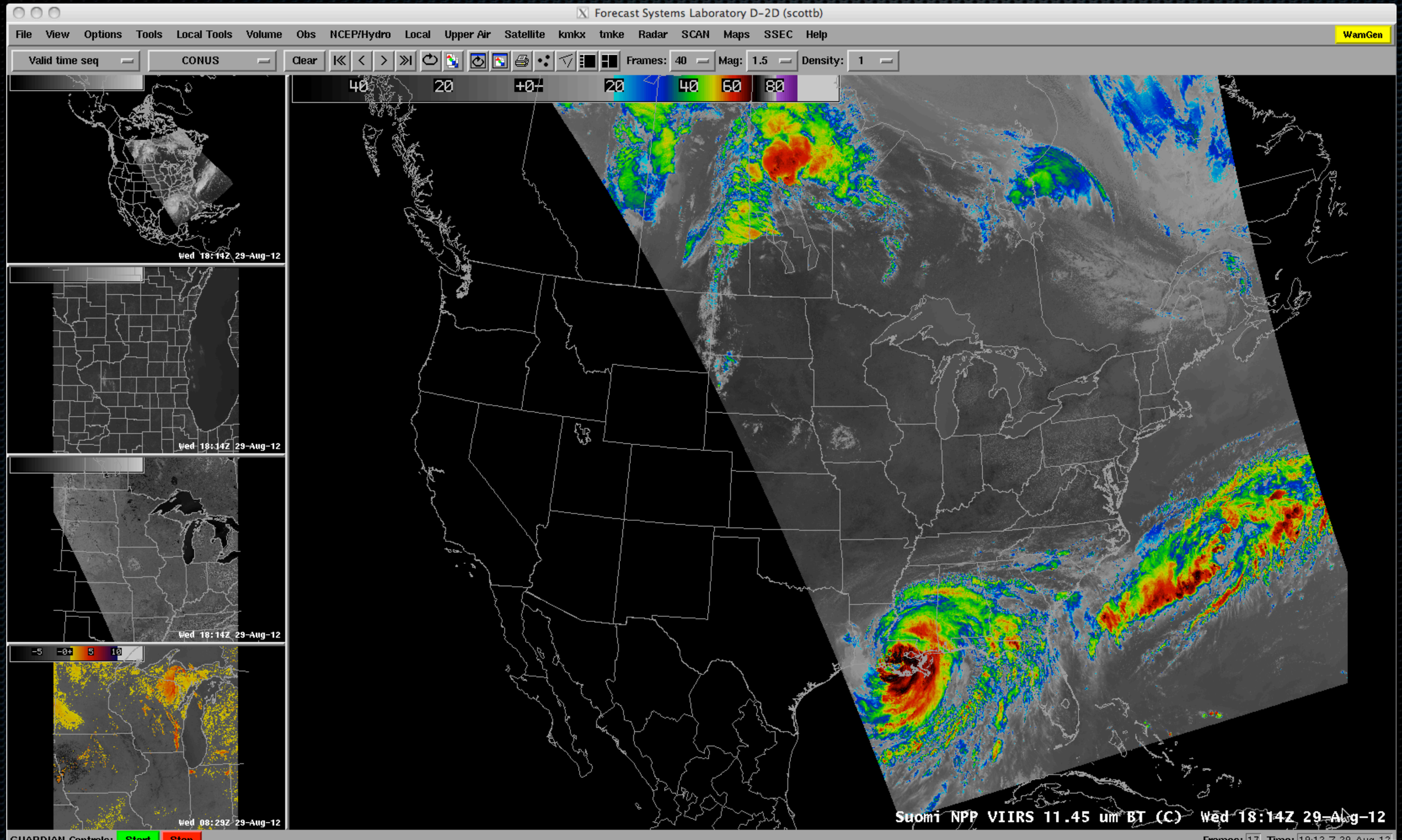
VIIRS Imagery in AWIPS



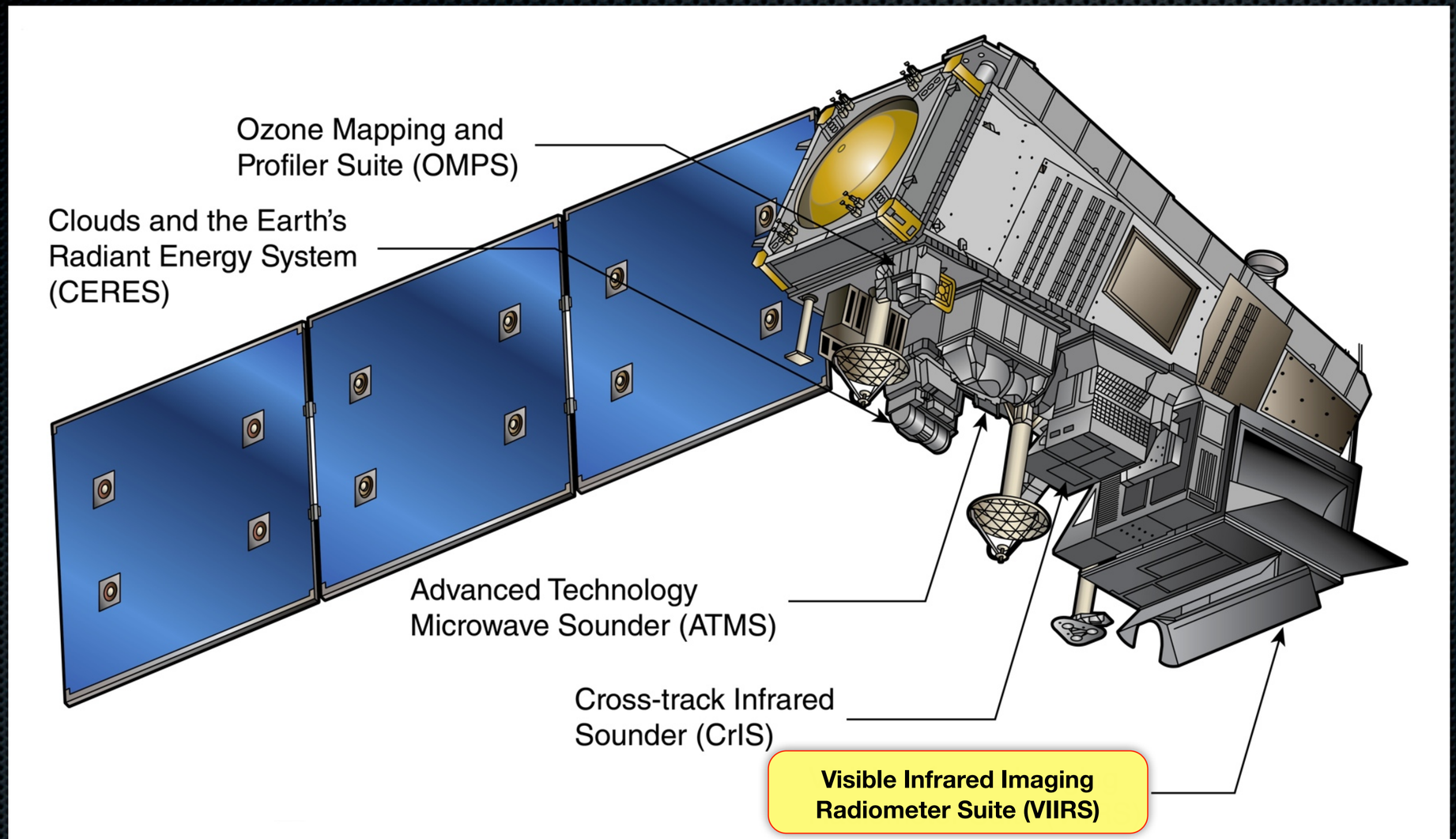
VIIRS Imagery in AWIPS

Contributors:

Scott Bachmeier, Jordan Gerth, Mat Gunshor, Scott Lindstrom,
Kathy Strabala, William Straka

Cooperative Institute for Meteorological Satellite Studies
Space Science and Engineering Center
University of Wisconsin - Madison

Suomi NPP (National Polar-orbiting Partnership) Satellite



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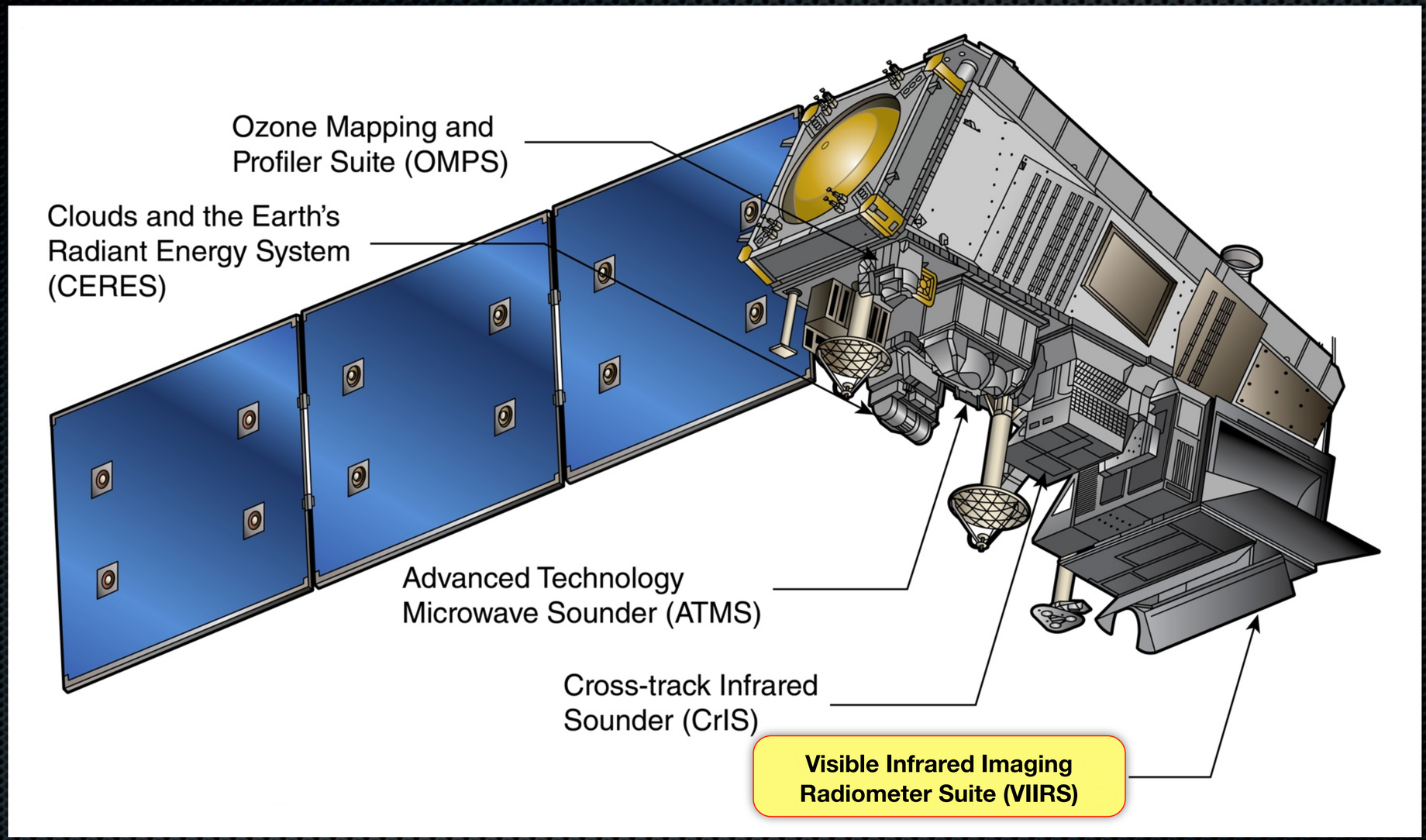

Launched on 28 October 2011

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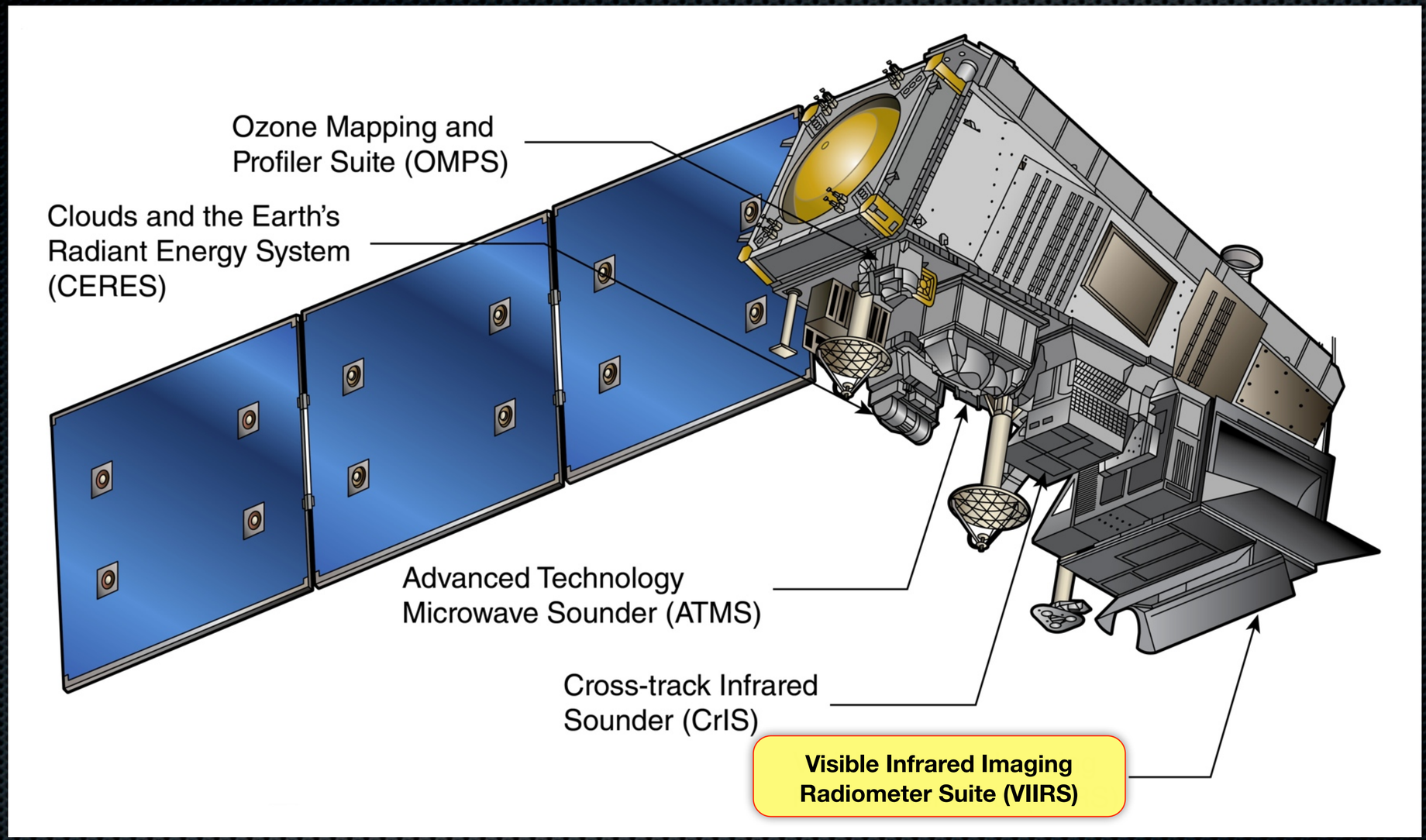

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Named in honor of Verner Suomi, professor at the University of Wisconsin
(widely regarded as "The father of satellite meteorology")

VIIRS: Visible Infrared Imaging Radiometer Suite

22 spectral bands:

- 5 "I-bands" (~375 meter spatial resolution)
- 16 "M-bands" (~750 meter resolution)
- 1 "Day/Night Band" (~750 meter resolution)

		Band No.	Wave-length (μm)	Horiz Sample Interval (km Downtrack x Crosstrack)		Driving EDRs	Radi-ance Range	Ltyp or Ttyp	Signal to Noise Ratio (dimensionless) or NEΔT (Kelvins)		
				Nadir	End of Scan				Required	Predicted	Margin
VIS/NIR FPA	Silicon PIN Diod	M1	0.412	0.742 x 0.259	1.60 x 1.58	Ocean Color Aerosols	Low High	44.9 155	352 316	441 807	25% 155%
		M2	0.445	0.742 x 0.259	1.60 x 1.58	Ocean Color Aerosols	Low High	40 146	380 409	524 926	38% 126%
		M3	0.488	0.742 x 0.259	1.60 x 1.58	Ocean Color Aerosols	Low High	32 123	416 414	542 730	30% 76%
		M4	0.555	0.742 x 0.259	1.60 x 1.58	Ocean Color Aerosols	Low High	21 90	362 315	455 638	26% 102%
		I1	0.640	0.371 x 0.387	0.80 x 0.789	Imagery	Single	22	119	146	23%
		M5	0.672	0.742 x 0.259	1.60 x 1.58	Ocean Color Aerosols	Low High	10 68	242 360	298 522	23% 45%
		M6	0.746	0.742 x 0.776	1.60 x 1.58	Atmospheric Corr'n	Single	9.6	199	239	20%
		I2	0.865	0.371 x 0.387	0.80 x 0.789	NDVI	Single	25	150	225	50%
		M7	0.865	0.742 x 0.259	1.60 x 1.58	Ocean Color Aerosols	Low High	6.4 33.4	215 340	388 494	81% 45%
CCD		DNB	0.7	0.742 x 0.742	0.742 x 0.742	Imagery	Var.	6.70E-05	6	5.7	-5%
S/MWIR	PV HgCdTe (HCT)	M8	1.24	0.742 x 0.776	1.60 x 1.58	Cloud Particle Size	Single	5.4	74	98	32%
		M9	1.378	0.742 x 0.776	1.60 x 1.58	Cirrus/Cloud Cover	Single	6	83	155	88%
		I3	1.61	0.371 x 0.387	0.80 x 0.789	Binary Snow Map	Single	7.3	6.0	97	1523%
		M10	1.61	0.742 x 0.776	1.60 x 1.58	Snow Fraction	Single	7.3	342	439	28%
		M11	2.25	0.742 x 0.776	1.60 x 1.58	Clouds	Single	0.12	10	17	66%
		I4	3.74	0.371 x 0.387	0.80 x 0.789	Imagery Clouds	Single	270 K	2.500	0.486	415%
		M12	3.70	0.742 x 0.776	1.60 x 1.58	SST	Single	270 K	0.396	0.218	82%
		M13	4.05	0.742 x 0.259	1.60 x 1.58	SST Fires	Low High	300 K 380 K	0.107 0.423	0.063 0.334	69% 27%
LWIR	PV HCT	M14	8.55	0.742 x 0.776	1.60 x 1.58	Cloud Top Properties	Single	270 K	0.091	0.075	22%
		M15	10.763	0.742 x 0.776	1.60 x 1.58	SST	Single	300 K	0.070	0.038	85%
		I5	11.450	0.371 x 0.387	0.80 x 0.789	Cloud Imagery	Single	210 K	1.500	0.789	90%
		M16	12.013	0.742 x 0.776	1.60 x 1.58	SST	Single	300 K	0.072	0.051	42%

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Visible →

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Day/Night Band →

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Day/Night Band

Snow/Ice

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Day/Night Band

Snow/Ice

Shortwave IR

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		M13	4.05	0.742 x 0.259	1.60 x 1.58	SST Fires	Low High	300 K 380 K	0.107 0.423	0.063 0.334	69% 27%
LWIR	PV HCT	M14	8.55	0.742 x 0.776	1.60 x 1.58	Cloud Top Properties	Single	270 K	0.091	0.075	22%
		M15	10.763	0.742 x 0.776	1.60 x 1.58	SST	Single	300 K	0.070	0.038	85%
		I5	11.450	0.371 x 0.387	0.80 x 0.789	Cloud Imagery	Single	210 K	1.500	0.789	90%
		M16	12.013	0.742 x 0.776	1.60 x 1.58	SST	Single	300 K	0.072	0.051	42%

VIIRS: Visible Infrared Imaging Radiometer Suite

22 spectral bands:

- 5 "I-bands" (~375 meter spatial resolution)
- 16 "M-bands" (~750 meter resolution)
- 1 "Day/Night Band" (~750 meter resolution)

Available in AWIPS:

Visible

Day/Night Band

Snow/Ice

Shortwave IR

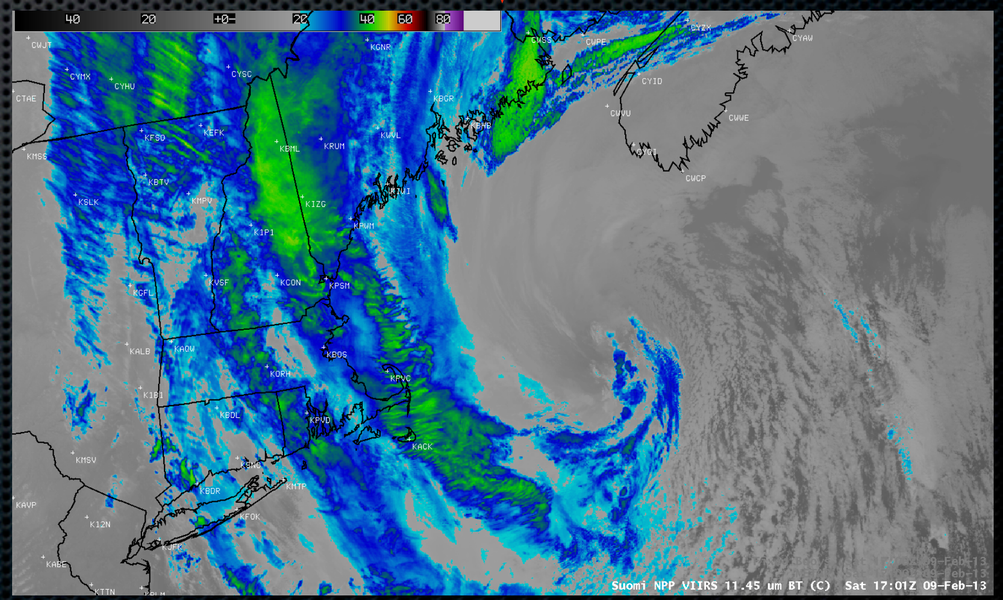
11 µm - 3.7 µm
"Fog/stratus product"

Longwave IR

		Band No.	Wave-length (µm)	Horiz Sample Interval (km Downtrack x Crosstrack)		Driving EDRs	Radi-ance Range	Ltyp or Ttyp	Signal to Noise Ratio (dimensionless) or NEΔT (Kelvins)		
				Nadir	End of Scan				Required	Predicted	Margin
VIS/NIR FPA	Silicon PIN Diodes	M1	0.412	0.742 x 0.259	1.60 x 1.58	Ocean Color Aerosols	Low High	44.9 155	352 316	441 807	25% 155%
		M2	0.445	0.742 x 0.259	1.60 x 1.58	Ocean Color Aerosols	Low High	40 146	380 409	524 926	38% 126%
		M3	0.488	0.742 x 0.259	1.60 x 1.58	Ocean Color Aerosols	Low High	32 123	416 414	542 730	30% 76%
		M4	0.555	0.742 x 0.259	1.60 x 1.58	Ocean Color Aerosols	Low High	21 90	362 315	455 638	26% 102%
		I1	0.640	0.371 x 0.387	0.80 x 0.789	Imagery	Single	22	119	146	23%
		M5	0.672	0.742 x 0.259	1.60 x 1.58	Ocean Color Aerosols	Low High	10 68	242 360	298 522	23% 45%
		M6	0.746	0.742 x 0.776	1.60 x 1.58	Atmospheric Corr'n	Single	9.6	199	239	20%
		I2	0.865	0.371 x 0.387	0.80 x 0.789	NDVI	Single	25	150	225	50%
		M7	0.865	0.742 x 0.259	1.60 x 1.58	Ocean Color Aerosols	Low High	6.4 33.4	215 340	388 494	81% 45%
		DNB	0.7	0.742 x 0.742	0.742 x 0.742	Imagery	Var.	6.70E-05	6	5.7	-5%
SWIR/MWIR	PV HgCdTe (HCT)	M8	1.24	0.742 x 0.776	1.60 x 1.58	Cloud Particle Size	Single	5.4	74	98	32%
		M9	1.378	0.742 x 0.776	1.60 x 1.58	Cirrus/Cloud Cover	Single	6	83	155	88%
		I3	1.61	0.371 x 0.387	0.80 x 0.789	Binary Snow Map	Single	7.3	6.0	97	1523%
		M10	1.61	0.742 x 0.776	1.60 x 1.58	Snow Fraction	Single	7.3	342	439	28%
		M11	2.25	0.742 x 0.776	1.60 x 1.58	Clouds	Single	0.12	10	17	66%
		I4	3.74	0.371 x 0.387	0.80 x 0.789	Imagery Clouds	Single	270 K	2.500	0.486	415%
		M12	3.70	0.742 x 0.776	1.60 x 1.58	SST	Single	270 K	0.396	0.218	82%
		M13	4.05	0.742 x 0.259	1.60 x 1.58	SST Fires	Low High	300 K 380 K	0.107 0.423	0.063 0.334	69% 27%
LWIR	PV HCT	M14	8.55	0.742 x 0.776	1.60 x 1.58	Cloud Top Properties	Single	270 K	0.091	0.075	22%
		M15	10.763	0.742 x 0.776	1.60 x 1.58	SST	Single	300 K	0.070	0.038	85%
		I5	11.450	0.371 x 0.387	0.80 x 0.789	Cloud Imagery	Single	210 K	1.500	0.789	90%
		M16	12.013	0.742 x 0.776	1.60 x 1.58	SST	Single	300 K	0.072	0.051	42%

VIIRS Imagery in AWIPS

- VIIRS data acquired using a Direct Broadcast ground station (located at the University of Wisconsin - Madison)
- Overpass data processed and converted to appropriate AWIPS file format
- Images available in AWIPS via LDM subscription from NWS Regional Headquarters servers
- Image latency ≤1 hour



Suomi NPP Satellite: 1 Daytime, 1 Night-time Overpass

Overpass maps: http://www.ssec.wisc.edu/datacenter/npp/

VIIRS Imagery in AWIPS

GOES-R PG: VIIRS Imagery and Products in D-2D

cimss.ssec.wisc.edu/goes_r/proving-ground/awips/snpp

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GOES-R Proving Ground

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VIIRS Imagery and Products in D-2D

Instructions for AWIPS Installation

Space Science and Engineering Center
University of Wisconsin - Madison
Released September 21, 2012
Version 1.0 (September 21, 2012)

Project members: Scott Bachmeier, Jordan Gerth, Kathy Strabala, William Straka III

Announcements

This data is provided as part of the GOES-R Proving Ground. For assistance and suggestions on obtaining and using the data, please contact Jordan Gerth.

This data has been undergoing evaluation at the National Weather Service forecast offices in Milwaukee/Sullivan and Honolulu since 2012.

Acquiring Data at a NWSFO

This page contains information for obtaining data from the NOAA satellites equipped with a Visible Infrared Imaging Radiometer Suite (VIIRS) for display in AWIPS.

For VIIRS imagery and products

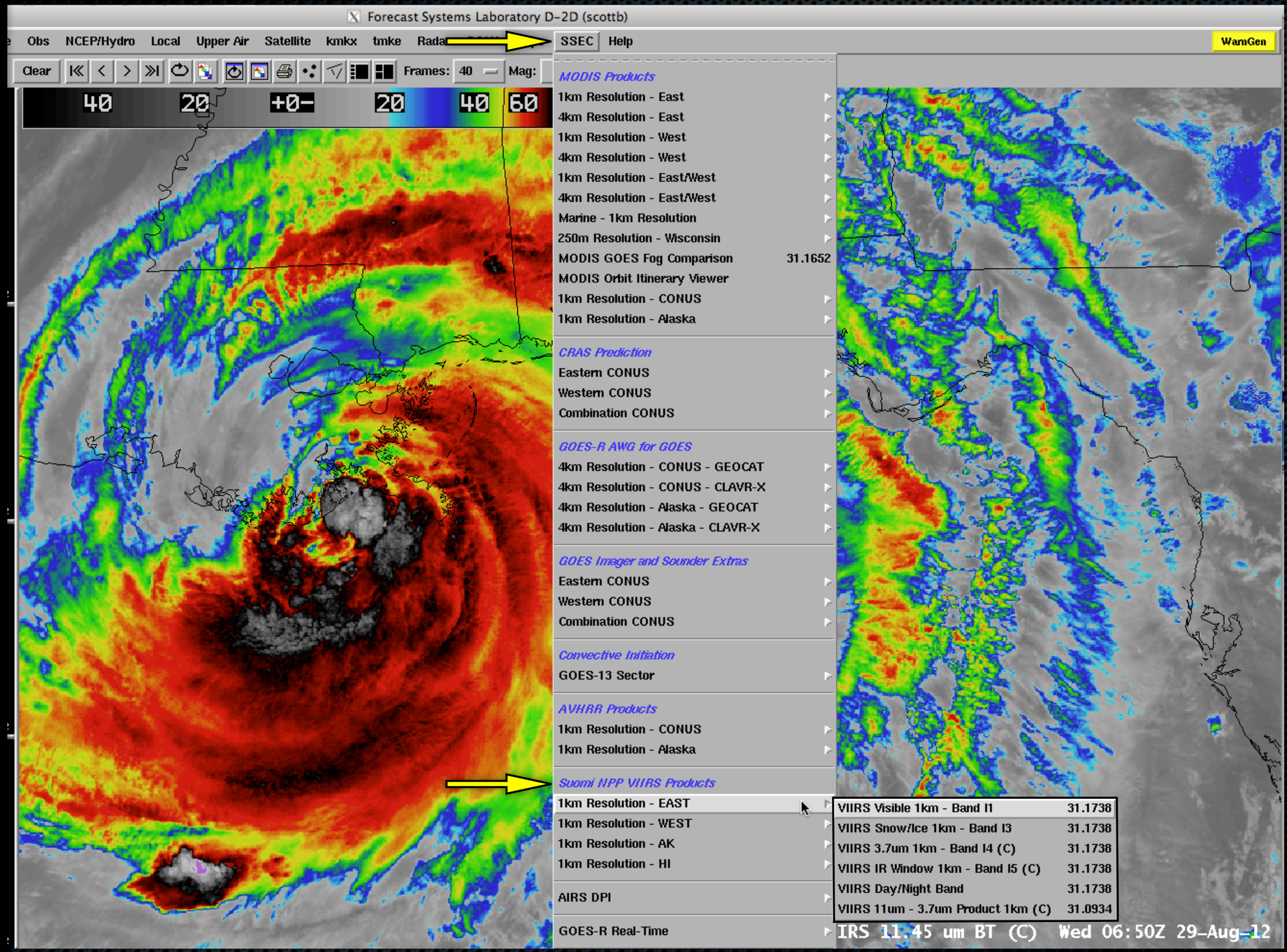
Data is currently available to Weather Forecast Offices in Central Region, Pacific Region, Southern Region, Western Region, and Alaska Region. Data is transmitted in compressed netCDF format on the EXP feed of the Local Data Manager (LDM). This is not an operational dataset, so unplanned data errors and outages may result. **Contact Jordan Gerth once you are receiving data so we can add your office to the e-mail announcement list. We value any feedback.**

The Space Science and Engineering Center is not continuously staffed. Consequently, data outages and processing issues may result. The products should be considered non-operational.

Required LDAD/Processing Configurations

Perform the following actions to configure your Local Data Acquisition and Dissemination (LDAD) server.

VIIRS Imagery in AWIPS

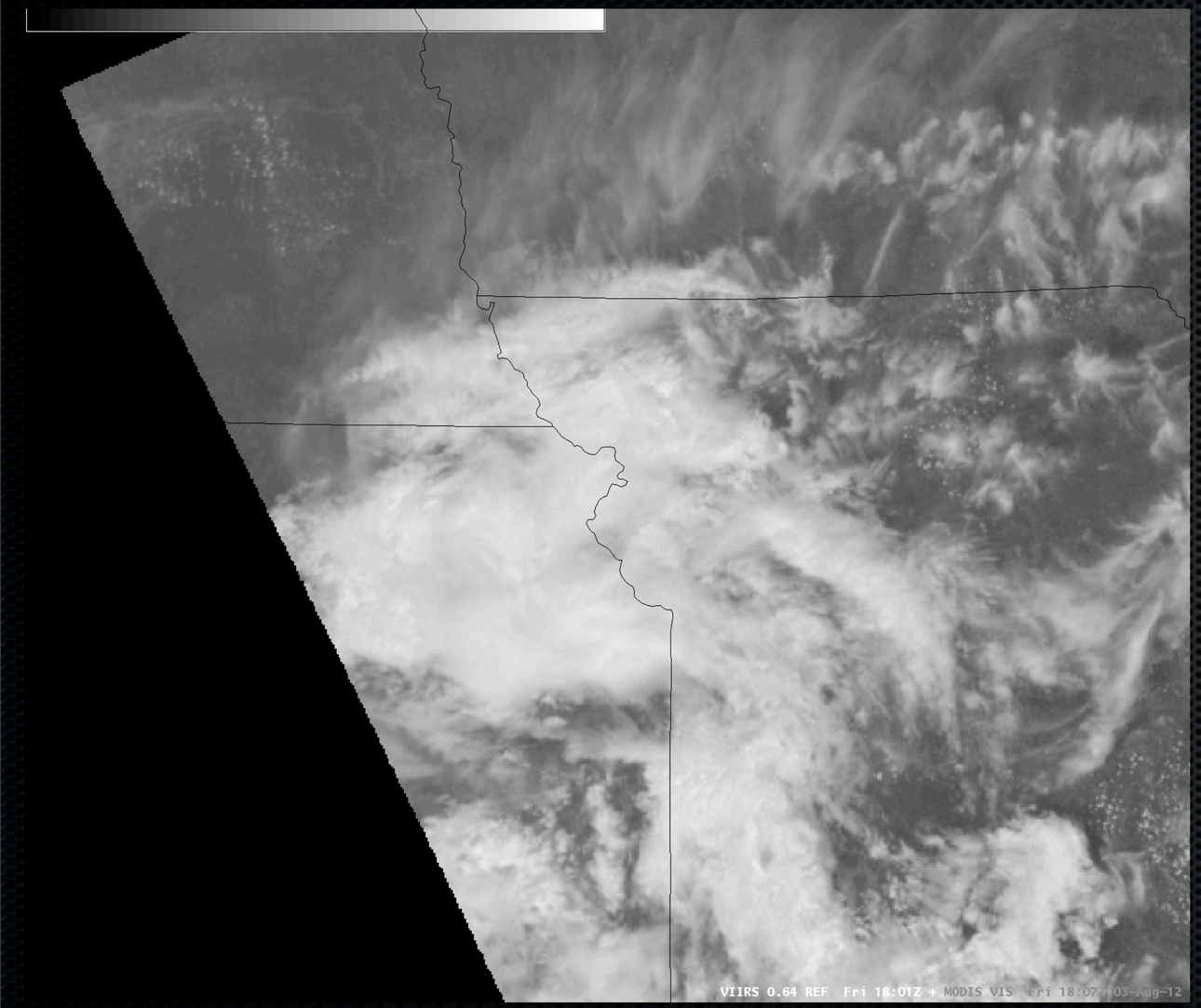


- VIIRS I-band (~375-meter resolution) images are projected onto a 1-km AWIPS grid
- This produces better image quality than using M-Band (~750-meter resolution) data

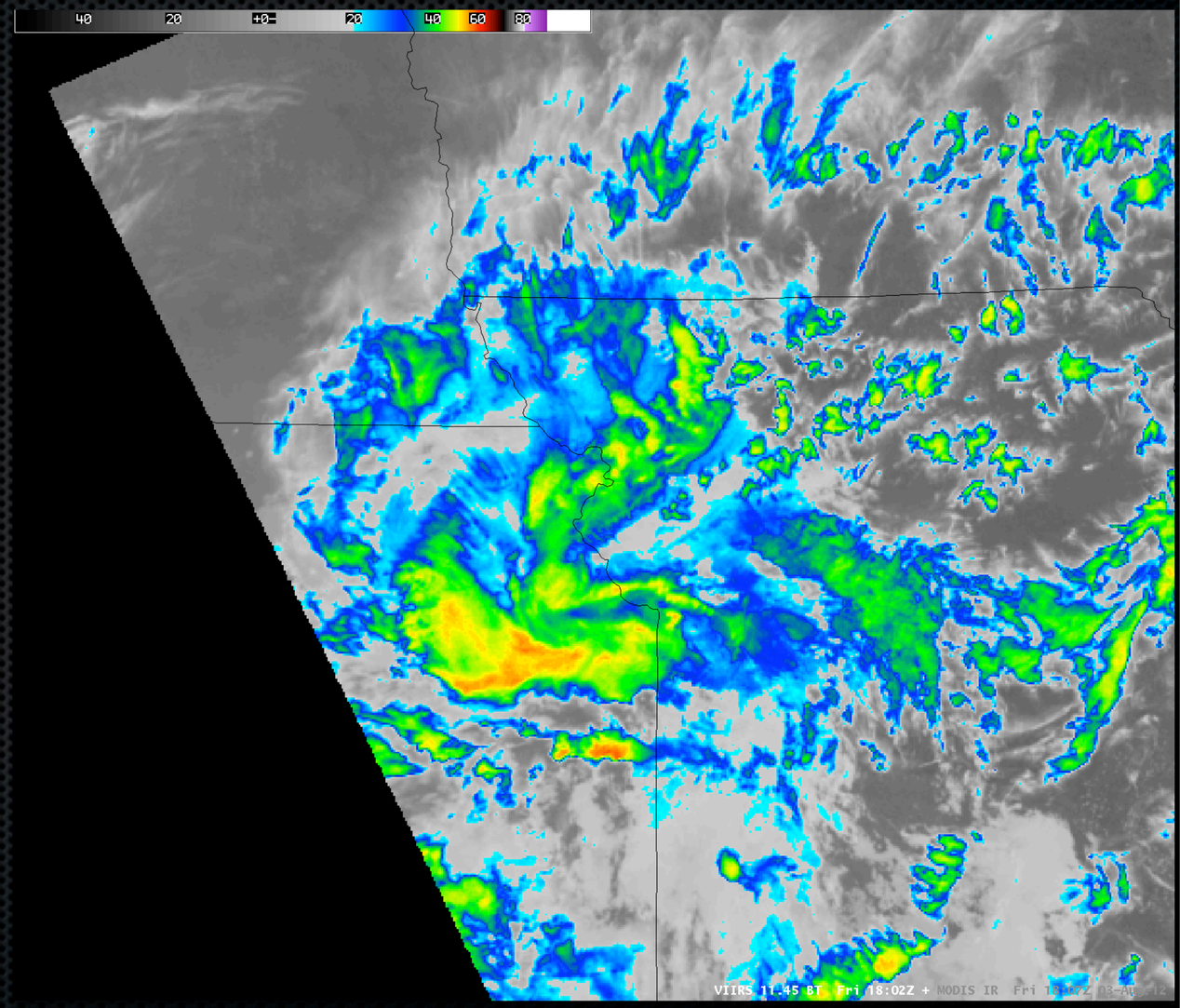
Using M-Band (~750-meter resolution)

Using I-Band (~375-meter resolution)

VIIRS: Better image quality along the swath edge (compared to MODIS)

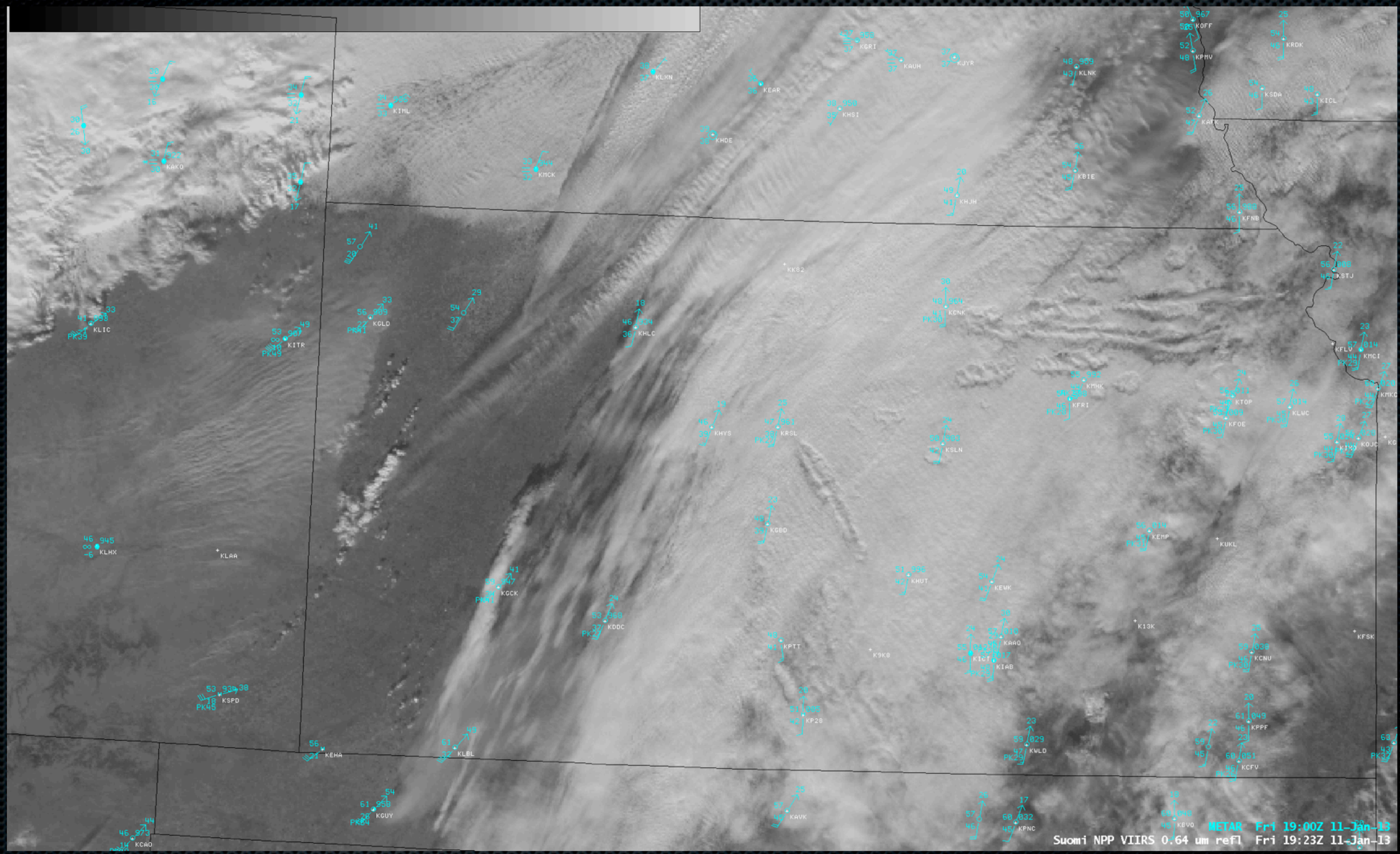


Visible: VIIRS vs MODIS



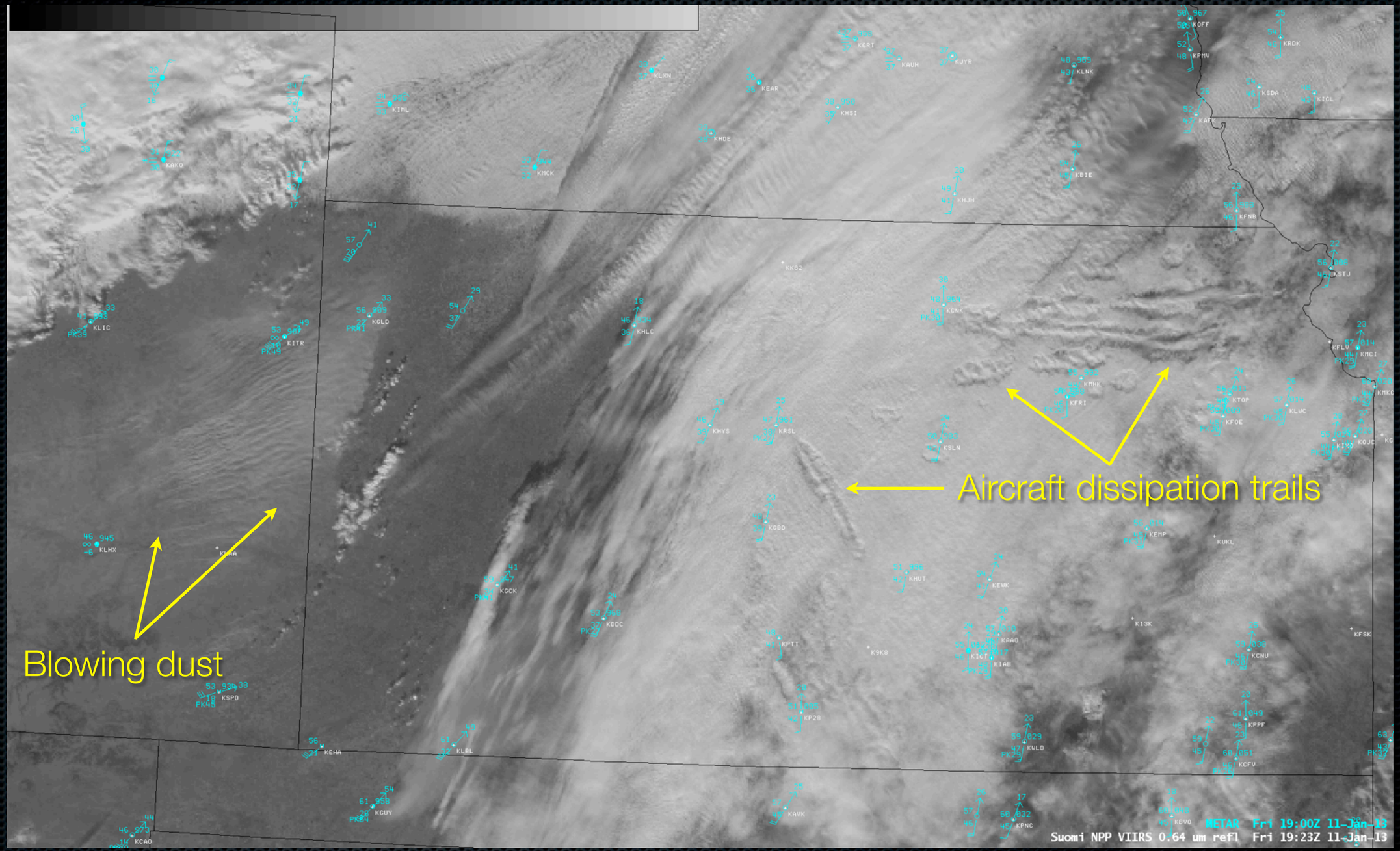
IR: VIIRS vs MODIS

VIIRS Visible Channel (0.64 μm)



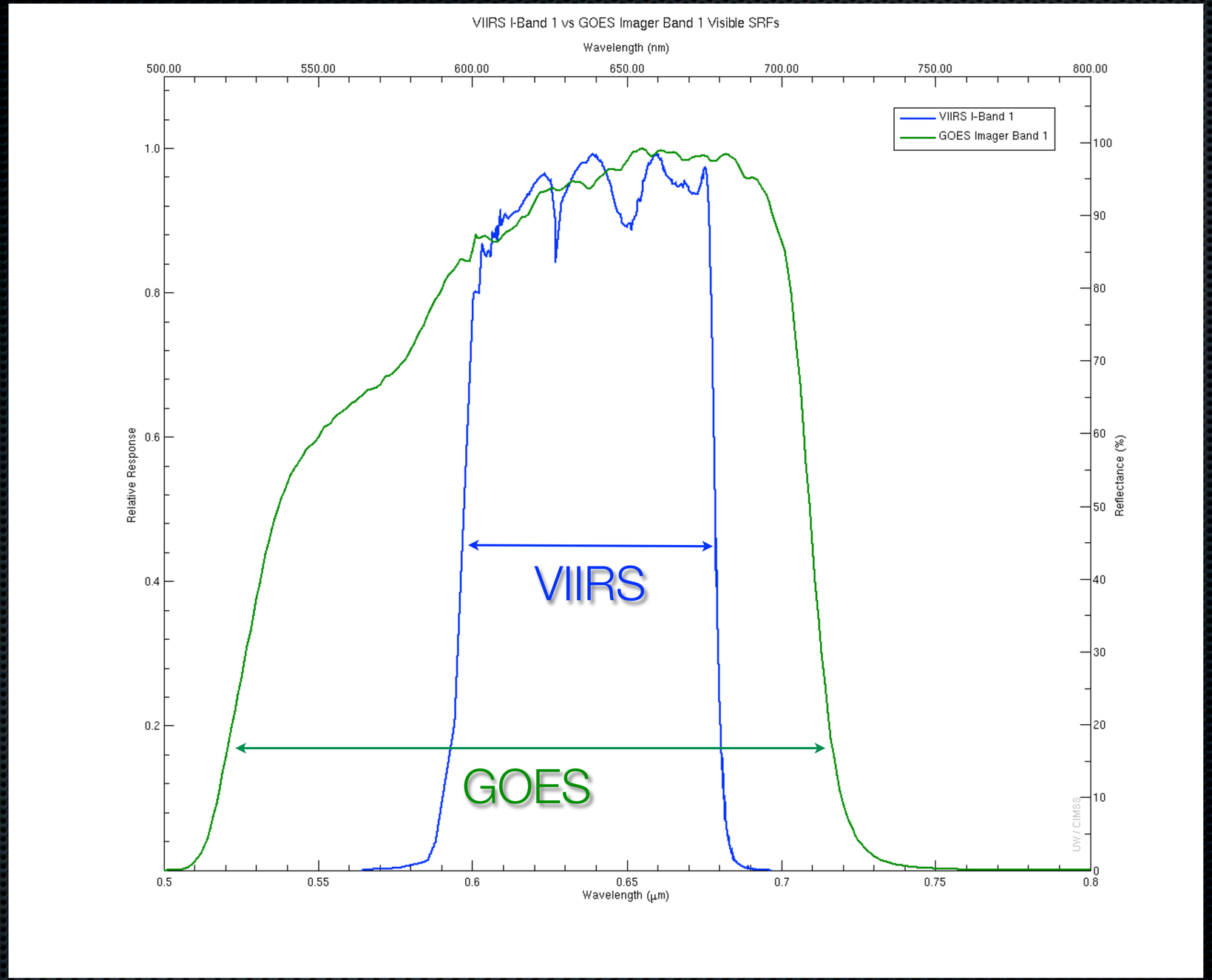
Similar to GOES 0.63 μm visible channel

VIIRS Visible Channel (0.64 μm)



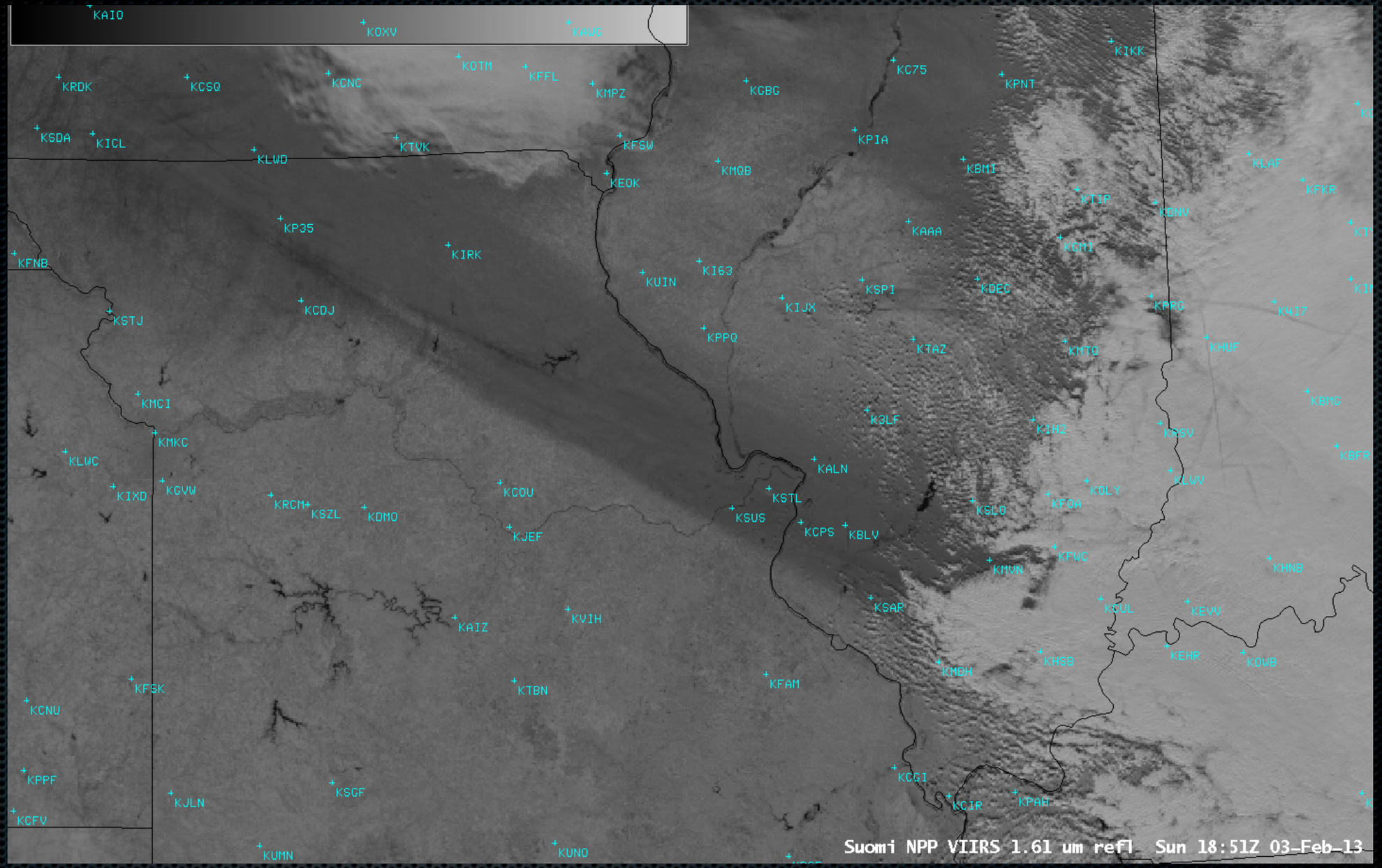
Similar to GOES 0.63 μm visible channel

VIIRS Visible Channel (0.64 µm)



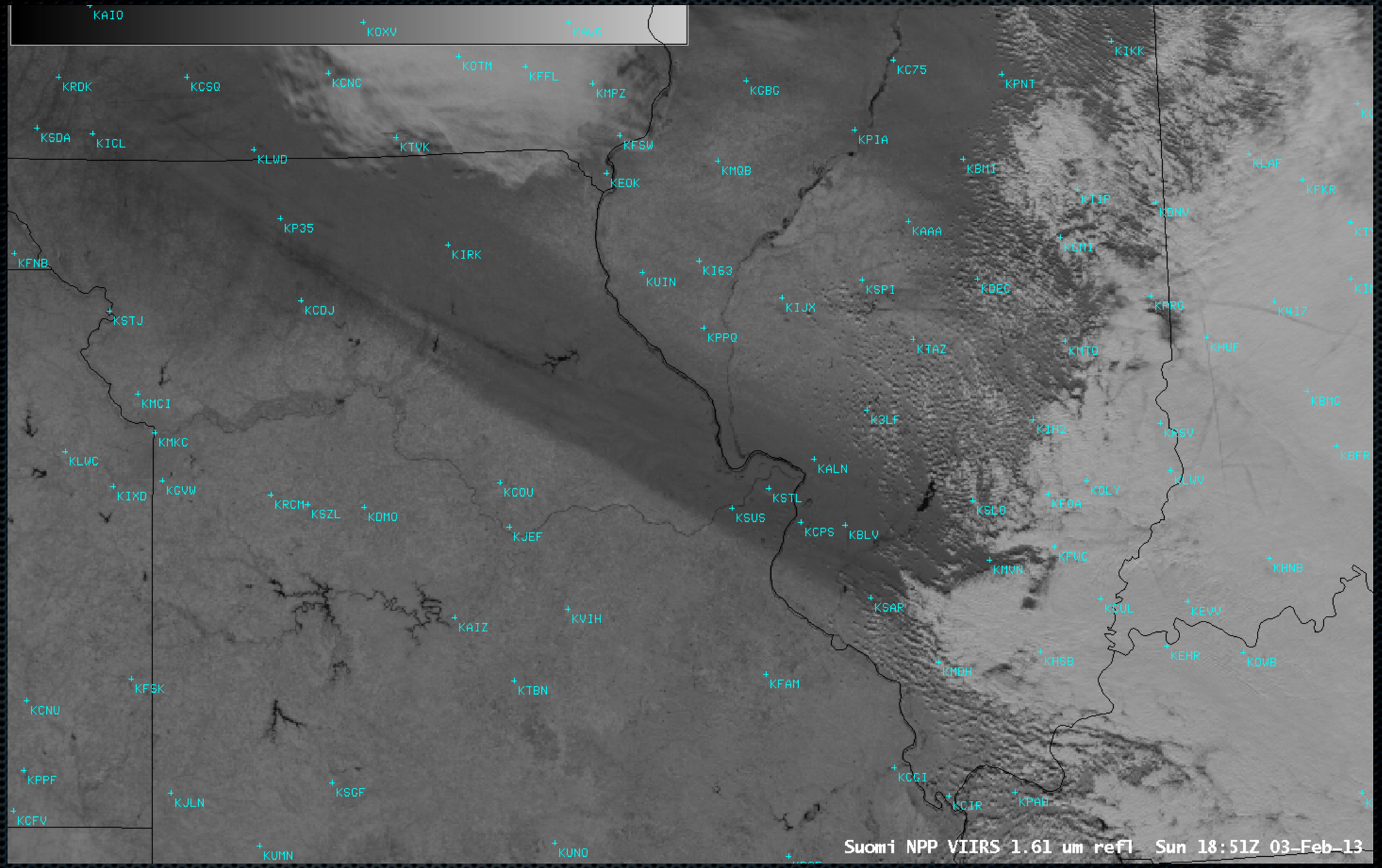
Spectrally more narrow than the GOES 0.63 µm visible channel

“Snow/Ice” Channel (1.61 µm)



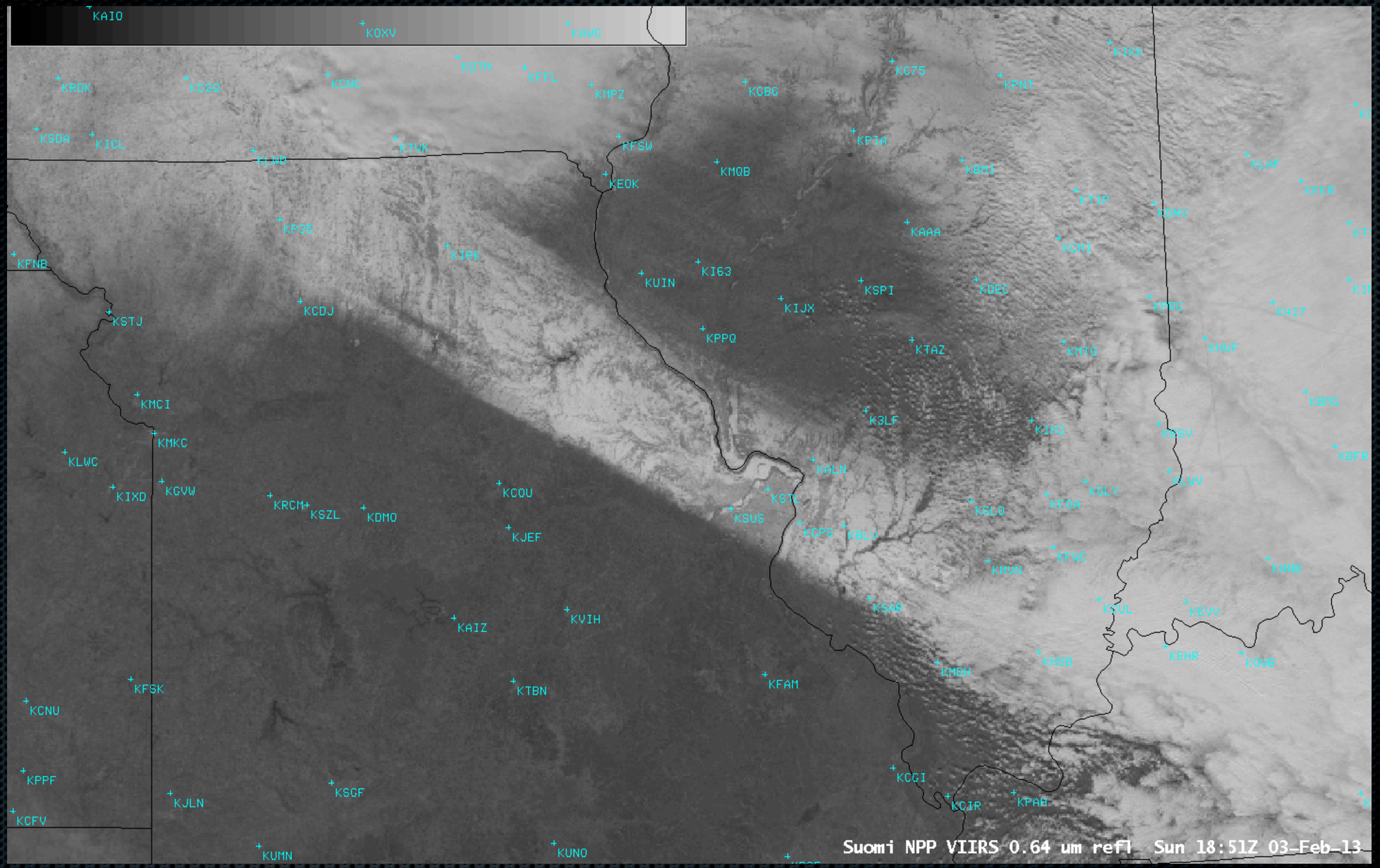
- Useful for discrimination of snow/ice vs supercooled water droplet cloud features

“Snow/Ice” Channel (1.61 μm)



- Useful for discrimination of snow/ice vs supercooled water droplet cloud features
- Snow/ice are strong absorbers at 1.61 μm -- so they appear <u>darker</u> than clouds

“Snow/Ice” Channel (1.61 μm)



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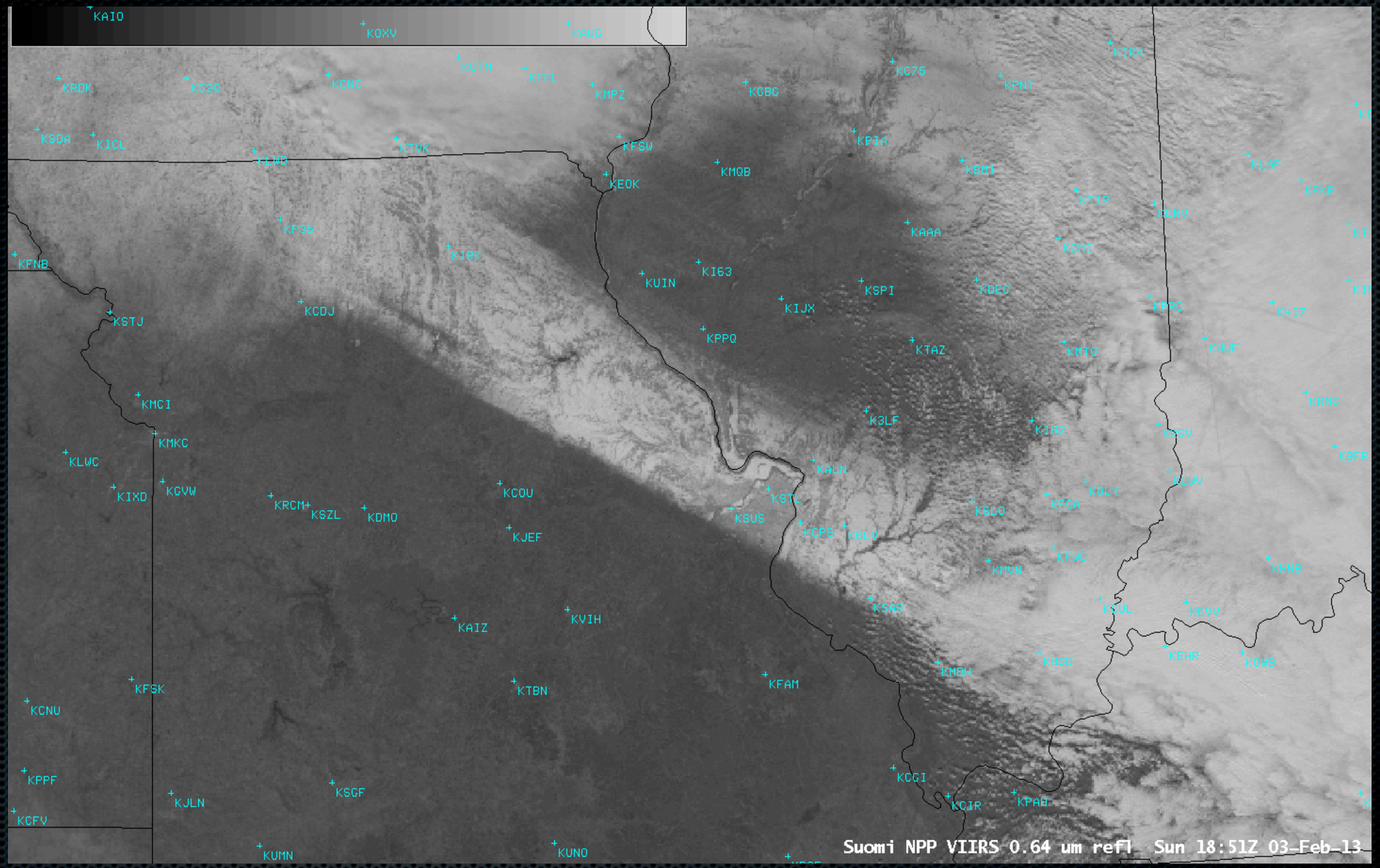
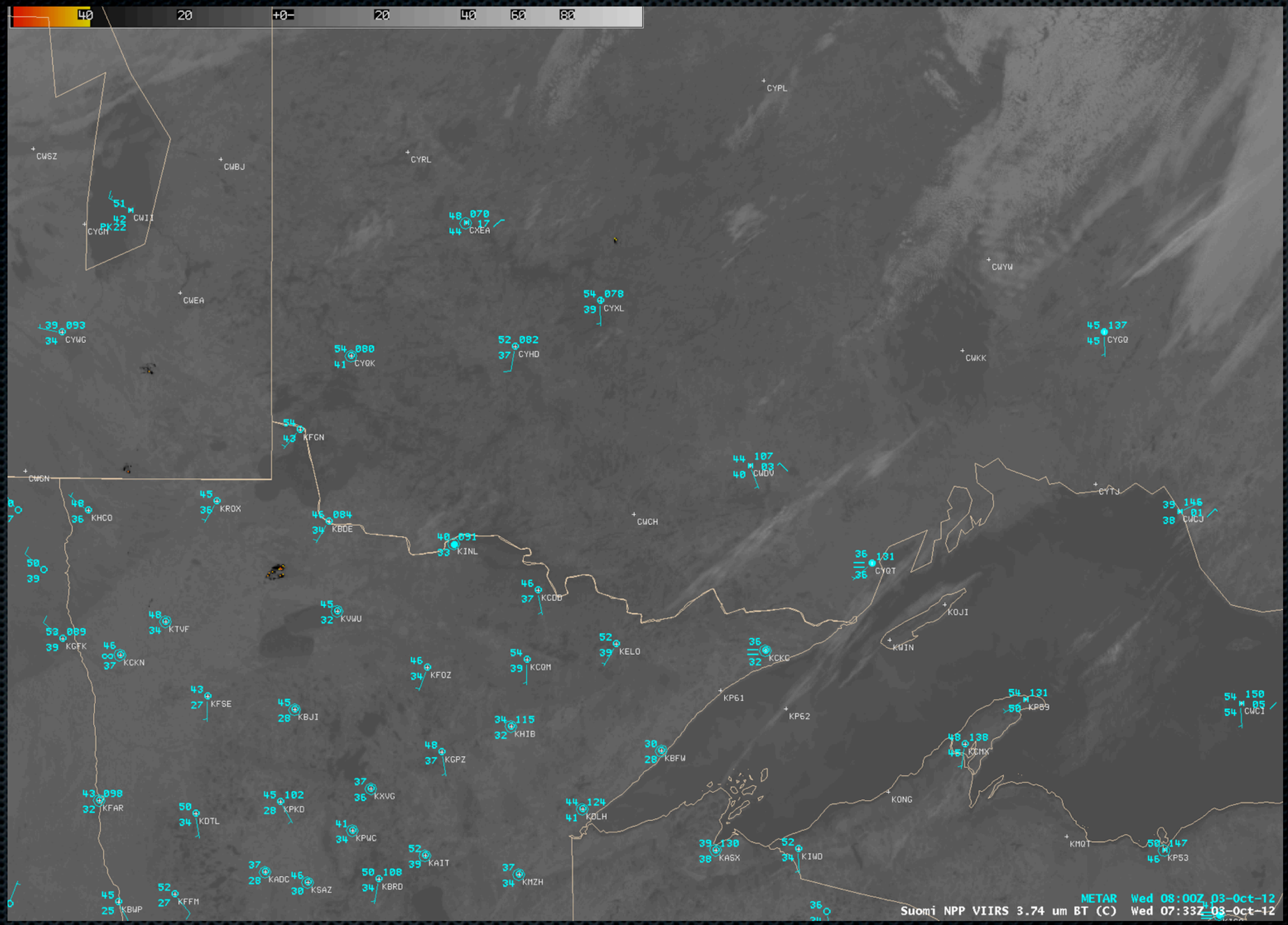
“Snow/Ice” Channel (1.61 µm)



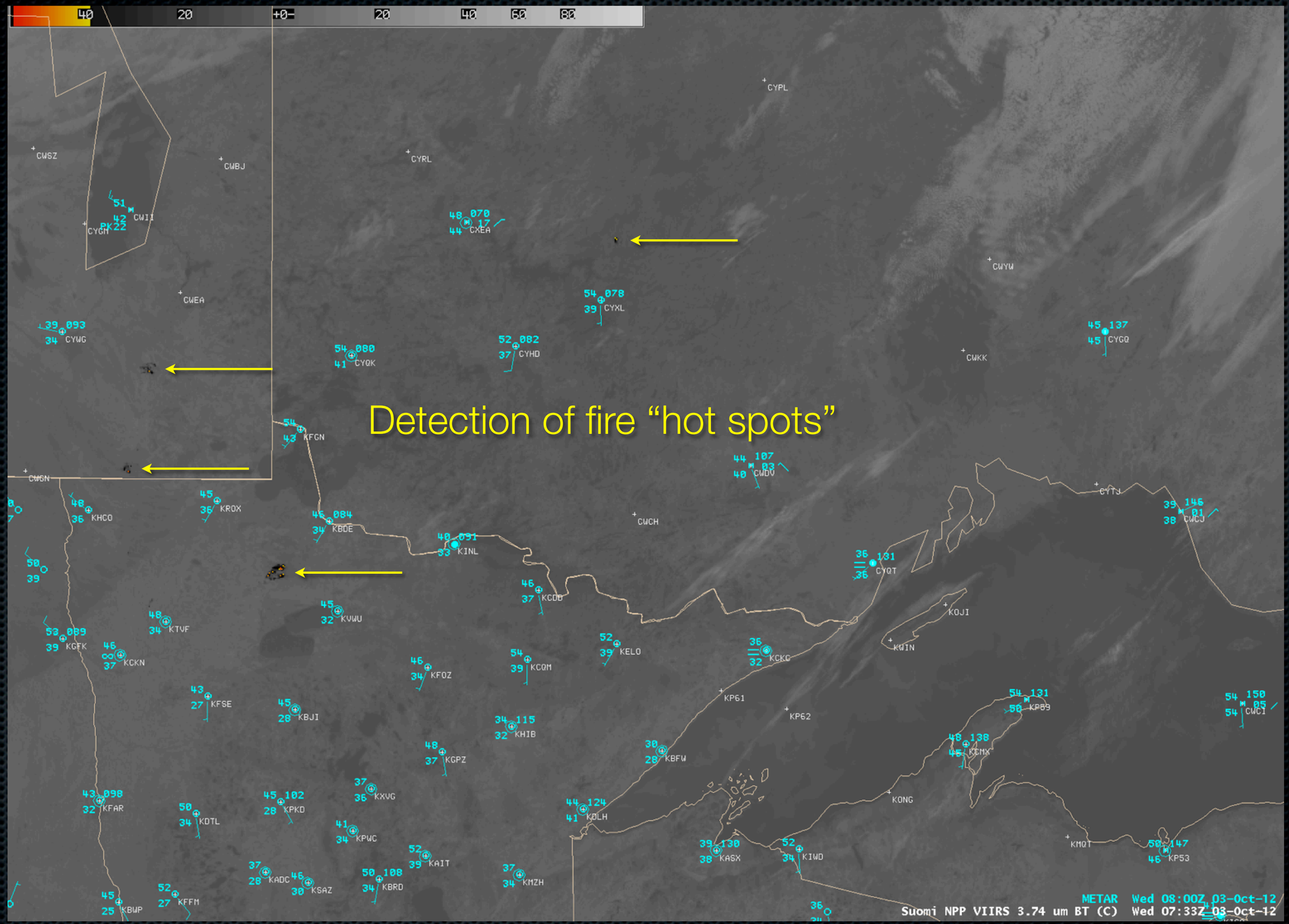
- Can also be used as a component of false-color Red/Green/Blue (RGB) images

Shortwave IR Channel (3.74 µm)



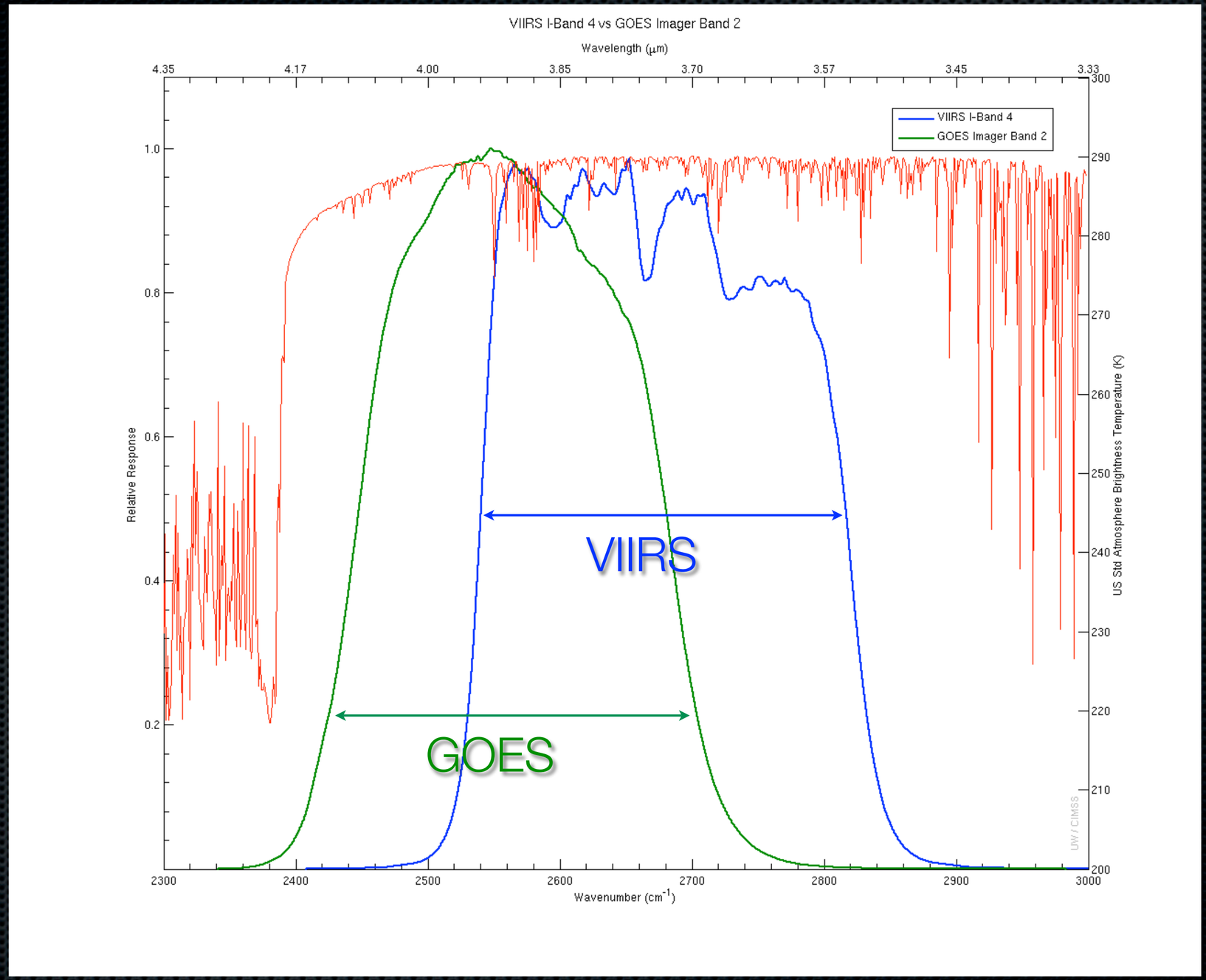
Similar to GOES 3.9 µm shortwave IR channel

Shortwave IR Channel (3.74 μm)



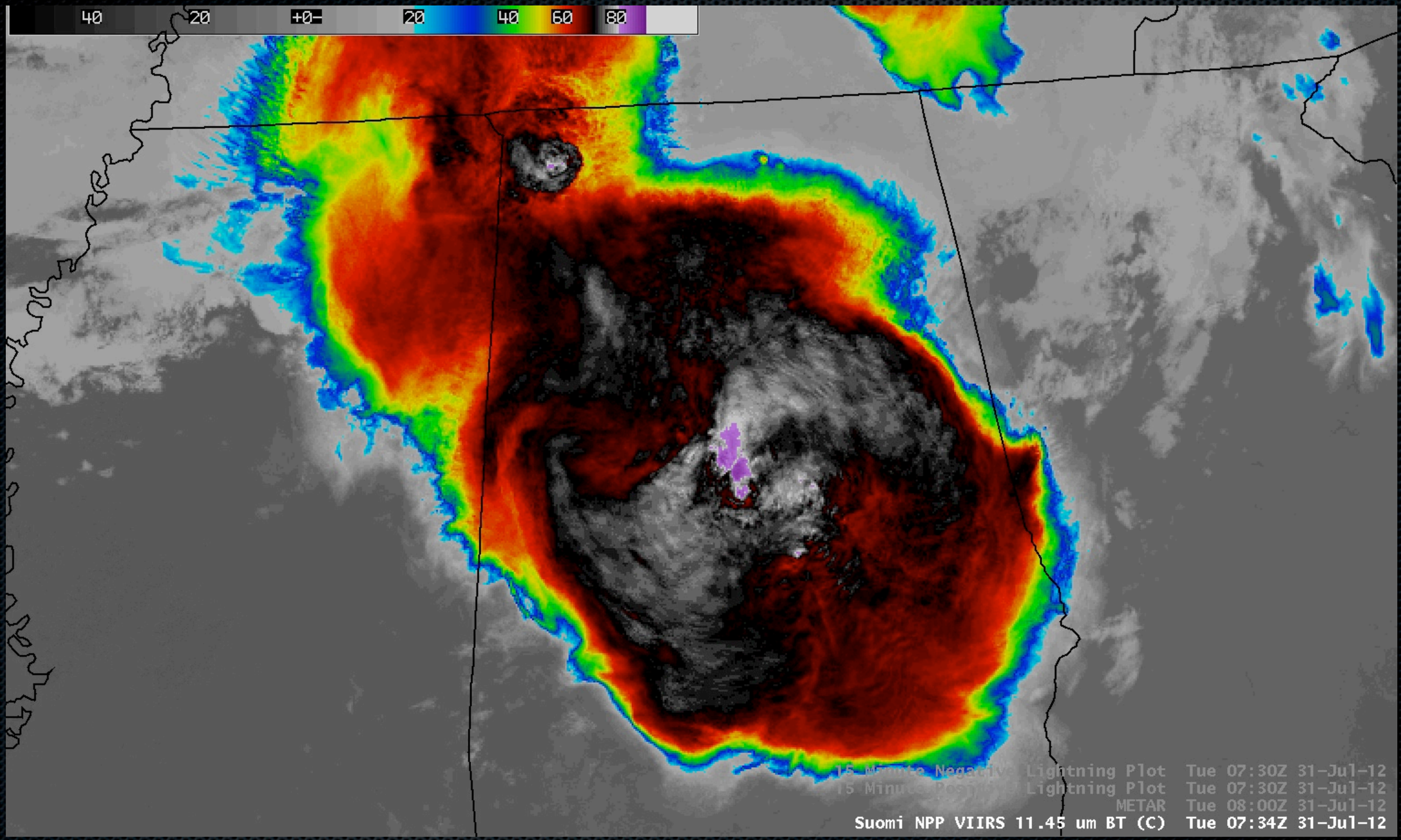
Similar to GOES 3.9 μm shortwave IR channel

Shortwave IR Channel (3.74 μm)



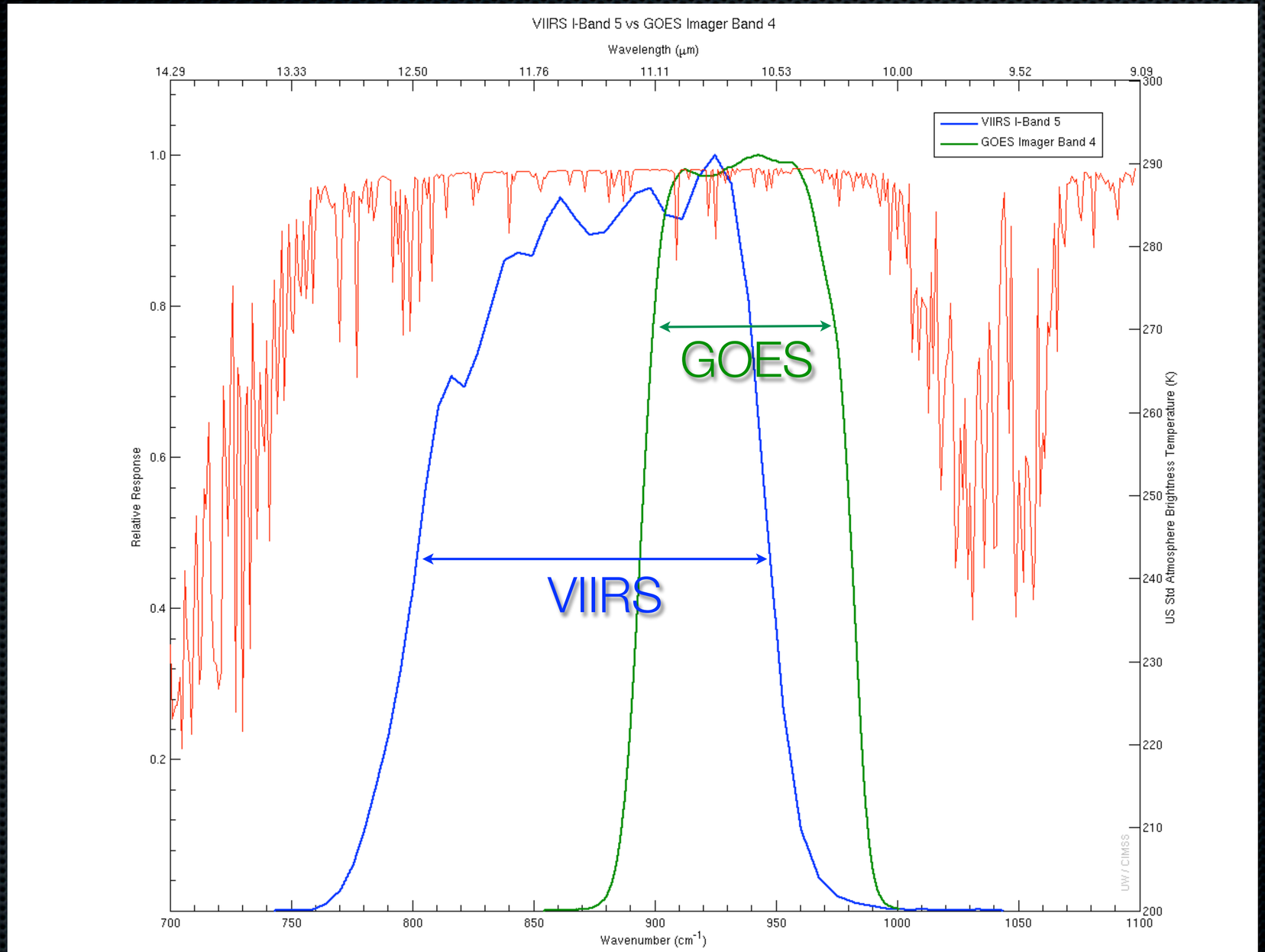
Spectrally <u>wider</u> than the GOES 3.9 μm shortwave IR channel, and shifted to shorter wavelengths

Longwave IR or “IR Window” Channel (11.45 μm)



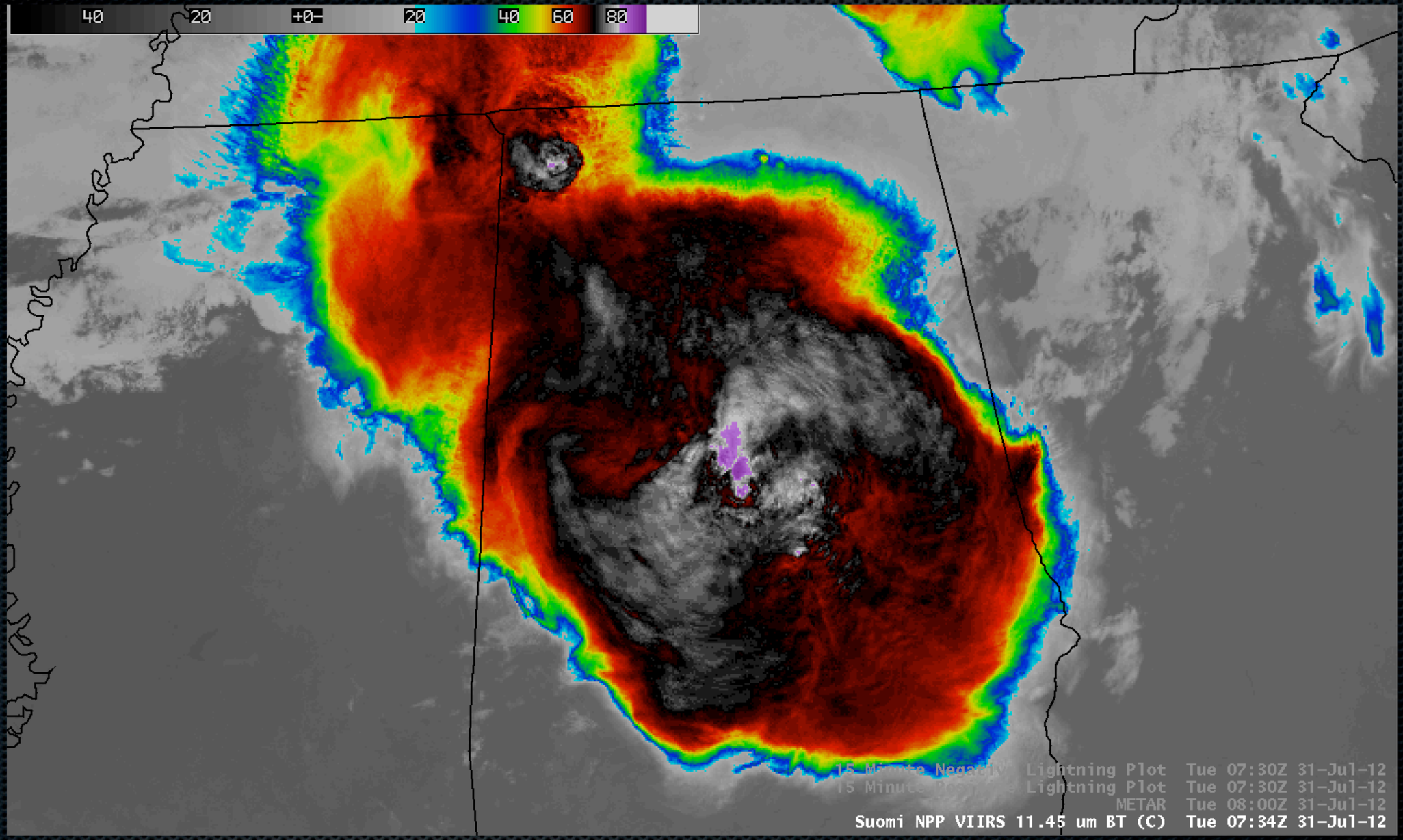
Similar to GOES 10.7 μm “IR Window” channel

Longwave IR or “IR Window” Channel (11.45 μm)



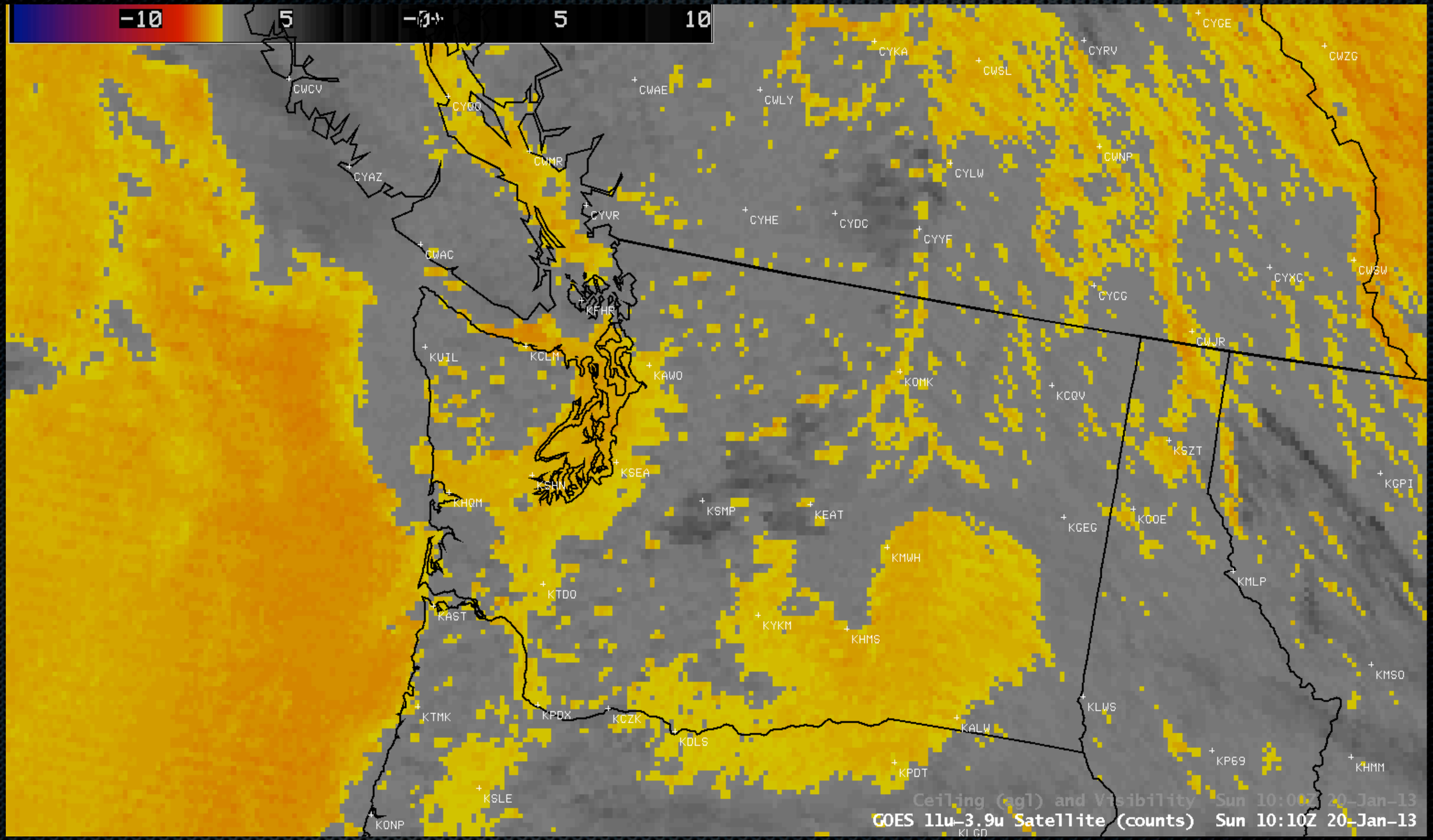
Spectrally <u>wider</u> than the GOES 10.7 μm “IR Window” band, and shifted to higher wavelengths

Longwave IR or “IR Window” Channel (11.45 μm)



Higher spatial resolution allows a more accurate analysis of the location (and colder IR brightness temperature) of convective overshooting tops

“Fog/Stratus Product” (10.80 - 3.74 µm)



Similar to GOES 11-3.9 µm fog/stratus product

VIIRS Day/Night Band (0.7 µm)

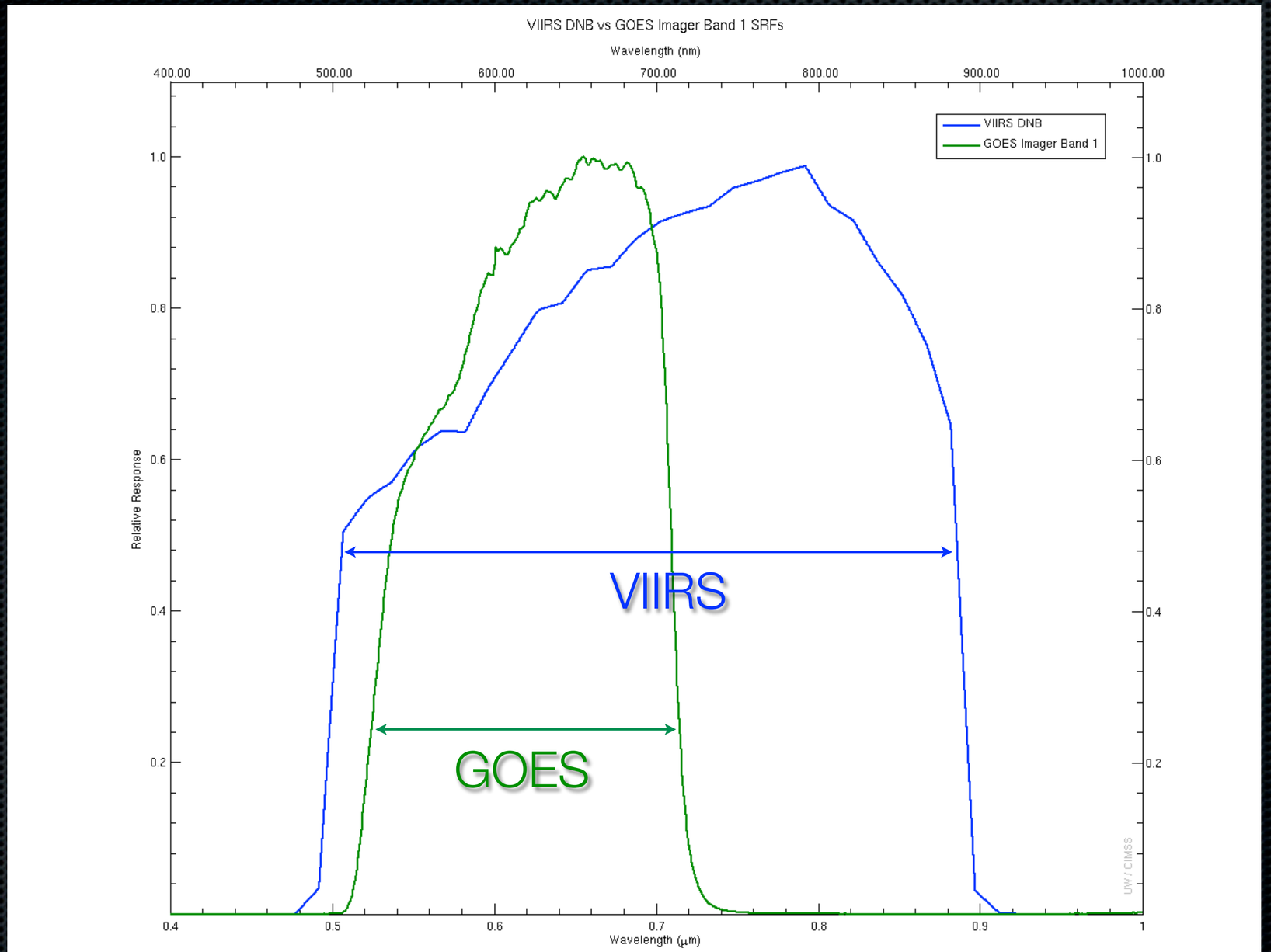
Provides a “visible image at night”, given sufficient illumination by moonlight (which is dependent upon the phase of the Moon):

- Cloud features
- Snow cover
- Smoke plumes

Also detects natural and man-made sources of light:

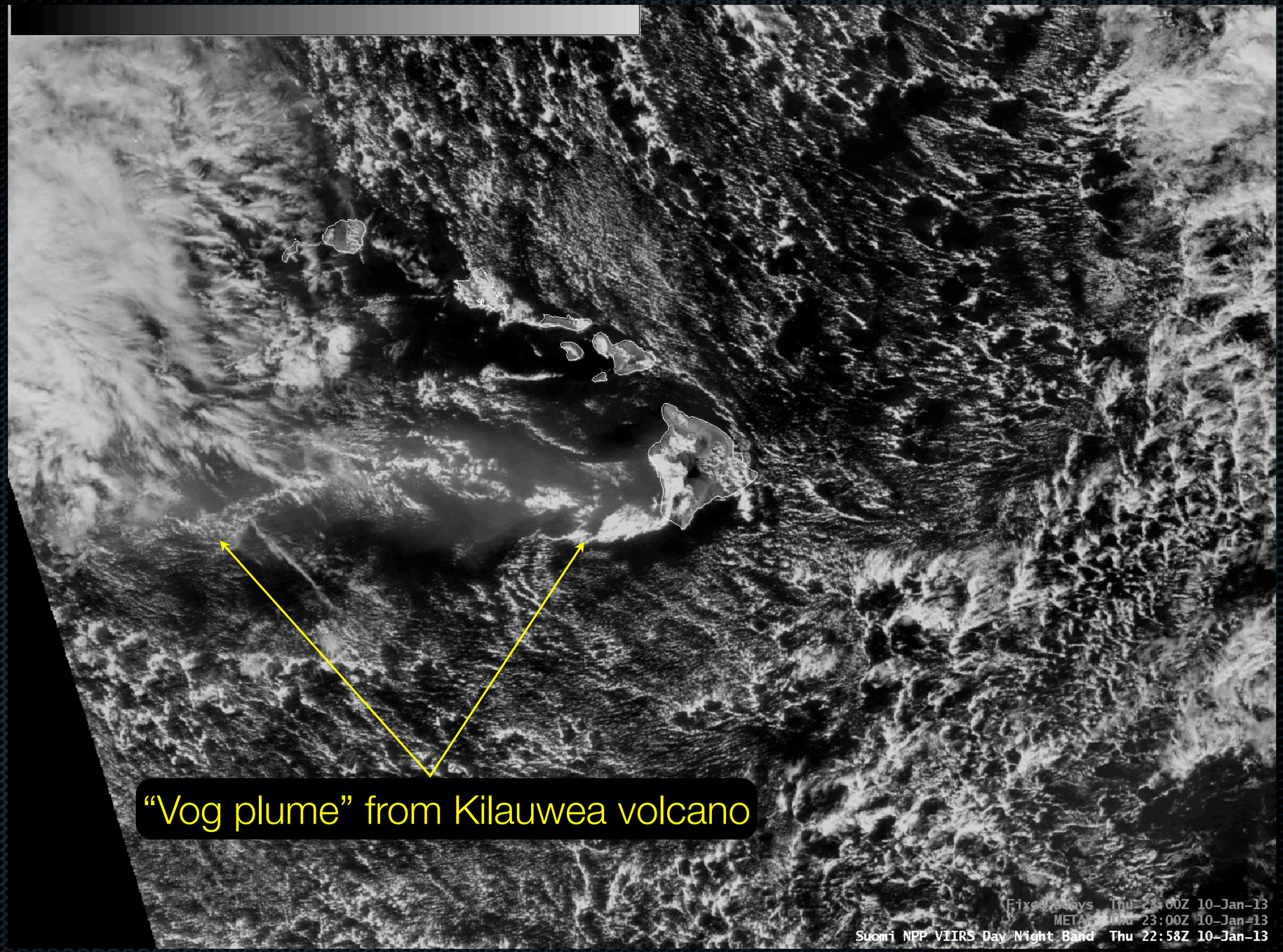
- City lights (which appear diffuse when viewed through a cloud layer)
- Aurora borealis
- Drilling activity, natural gas flares
- Fires

Day/Night Band (0.7 µm)



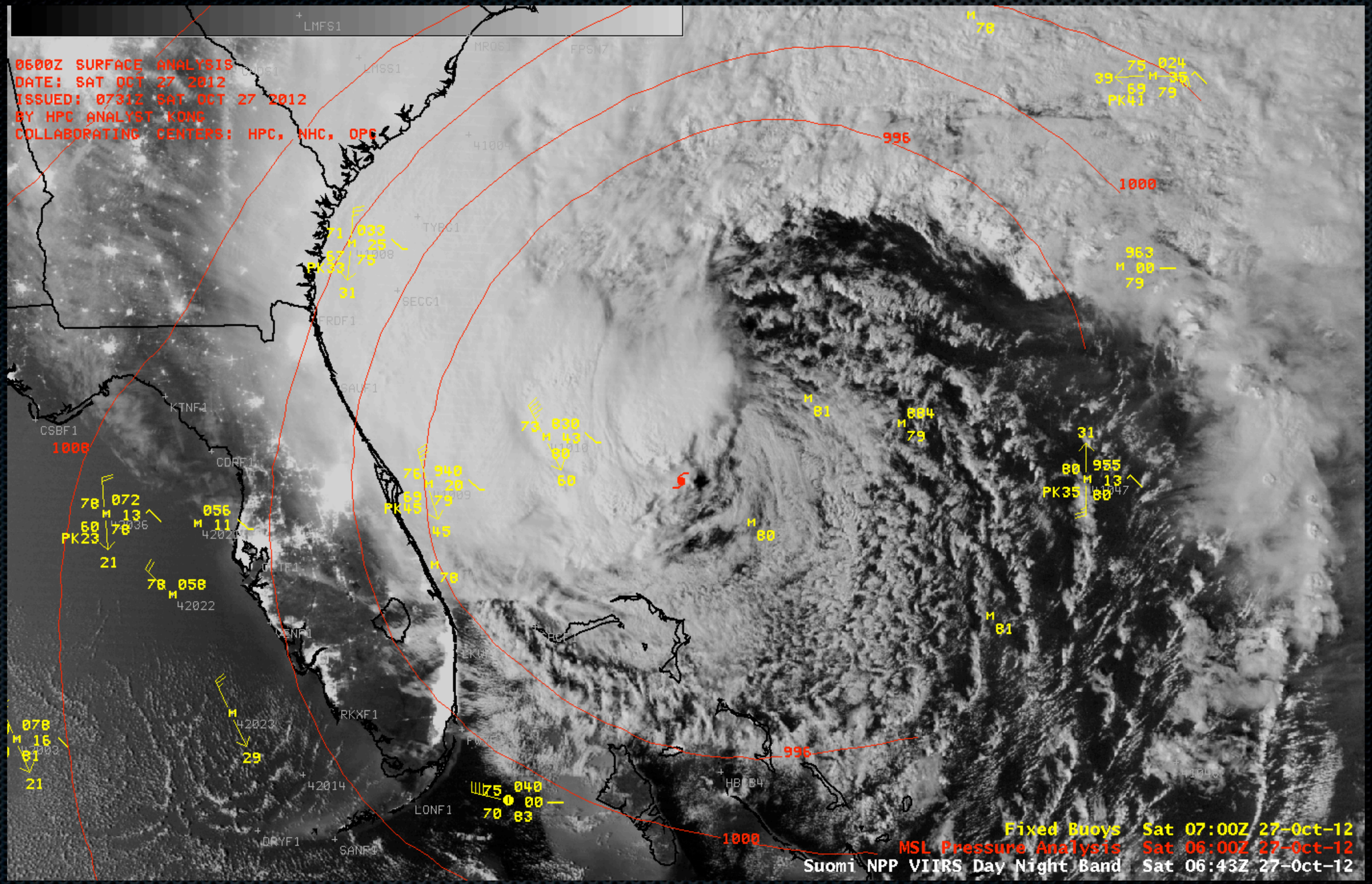
Spectrally much <u>wider</u> than the GOES 0.63 µm visible band

VIIRS Day/Night Band (0.7 µm)



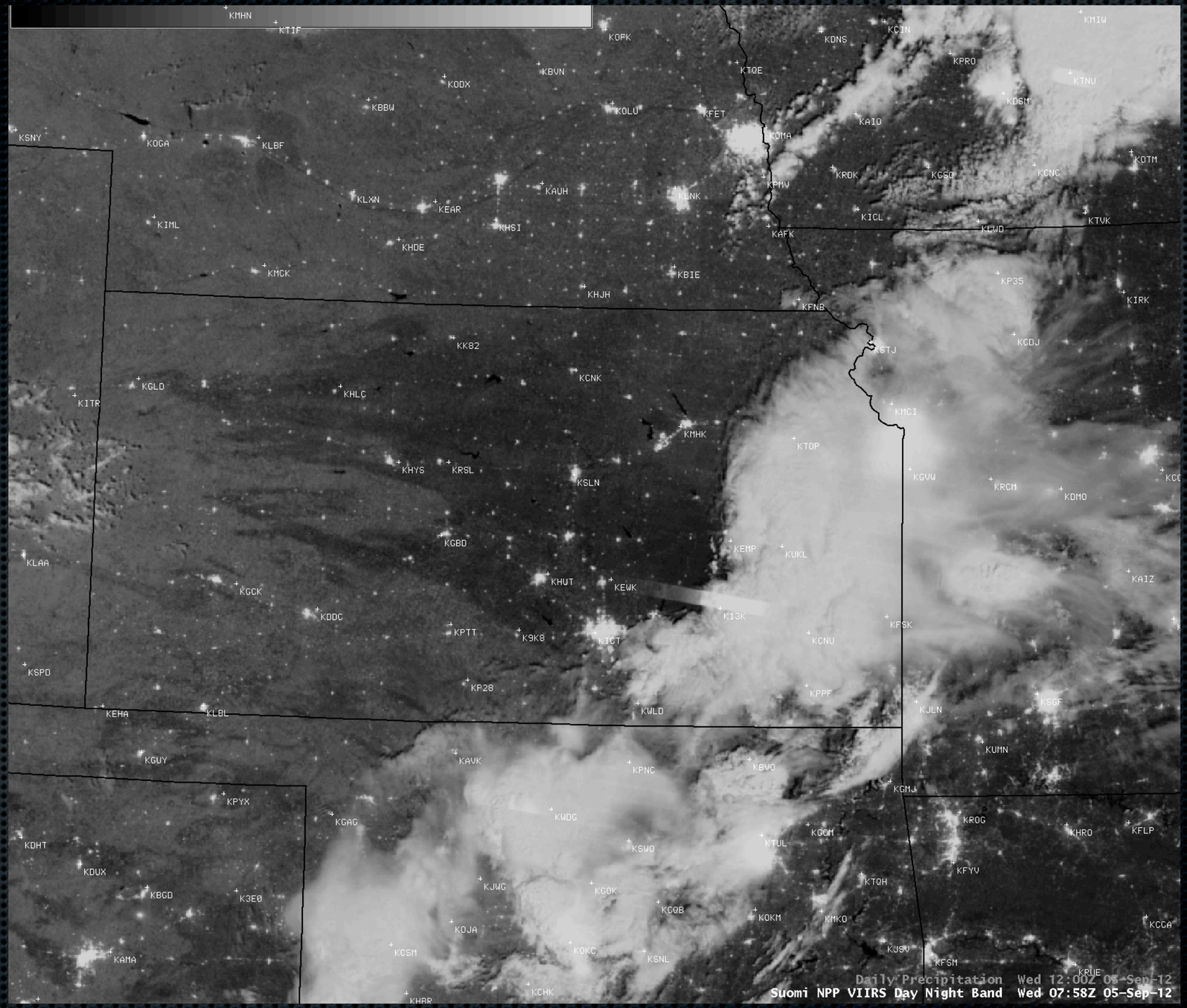
Wider spectral response than VIIRS visible channel -- more accurate aerosol plume detection

VIIRS Day/Night Band (0.7 μm)



"Visible imagery at night": Tropical Storm Sandy

VIIRS Day/Night Band (0.7 μm)

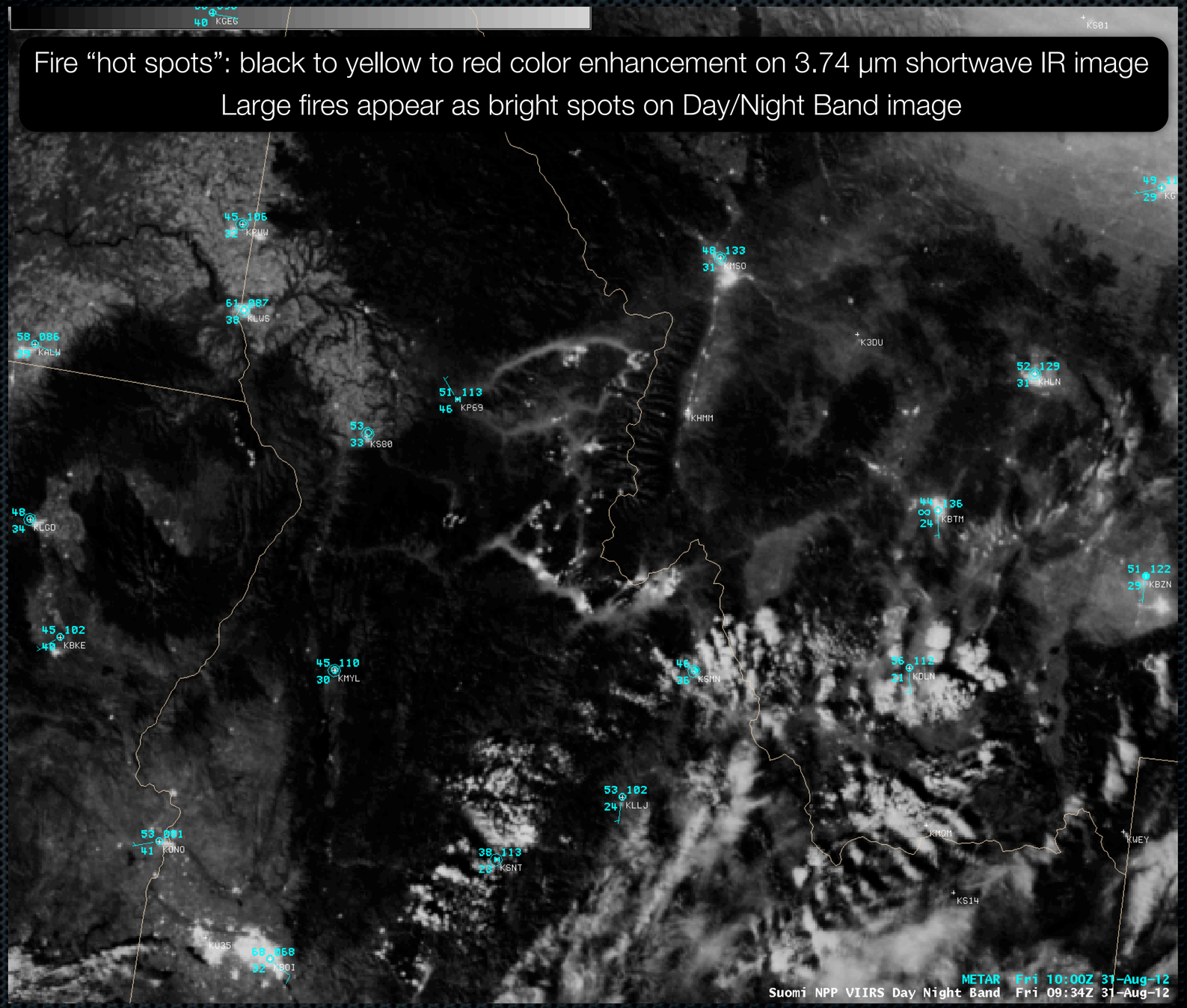


"Visible imagery at night": Swaths of wet soil surface over Kansas

VIIRS Day/Night Band (0.7 μm)

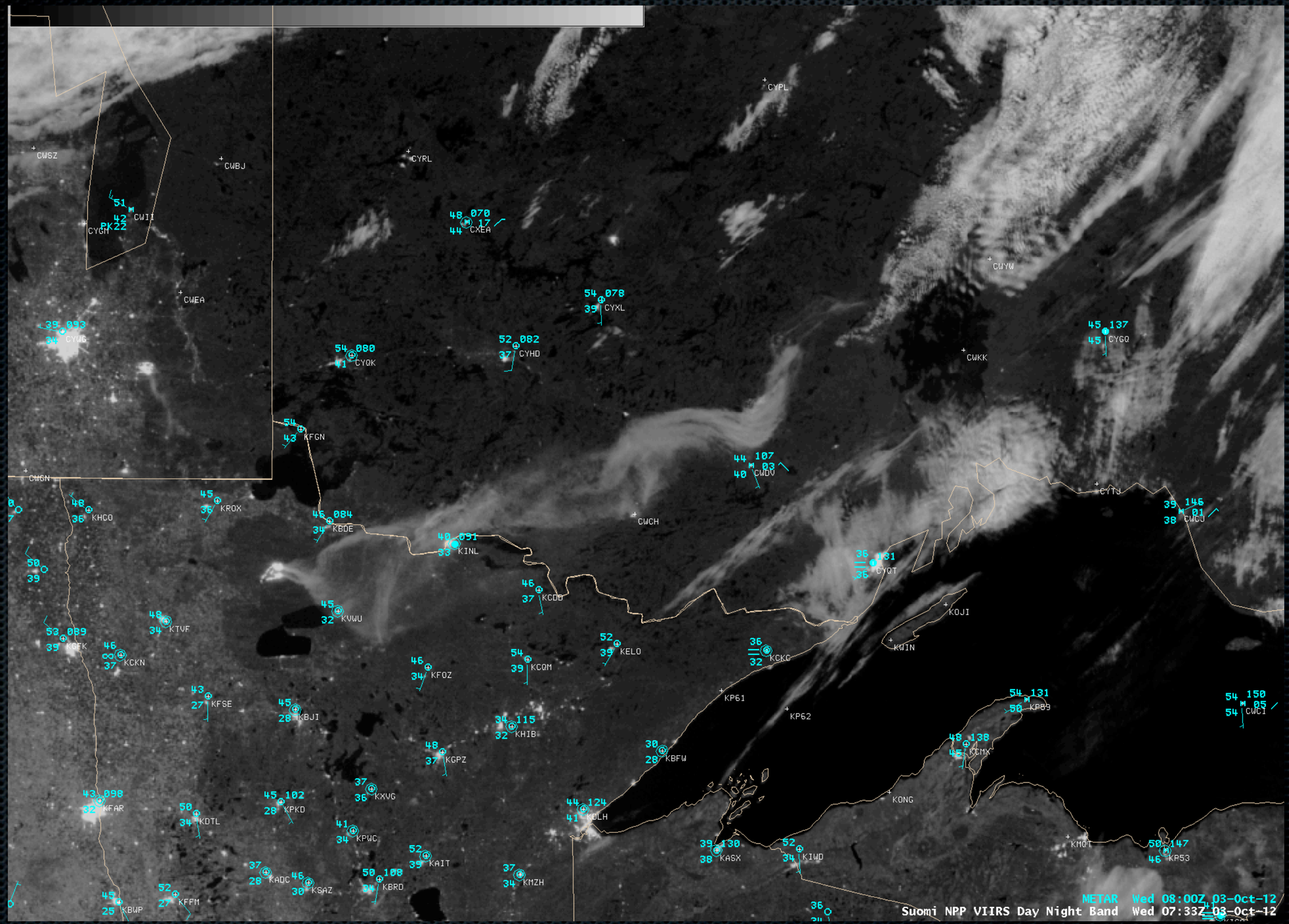
"Visible imagery at night": Smoke aloft from fires in northern Florida

VIIRS Day/Night Band (0.7 μm)



“Visible imagery at night”: Thick smoke trapped in valleys of northern Idaho

VIIRS Day/Night Band (0.7 μm)

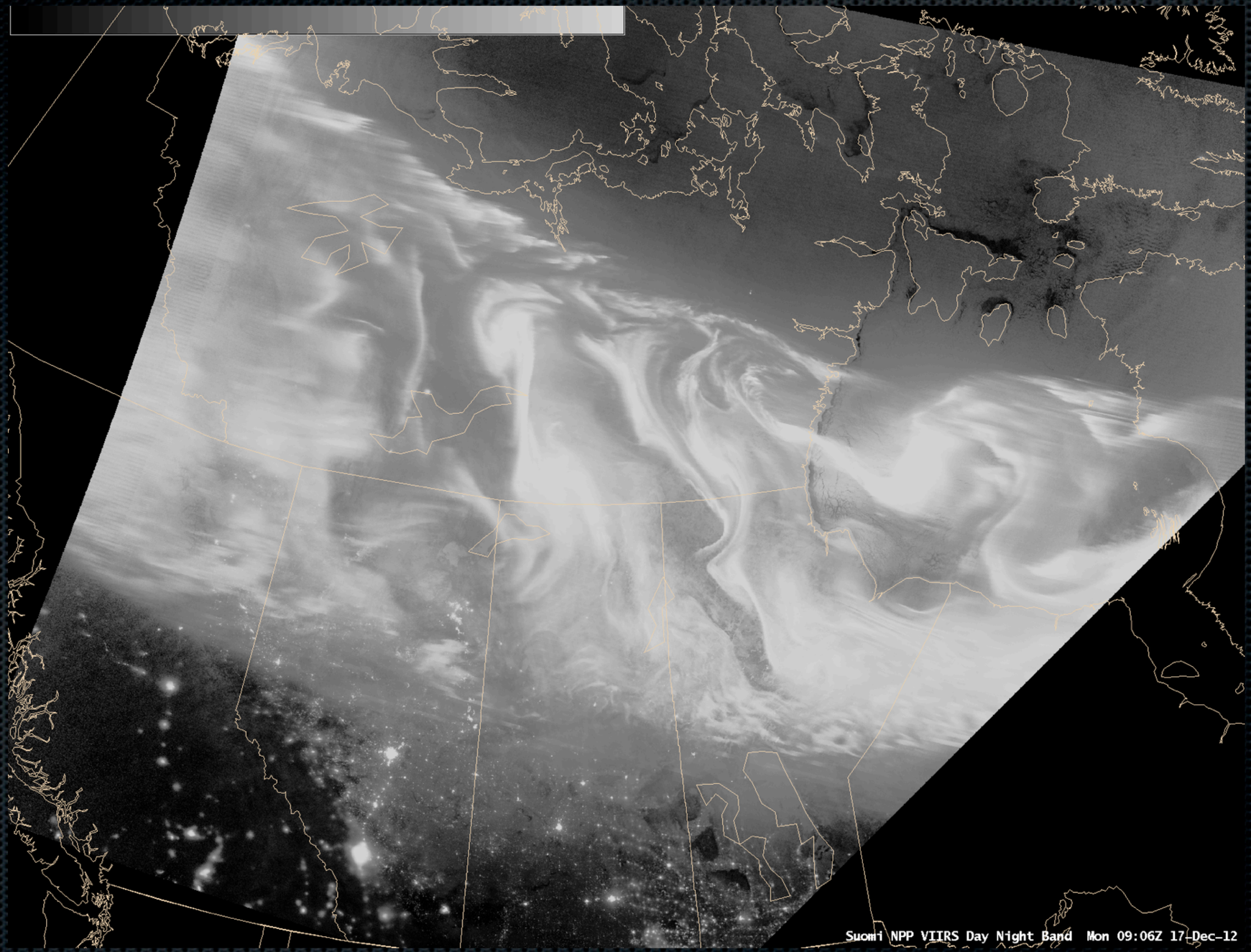


"Visible imagery at night": Thick smoke plume (smoke is transparent on IR image)

VIIRS Day/Night Band (0.7 μm)

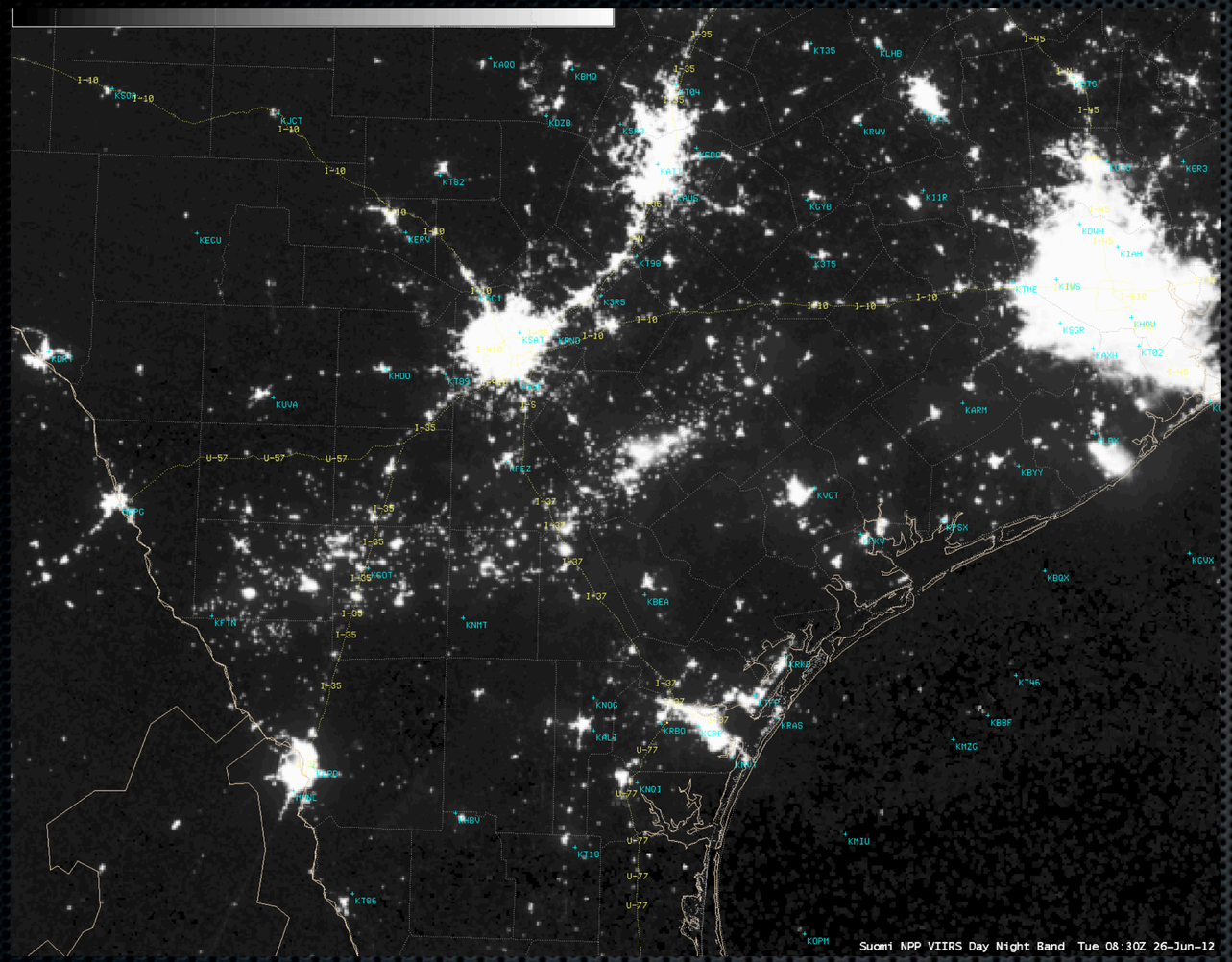
Night-time detection of cloud illumination by lightning

VIIRS Day/Night Band (0.7 µm)

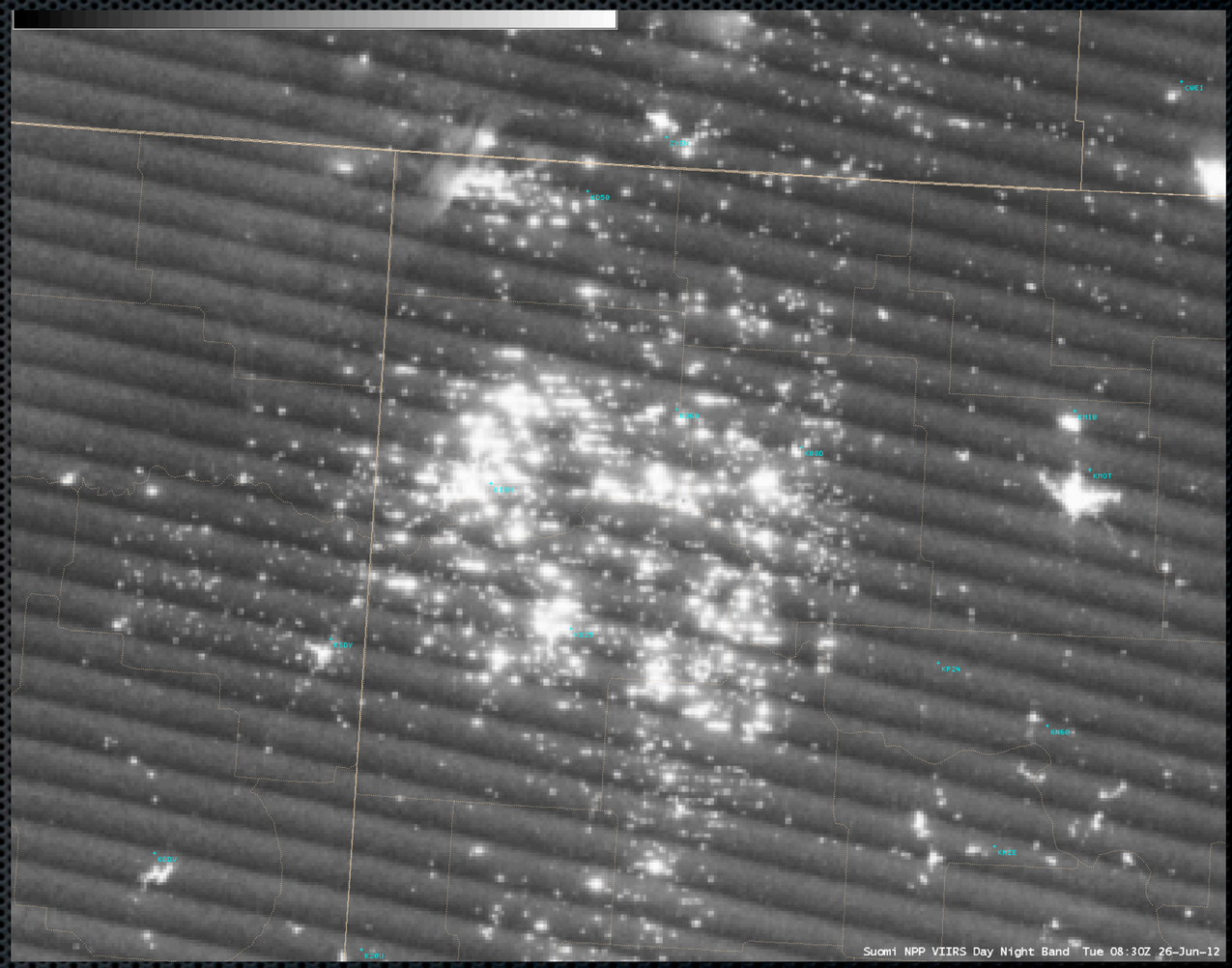


Night-time detection of aurora borealis

VIIRS Day/Night Band (0.7 µm)



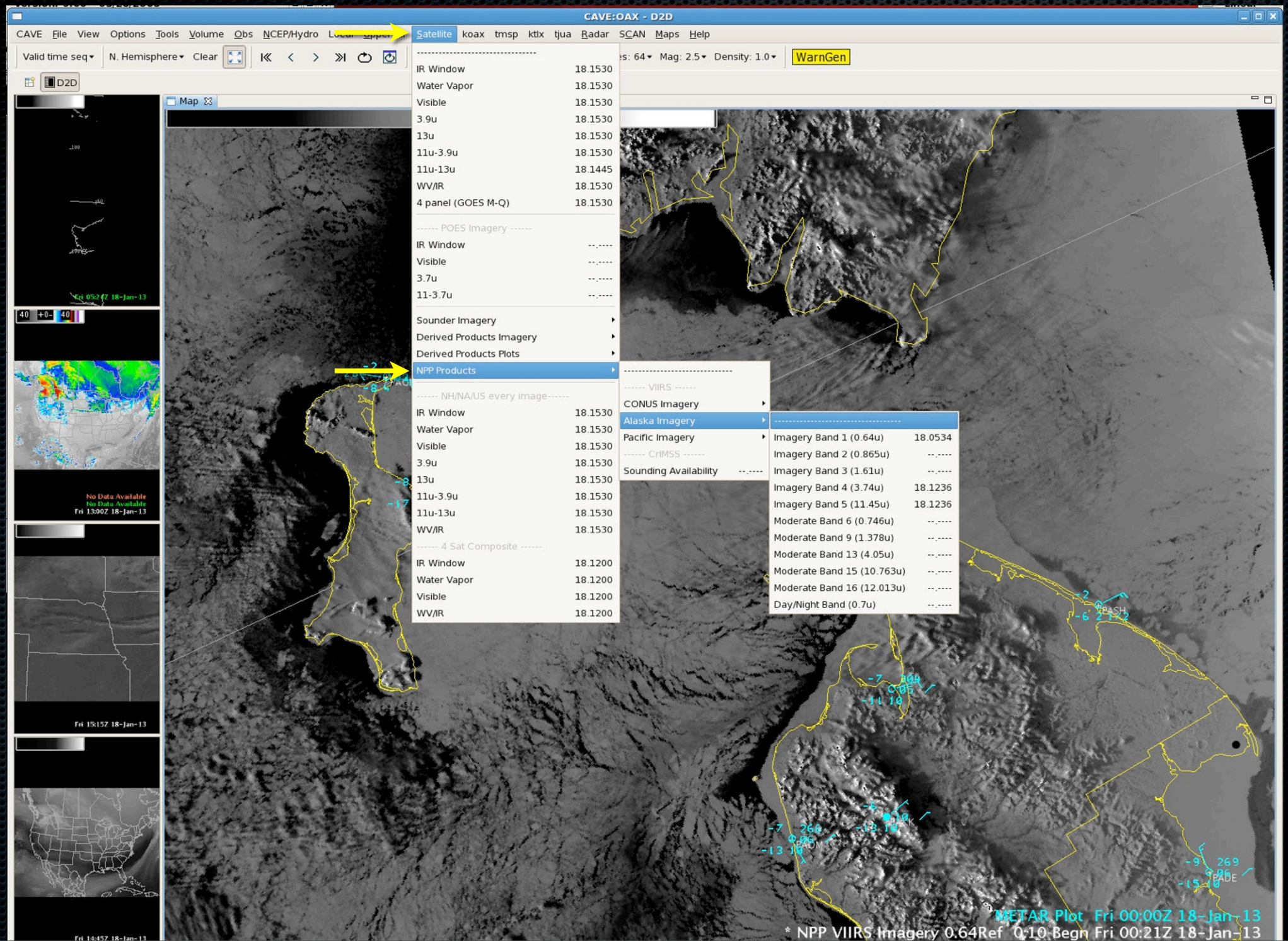
Eagle Ford formation in southern Texas



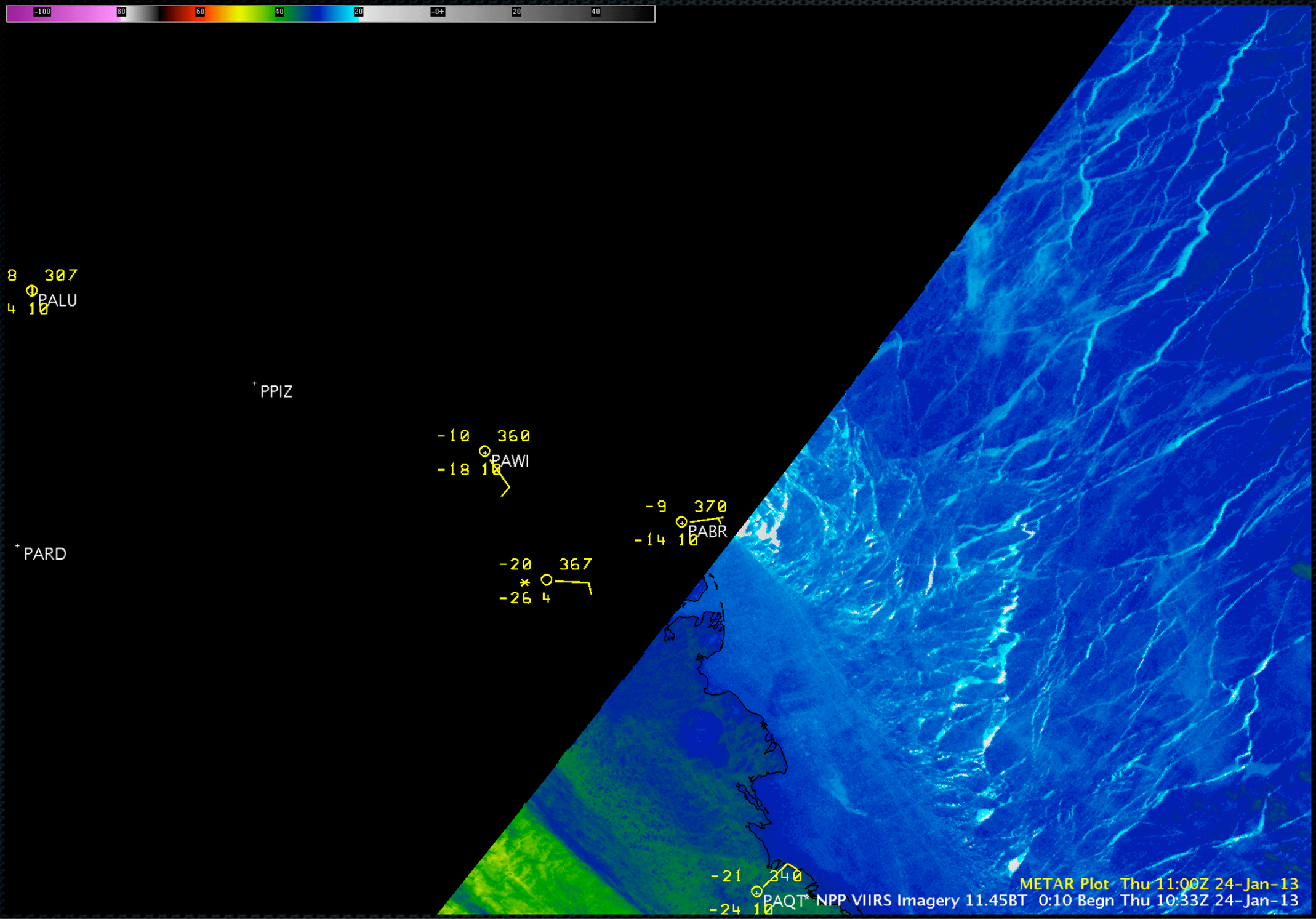
Bakken formation in North Dakota and Montana

Night-time detection of oil shale drilling activity (illuminated “man camps”, and natural gas flares)

VIIRS Imagery in AWIPS-II



VIIRS Imagery in AWIPS-II



VIIRS « CIMSS Satellite Blog

http://cimss.ssec.wisc.edu/goes/blog/archives/category/viirs

University of Wisconsin-Madison / Space Science and Engineering Center

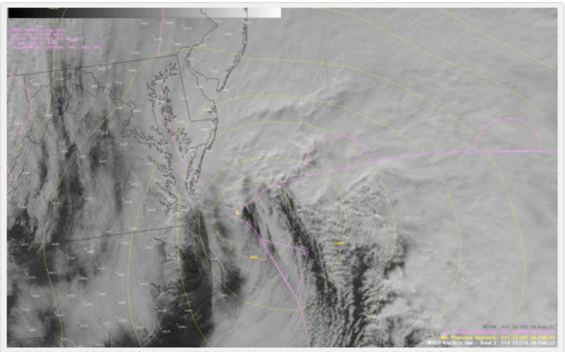
CIMSS Satellite Blog

/ CIMSS / CIMSS Satellite Blog /

Search for: VIIRS Search

Development of an intense winter storm off the US East Coast

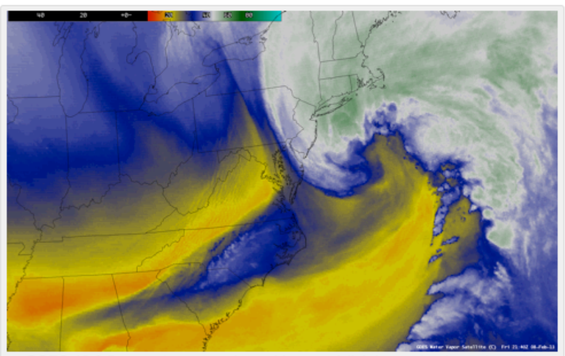
February 8th, 2013



POES AVHRR 0.86 µm, MODIS 0.65 µm, and Suomi NPP VIIRS 0.64 µm visible channel images

A winter storm began to intensify just off the East Coast of the US on 08 February 2013. A sequence of 1-km resolution POES AVHRR 0.86 µm, MODIS 0.65 µm, and Suomi NPP VIIRS 0.64 µm visible channel images ***(above)*** revealed the formation of gravity waves in the lower-tropospheric cloud field within the southwest quadrant of the area of low pressure (corresponding IR images).

GOES-13 4-km resolution 6.5 µm water vapor channel images ***(below; click image to play animation)*** showed a very well-defined dry slot and the development of a distinct comma head. Strong northwesterly winds were also causing mountain waves to the lee of the Appalachians.



GOES-13 6.5 µm water vapor channel images (click image to play animation)

The MIMIC Total Precipitable Water (TPW) product ***(below; click image to play animation)*** showed TPW values as high as 48 mm or 1.9 inches being drawn northward into the intensifying low.

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- CIMSS "Satellite Proving Ground"
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- Mobile users
- POES/AVHRR in AWIPS
- SatePedia
- Suomi NPP / JPSS Proving Ground
- VISIT / SHyMet Training Topics

February 2013

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25	26	27	28			

« Jan

Categories

- Air quality
- Antarctic
- Arctic
- AVHRR
- Aviation
- AWIPS II
- Calibration/Anomalies
- Cloud-Top Cooling
- Convective Initiation
- Fire detection
- Fog detection
- General interpretation
- GOES sounder
- GOES-10
- GOES-11
- GOES-12
- GOES-13
- GOES-14
- GOES-15
- GOES-R
- Google Earth
- Heavy rain / flooding
- Historical
- Hydrology
- Lightning
- Marine weather
- McIDAS-V
- Meteosat
- MODIS
- MTSAT
- Other Satellites
- POES
- Red/Green/Blue (RGB) images
- Satellite winds
- Severe convection
- Suomi NPP
- Synthetic satellite imagery
- Training
- Tropical cyclones
- VIIRS
- Volcanic activity
- Web Map Server
- What the heck is this?
- Winter weather

http://cimss.ssec.wisc.edu/goes/blog/archives/category/viirs

To view additional examples of VIIRS imagery in AWIPS, the CIMSS Satellite Blog has a “VIIRS” category