

# CSPP LEO: Recent updates and support for JPSS-1

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# CSPP LEO Overview

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- CSPP LEO supports processing of data from these satellites:
  - Suomi NPP, JPSS-1, Metop-A/B, NOAA-18/19, Terra, Aqua, GCOM-W1, and FY-3B/C.
- CSPP LEO supports the creation of **calibrated observational data, geophysical derived products, and mapped images** from visible, infrared, and microwave sensors using NOAA algorithms.
- Data source is usually Direct Broadcast (DB) from the spacecraft. However, archived data are also supported (e.g., from NOAA CLASS).

# CSPP LEO Software Packages



CSPP Software	Product Description
<b>1. SDR (NOAA)</b>	VIIRS, CrIS, and ATMS geolocated and calibrated earth observations.
<b>2. VIIRS EDR (NOAA)</b>	VIIRS imager cloud mask, active fires, surface reflectance, vegetation indices, sea surface temperature, land surface temperature, and aerosol optical depth.
<b>3. HSRTV</b>	Hyperspectral infrared sounder retrievals of temperature and moisture profiles, cloud properties, total ozone, and surface properties.
<b>4. Polar2grid</b>	Reprojected imagery (single and multi-band) in GeoTIFF and AWIPS formats.
<b>5. Hydra</b>	Interactive visualization and interrogation of multispectral imagery and hyper spectral soundings.
<b>6. MIRS (NOAA)</b>	Microwave sounder retrievals of temperature and moisture profiles; surface properties; snow and ice cover; rain rate; and cloud/rain water paths.
<b>7. CLAVR-x (NOAA)</b>	Multispectral imager retrievals of cloud properties; aerosol optical depth; surface properties; ocean properties.
<b>8. NUCAPS (NOAA)</b>	Combined hyperspectral infrared sounder and microwave sounder retrievals of temperature and moisture profiles, cloud cleared radiances, and trace gases.
<b>9. IAPP</b>	Combined infrared sounder and microwave sounder retrievals of temperature and moisture profiles, water vapor, total ozone, and cloud properties.
<b>10. ACSPO (NOAA)</b>	Multispectral imager retrievals of sea surface temperature.
<b>11. Sounder Quicklook</b>	Projected 2D maps of temperature and water vapor retrievals, and Skew-T profiles for individual atmospheric profiles.
<b>12. VIIRS Imagery EDR</b>	VIIRS imagery in Ground Track Mercator projection from I-bands and Day/Night Band Near Constant Contrast
<b>13. Active Fires (NOAA)</b>	Detection of wildfires using VIIRS thermal emissive bands (M-ban resolution).

# CSPP LEO Supported Sensors



CSPP Software	Suomi NPP	Metop-A/B	NOAA-18/19	Terra	Aqua
1. SDR	VIIRS, CrIS, ATMS	Provided by AAPP	Provided by AAPP	Provided by SeaDAS	Provided by SeaDAS
2. VIIRS EDR	VIIRS	N/A	N/A	N/A	N/A
3. HSRTV	CrIS	IASI	N/A	N/A	AIRS
4. Polar2Grid	VIIRS, CrIS, ATMS	AVHRR, AMSU, MHS	AVHRR, AMSU, MHS	MODIS	MODIS, AIRS
5. Hydra	VIIRS, CrIS, ATMS	AVHRR, IASI	AVHRR	MODIS	MODIS, AIRS
6. MIRS	ATMS	AMSU, MHS	AMSU, MHS	N/A	N/A
7. CLAVR-x	VIIRS	AVHRR	AVHRR	MODIS	MODIS
8. NUCAPS	CrIS, ATMS	In progress	N/A	N/A	Future version
9. IAPP	N/A	HIRS, AMSU, MHS	HIRS, AMSU, MHS	N/A	N/A
10. ACSPO	VIIRS	AVHRR	AVHRR	MODIS	MODIS
11. Sounder Quicklook	CrIS, ATMS	IASI, AMSU, MHS	AMSU, MHS	N/A	AIRS

# CSPP LEO releases since ITSC-20

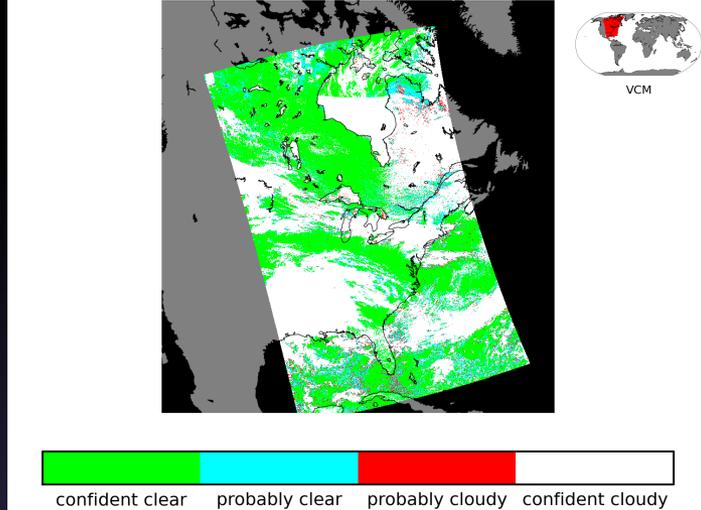
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Oct 31, 2017	VIIRS Active Fires v1.0
Oct 11, 2017	SNPP/JPSS-1 SDR v3.0
Apr 27, 2017	Polar2Grid v2.1
Mar 3, 2017	IAPP v1.1
Apr 7, 2016	CLAIRx Cloud Retrieval v2.0
Apr 1, 2016	SNPP SDR v2.2
Feb 24, 2016	ACSPO Sea Surface Temperature v1.1
Feb 22, 2016	HYDRA2 Multispectral Data Analysis Toolkit v2.0
Dec 14, 2015	NUCAPS Atmospheric Profiles v1.1

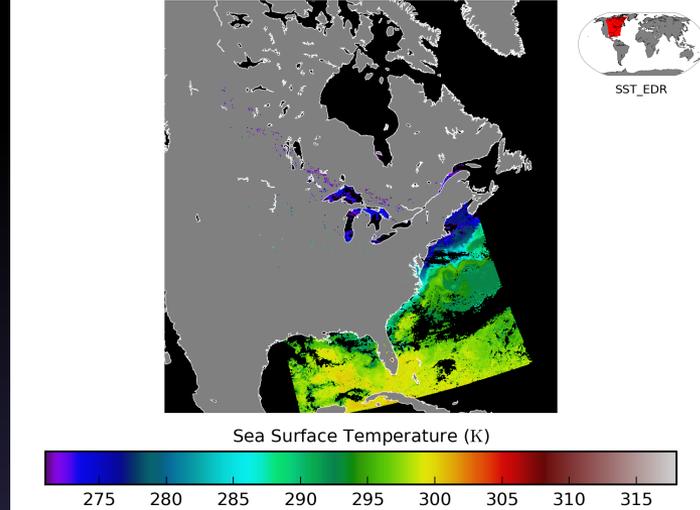
# LEO Geophysical Products (EDR)

SNPP VIIRS 2015/04/05 18:26 UTC

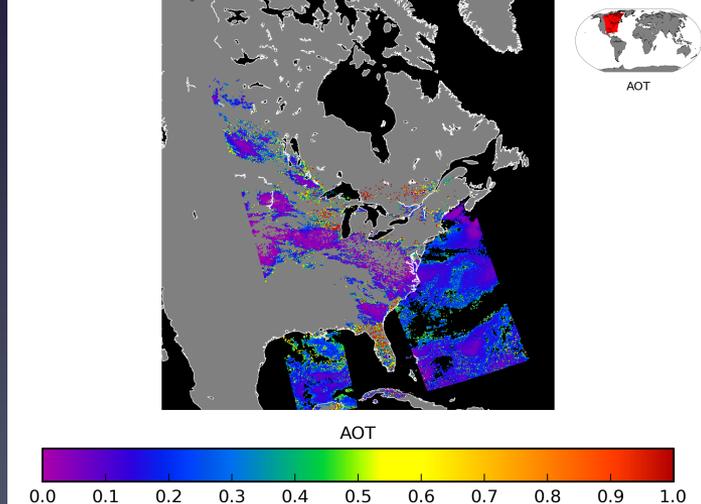
### Cloud Mask



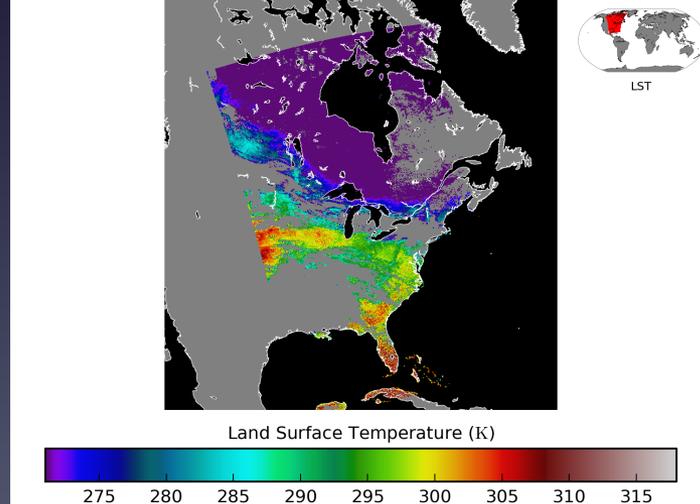
### Sea Surface Temperature



### Aerosol Optical Thickness



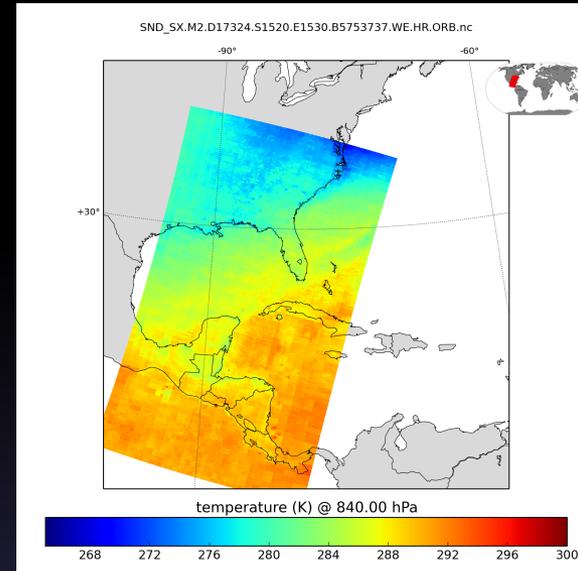
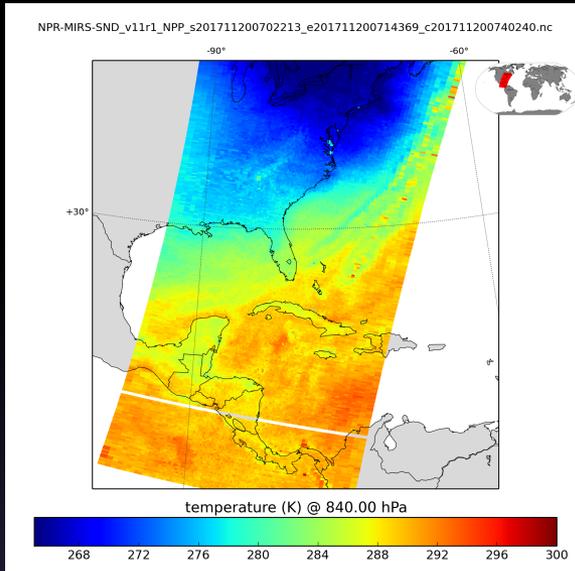
### Land Surface Temperature



# Temperature/Moisture (MIRS)

SNPP  
2017/11/20  
07:14 UTC

Atmospheric  
Temperature  
840 hPa

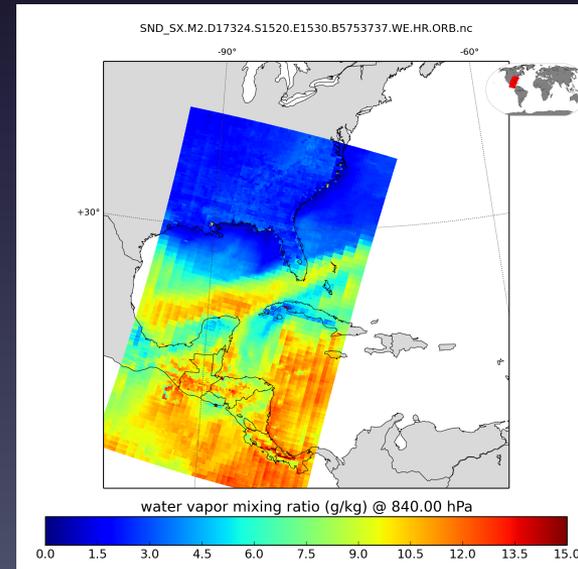
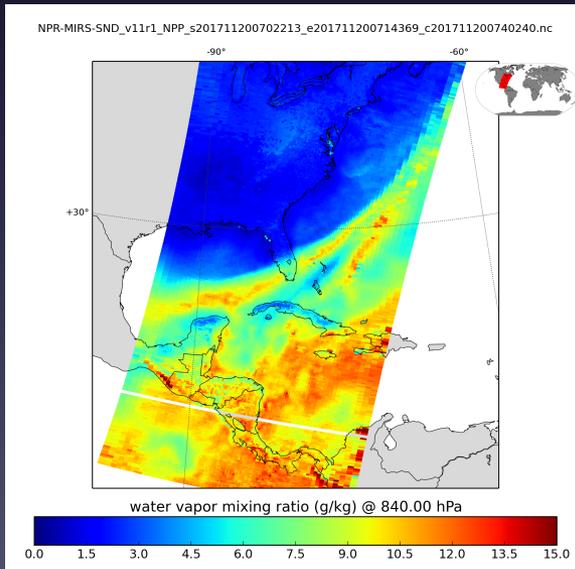


Metop-A IASI  
2017/11/20  
15:20 UTC

Atmospheric  
Temperature  
840 hPa

SNPP  
2017/11/20  
07:14 UTC

Water vapor  
Mixing ratio  
840 hPa

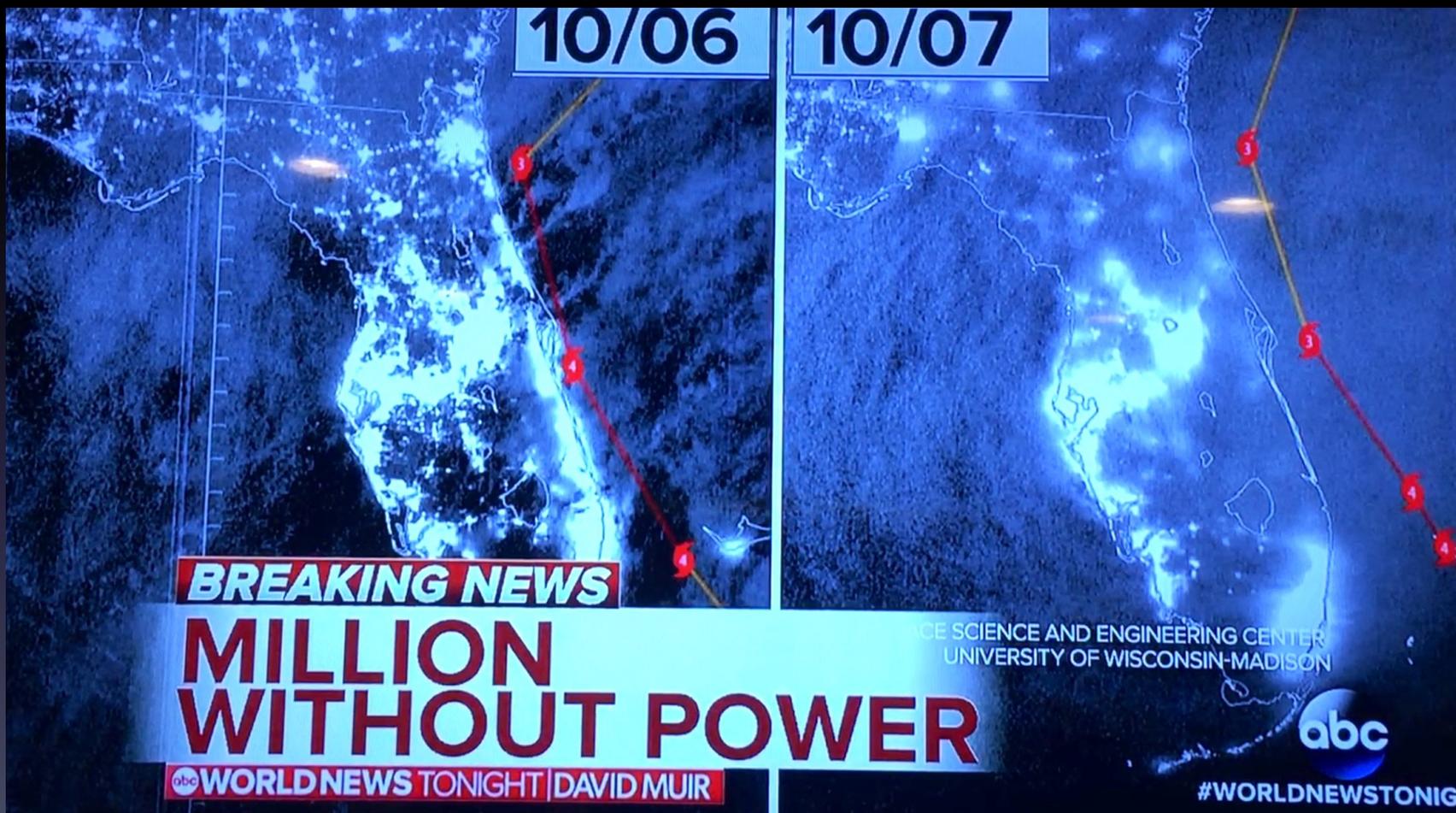


Metop-A IASI  
2017/11/20  
15:20 UTC

Water vapor  
Mixing ratio  
840 hPa

# VIIRS Day/Night Band (Polar2Grid)

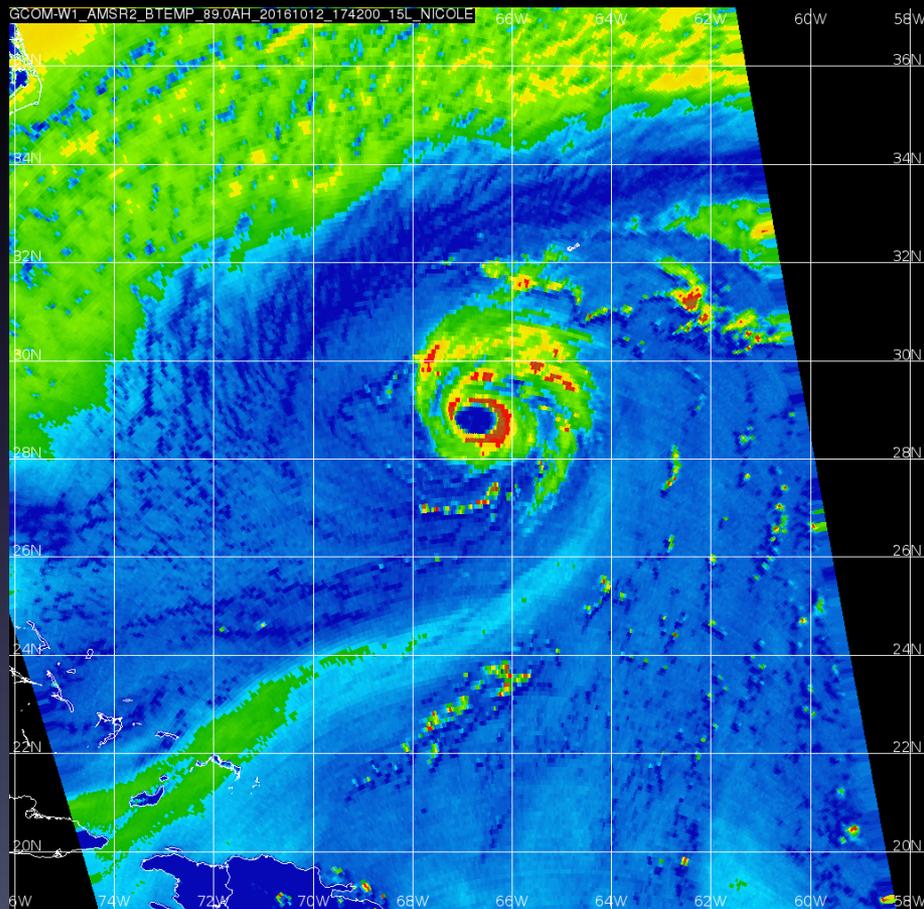
October 6/7, 2016 VIIRS Day/Night Band from SSEC direct broadcast  
Hurricane Matthew aftermath: lights out along east coast of Florida



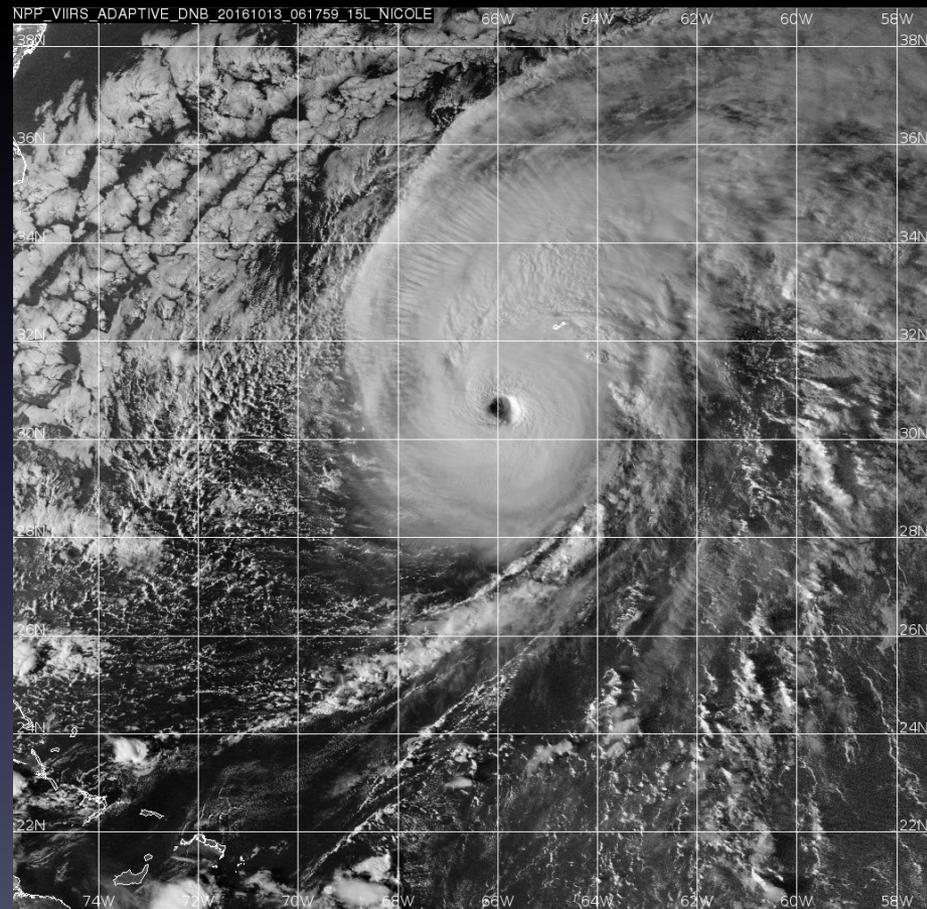
ABC World News Tonight averaged 8 million viewers per night in October, 2016

# Storm-centered Images (Polar2Grid)

GCOM-W1 AMSR2 89 GHz  
2016/10/12 17:42  
HURRICANE NICOLE



SUOMI NPP VIIRS DAY/NIGHT  
2016/10/13 06:17  
HURRICANE NICOLE



# New product: VIIRS flood detection

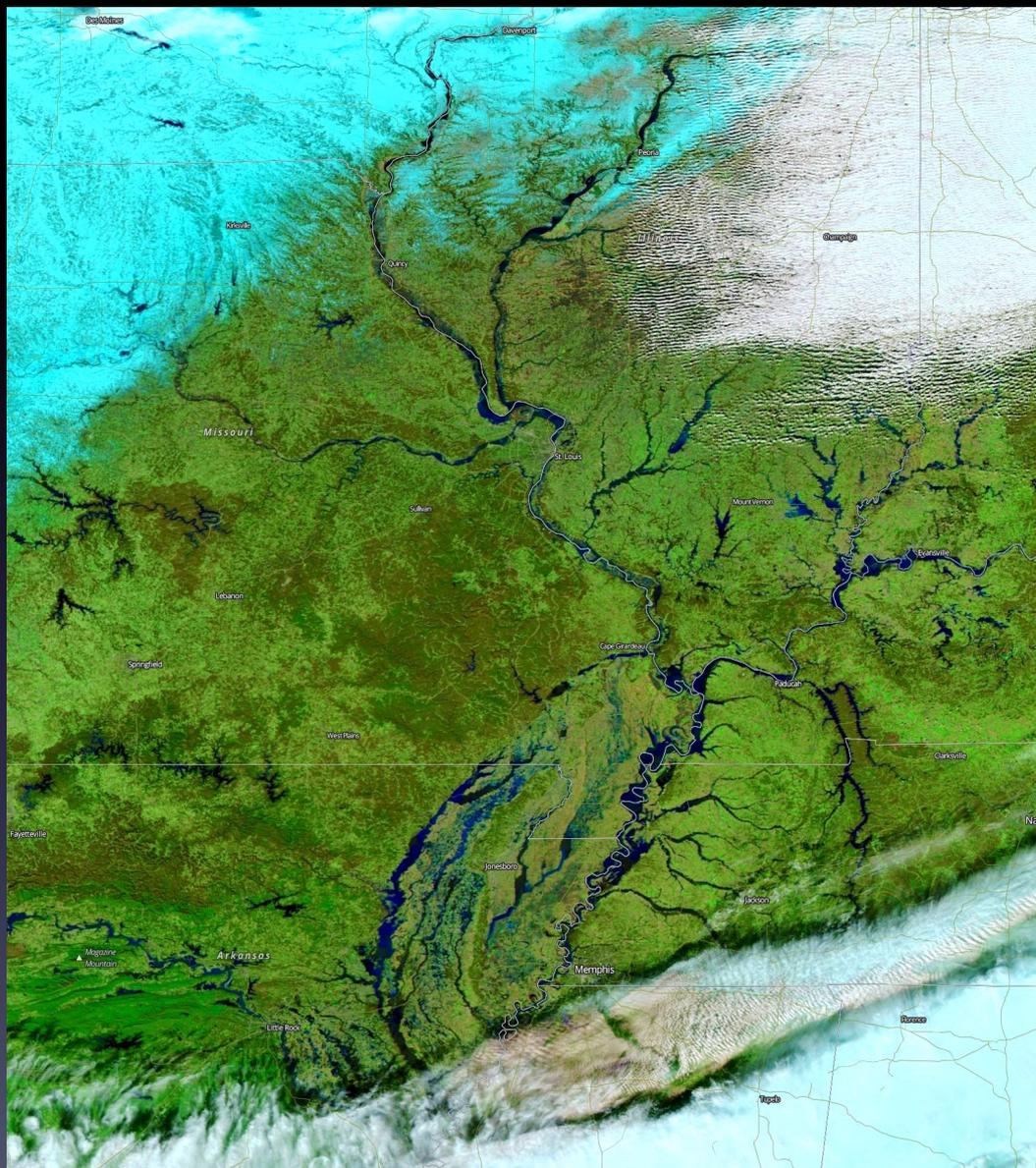
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## Algorithm developed by Sanmei Li at George Mason University

- Daytime algorithm using VIIRS I-bands at 375 meter resolution.
- Includes built-in tests for detecting clouds, snow, ice, and shadows from clouds and terrain.
- Uses static global water database to identify “normal water”.
- CSPP release by the end of December 2017.

# VIIRS flood detection

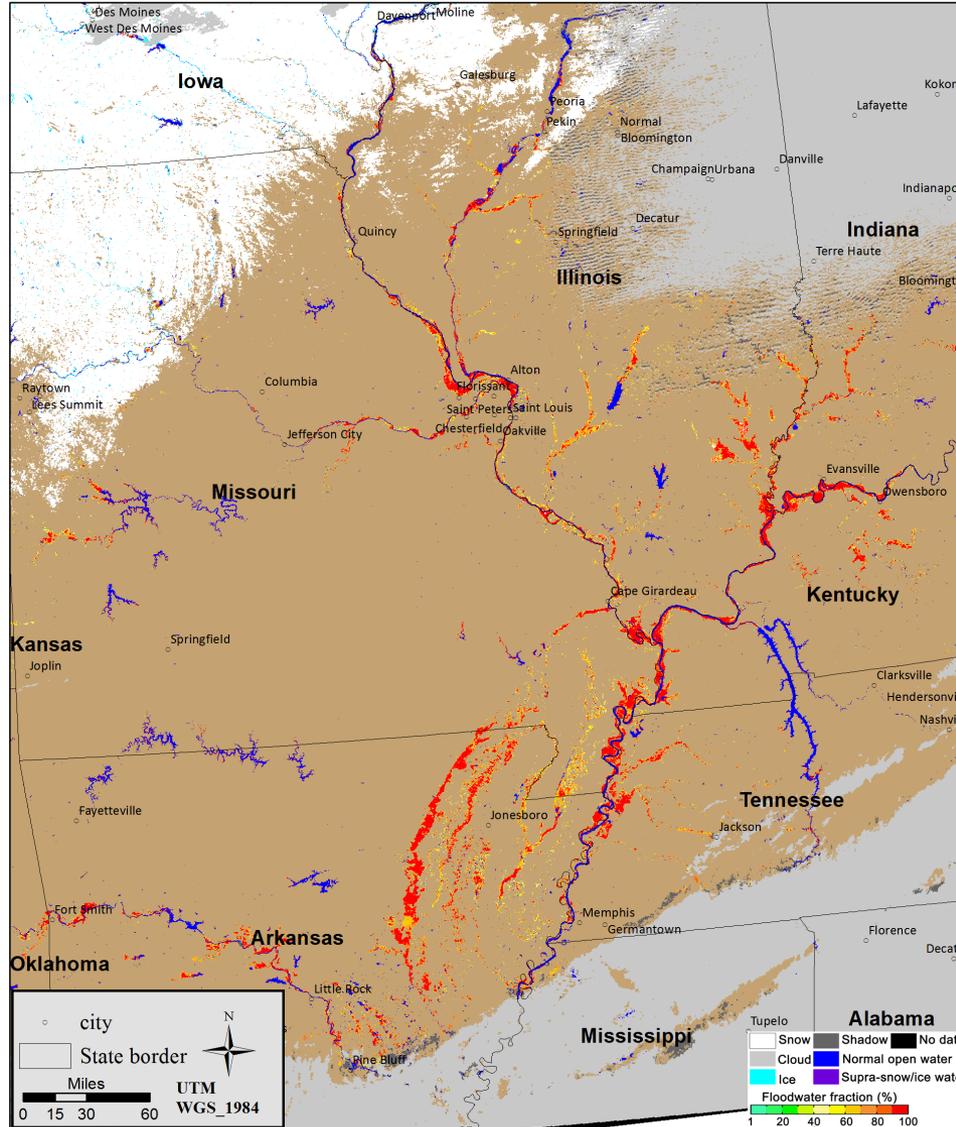
SNPP VIIRS  
False Color  
January 1, 2016



# VIIRS flood detection



SNPP/VIIRS Flood Detection Map January 01 2016 18:48 (UTC)



SNPP VIIRS  
Flood Map  
January 1, 2016

Red areas are  
flood waters

# JPSS-1

Launched November 18, 2017 by Delta 2



- Spacecraft and sensor checkout/activation is underway (ATMS data at Launch+11 days)
- HRD signal has been received at SSEC (no sensor data yet)

# CSPP SDR v3.0: Overview

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- CSPP Sensor Data Record (SDR) v3.0 was released on October 11, 2017.
- Supports ATMS, CrIS, and VIIRS SDR processing for SNPP and JPSS-1 (one package supports both satellites).
- CentOS 6.9 x86\_64 is the primary supported operating system. Hardware requirements unchanged from SDR v2.2.
- HDF5 product format and file name conventions for JPSS-1 are the same as for SNPP.
- New version of RT-STPS (v5.9 or v6.0) is required to create input RDR data.

# CSPP SDR v3.0: Features



- Supports multi-core processing for reduced runtimes (e.g., 13-minute pass processed in 8 minutes using 8 cores).
- CrIS can be processed at Normal Spectral Resolution (NSR) or Full Spectral Resolution (FSR).
  - Default mode for SNPP CrIS is NSR.
  - Default mode for JPSS-1 CrIS is FSR.
- Supports offline downloads of required ancillary data and calibration lookup tables.

**Patches will be released in the coming weeks as the software is tested with JPSS-1 on-orbit data.**

# CSPP Summary

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- CSPP continues to support the creation a range of calibrated sensor observations, geophysical products, and imagery from multiple LEO satellites and sensors.
- JPSS-1 support is now available in CSPP SDR v3.0.
- CIMSS/SSEC/UW acknowledges the support of NOAA JPSS Program Scientist Mitch Goldberg in the development of CSPP LEO.

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<http://cimss.ssec.wisc.edu/cspp/>