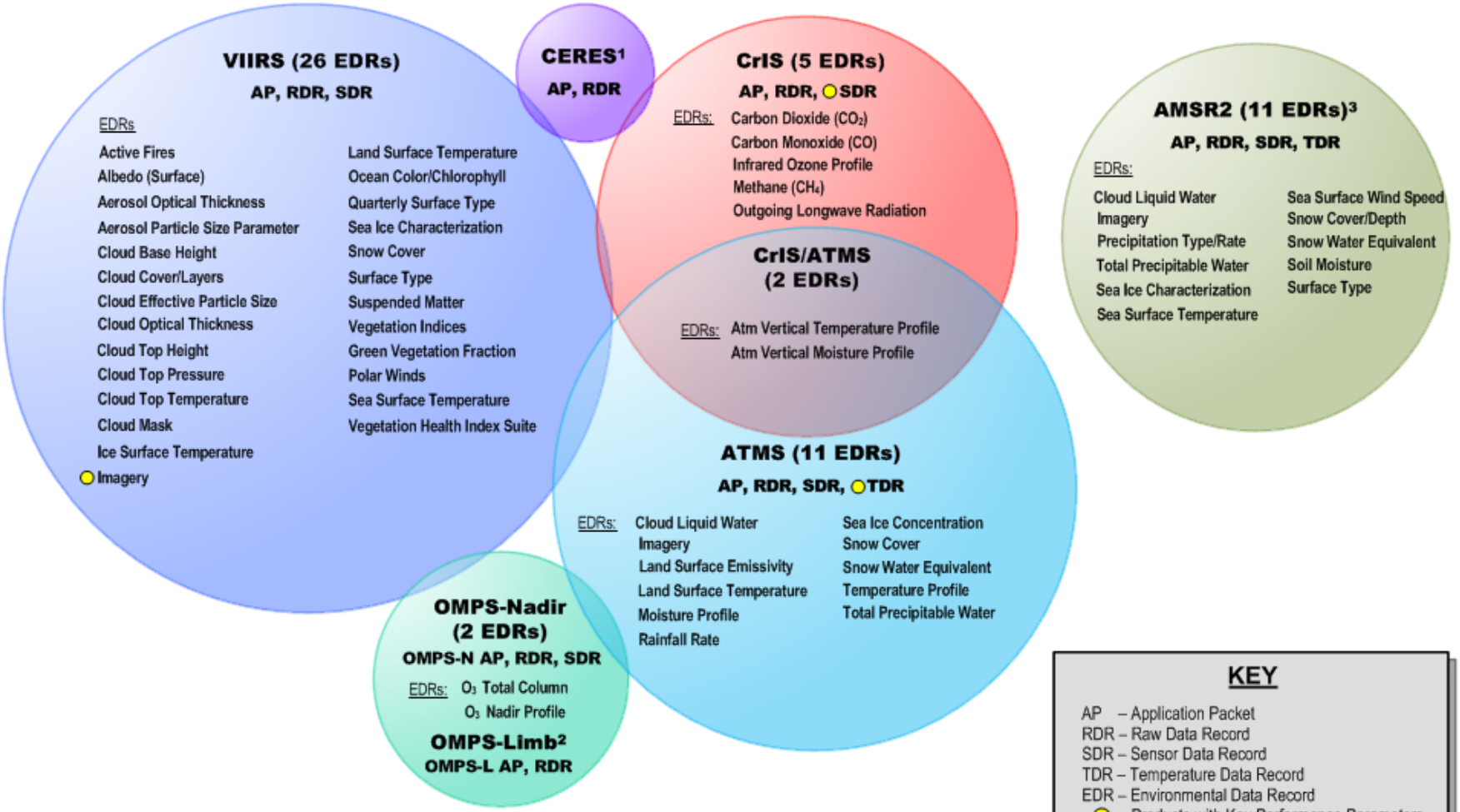


**JPSS SCIENCE MEETING**
**August 2016**

www.jpss.noaa.gov

# JPSS Program Data Products

JPSS Level 1 Requirements Document, v1.8




**KEY**

AP – Application Packet
RDR – Raw Data Record
SDR – Sensor Data Record
TDR – Temperature Data Record
EDR – Environmental Data Record
○ – Products with Key Performance Parameters

Notes:

[1]AP and RDR for the JPSS-2 Mission are contingent on NASA manifest of the Radiation Budget Instrument (RBI)

[2]Not applicable to JPSS-1; AP and RDR contingent on NASA manifest of OMPS-Limb on the JPSS-2 Mission

[3]All products dependent on the Global Change Observation Mission (GCOM) provided by the Japan Aerospace Exploration Agency

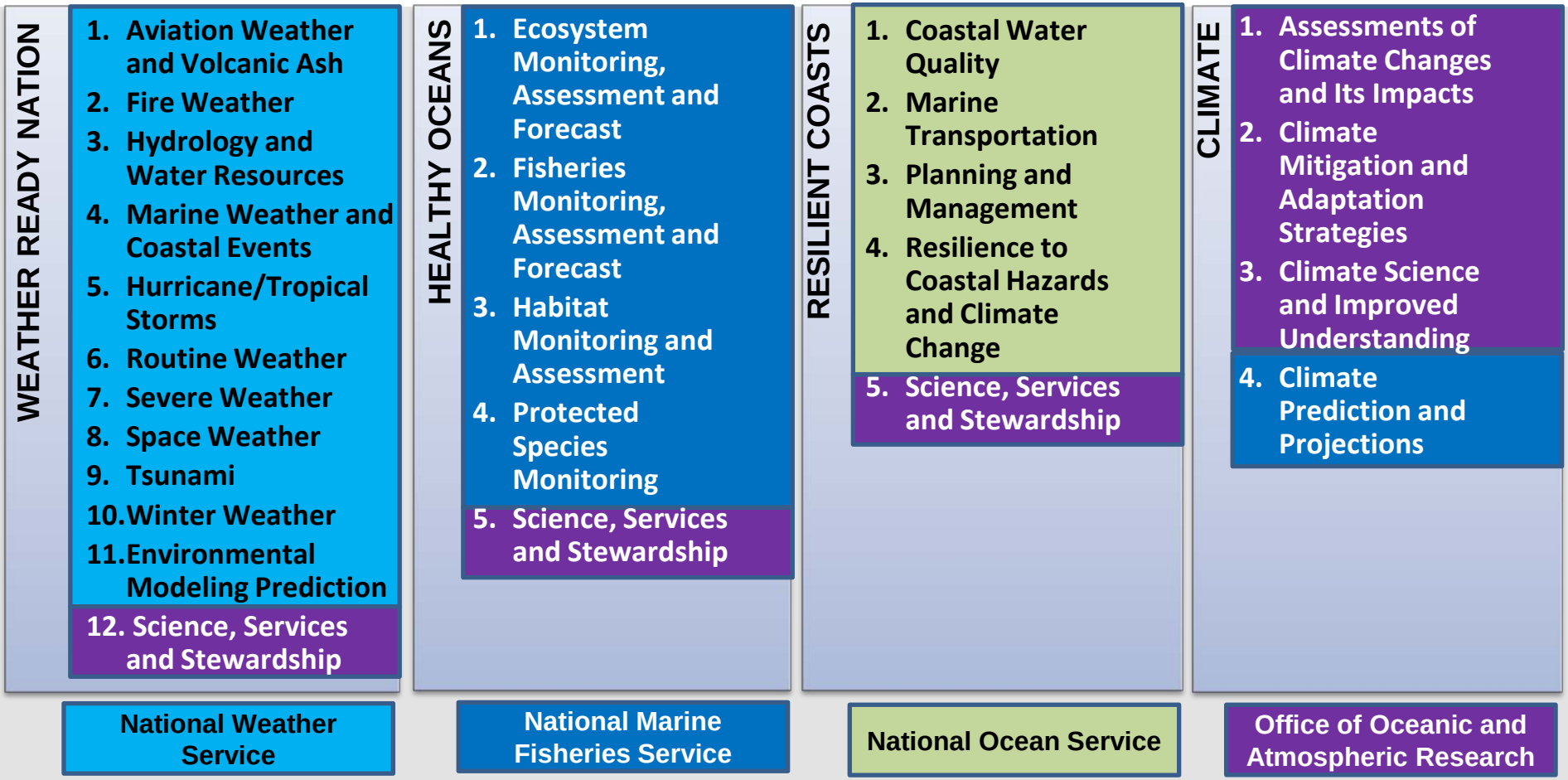
The JPSS Program includes Ground System Support for the Metop, DMSP, and GCOM missions

**April 3, 2015**

**This chart is controlled by JPSS Program Systems Engineering**

**JPSS-P Rev C.1**

# Addressing Needs Across NOAA




NOAA Mission Service Areas by Line Office

# NOAA End-to-End Science Approach

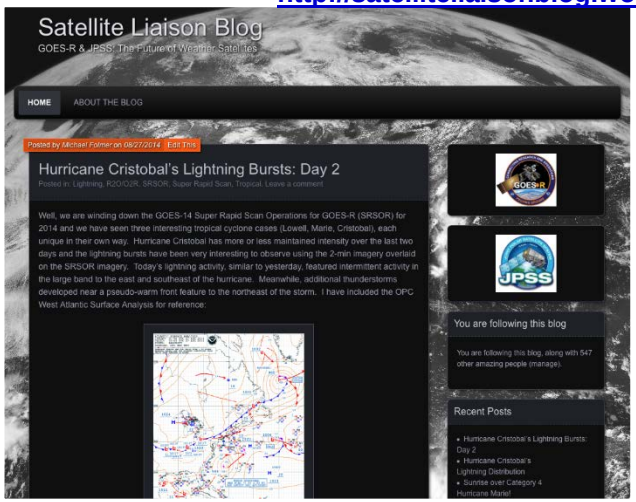
- User Readiness (Proving Ground)
  - User engagement and priorities through JPSS Proving Ground Executive Board and Satellite Development Executive Board and Proving Ground and User Readiness Meeting.
  - Projects to improve NOAA products and services throughout NOAA LOs via infusion of JPSS data into applications (prioritized by PGED/SDEB).
  - Proving Ground Initiative Process for improved user interactions
  - Training for better understanding of how to best use our products in key applications
- New Science (Risk Reduction)
  - To meet user needs (e.g. flood mapping and river ice, improved data fusion of multiple data source)
  - User of Direct Readout to test new algorithms or to further reduce latency.

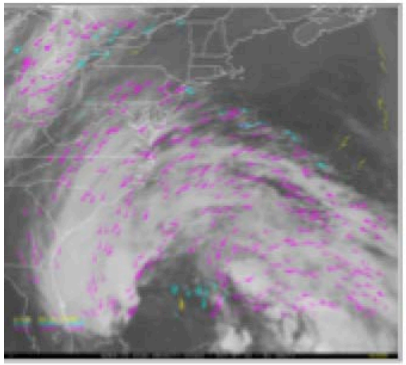
# Satellite Proving Grounds

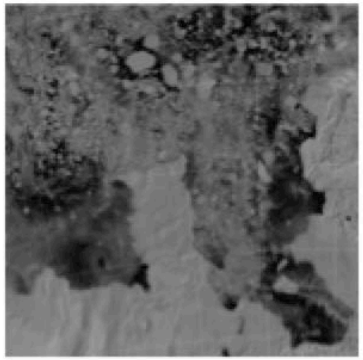
Key Aspects:

- Demonstrations
- Satellite liaisons (subject matter experts) at NWS National Centers
- Develop training for users
- International Projects
- Visiting Scientist Program

http://satelliteliaisonblog.wordpress.com

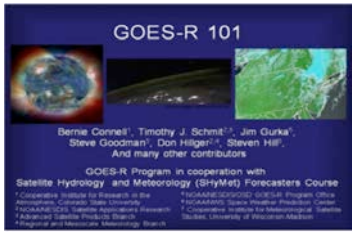




S-NPP Day/Night Band
Ice Detection

# Training and Education


## GOES-R Online Training Modules (COMET)

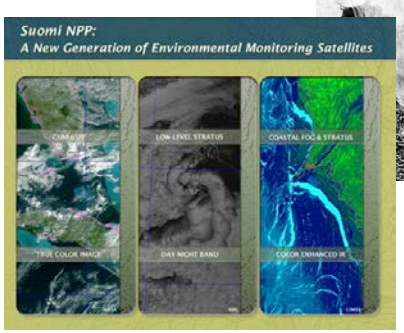
- GOES-R GLM: Introduction to the Geostationary Lightning Mapper
- How Satellite Observations Impact NWP
- GOES-R ABI: Next Generation Satellite Imaging
- GOES-R: Benefits of Next-Generation Environmental Monitoring
- Satellite Hydrology and Meteorology for Forecasters (SHyMet)
- SPoRT product training modules
- VISIT Training Resources
- GOES-R: beneficios de la observación ambiental de próxima generación
  Suomi NPP: Una nueva generación de satélites de observación ambiental
- Numerous other training modules in Spanish at http://bit.ly/COMETspanish

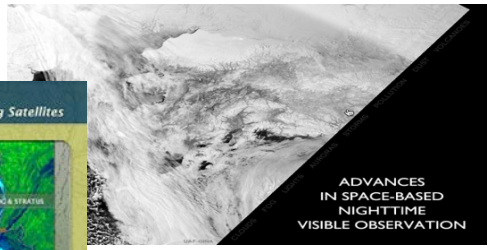
### Printed Materials

- ABI Bands Quick Information Guides
- GOES-R Fact Sheets (18)
- User Readiness Plan
- GRB Downlink Specifications and Product Users Guide
- Proving Ground Demonstration Final Reports and Annual Reports

## JPSS COMET Online Training Modules

- Suomi NPP
- Advances in Space-Based Nighttime Visible Imagery (VIIRS Day Night Band)
- Remote Sensing Using Satellite, 2nd Edition (COMET)
- Multispectral Satellite Applications: RGB Products Explained
- Coming attractions from COMET:
  - Polar Sat updates on hyperspectral, wildland fires, and VIIRS
  - Nighttime Polar Applications Module
  - Satellite Data Informing NWP
  - Satellite Feature ID: Three Dimensionality of Water Vapor



# Proving Ground Initiatives

- What is an initiative? An interagency group of developers and operational users that frequently interact in a structured forum to address forecast and mission support challenges in NOAA operational focus 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
  - NOAA stakeholders are actively participating
  - Products and capabilities are evaluated in operational environments
  - Monthly and bi-monthly meetings ensure proposed improvements can be worked on and then implemented quickly

# PGRR Proving Ground Initiatives

- River Ice and Flooding
- Fire and Smoke (Aerosols)
- Sounding Applications
- NWP Data Assimilation
- Imagery/Nowcasting
- Ocean and Coastal
- Hydrology
- Arctic
- Land Data Assimilation
- Atmospheric Chemistry

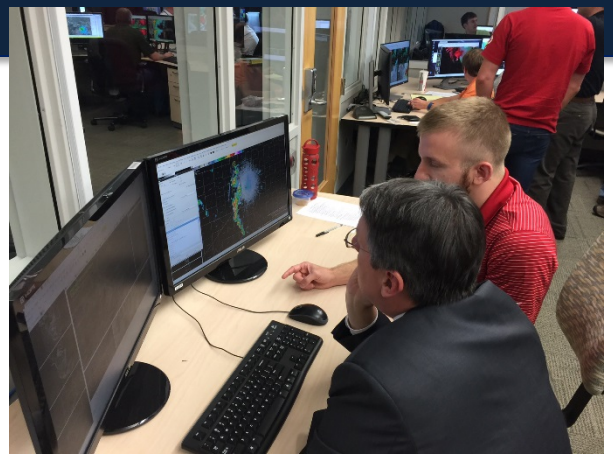
# Soundings and Fire/Smoke Initiatives

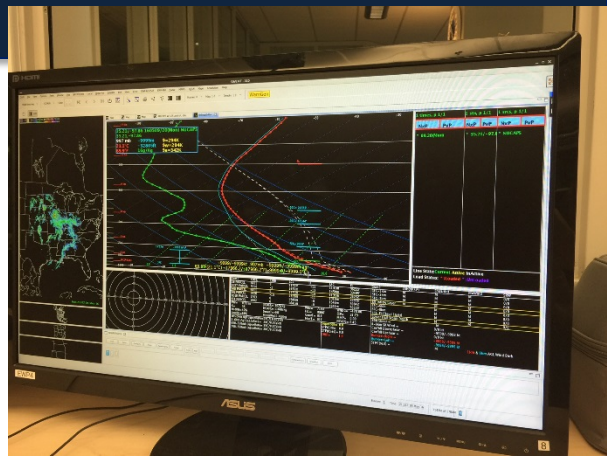
Sounding Products

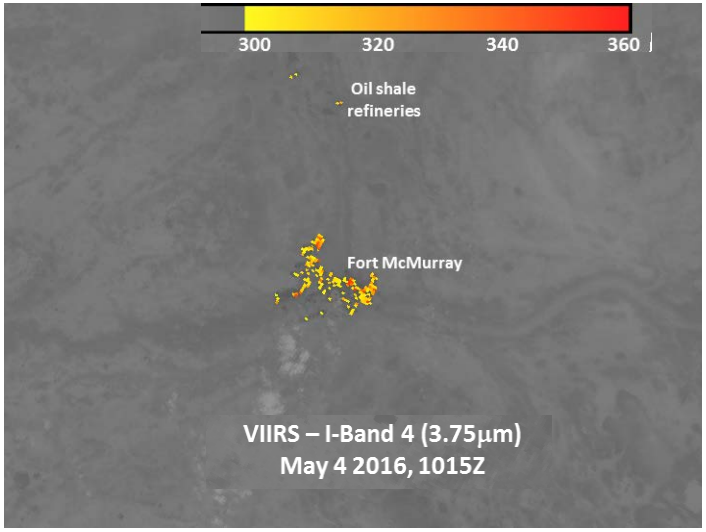
- On AWIPS and AWIPS Thin Client
- Demonstrations with operational forecasters at 2015 & 2016 Spring Experiment

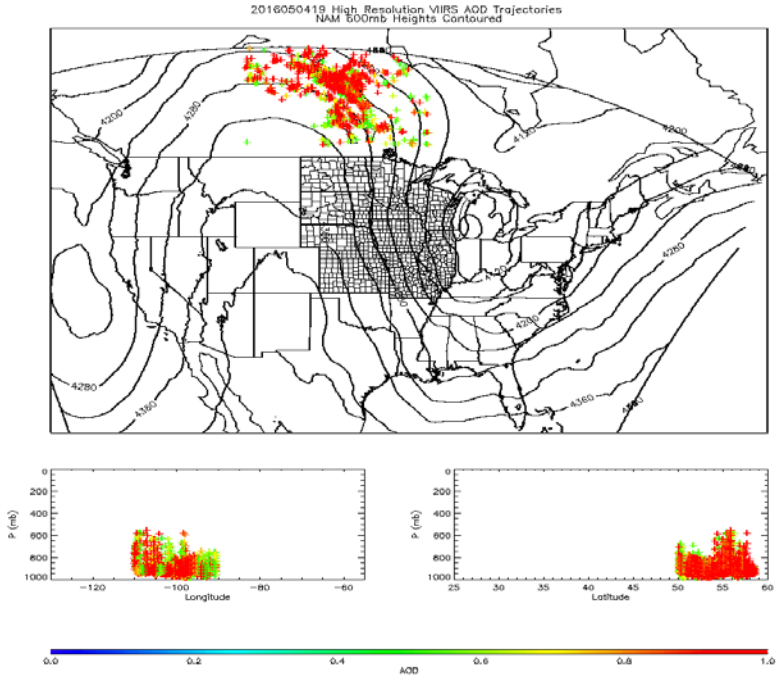
Imagery

- NCC/DNB now on AWIPS
- Active fires and smoke forecasting







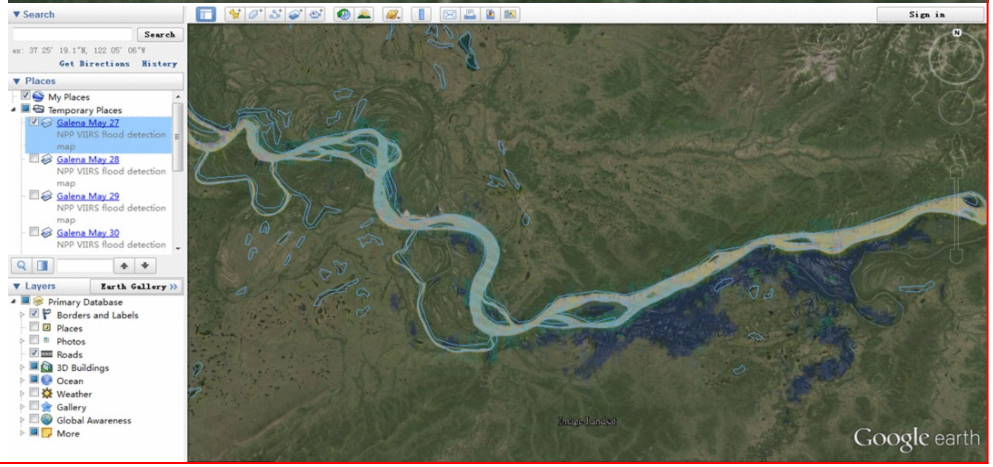




High resolution (NAM 3km) trajectory forecast Fort McMurray Wildfire May 04, 2016

# First Initiative:
# VIIRS flood mapping and river ice products with NWS River Forecast Centers (RFCs) (Alaska Pacific, North Central and Ohio River)

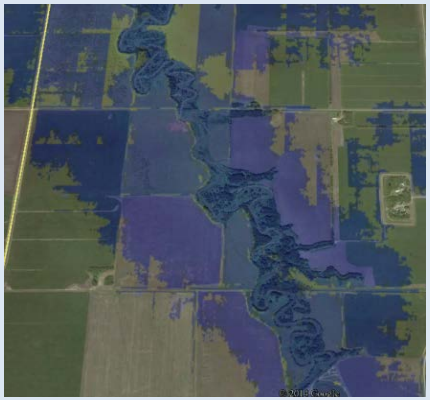
JPSS Proving Ground presented flood map and river ice examples to RFC's and received strong user support for further evaluation.

- JPSS PG established an operational demonstration work plan with the RFCs which included implementation of algorithm in CSPP (direct readout), experimental products in AWIPS and assessment from users (RFCs) including validation with airborne imagery.


- VIIRS can identify river ice jams which can lead to large flood events
- Flooding from ice jams can occur in a very short time
- Flooding can occur from snow melt and heavy rains

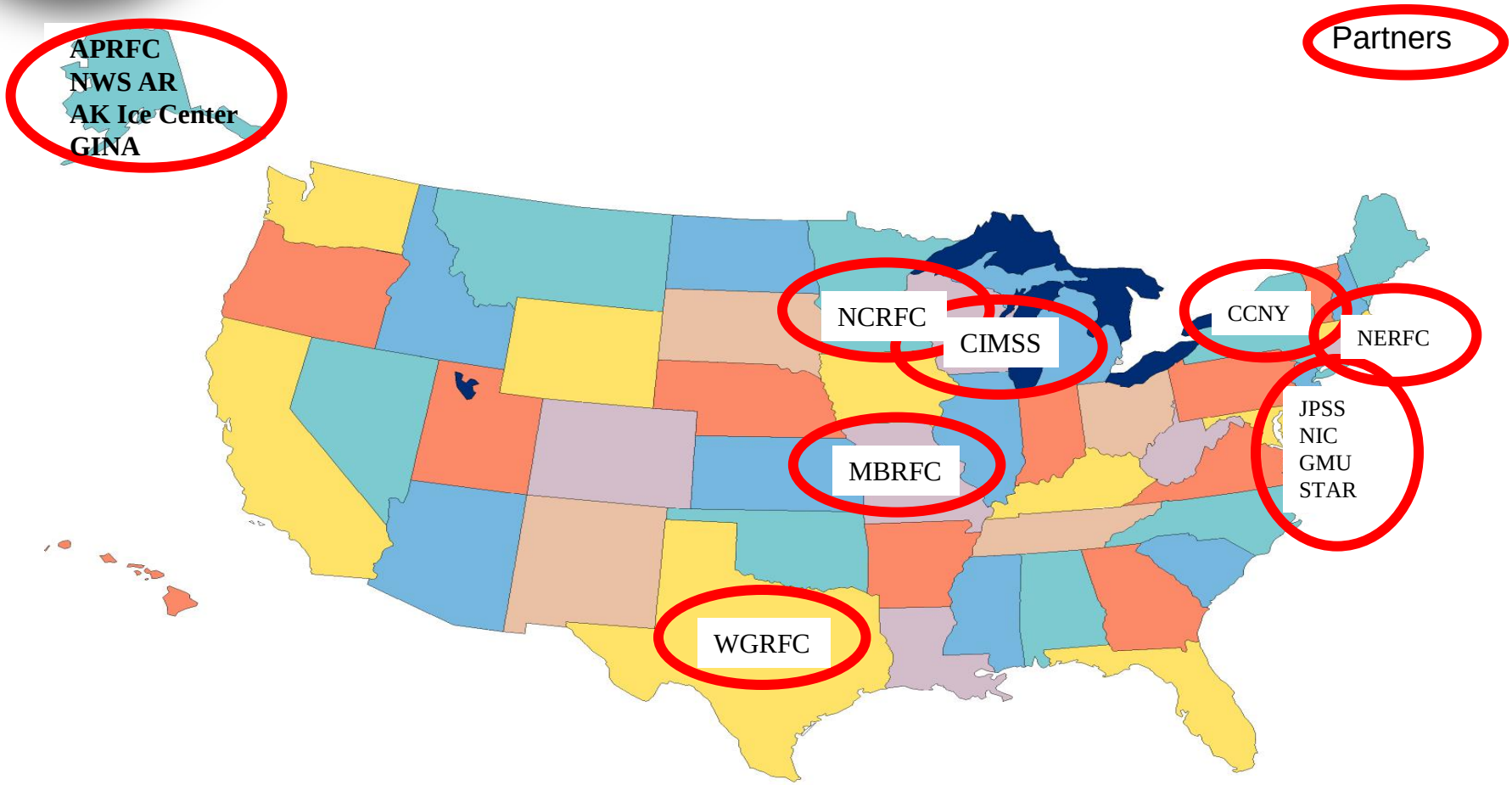
**April 15, 2014**
Red River Flooding from snow melt



**Feedback from the RFCs**

- *"River ice vs no ice detection appears excellent"*
- *"Prove useful delineating area of active snowmelt at multiple basin scales"*
- *"All RFCs identified significant value and future potential for river forecasting applications"*
- *"Color coded products with overlays are easily interpreted by forecasters"*
- *"Will formally request product to become operational"*

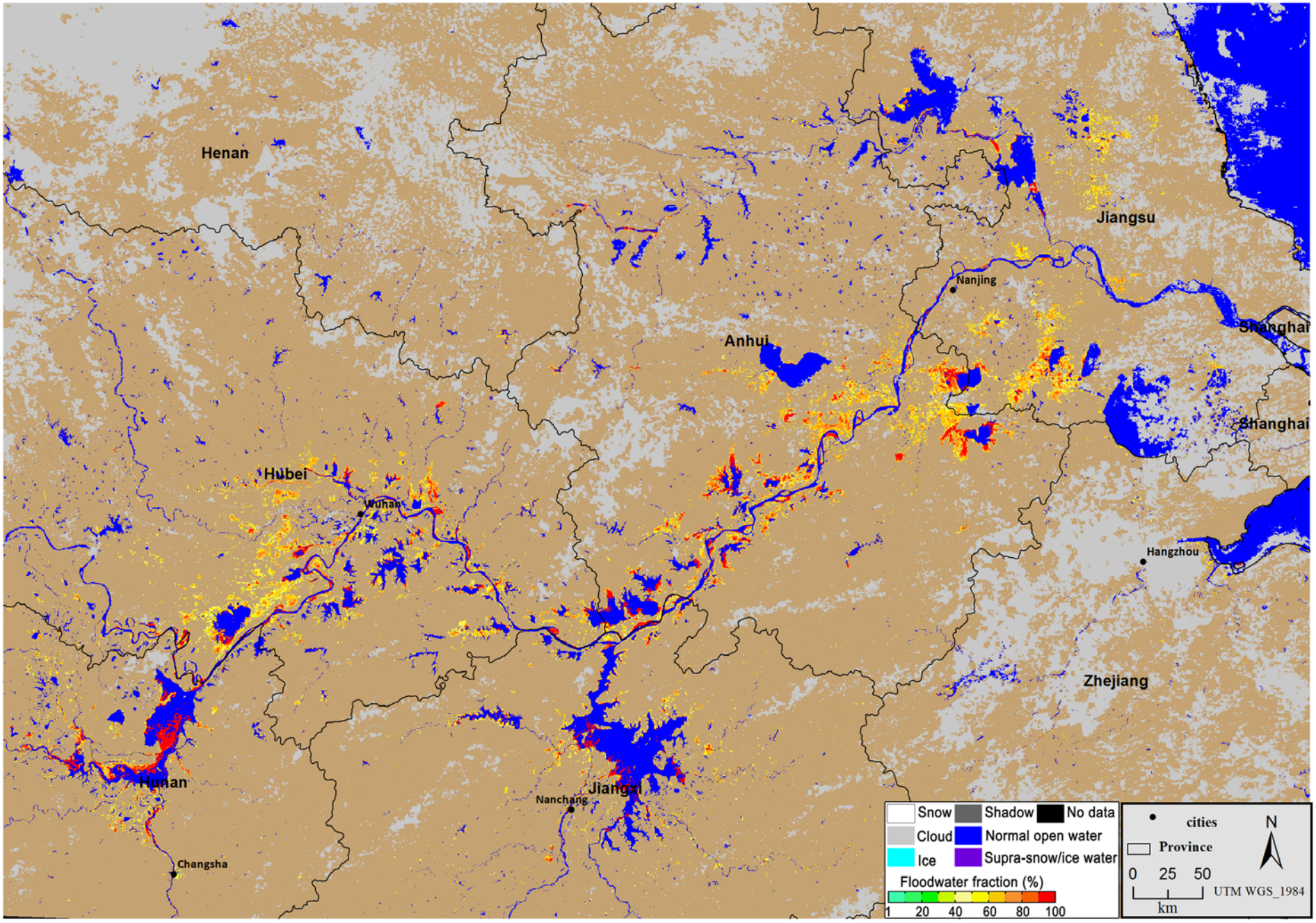
# River Ice & Flooding Initiative



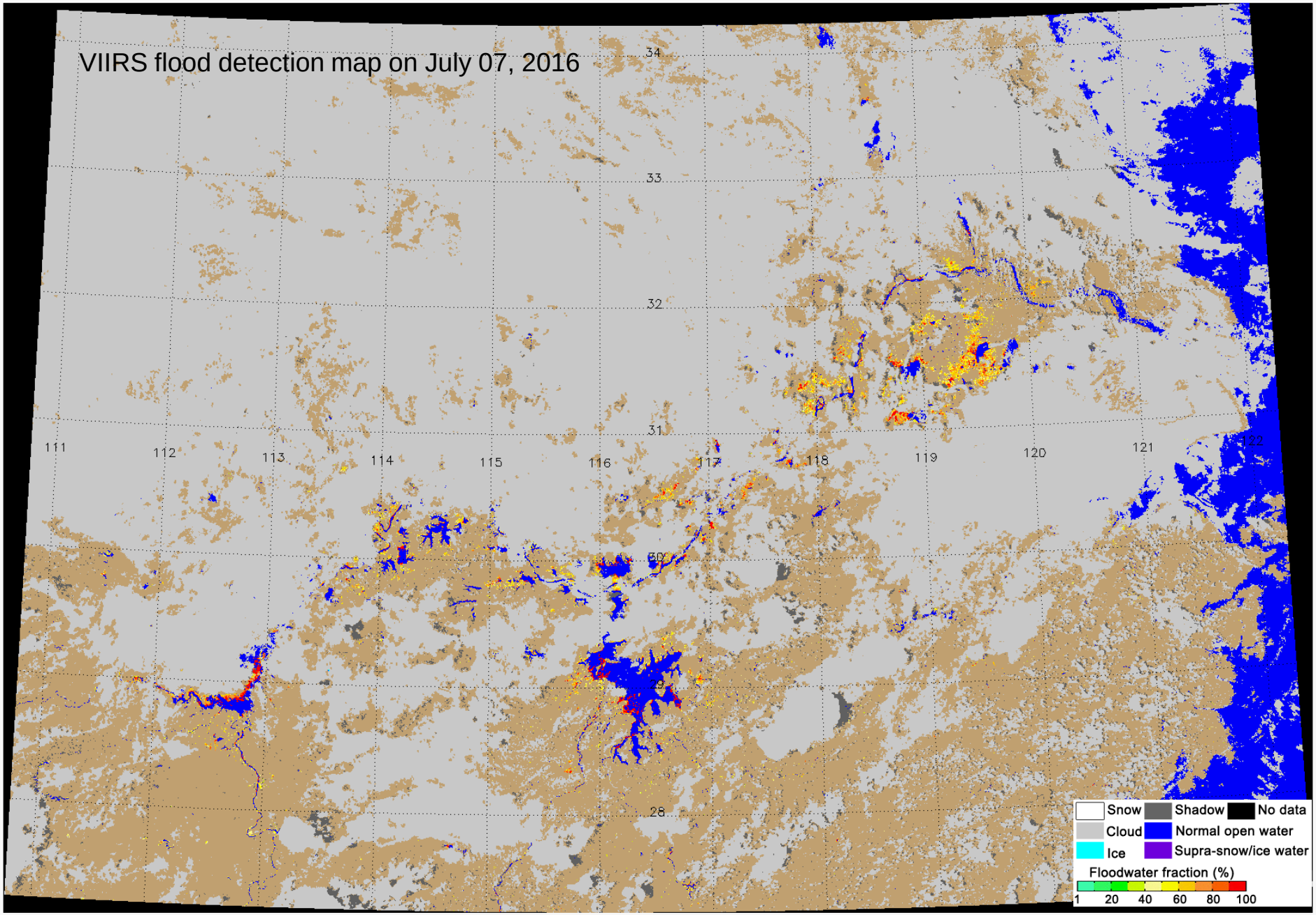

Produced by the Cartographic Research Lab
University of Alabama

# SNPP/VIIRS Automatic Flood Detection Map in Southern China

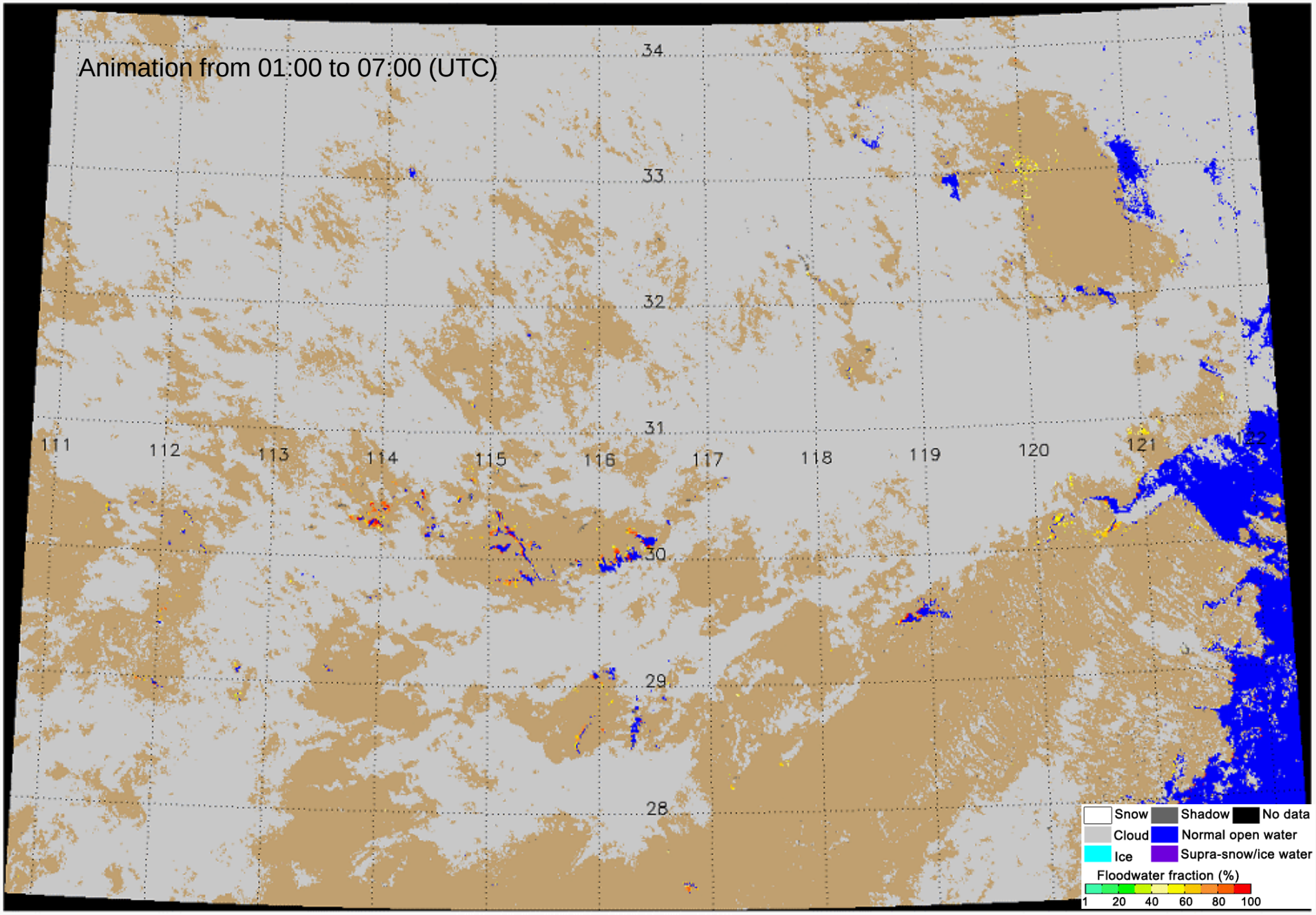
July 07 to July 09, 2016



SNPP/VIIRS Flood Detection Map 20160707 04:43(UTC)

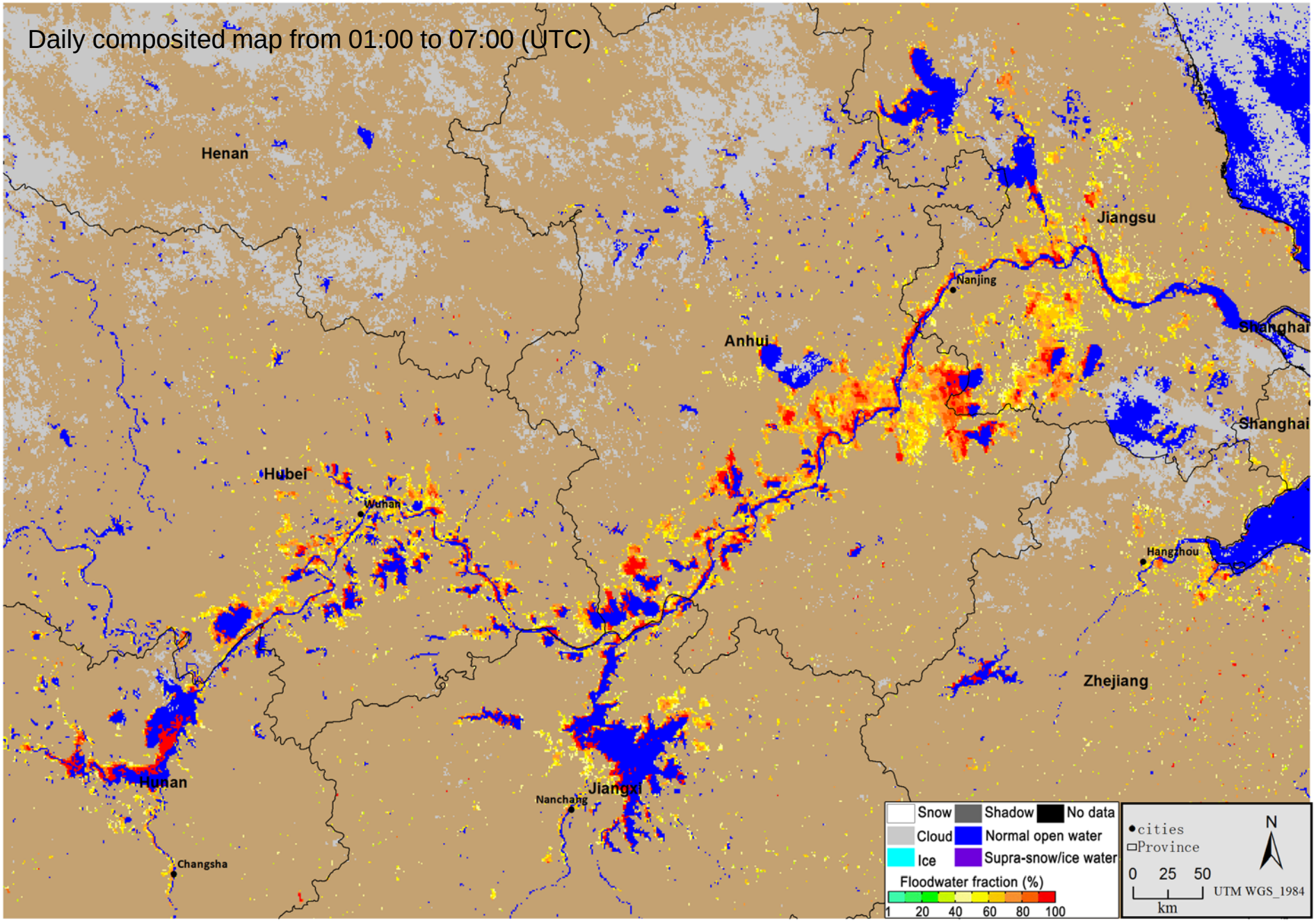


HIMAWARI-8 Flood Detection Map 20160707 01:00(UTC)



# HIMAWARI-8 Automatic Flood Detection Map in Southern China

July 07, 2016



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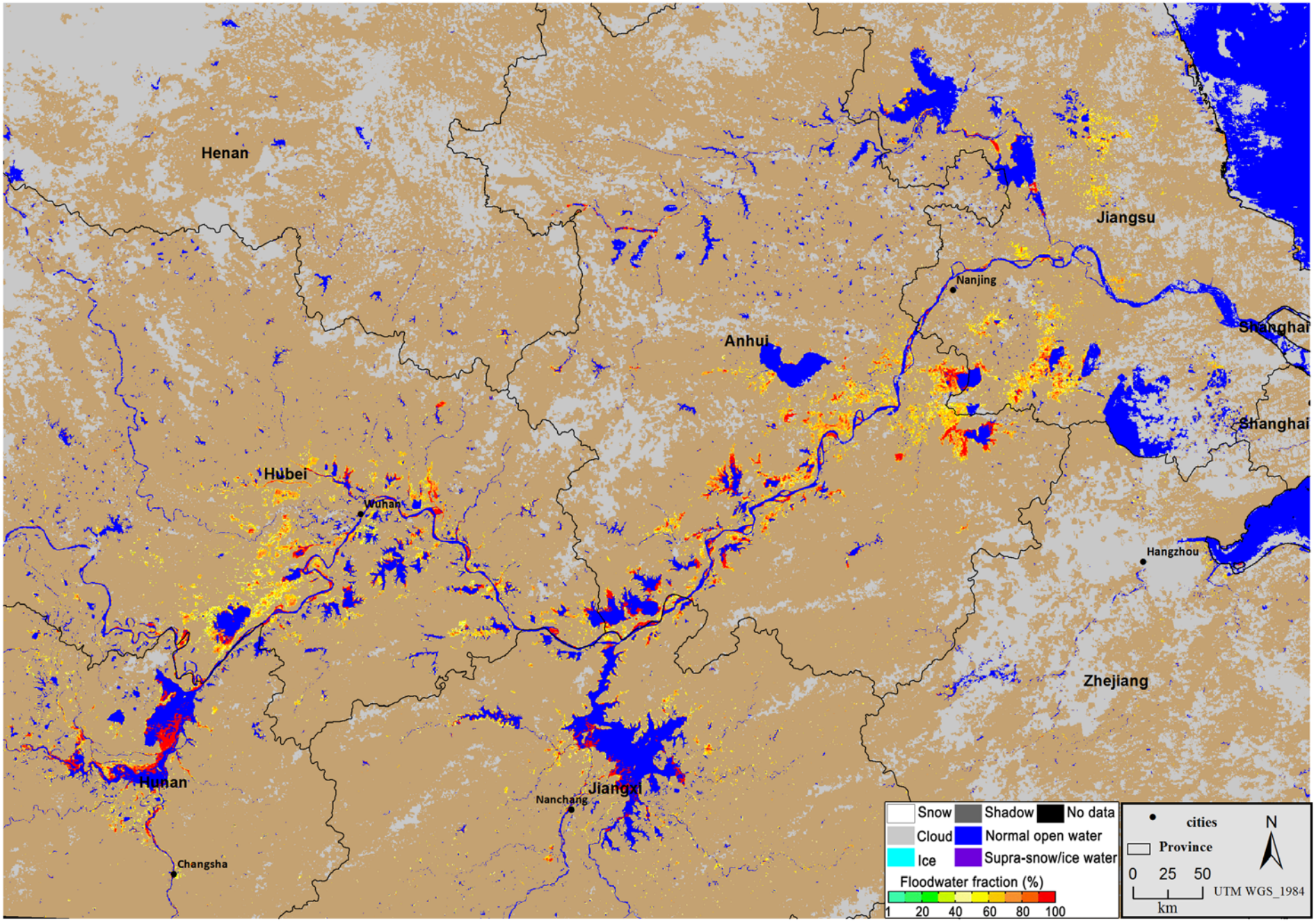
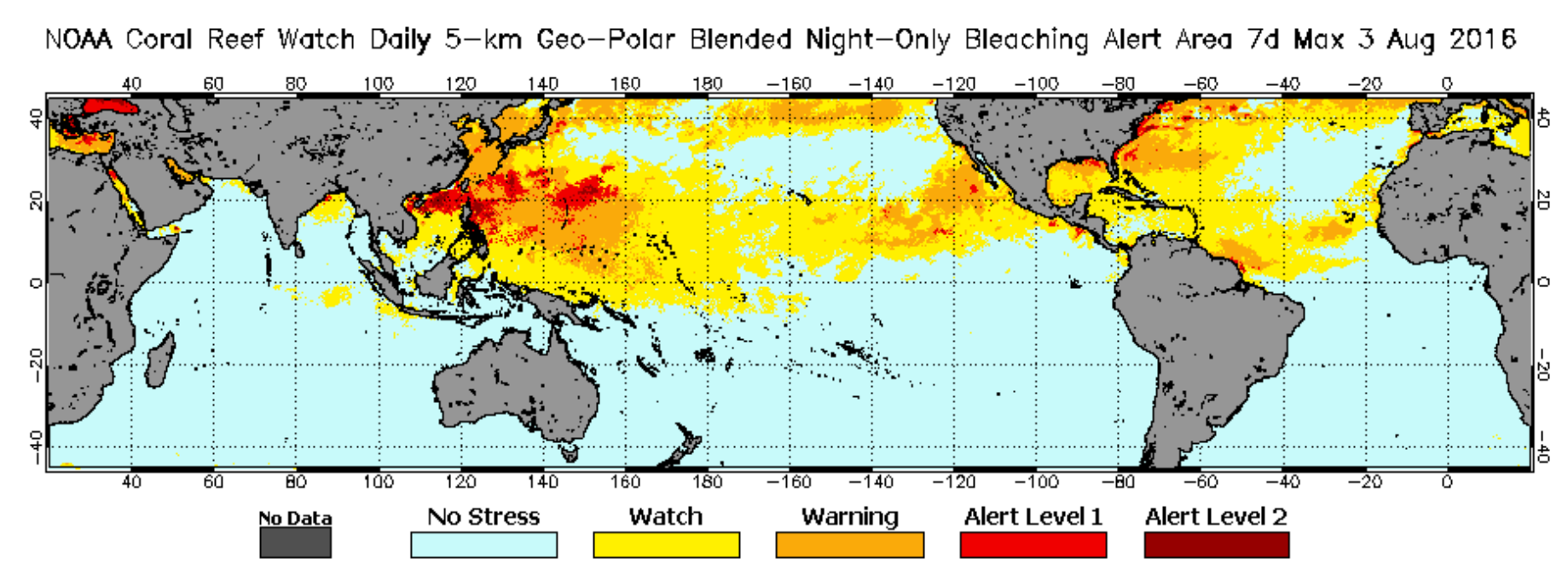


# STAR JPSS Oceans

## *VIIRS SST User: NESDIS & NOAA Coral Reef Conversation Program*

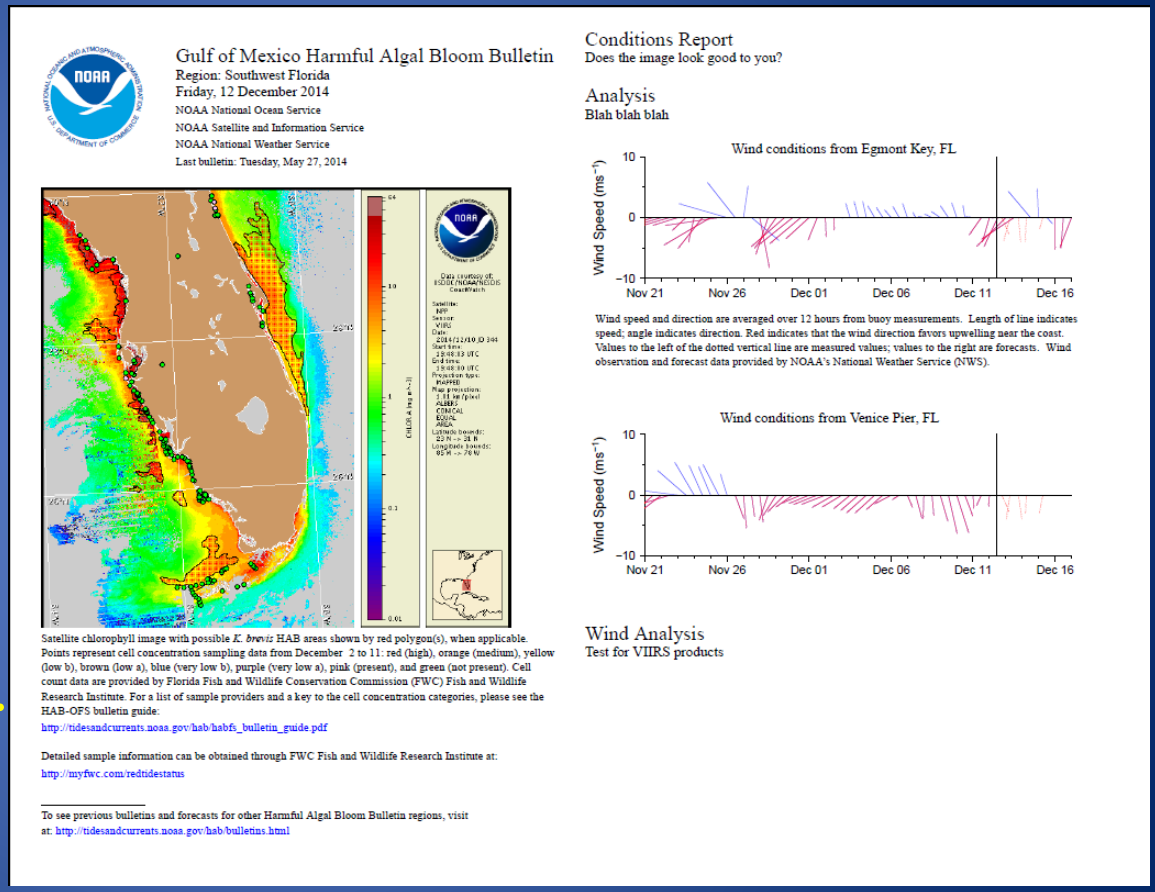



… to generate a new climatology for their bleaching alert and monitoring products for coral reef managers around the globe.

# STAR JPSS Oceans

## *VIIRS Ocean Color User: NOS*

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



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

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

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

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

Conditions Report
Does the image look good to you?

Analysis
Blah blah blah

Wind conditions from Egmont Key, FL

Wind Speed (ms⁻¹)
10
0
-10
Nov 21 Nov 26 Dec 01 Dec 06 Dec 11 Dec 16

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

Wind conditions from Venice Pier, FL

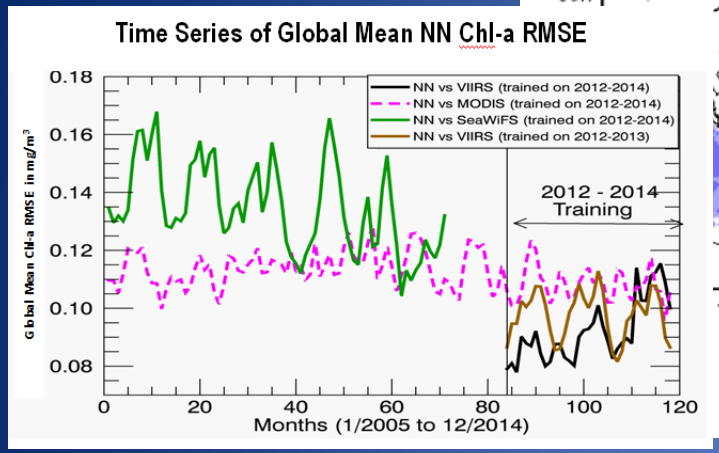
Wind Speed (ms⁻¹)
10
0
-10
Nov 21 Nov 26 Dec 01 Dec 06 Dec 11 Dec 16

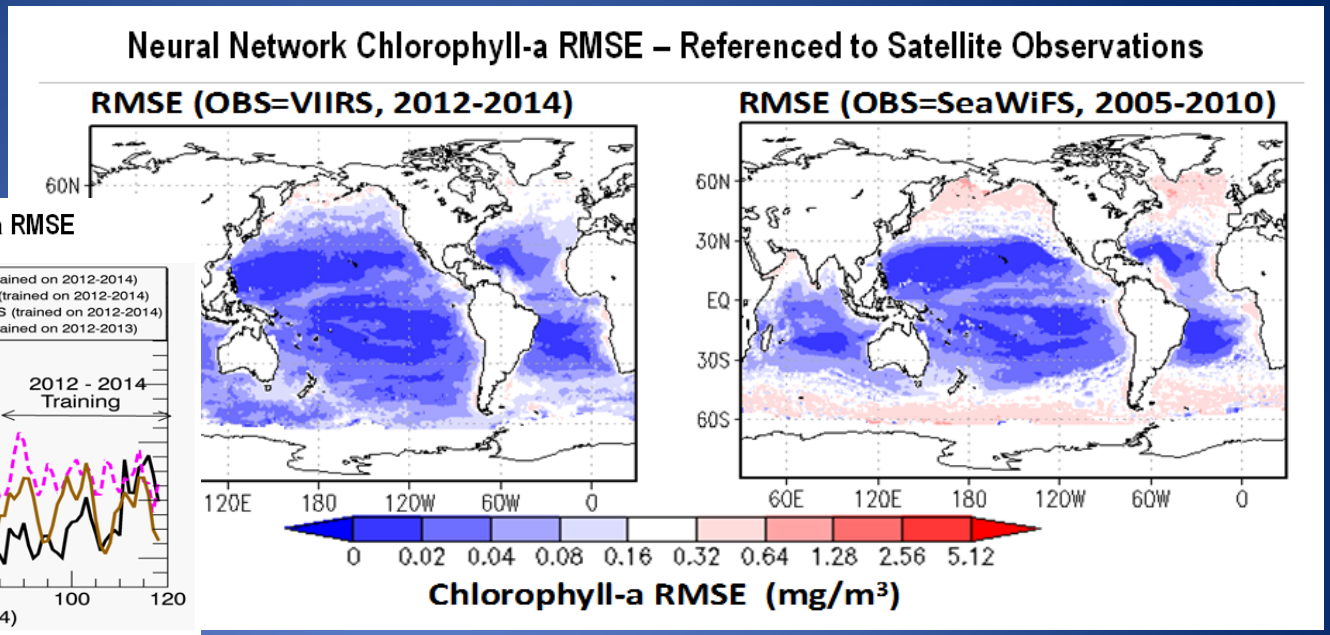
Wind Analysis
Test for VIIRS products

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

# STAR JPSS Oceans

***VIIRS Ocean Color***
***User: NWS***

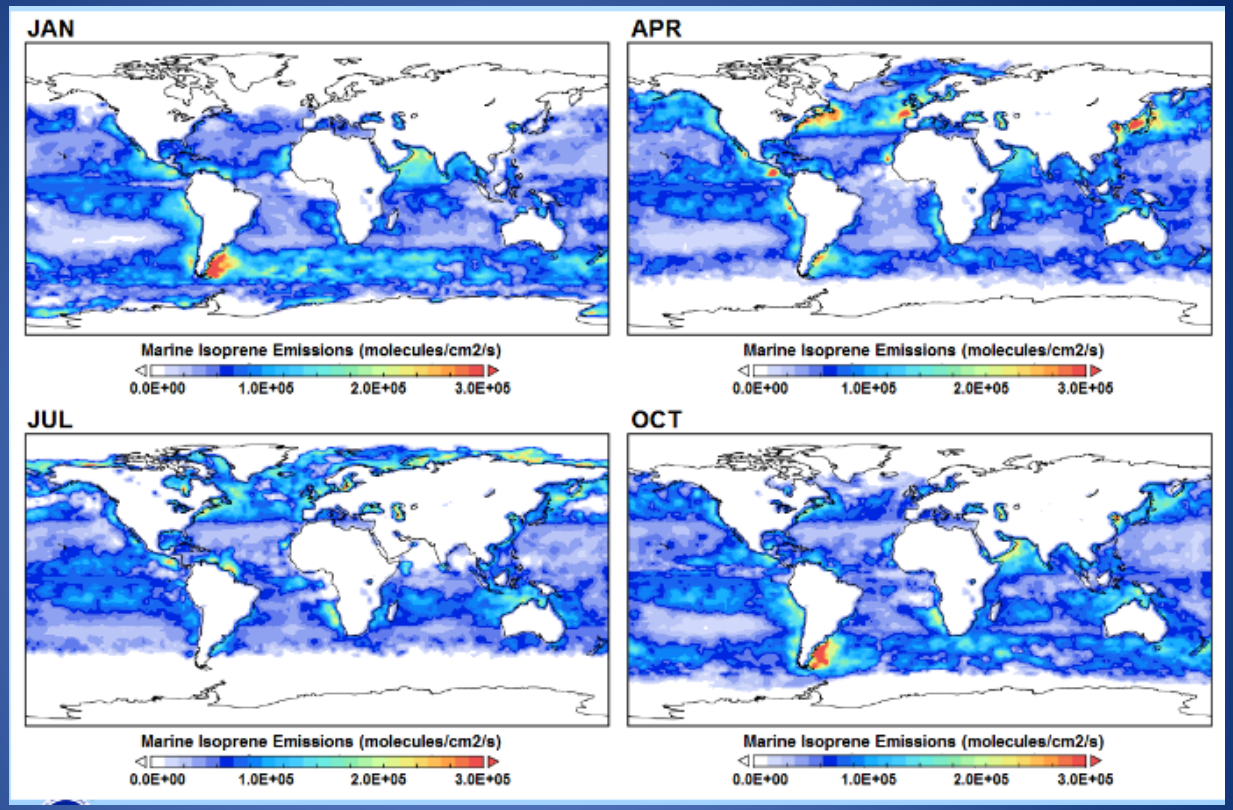



**NWS/NCEP/EMC** is using VIIRS Ocean Color to train a neural network to estimate gap-free, consistent ocean color fields (e.g., chlorophyll-a) to be assimilated into a pre-operational environment for NOAA's operational ocean models (HYCOM, MOM4).
(And see Kim et al. at OC Breakout, Wednesday afternoon.)

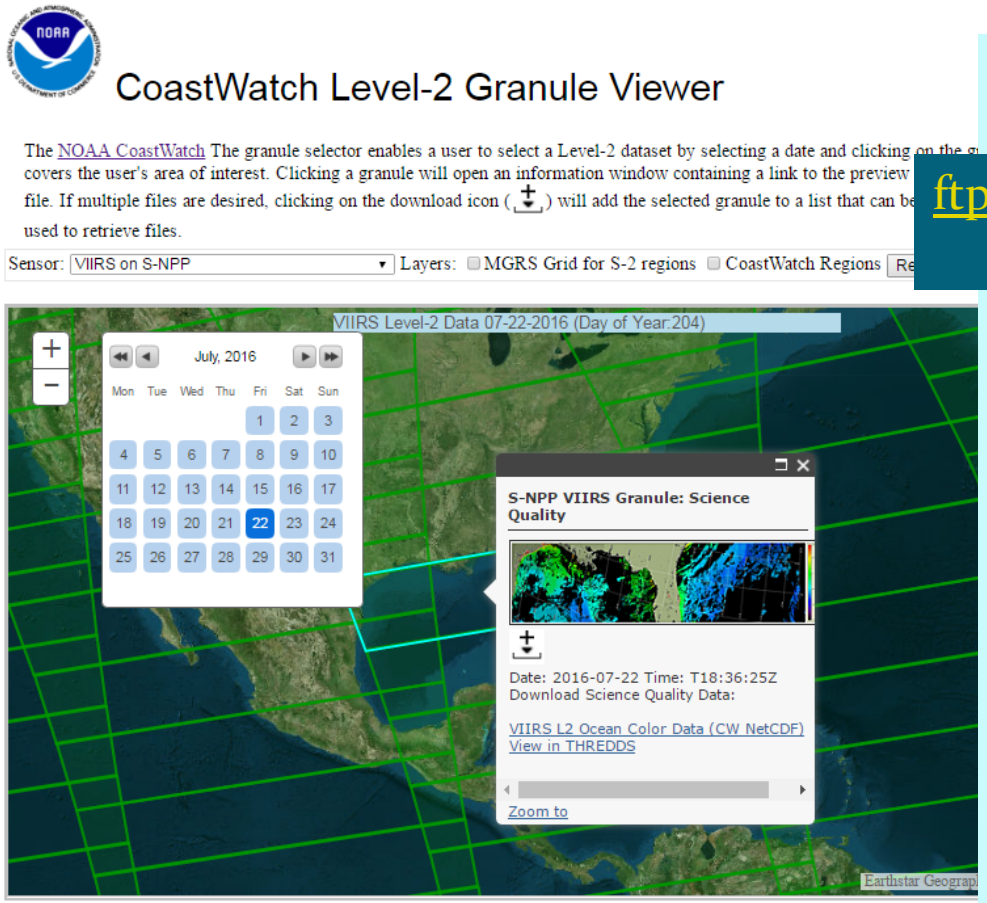
# STAR JPSS Oceans

***VIIRS Ocean Color User: OAR***




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

# Science Quality 'Life-of-Mission'



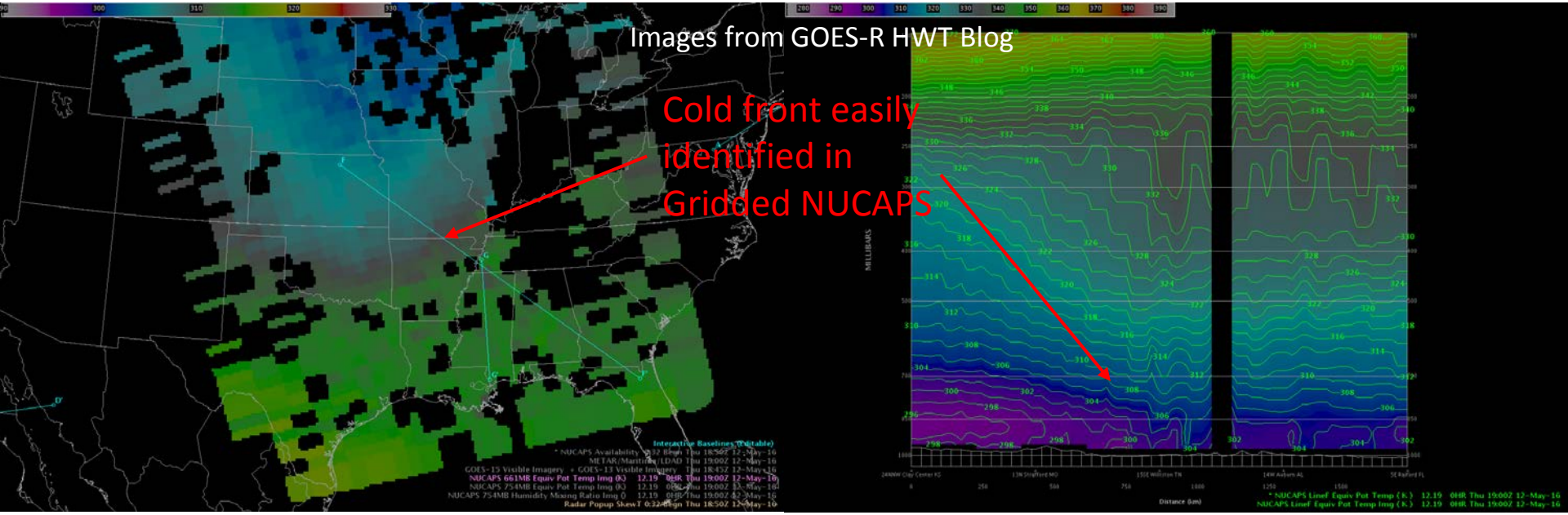

- FTP OC 2012 to [Present – 15 days]:

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

- Integrated with the same L2 Granule Selector tool
  - Present – 15 days: NRT Granules
  - 15 days old and prior: Science Quality
  - Includes data preview and data cart
- VIIRS SST RAN1 will be included when ready
- OLCI OC will be included when ready for release

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

# Gridded NUCAPS Convection Application

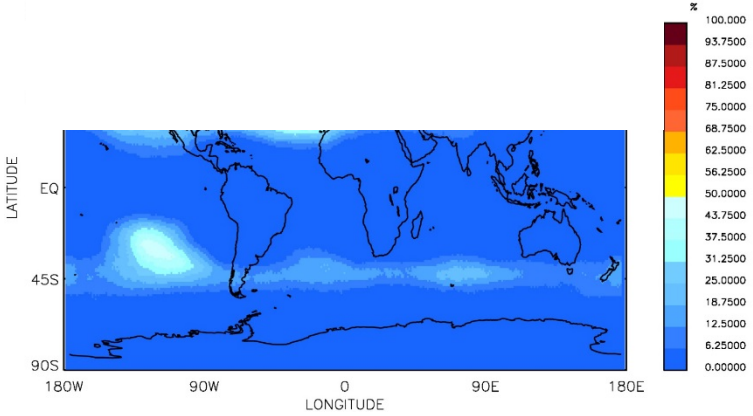


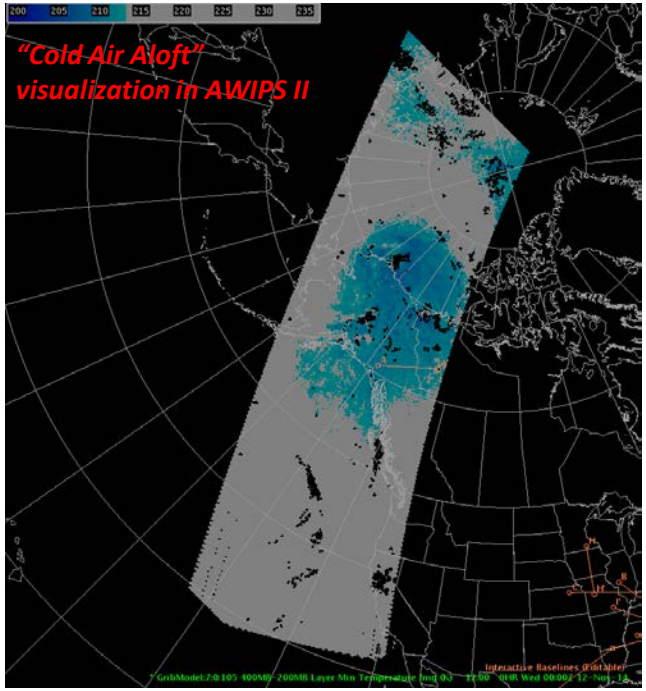

"We recently gained the ability to create cross sections through the NUCAPS swaths. This will be helpful for diagnosing phenomena such as boundaries and convective instability. The first image below is a plan view display of theta-e at 660 mb across the region. Obvious is the much cooler, drier air behind the cold front (low theta-e) with moist, warmer air ahead of it to the east (high theta-e). Also plotted is a line, denoting the location for which the cross-section (image below) was taken, through the cold front. The cross-section depicts theta-e vertically through the atmosphere. This provides another perspective on the cold front, which is obvious in the image."

# Forecast Challenge: Cold Air Aloft

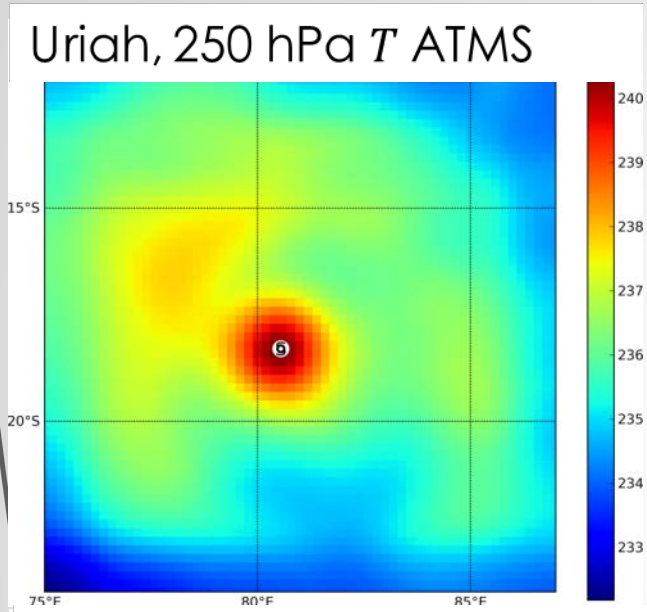
- Have found that temperatures below -60°C at flight levels occur regularly in the arctic and also pockets of colder air even occur over the mid-latitudes
- Using visualization color curve based on web graphics developed by CIRA, the Gridded NUCAPS products will be evaluated
  - Light blue shading for temperatures anywhere below 100 hPa in the column that are < -60°C
  - Darker blue shading for temperatures anywhere below 100 hPa in the column that are < -65°C
- Will be deploying NUCAPS data and visualization capabilities as part of an operational demonstration with forecasters at the Alaska CWSU in the fall/winter

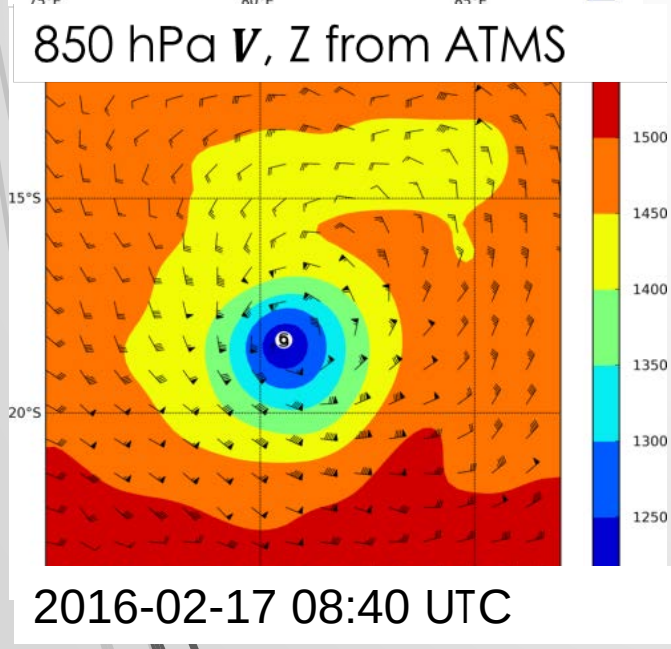
***Probability of observing T ≤ -60°C in AIRS at at 200 hPa from Jan. 2005 to Jan. 2015***



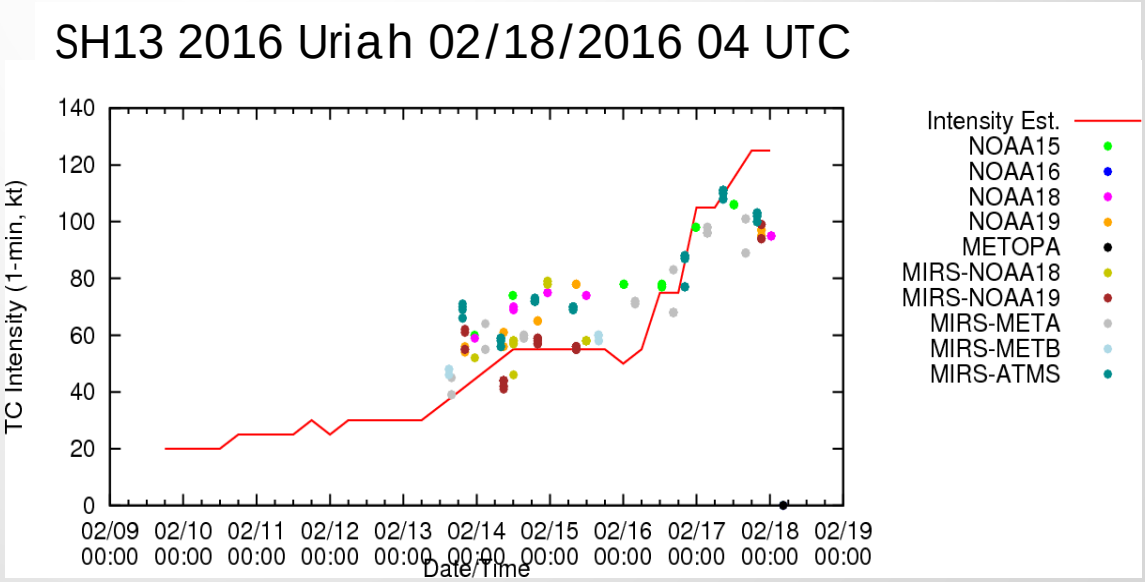
# CIRA Operational ATMS TC Intensity and Structure Algorithm – Output Example



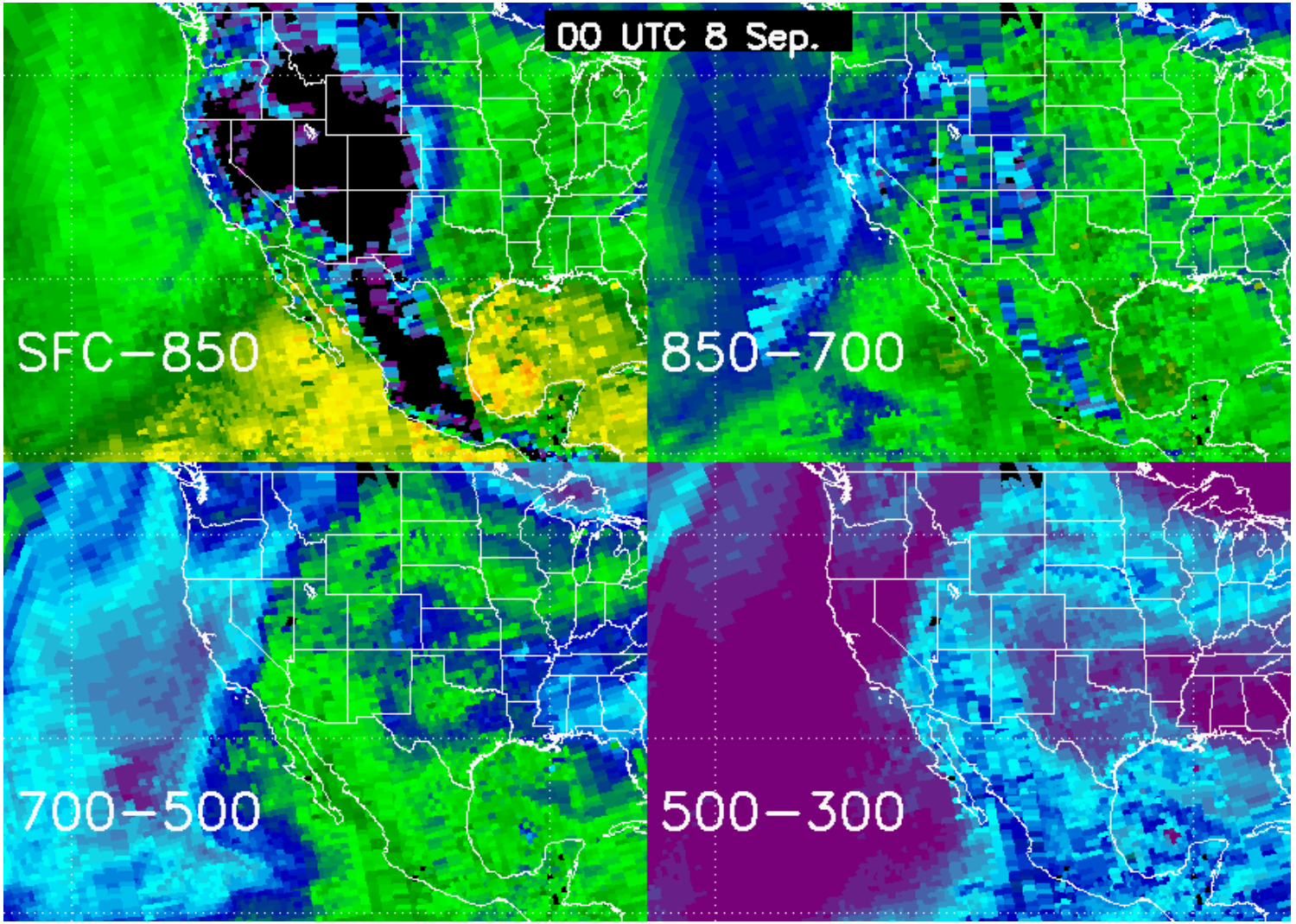




- **Operational version uses S-NPP ATMS-MIRS**
- **Version using JPSS-1 data will be transitioned to operations in 2019**

- The ability of ATMS-MIRS to resolve warm core is important for obtaining accurate wind and structure estimates



# Four-layer LPW leading up to the Colorado Front Range floods in September 2013




Cooperative Institute for Research in the Atmosphere

# Delivering Existing Layer Precipitable Water Product to National Centers

MESOSCALE PRECIPITATION DISCUSSION 0530
NWS WEATHER PREDICTION CENTER COLLEGE PARK MD
1016 AM EDT TUE SEP 29 2015

CONCERNING...HEAVY RAINFALL...FLASH FLOODING LIKELY

SUMMARY...A TROPICAL AIRMASS WITH NEAR RECORD PRECIPITABLE WATER WILL RESULT IN A CONTINUED FLOOD AND FLASH FLOOD THREAT INTO THIS AFTERNOON.

...

FORCING FROM THE SHORTWAVE IN GA AND A GENERALLY DIVERGENT PATTER ALOFT IS HELPING FORCE ASCENT ON THE LARGE SCALE...WITH 20-30 KTS OF LOW LEVEL UPSLOPE FLOW AIDING IN LIFT. LAYERED PRECIPITABLE WATER PRODUCTS SHOW AN IMPRESSIVE COMBINATION OF FACTORS CONTRIBUTING TO THE NEAR RECORD PRECIPITABLE WATER VALUES ACROSS THIS REGION. A CONNECTION TO THE PACIFIC AND TROPICAL STORM MARTY CAN BE SEEN IN THE MID/UPPER LEVELS...WITH A DEEP LAYER CONNECTION TO THE GULF OF MEXICO AND ALSO TROPICAL STORM JOAQUIN IN THE ATLANTIC. THIS IS ALL RESULTING IN A VERY EFFICIENT ATMOSPHERE FOR HEAVY RAIN RATES. THE ONE THING LACKING IS INSTABILITY...BUT AT LEAST SOME DOES EXIST ACROSS THE AREA AS NOTED BY SOME LIGHTNING AND COLDER CLOUD TOPS…

**Example NOAA WPC usage of LPW for flooding in New England**

AXNT20 KNHC 301212
TWDAT

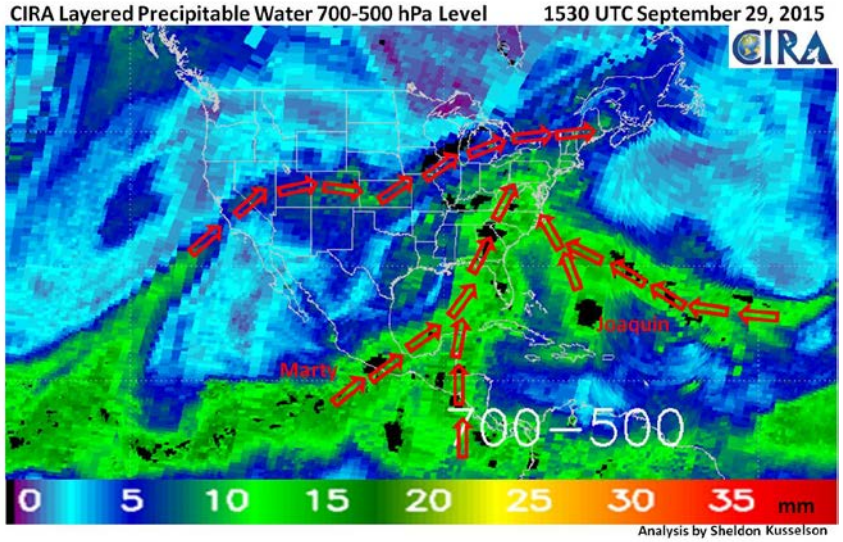
TROPICAL WEATHER DISCUSSION
NWS NATIONAL HURRICANE CENTER MIAMI FL
805 AM EDT WED SEP 30 2015

...

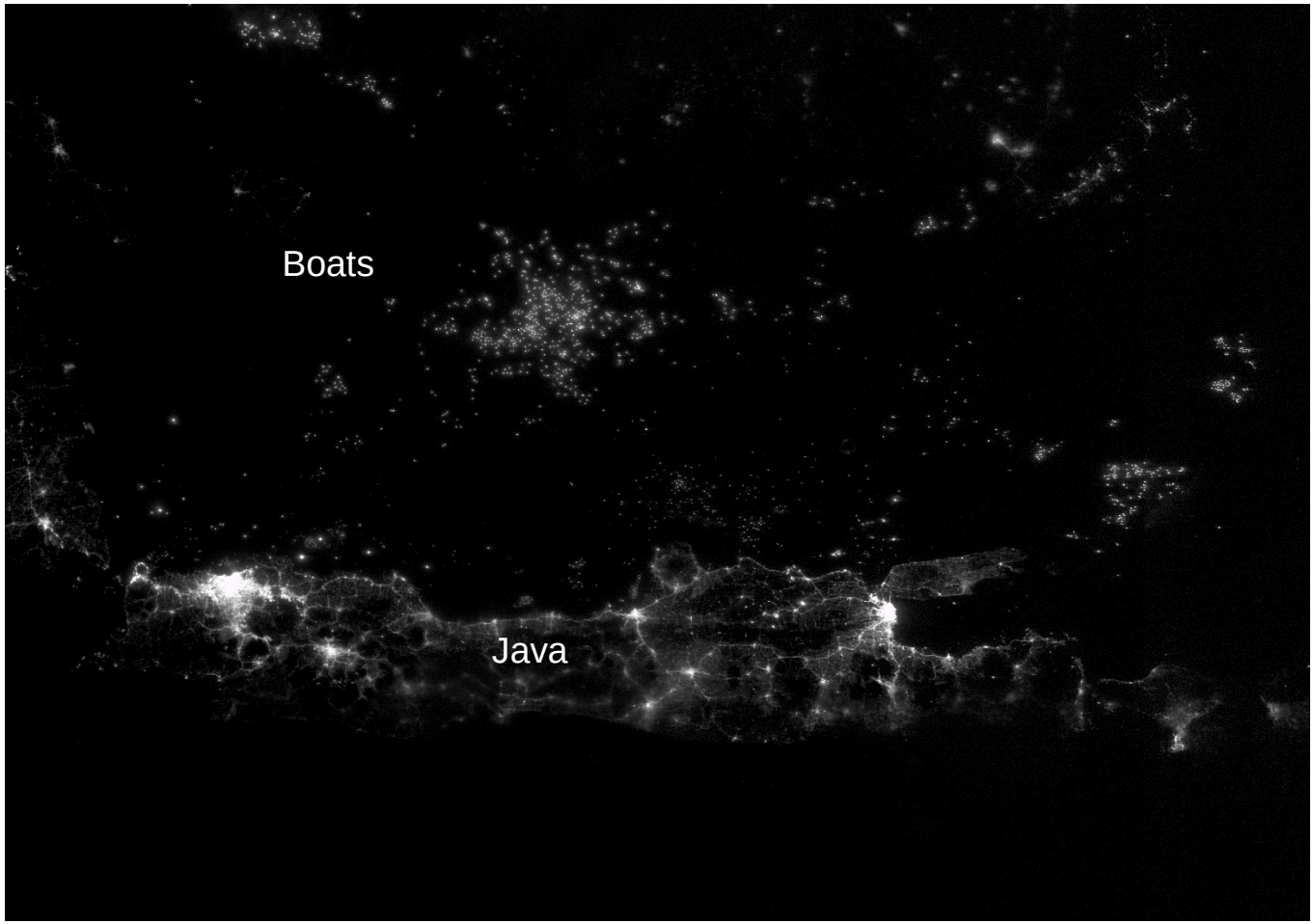
A TROPICAL WAVE IS IN THE CENTRAL ATLC WITH TILTED AXIS EXTENDING FROM 16N36W SW TO A 1009 MB LOW PRESSURE CENTER EMBEDDED IN THE MONSOON TROUGH NEAR 11N39W...MOVING W AT 5-10 KT. CIRA LAYER PRECIPITABLE WATER IMAGERY SHOW THE WAVE IS EMBEDDED IN A MODERATE MOIST ENVIRONMENT FROM THE SURFACE TO 850 MB. HOWEVER...SOME DRY AIR INTRUSION IS ALSO DEPICTED IN THE N-NW WAVE ENVIRONMENT...WHERE METEOSAT ENHANCED IMAGERY SHOW DRY AIR AND DUST.

**Example NHC usage of LPW**

**Five streams of moisture fuel flooding in SC**



# VIIRS Boat Detection (VBD) Product




Java Sea, Indonesia September 28, 2014

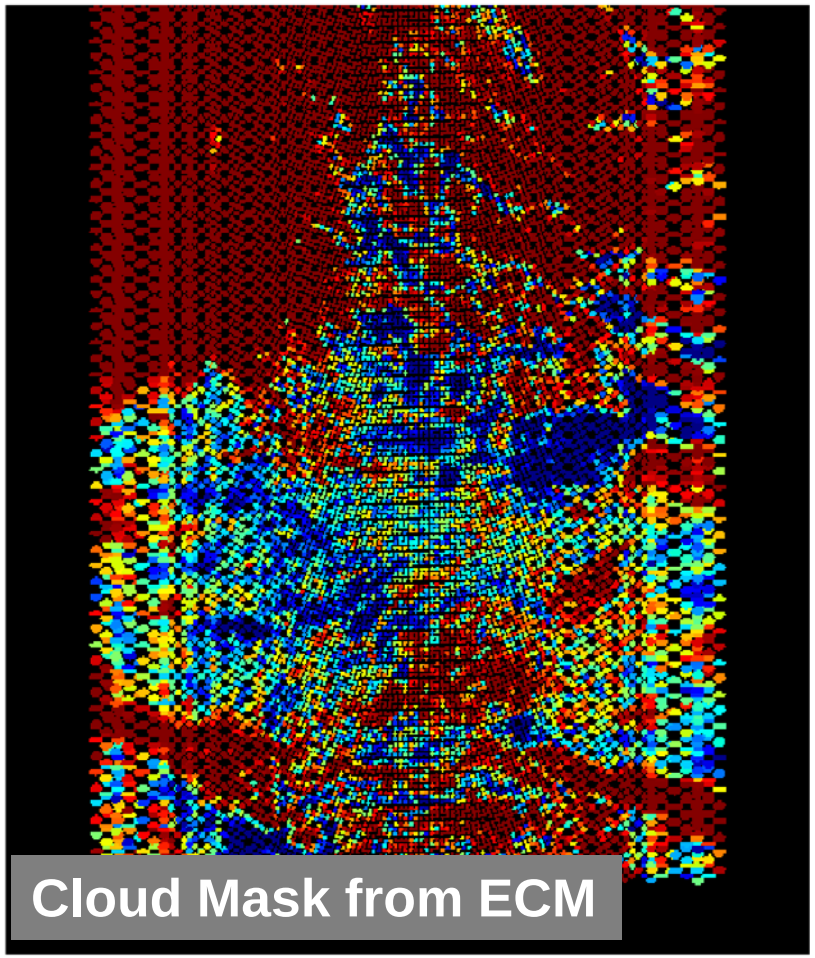
- The Visible Infrared Imaging Radiometer suite has a unique capability to detect lights at the earth's surface. This includes heavily lit boats.

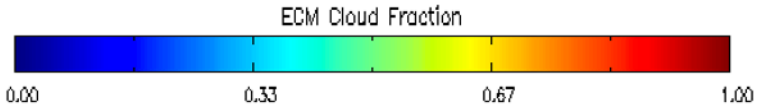
- NCEI has been working on algorithms for reporting boat detections since September 2014.

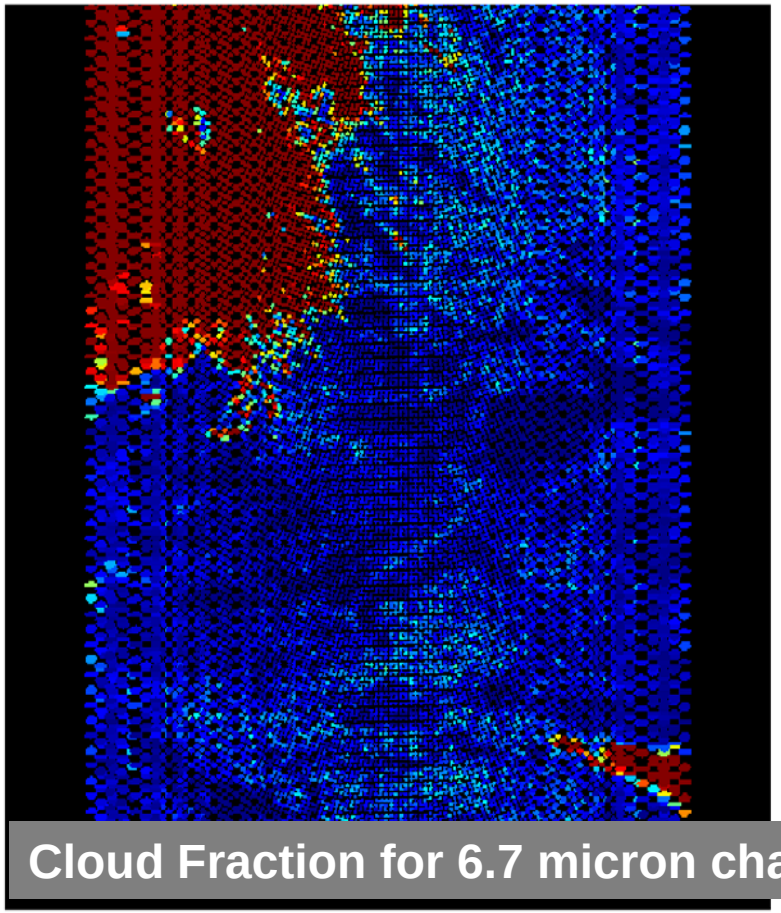
- Supported by the JPSS program office and USAID.

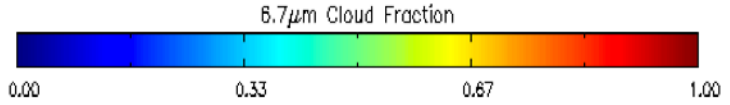
- Files available by 06:00 local time.

# Resulting Cloud Mask for 6.7 micron channel.

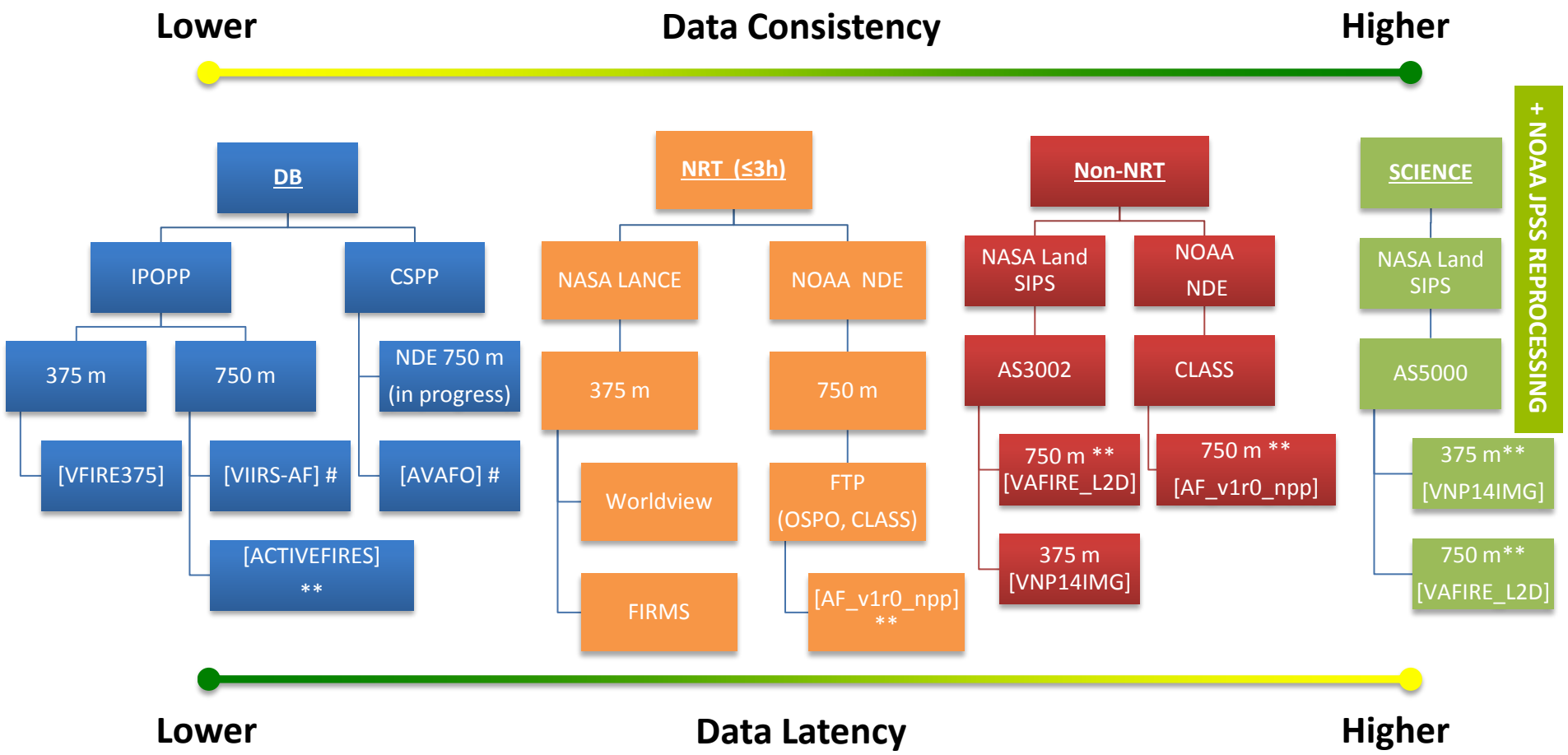


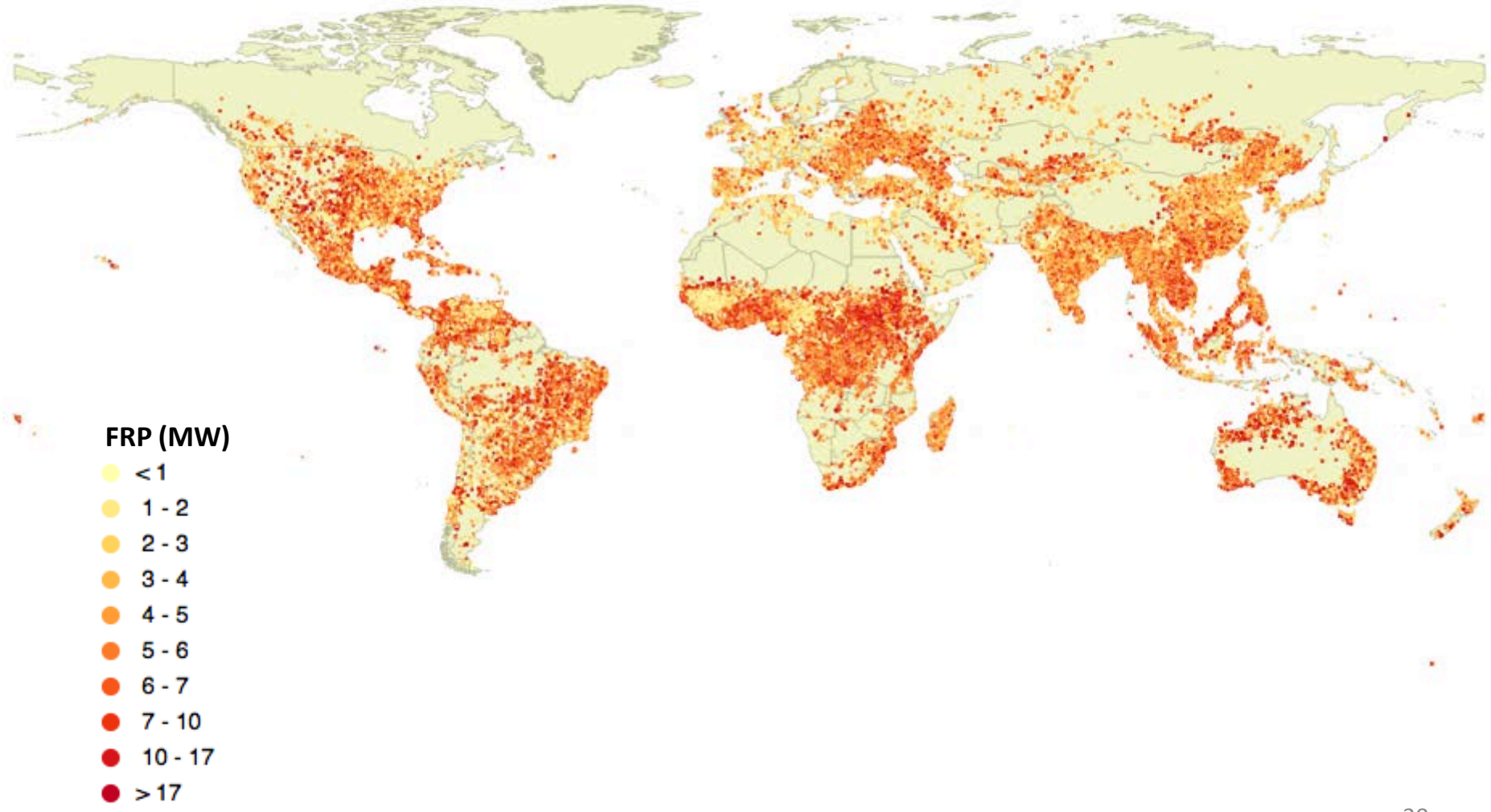
# VIIRS Active Fire Product Lineage




** marked products include FRP retrieval
# marked products describe discontinued algorithm
[ ] indicate official product name

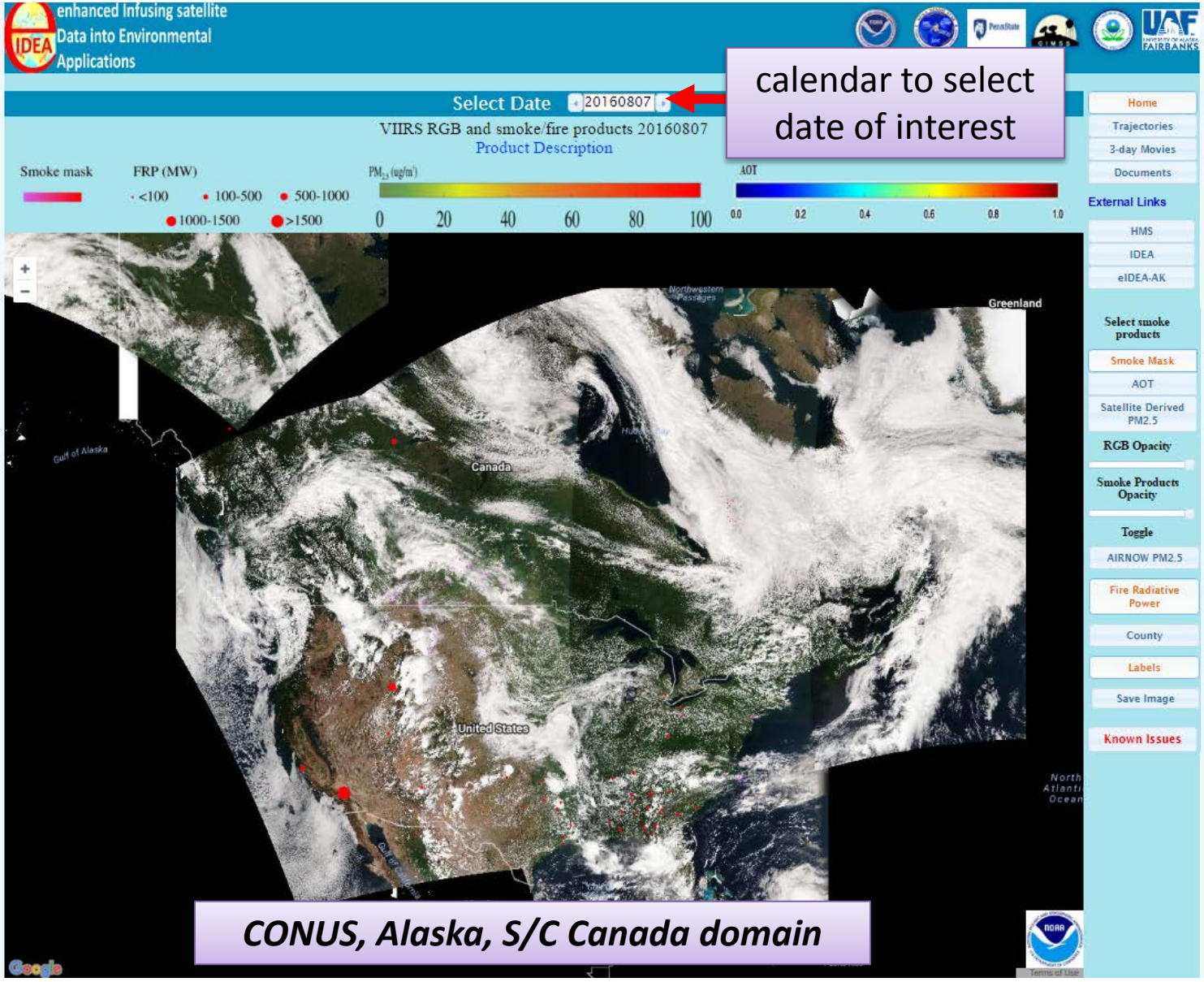
Details soon to be available at:
http://viirsfire.geog.umd.edu/

# VIIRS 375m (hybrid) Fire Pixels (March 2016)
## **'Collection 2'**

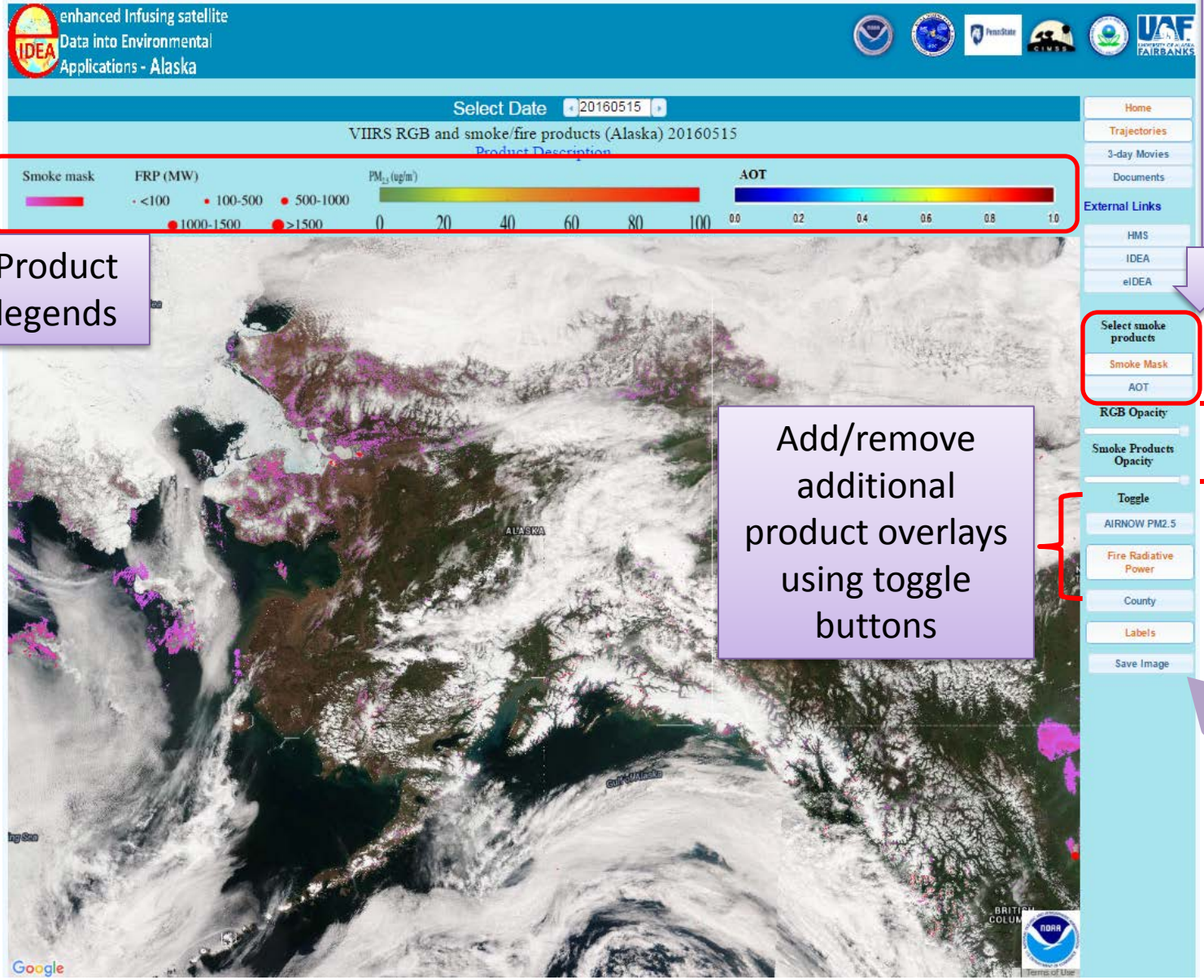


# eIDEA: New 1-Stop Fire and Smoke Imagery

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



# eIDEA-Alaska: Overlays



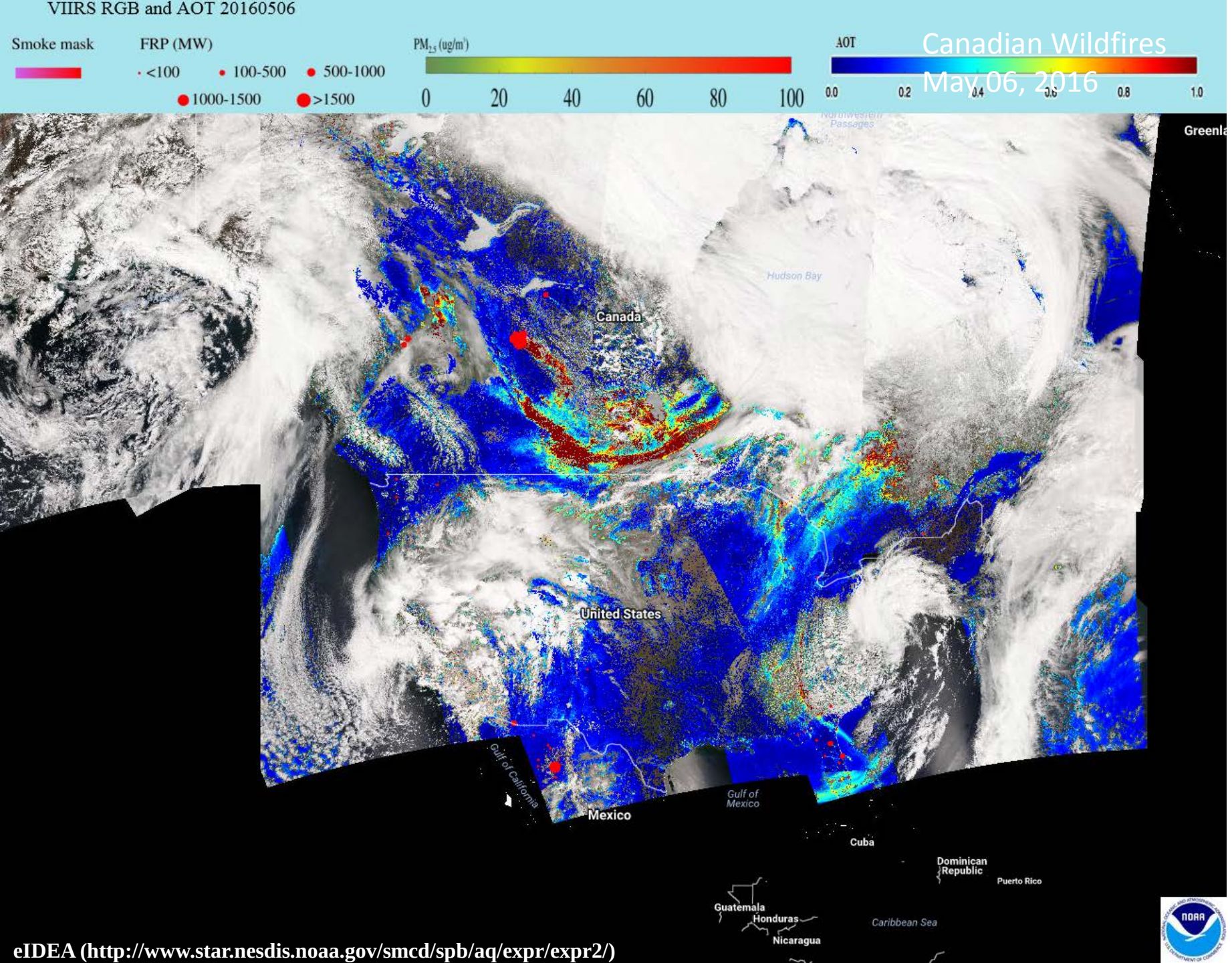

Product legends

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

Slider bars adjust opacity of RGB and smoke products

Add/remove additional product overlays using toggle buttons

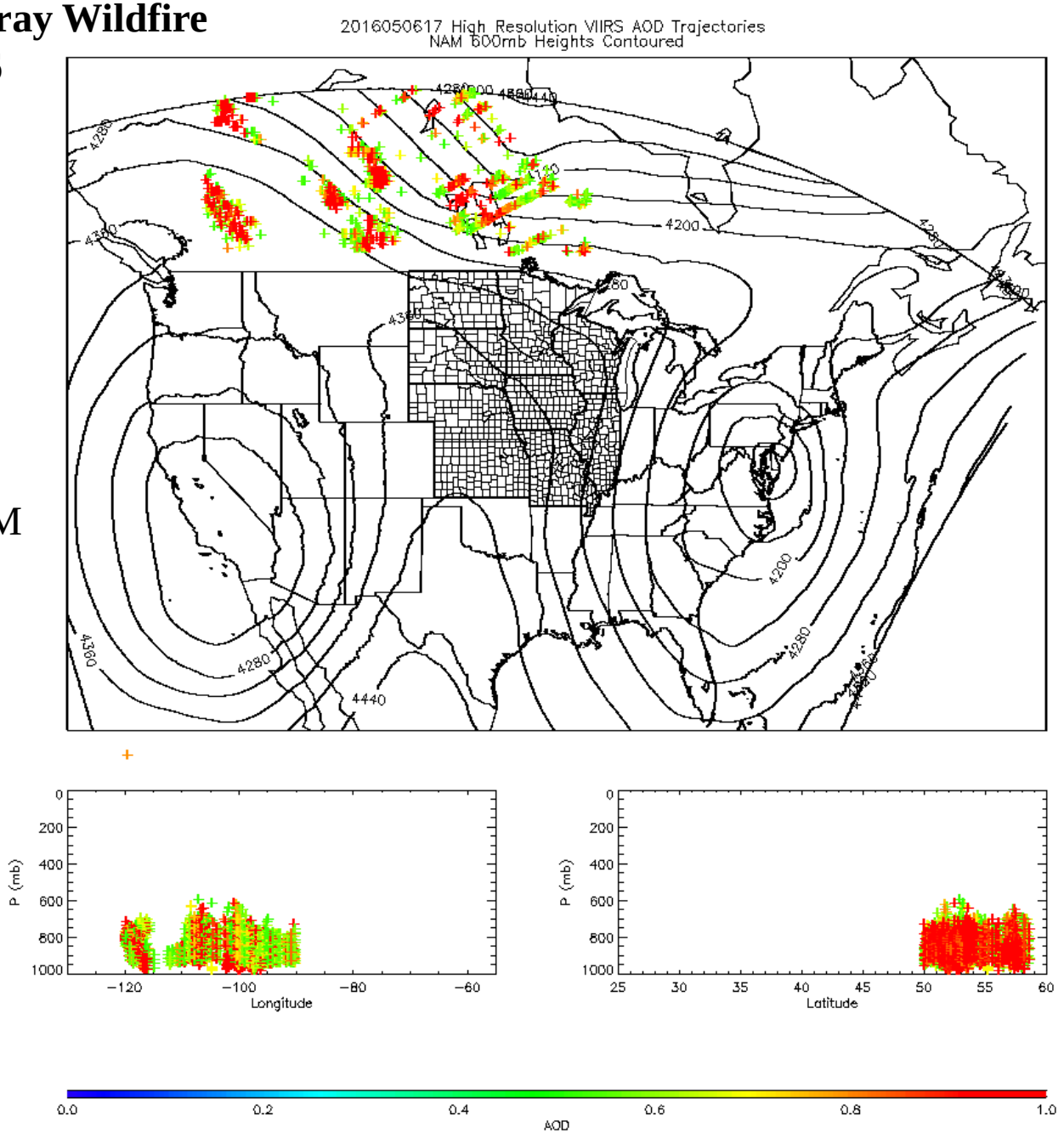
Click "Save Image" to save configuration as a graphics file




eIDEA (http://www.star.nesdis.noaa.gov/smcd/spb/aq/expr/expr2/)

# IDEA-I High resolution (NAM 4km) trajectory forecast
# Fort McMurray Wildfire
# May 06, 2016

- IDEA-I high resolution trajectories initialized at each 6km VIIRS pixel (only AOD>0.5 initialized)
- Upper panel shows NAM 600mb heights
- Lower panels show longitude and latitude cross sections
- IDEA-I high resolution trajectory forecast colored by initial AOD



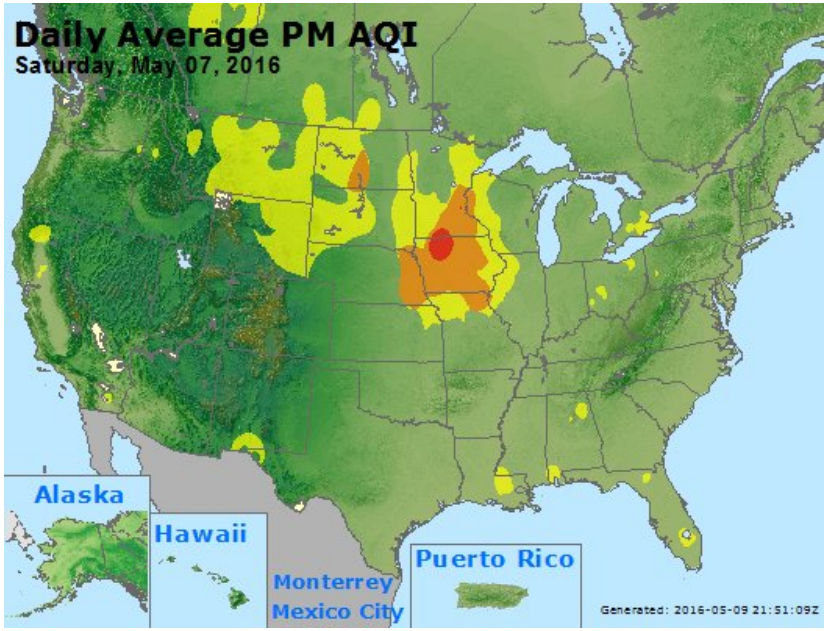
652
WWUS83 KMPX 070627
SPSMPX

From Andy Edman/NWS

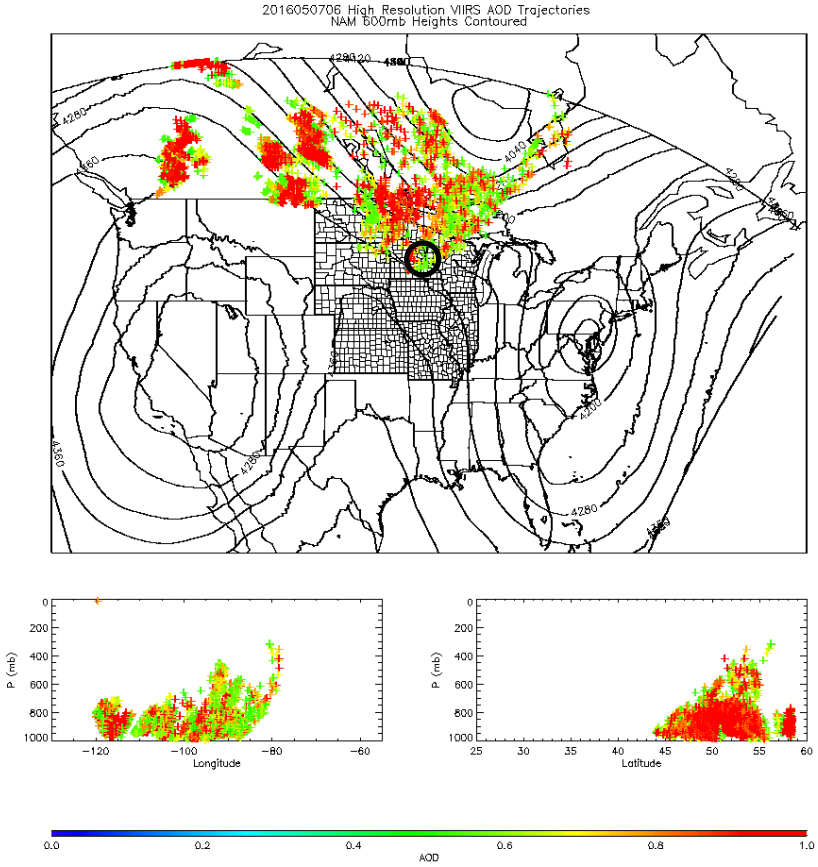
SPECIAL WEATHER STATEMENT
NATIONAL WEATHER SERVICE TWIN CITIES/CHANHASSEN MN
127 AM CDT SAT MAY 7 2016

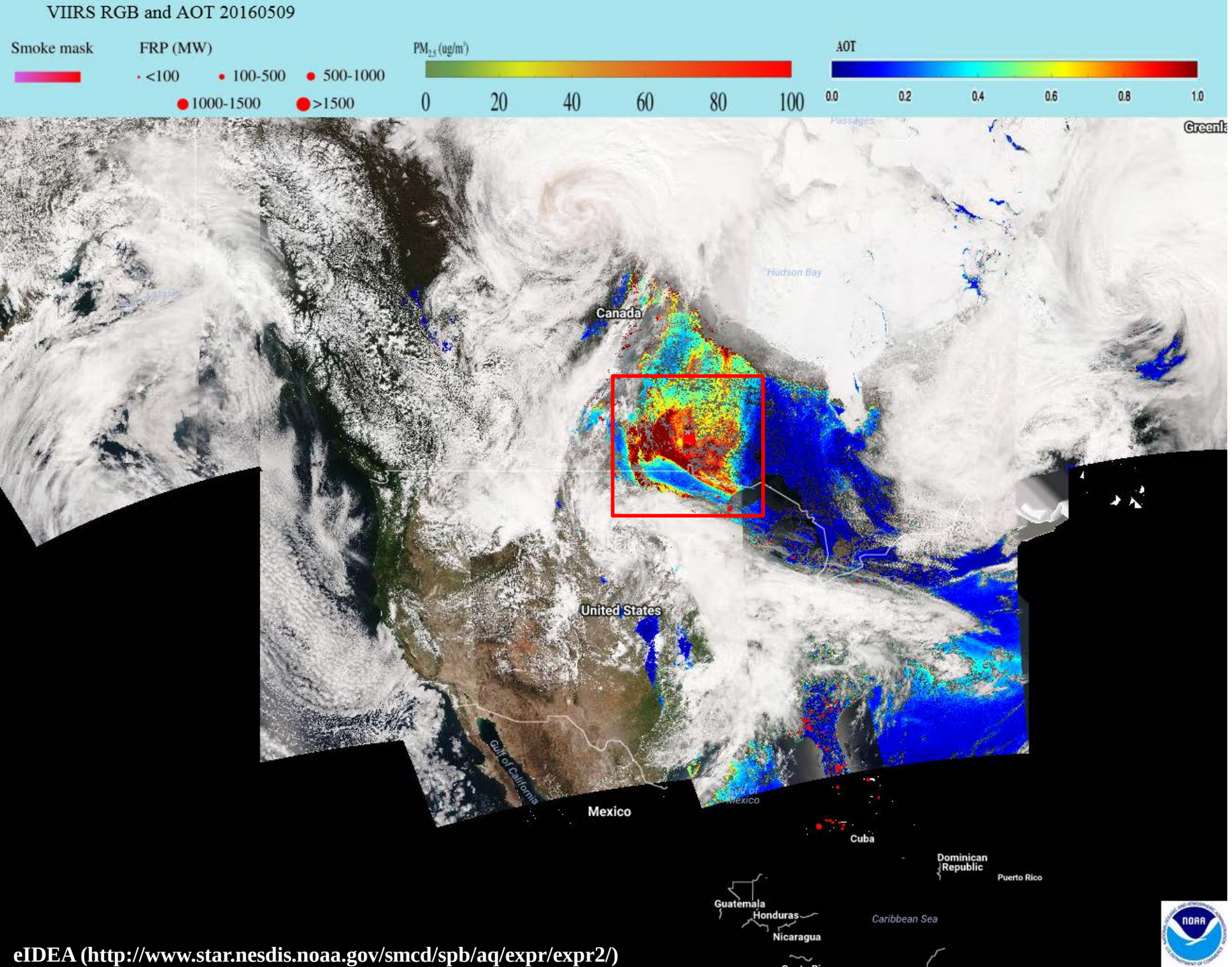
...SMOKY CONDITIONS TO PERSIST THROUGH THE OVERNIGHT HOURS...

WIDESPREAD SMOKE FROM BOTH THE LARGE CANADIAN WILDFIRES AND A SMALLER WILDFIRE NEAR LAKE HATTIE IN HUBBARD COUNTY MINNESOTA HAS BLOWN INTO CENTRAL MINNESOTA...PARTICULARLY WITHIN AND NEAR THE TWIN CITIES METROPOLITAN AREA...DUE TO STRONG WINDS FROM THE NORTHWEST. VISIBILITIES HAVE BEEN REDUCED TO BETWEEN 1 AND 3 MILES...AND AIR QUALITY HAS BEEN SIGNIFICANTLY IMPACTED.



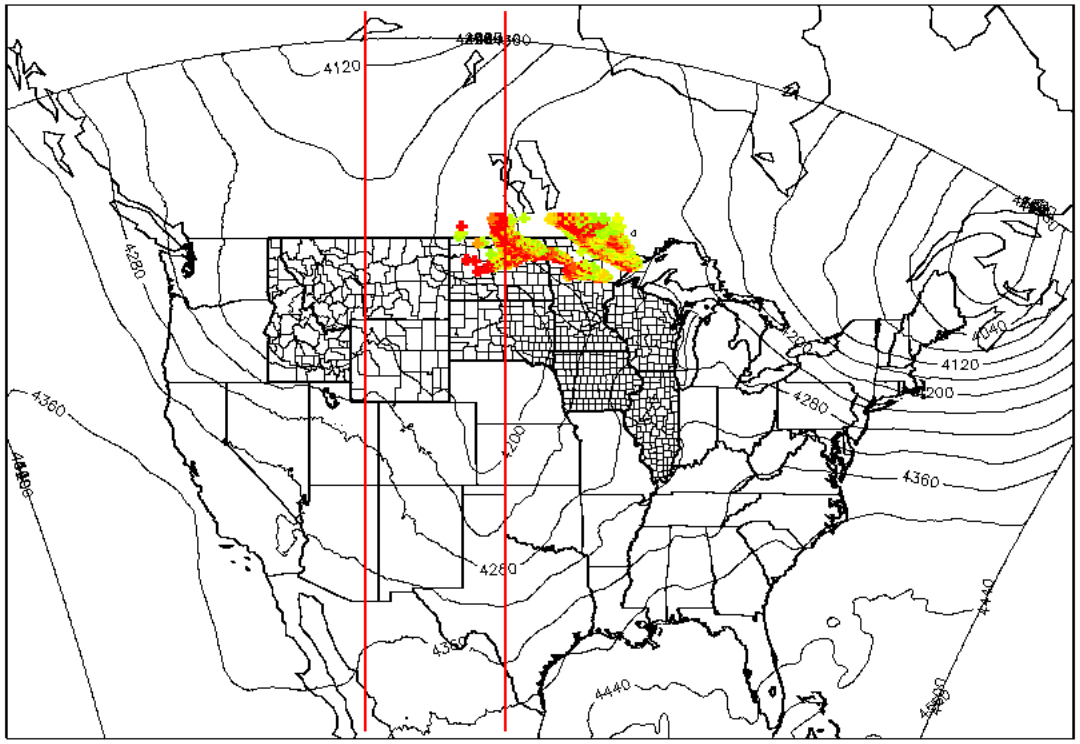

https://www.airnow.gov/



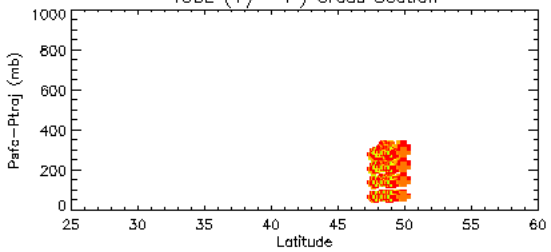


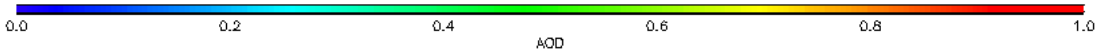

eIDEA (http://www.star.nesdis.noaa.gov/smcd/spb/aq/expr/expr2/)

2016050919 High Resolution VIIRS AOD Trajectories
NAM 600mb Heights Contoured/PCP (mm/hr) Purple

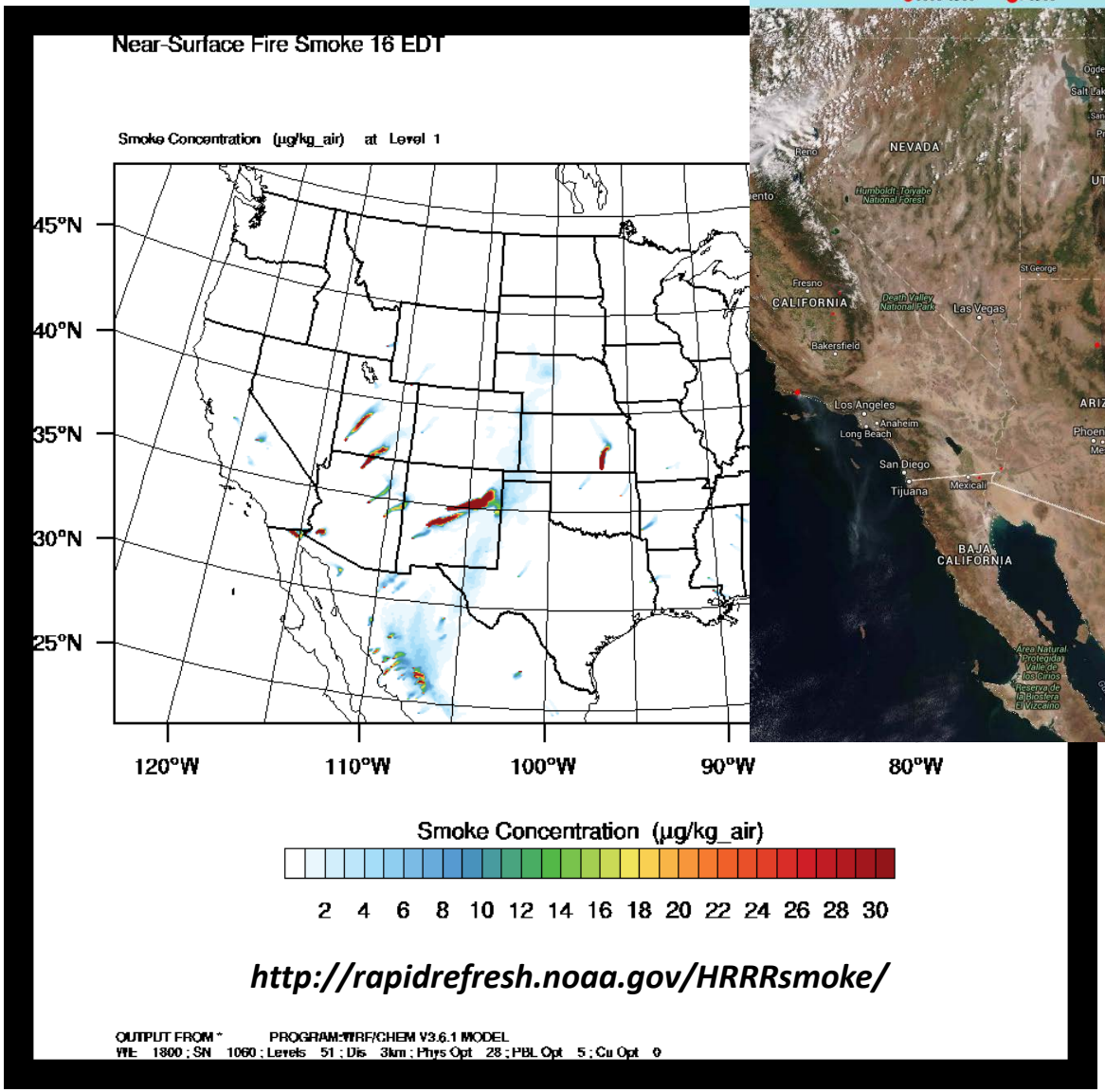


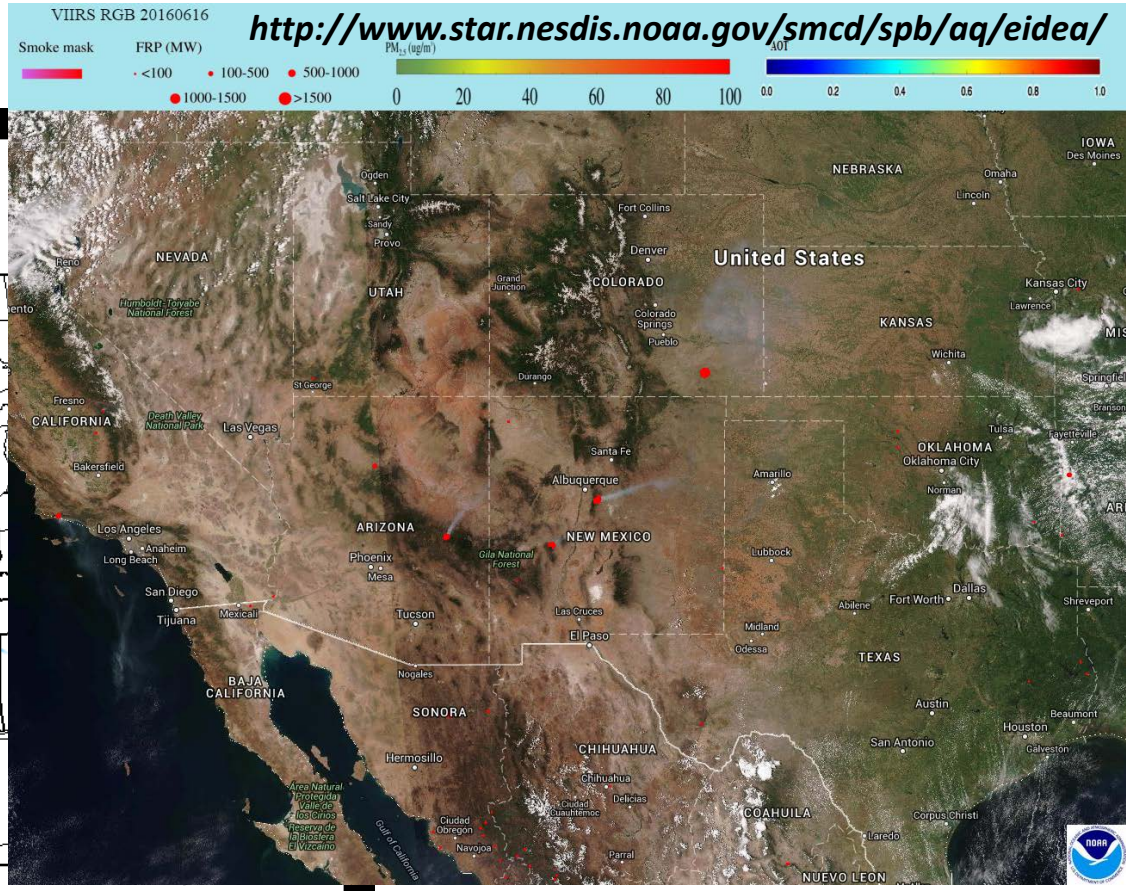

100E (+/- 1°) Cross Section



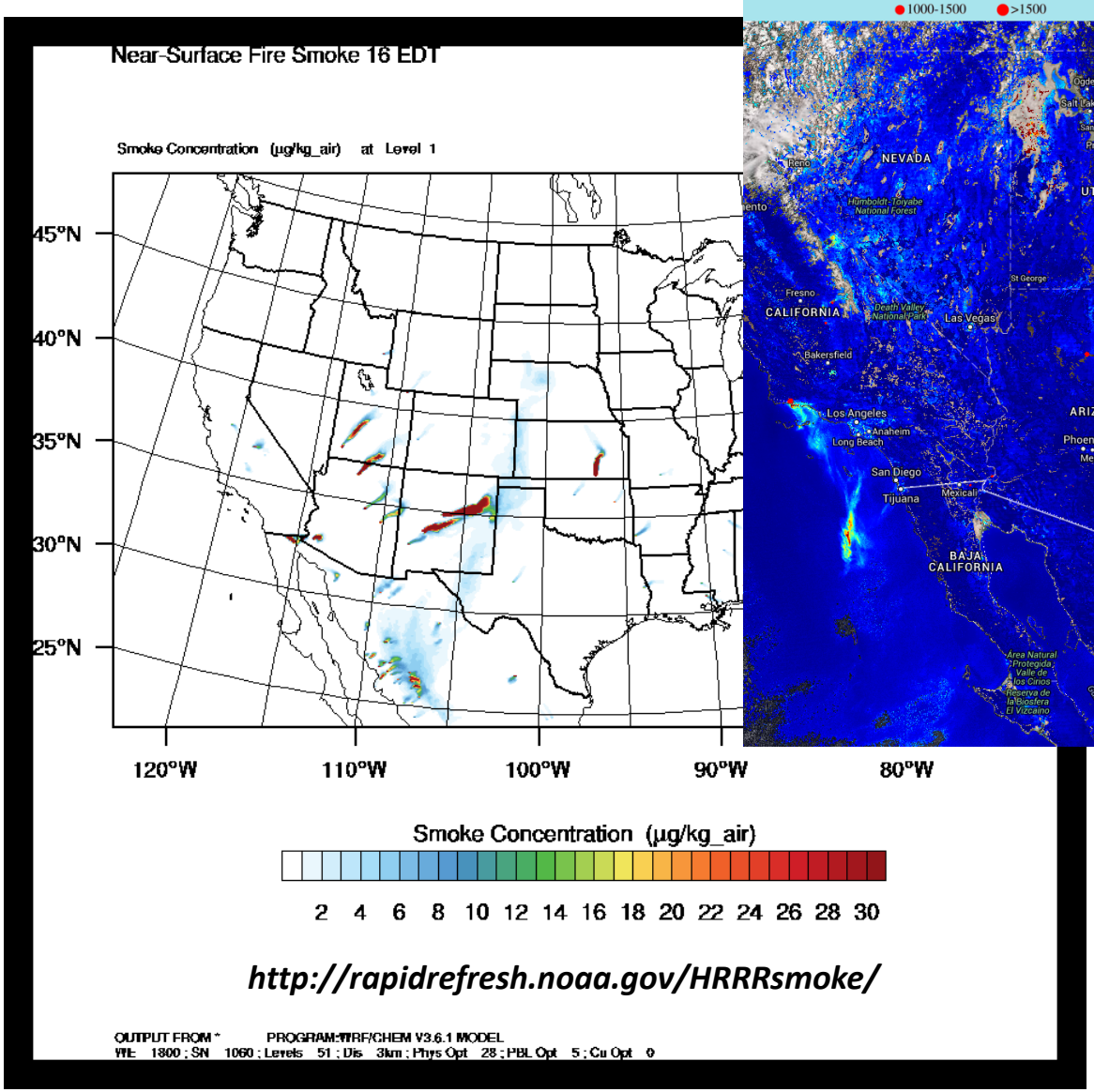
# HRRR smoke forecast vs. eIDEA observations

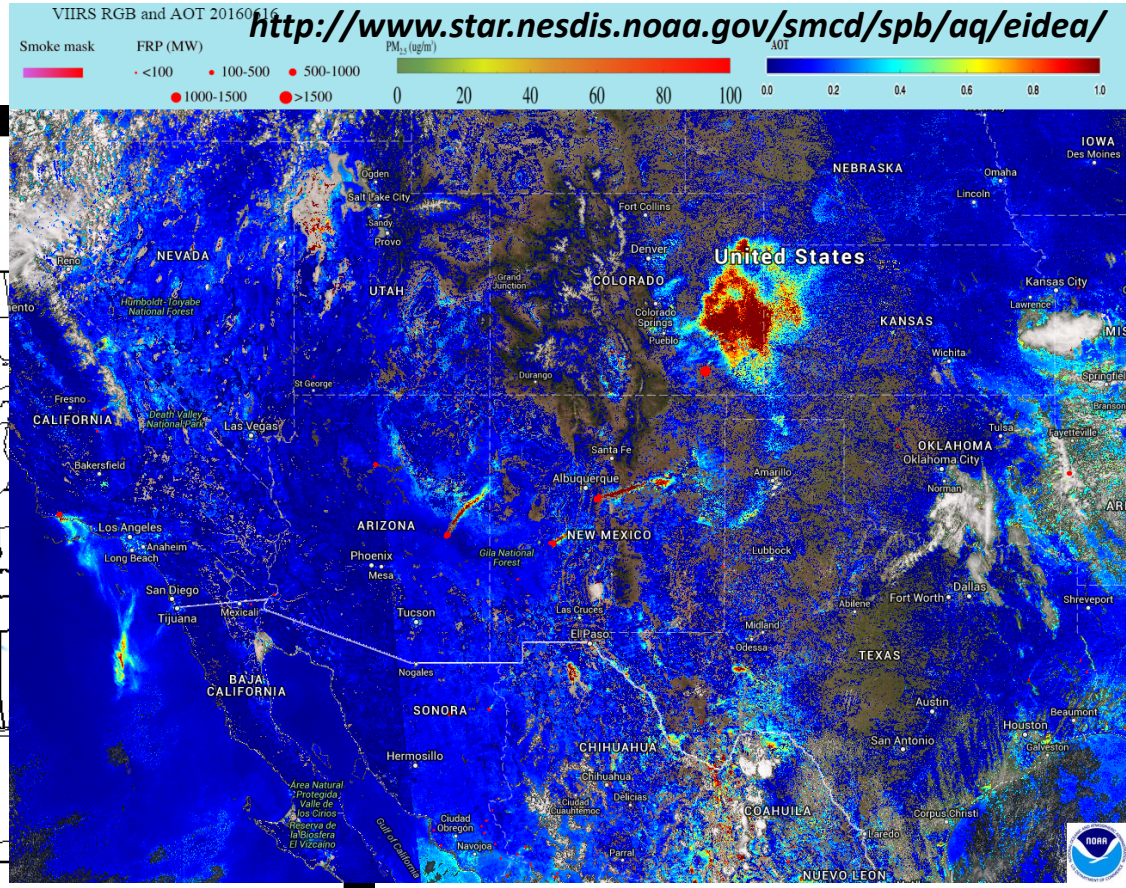



June 16, 2016

# HRRR smoke forecast vs. eIDEA observations

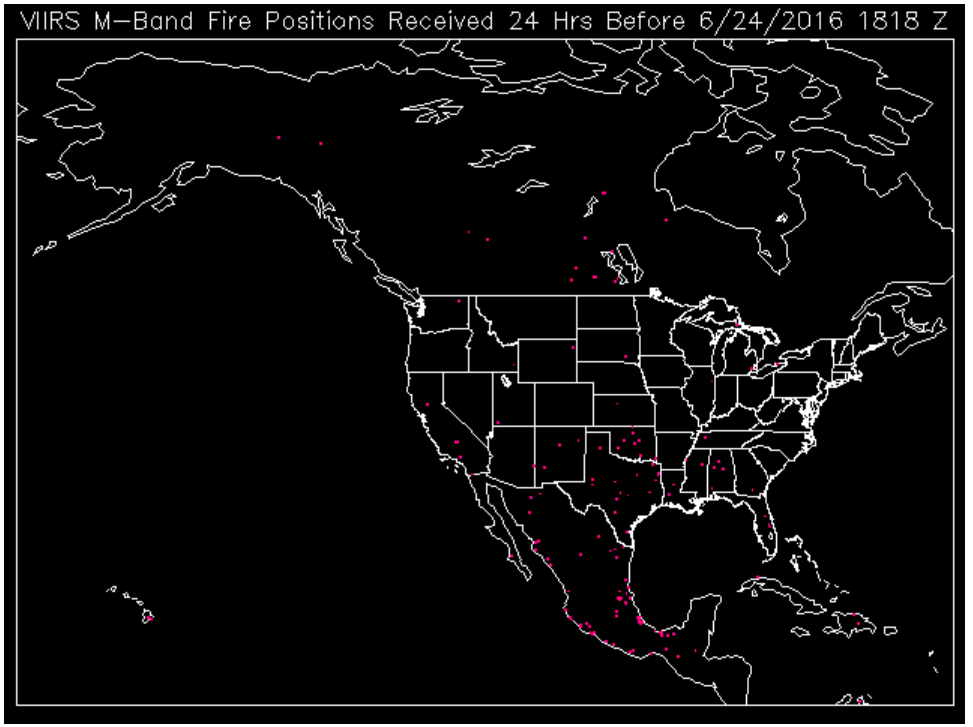



June 16, 2016

# Hazard Mapping System / OSPO status

- Global NDE data are available in text format
  - granule-based (.txt) : real-time
  - daily summary (.dat)
- Graphics / web GIS  under development
- VIIRS data to appear in HMS in the next release (October 2016)




*NOAA NESDIS Office of Satellite and Product Operations (OSPO)*

http://satepsanone.nesdis.noaa.gov/pub/FIRE/VIIRS/

# Incorporating NOAA-derived VIIRS AOD into the Navy Aerosol Model to Monitor SAL Events over the North Tropical Atlantic Basin

Arunas Kuciauskas[1], P. Lynch[1], J. Campbell[1], E. Hyer[1], and M. Oyola[2]

1. Naval Research Laboratory, Marine Meteorology Division (NRL-MMD)
2. American Society for Engineering Education, Washington, DC

Focus:

Assist Puerto Rico NWS/Fire Weather Agency in forecasting SAL events beyond 3 days

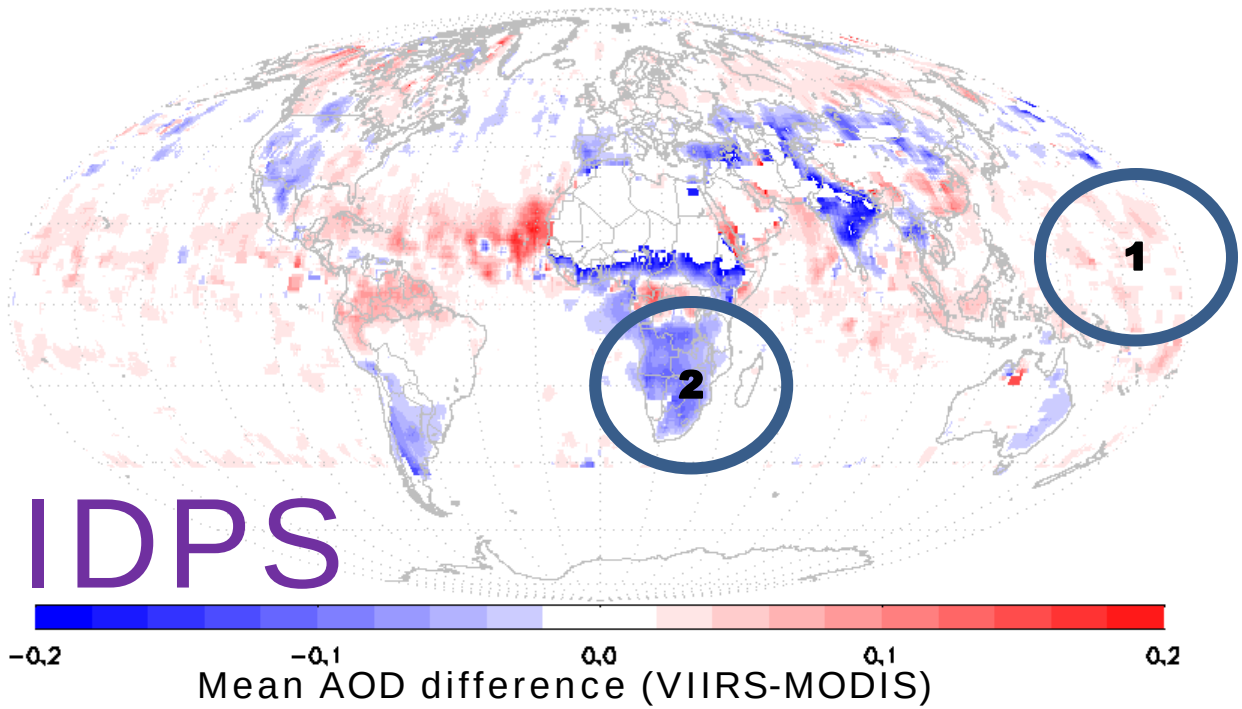
*effort adaptable to downwind regions:*
*South/Southeast US, Gulf of Mexico, Bahamas, Central America, North and South America*

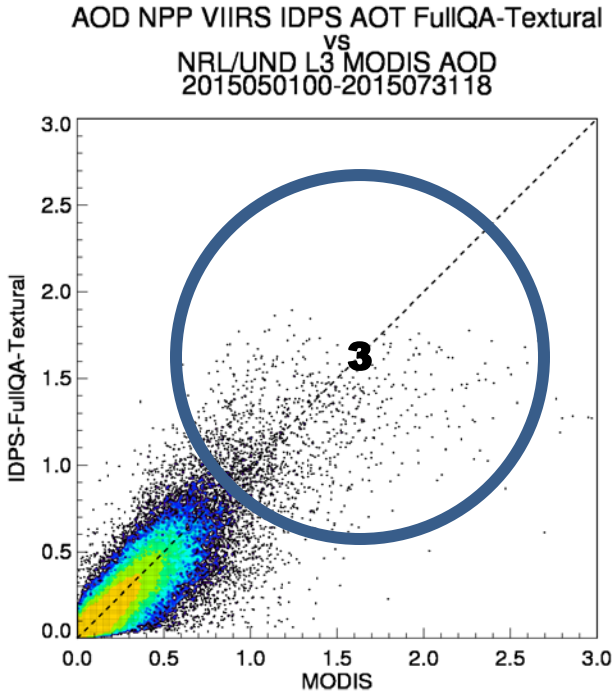


*STAR JPSS 2016 Annual Science Team Meeting, 8 – 12 August, College Park, MD*

*photo courtesy: NOAA*

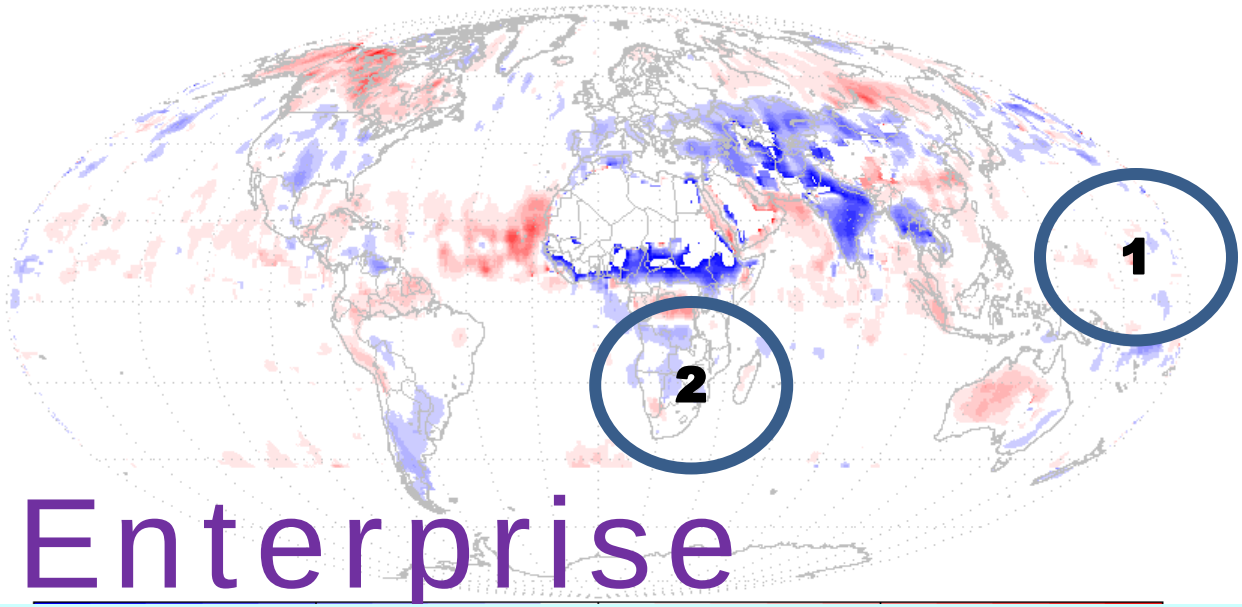
# VIIRS AOD data using IDPS



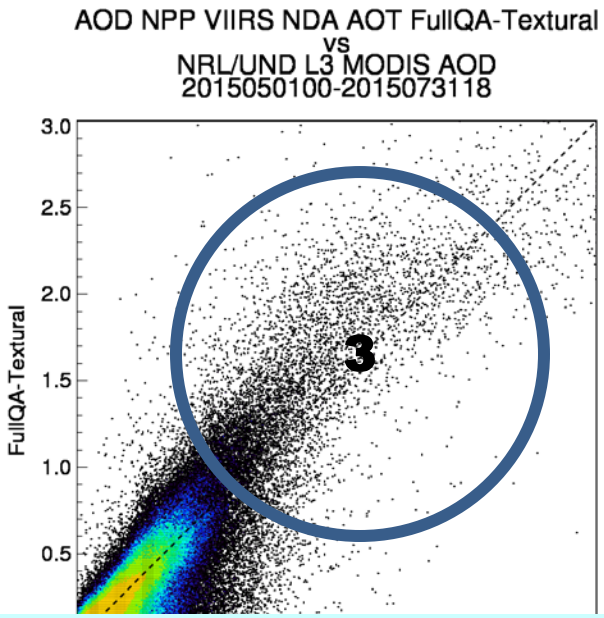




- 3-month comparison to MODIS NRL/UND L3 Data Assimilation product: 201505-201507
- VIIRS data aggregated and filtered ‘FullQA’ + buddy checks and neighborhood tests
- Left: map of AOD differences (paired) (smoothed for plotting)
- Right: scatter-density plot of AOD differences vs MODIS

# New VIIRS AOD data using NOAA STAR Enterprise




Enterprise




***Enterprise AOD from NOAA STAR***

- ***Improves bias correction compared to AERONET***
- ***Allows greater number of dust-related values into NAAPS DA***
- ***DA testing of new Enterprise product is underway at NRL***

U.S. NAVAL RESEARCH LABORATORY

# Summary

## VIIRS impact on monitoring & predicting SAL events

## 1. Comparisons of NAAPS DA: MODIS (OPS) vs MODIS+VIIRS AOD

a) VIIRS + MODIS outperforms MODIS-only

b) Improvements seen in case studies and statistical analyses

c) VIIRS has more spatial coverage than MODIS, particularly over the tropics, so more AOT retrievals

d) IDPS VIIRS AOT contains more bias than NOAA STAR Enterprise VIIRS AOT

e) Positive impact to forecasting SAL dust events at NWS, San Juan

   i. VIIRS DA should yield improved forecasts and characteristics of SAL propagation out to 3–6 days

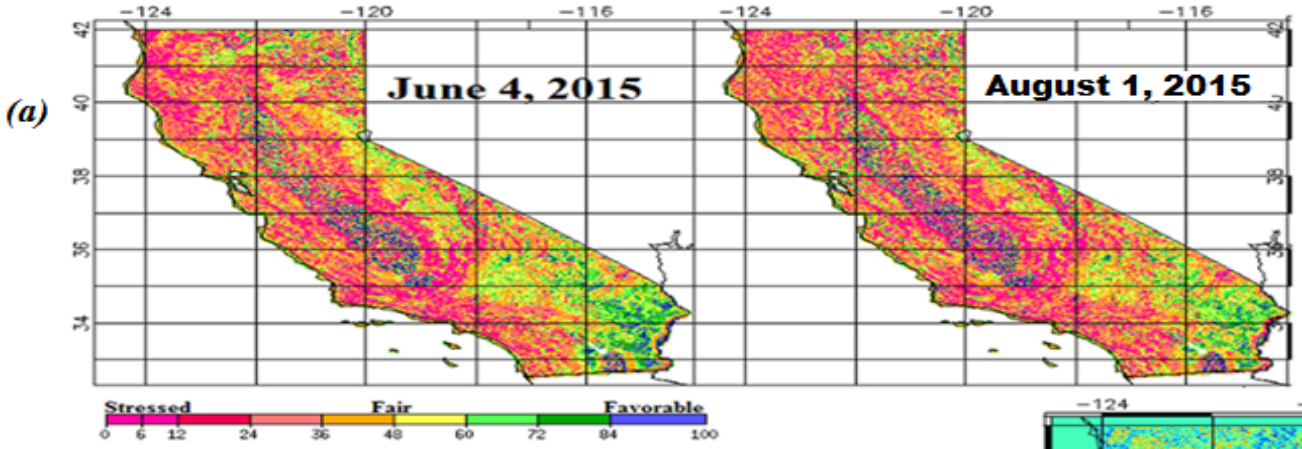
## 2. Future Efforts

a) Will provide NAAPS with Enterprise VIIRS AOD as DA into NRL-MMD SAL webpage

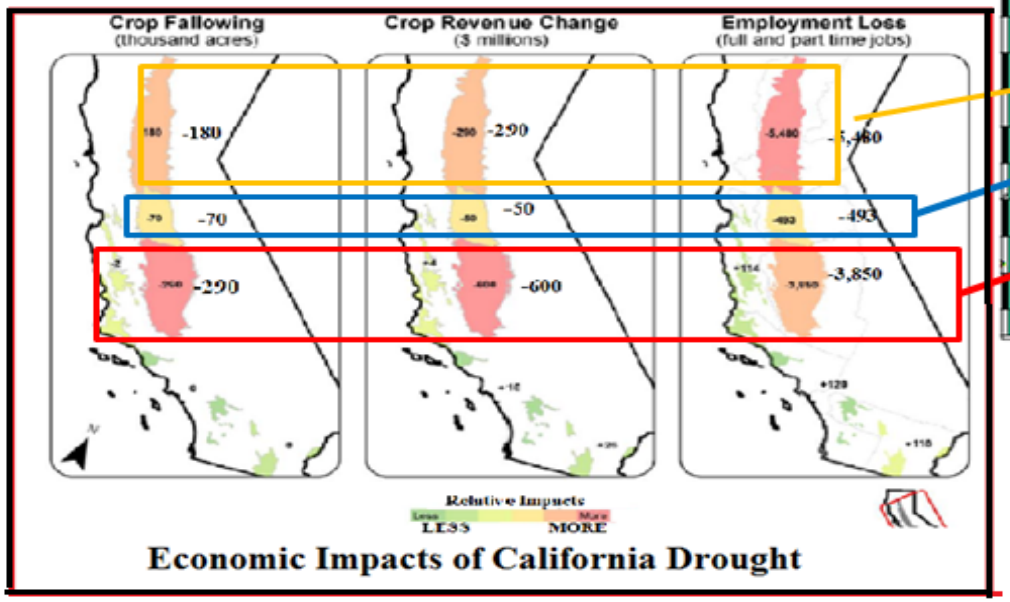
b) More interaction with forecasters/scientists within greater Caribbean

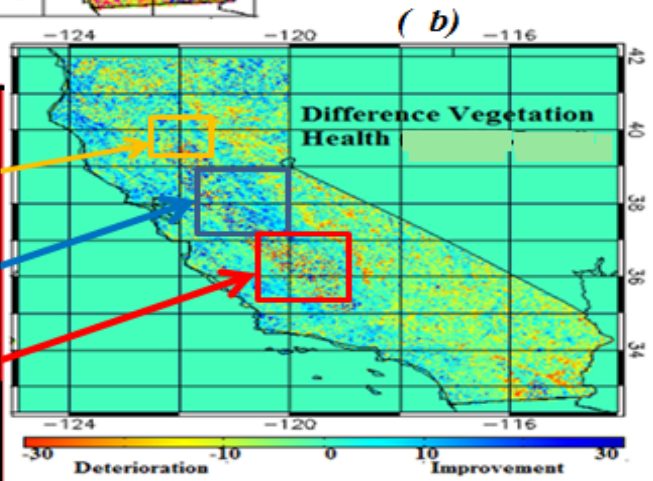
***Web resource: [http://www.nrlmry.navy.mil/NEXSAT.html & SAL.html](http://www.nrlmry.navy.mil/NEXSAT.html & SAL.html)***

# Vegetation Health from SNPP/VIIRS & Economic Indicators




Vegetation Health from 500 m S-NPP/VIIRS




Difference Vegetation Health
August 1 - June 4, 2015

(c)

Intensity of Economic and VH-assessed Impacts
Stronger Moderate Weaker

# Image of the month: JPSS Applications Advancements: USDA Agricultural Productivity Estimates

USDA provide outlooks monthly on agricultural productivity and NOAA/STAR'S vegetation health product is always a critical input to the reports

USDA United States Department of Agriculture

## World Agricultural Supply and Demand Estimates

ISSN: 1554-9089

**Office of the Chief Economist** | **Agricultural Marketing Service, Farm Service Agency** | **Economic Research Service, Foreign Agricultural Service**

WASDE - 553 | Approved by the World Agricultural Outlook Board | May 10, 2016

**Note:** This report presents USDA's initial assessment of U.S. and world crop supply and demand prospects and U.S. prices for 2016/17. Also presented are the first calendar-year 2017 projections of U.S. livestock, poultry, and dairy products. Due to spring planting still underway in the Northern Hemisphere and being several months away in the Southern Hemisphere, these projections are highly tentative. Forecasts for U.S. winter wheat area, yield, and production are from the May 10 *Crop Production* report. For other U.S. crops, the March 31 *Prospective Plantings* report is used for planted acreage. Methods used to project 2016/17 harvested acreage and yield are noted in each table.

**WHEAT:** U.S. wheat supplies for 2016/17 are projected up 6 percent from 2015/16 on higher beginning stocks and imports. All wheat production is projected at 1,998 million bushels, down 3 percent. The year-to-year decrease is due to a sharp reduction in planted area that more than offsets increased yields. The all wheat yield is projected at 46.7 bushels per acre, up 7 percent from the previous year. The survey-based forecast for 2016/17 winter wheat production is up with higher yields more than offsetting reduced harvested area. Winter wheat has benefited from excellent spring growing conditions and yields are projected higher for Hard Red Winter, Soft Red Winter, and White Winter. Spring wheat and Durum production for 2016/17 is projected to decline 16 percent on lower area, as well as a return to trend yield, which is below last year's level.

Total U.S. wheat use for 2016/17 is projected up 7 percent from the previous year on higher exports, feed and residual use, and food use. The 2016/17 exports are projected at 875 million bushels, up 95 million bushels from the previous year's low level but still well below average. Large supplies in several major competing countries will continue to limit U.S. exports. Feed and residual use is projected up 30 million bushels on increased supplies. U.S. ending stocks are projected to rise 51 million bushels from the elevated 2015/16 total to 1,029 million, the highest since the 1987/88 crop year. The all wheat season-average farm price is projected at $3.70 to $4.50 per bushel; the mid-point of this range is the lowest in 11 years.

Global wheat supplies are projected to rise 2 percent from 2015/16 as increased beginning stocks more than offset a decline in production from the previous year's record. Total wheat production is projected at 727.0 million tons, the second highest total on record. Large crops are expected in most key competing countries and favorable spring growing conditions suggest that yields will be well above trend in the EU, Russia, and Ukraine. Global wheat consumption for 2016/17 is projected slightly higher than in 2015/16 with higher food use more than offsetting a reduction in world wheat feeding. Global import demand for 2016/17 is down from last year's record, but still very large. Global ending stocks for 2016/17 are projected at a record 257.3 million tons, up 14.4 million from 2015/16.

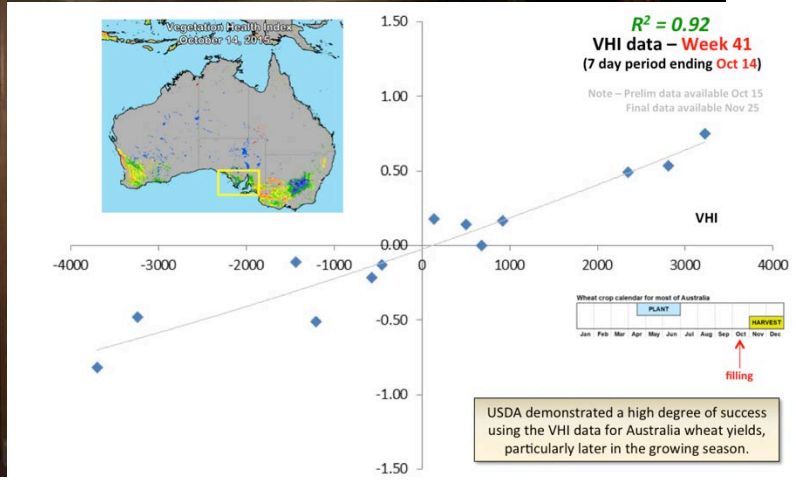
**COARSE GRAINS:** U.S. feed grain supplies for 2016/17 are projected up 4 percent from the 2015/16 record with increases in both beginning stocks and production. Corn production for 2016/17 is projected at 14.4 billion bushels, up 829 million from 2015/16 and 214 million higher than the previous record in 2014/15. A 5.6-million-acre increase in corn plantings more than offsets a small reduction in yield. The U.S. corn yield is projected at 168.0 bushels per acre, down 0.4 bushels from 2015/16. Corn supplies for 2016/17 are projected at a record 16.3 billion bushels, up 886 million from 2015/16, which more than offsets projected declines for sorghum, barley, and oats.

U.S. corn use for 2016/17 is projected at a record 14.1 billion bushels, 4 percent higher than for 2015/16. Feed and residual use for 2016/17 is projected 300 million bushels higher with higher production, lower expected prices, and further expansion in animal numbers in 2016/17. Corn used to produce ethanol is projected 50 million bushels higher than in 2015/16 with a reduction in sorghum use for ethanol and higher

APPROVED BY:

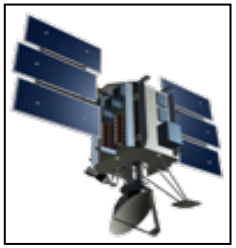
MICHAEL T. SCUSE
SECRETARY OF AGRICULTURE DESIGNATE





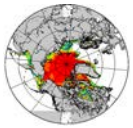
# NIC Product Generation

## Arctic Maritime Domain Awareness


Satellites

+


Buoys


Models

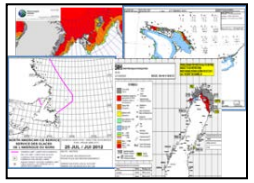

Aircraft


Webcam


Radar


Ship Obs

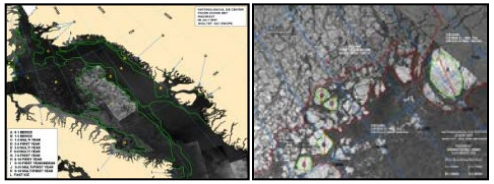

Surface Obs


International Partners

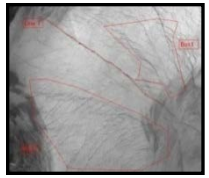
**Interpretive Snow and Sea Ice Analysis and Sea Ice Forecasting**

- Geographic Information System
- Meteorology
- Semi-automation
- Subject Matter Expertise

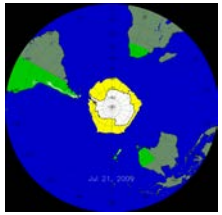
Annotated Images

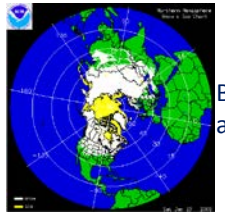


Fractures, Leads and Polynyas (FLAP)



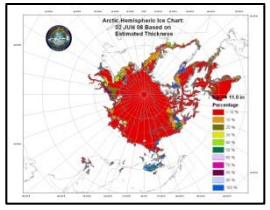
Automated Snow and Ice products



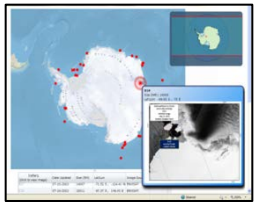


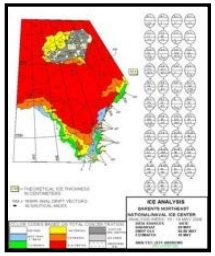
Blended Snow and ice cover

Ice Thickness Estimations



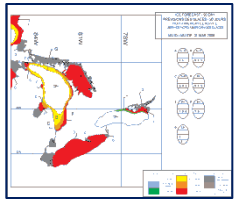
Antarctic Icebergs

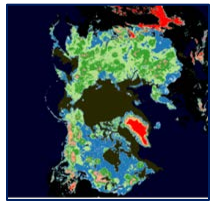




Hemispheric and Regional Ice Charts

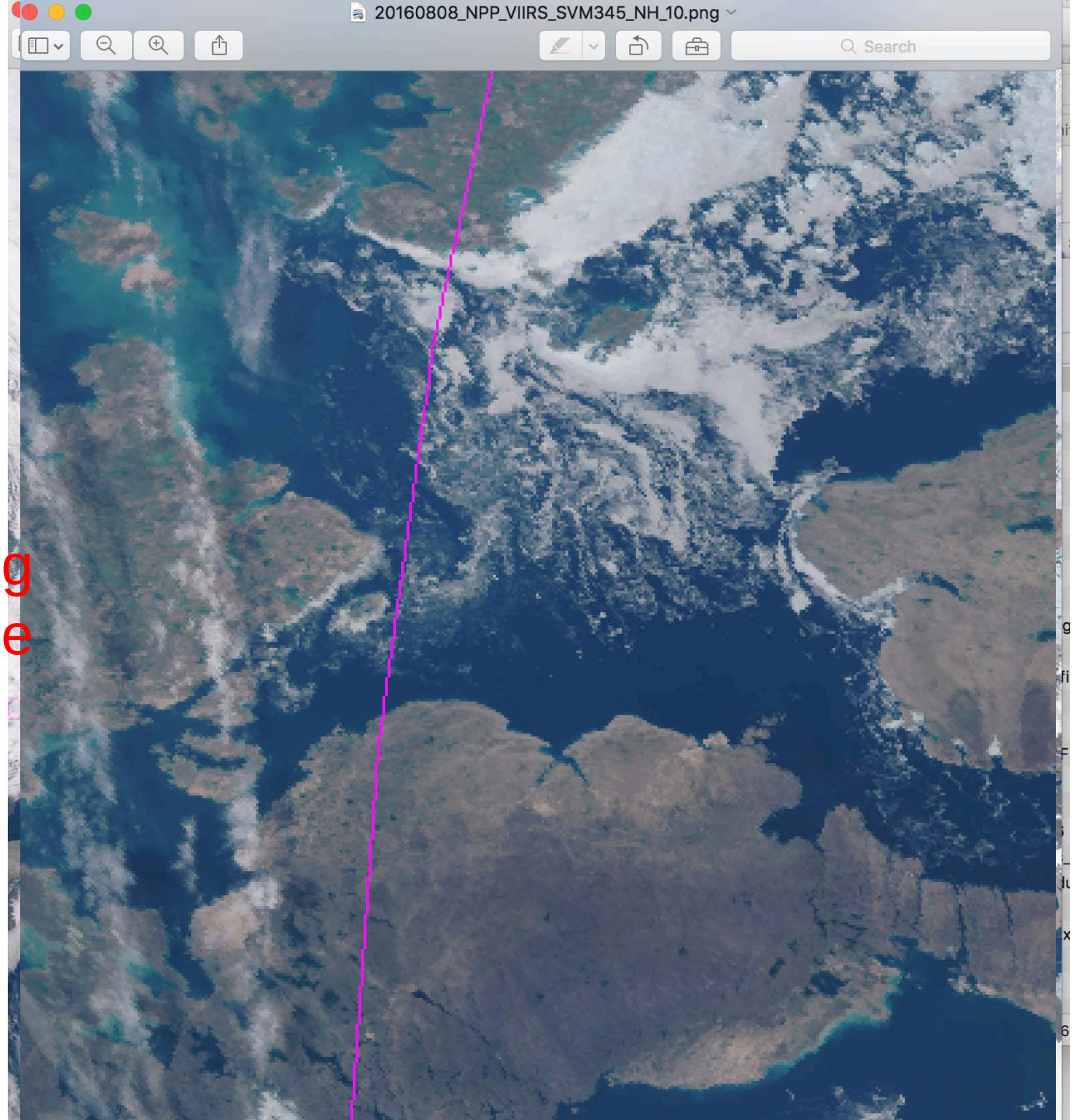
Ice Outlooks





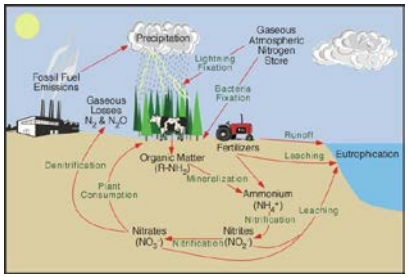
Blended Snow Depth

# Finding NW Shipping Passage



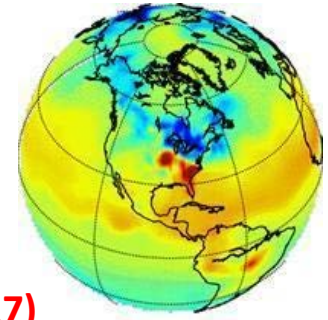
# FY13-FY16 Atmospheric Chemistry, Carbon Cycle, and Climate (AC4) Research Portfolio

## Nitrogen Cycle (FY13,15)




## Atmospheric composition from space (FY16)


## CarbonTracker (FY13)



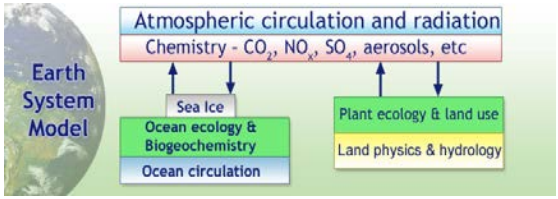
## Emissions and Chemistry of Wildfires (FY16-17)

## Urban Emissions (FY13,14,17)

## Oil & Gas Emissions (FY 14,17)

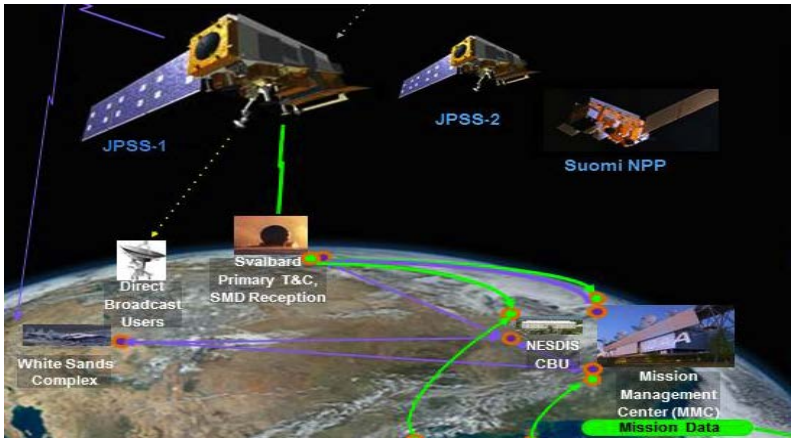
## ESRL/CSD, PMEL, ARL Field Campaigns

## GFDL Nitrogen Modeling




## ESRL/GMD Monitoring

# Atmospheric Composition from space

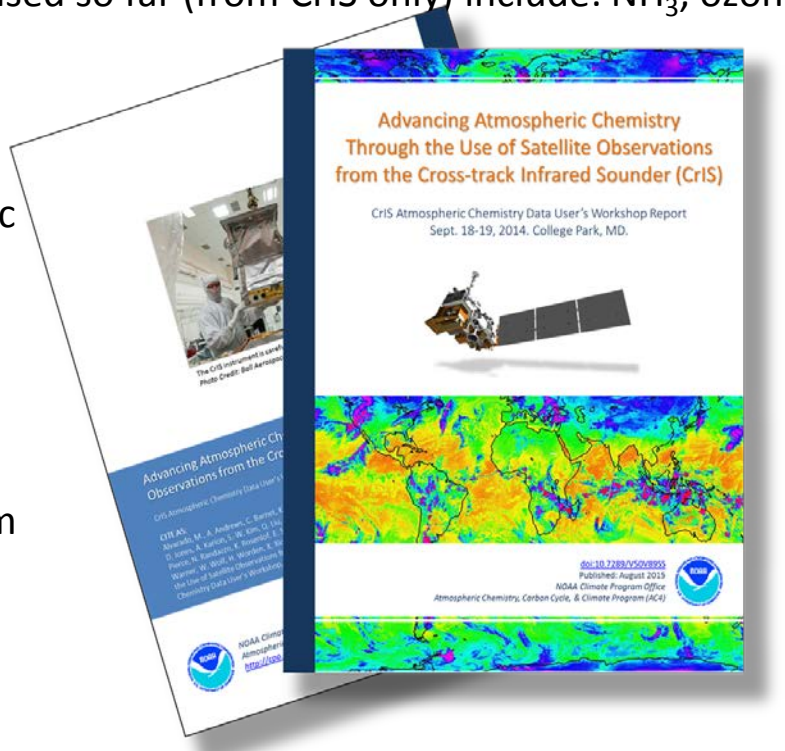



Data from JPSS instruments and AC4 program science:

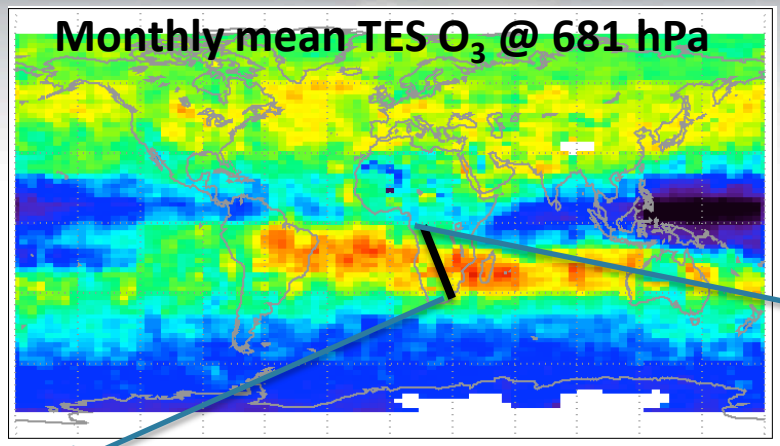
- AC4 typically supports field and laboratory data, which can be complemented by JPSS data
- CrIS, OMPS and VIIRS composition products (trace gases and aerosols) can all supply relevant products
- Retrievals are used in connection with global and Earth System models
- Data used so far (from CrIS only) include: $NH_3$, ozone

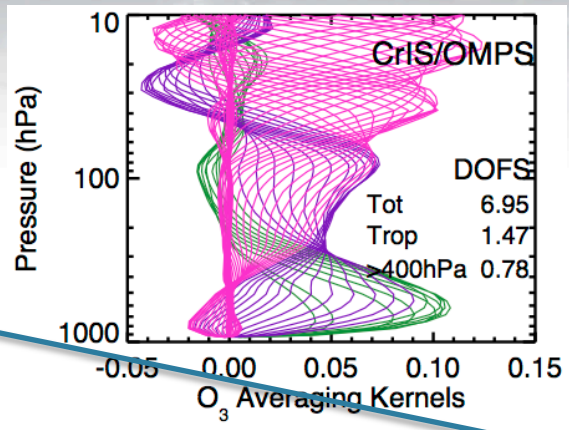
**AC4 current and future activities:**

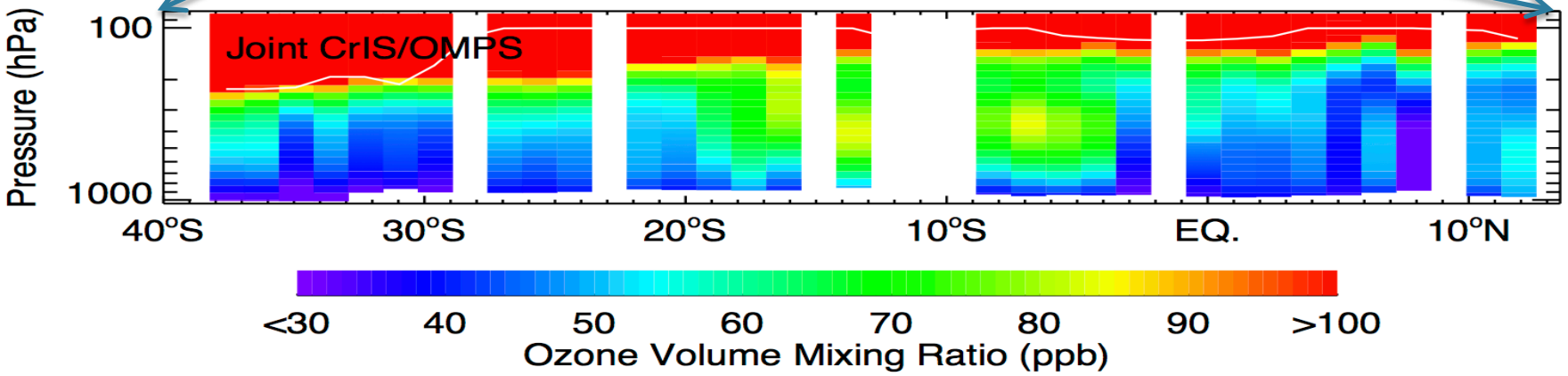
- CrIS data users workshop, focused on atmospheric composition took place September 18-19, 2014; report published August 2015
- Three projects include $NH_3$ data product development, validation and application
- Upcoming project on CrIS/OMPS ozone retrieval
- Ongoing interest in atmospheric composition from space, with special emphasis on monitoring and field campaign support/complement



# Extension to Joint CrIS/OMPS $O_3$ Retrievals



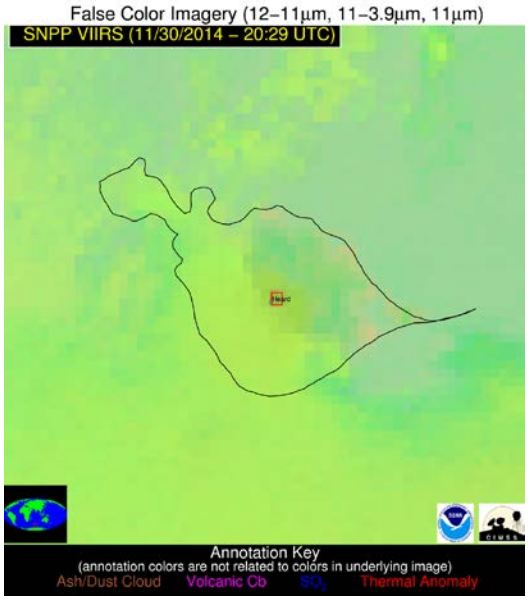



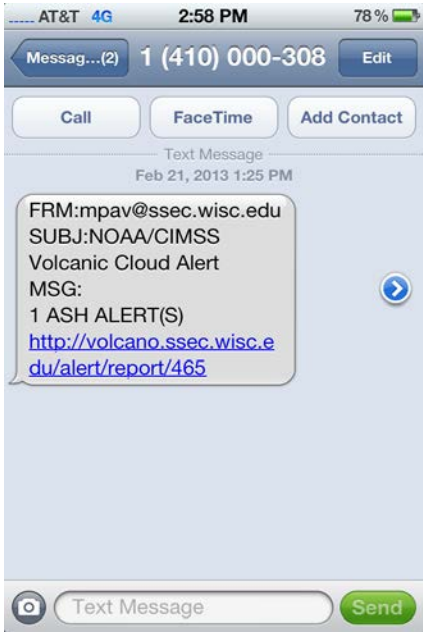

- MUSES has been applied to joint CrIS/OMPS ozone retrievals over Africa on October 21, 2013.
- The elevated ozone concentrations between 2 - 20° S are associated with biomass burning.
- Joint CrIS/OMPS $O_3$ and CrIS CO retrievals using MUSES will support the NOAA FIREX flight campaign (Fire Influence on Regional and global Environments Experiment) – an intensive study of the impacts of western North America fires on climate and air quality.

# VOLcanic Cloud Analysis Toolkit (VOLCAT)

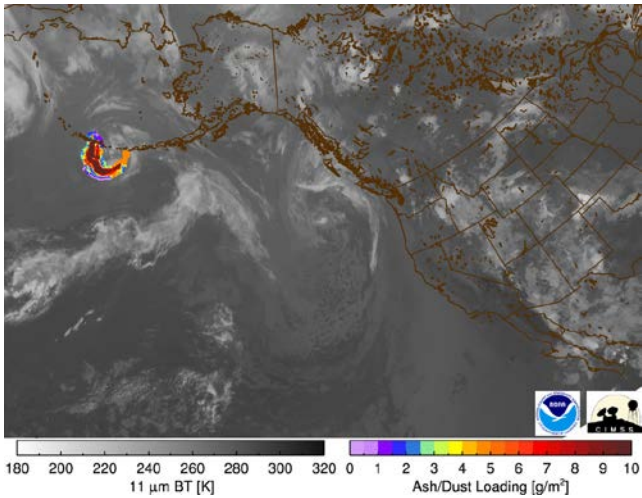
## 1). Unrest Alerts



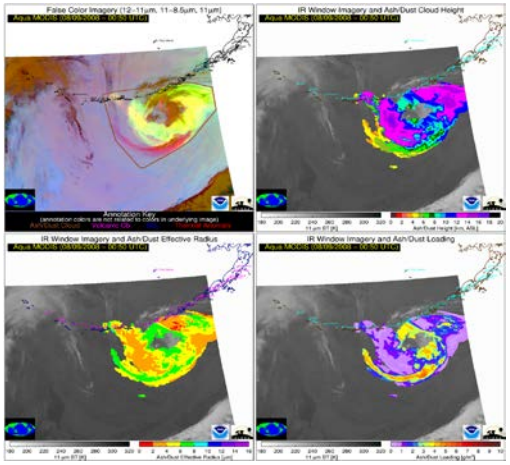

## 2). Eruption Alerts



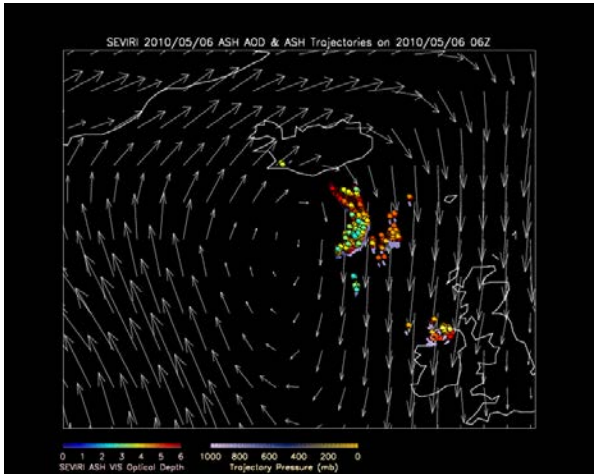

## 3). Volcanic Cloud Tracking




## 4). Volcanic Cloud Characterization



## 5). Dispersion Forecasting



# Spectrally Enhanced Cloud Objects (SECO) Method for $SO_2$ Detection

- Automatically extract coherent $SO_2$features from OMPS and CrIS using cloud object analysis
- Construct an *a priori* probability from OMPS and CrIS and utilize it in VIIRS implementation of SECO method
- Final $SO_2$ detection results are at the VIIRS resolution and are overlaid on VIIRS imagery
- The fused JPSS $SO_2$ detection results can then be used to aid in $SO_2$ detection and tracking from GEO satellites

# Take away

Cal/Val and periodic assessments of performance, and understanding issues and addressing them continues to be important.

End of the day,  it's the applications. But the applications will depend on the performance. Think about the applications, talk to the users, and talk to PG Initiative Coordinators– where we can verify the priority and user committment and help with the coordination.