

# CHALLENGES FORECASTING AT WFO FAIRBANKS PART 2: EXAMPLES

OCONUS Satellite Proving Ground  
June 20, 2013

Melissa Kreller – NWS Fairbanks  
Eric Stevens – UAF/GINA

*Ice Fog Taken From UAF Fairbanks  
December 20, 2012*

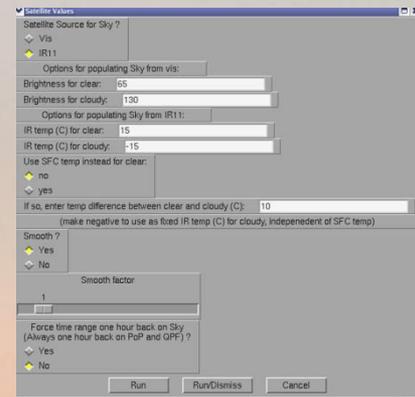
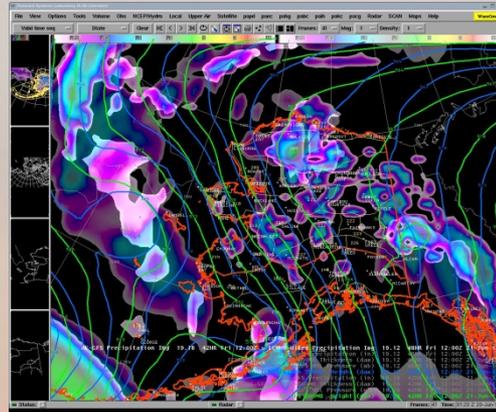
# OVERVIEW

- **Observational Limitations**
  - Maps
- **Stratus and Dense Fog**
  - March 11, 2013: North Slope Dense Fog Event
  - May 4, 2013: West Coast Dense Fog Event
  - May 9, 2013: North Slope and West Coast Stratus and Dense Fog Event
- **Sea Ice and Winter Weather**
  - May 17, 2012: Seas Ice breakup in Norton Sound
  - November 17-19, 2012: Marine Stratus on North Slope (Jiang, et al.)
- **Hydrologic – River flooding**
  - May 27-30, 2013: Fort Yukon River at Galena
  - May 28-29, 2013: Koyukuk River at Hughes and Huslia
- **Convective Weather**
  - June 4, 2012: Hail producing Thunderstorms east of Fairbanks
- **Fire Weather and Air Quality (Brader) – Smoke Plumes**
  - June 16-18, 2013: Lime Hill and Moore Creek Wildfire (Anchorage CWA)
  - June 17-19, 2013: Chisana River Wildfire

# OVERVIEW

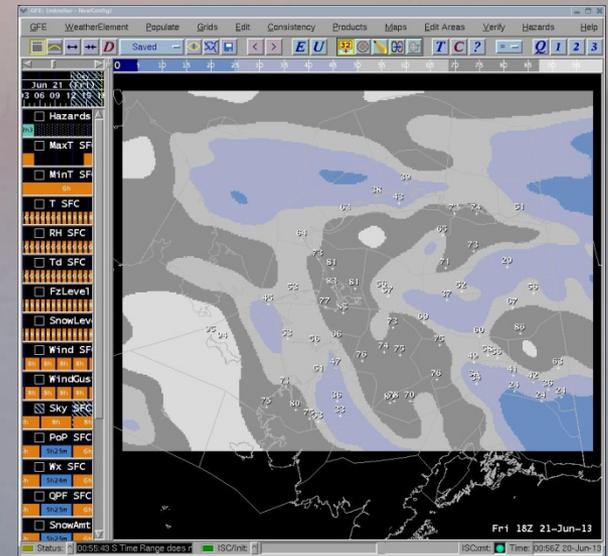


&

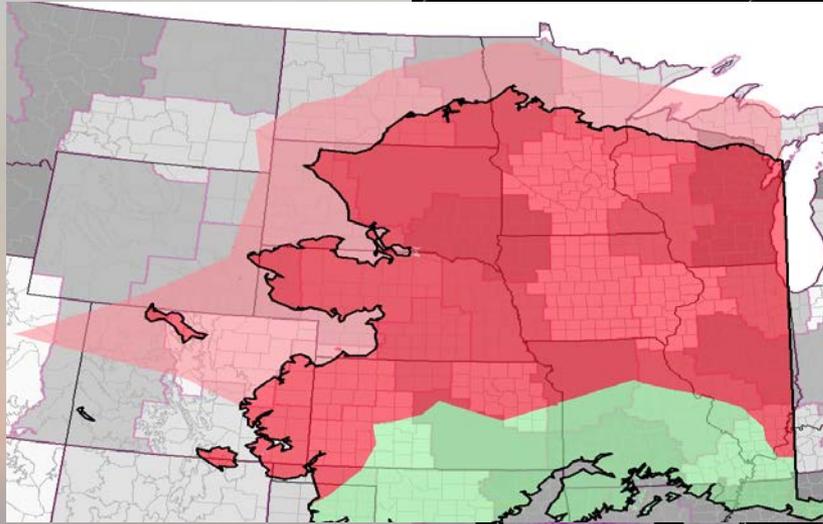


## • Forecast Process

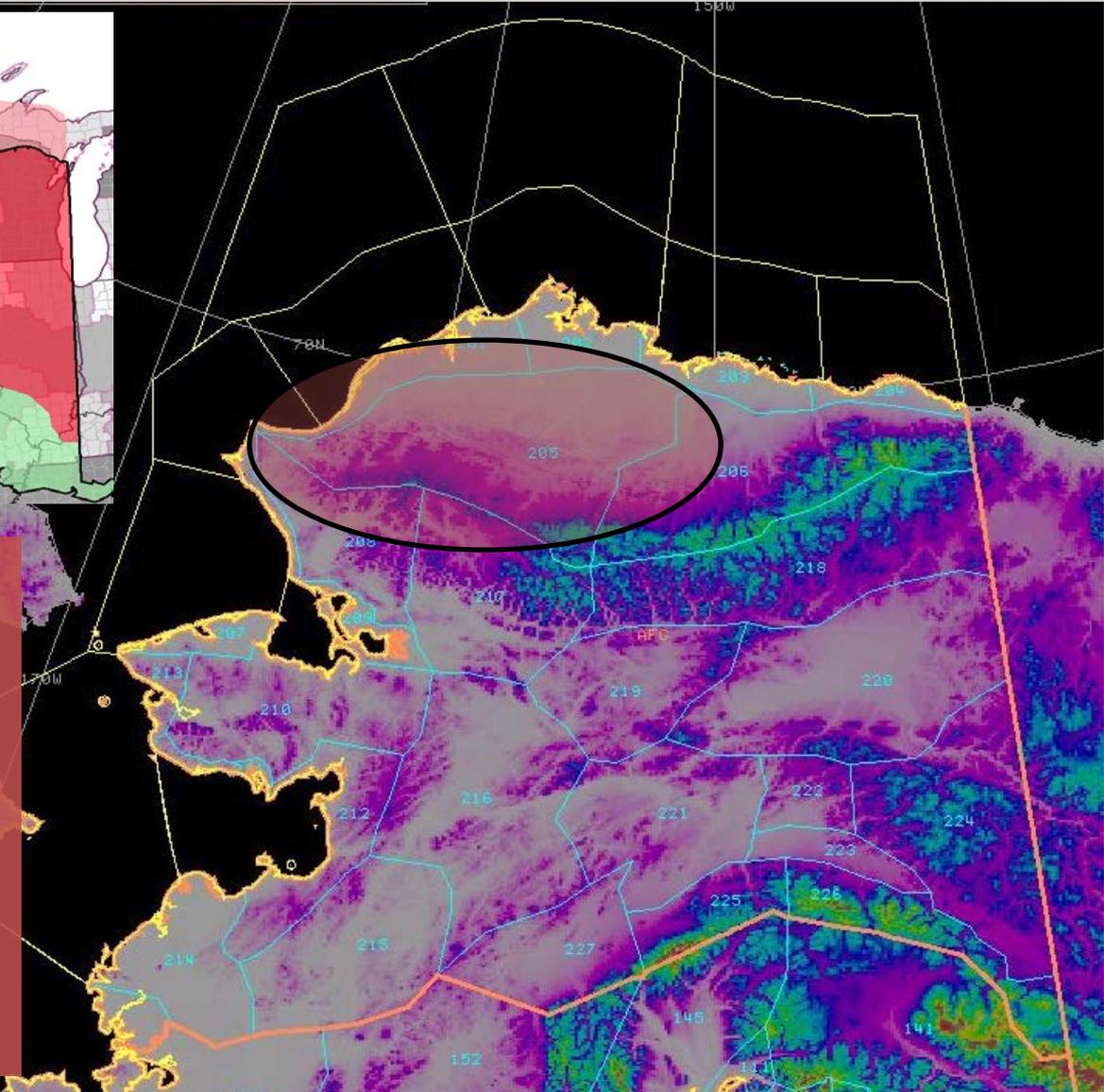
- Improve Numerical Models
- Ingest new satellite data in GFE
- Create and use GFE Smart Tools to produced better forecast product.



# OBSERVATIONAL LIMITATIONS



Public zone 205 is comparable to a medium sized CWA in the Lower 48 with only 5 RAWS sites.



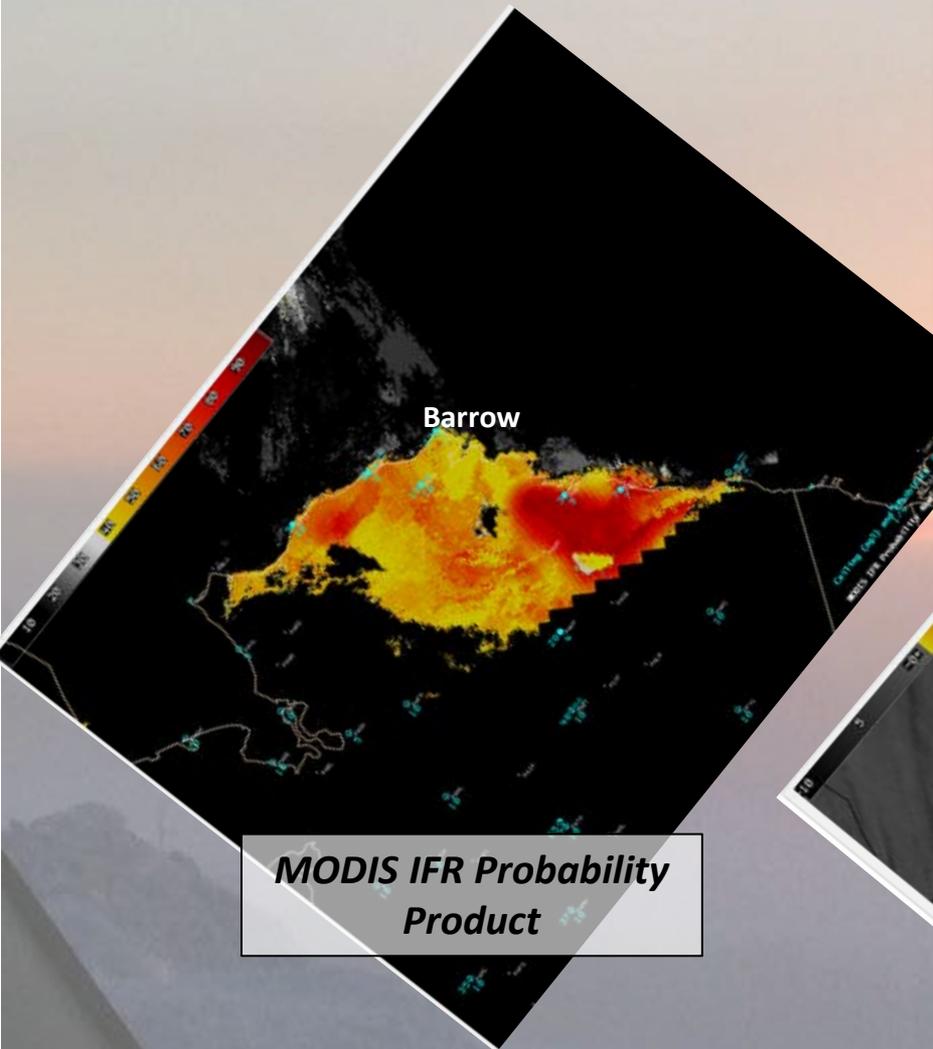
# STRATUS AND DENSE FOG

- March 11, 2013: North Slope
  - Highlight the MODIS IFR probability product and the SNPP VIIRS Fog Product
- May 4, 2013: West Coast and North Slope
  - Dense fog recorded in Public Zone 207 particularly at Shismaref (PASH) and Point Hope (PAPO).
  - Highlight images of the MODIS IFR/LIFR Probability, GOES-W IFR/LIF probability, and HRPT IR images.
- May 9, 2013: West Coast and North Slope
  - VIIRS DNB provides sensitivity to reflected moonlight over winter allowing for detection of low cloud features at night.

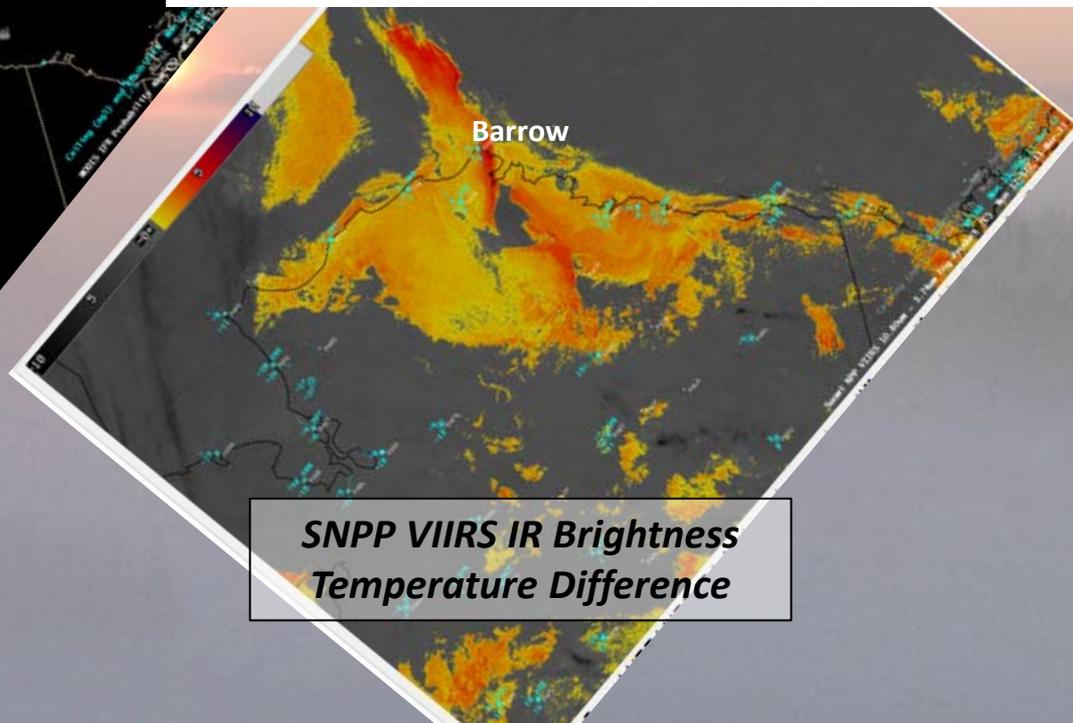
# STRATUS AND DENSE FOG

NORTHERN ALASKA FORECAST DISCUSSION  
NATIONAL WEATHER SERVICE FAIRBANKS AK  
1258 PM AKDT MON MAR 11 2013

NORTH SLOPE...THE SUOMI NPP VIIRS SATELLITE FOG PRODUCT WAS INDICATING A DECENT LAYER OF STRATUS ALONG THE NORTH SLOPE. OBSERVATIONS ACROSS THE AREA GENERALLY INDICATED 1 TO 2 MILES IN VISIBILITY WITH FLURRIES AND FOG. THE IFR CONDITIONS ALIGN VERY WELL WITH THE HIGHER PROBABILITIES OF MODIS IFR PRODUCT. THERE ARE SOME VERY ISOLATED POCKETS OF HIGHER PROBABILITIES OF THE MODIS IFR CONDITIONS. THESE CONDITIONS SHOULD REMAIN THROUGH TUESDAY EVENING OR WEDNESDAY MORNING AS THE SURFACE HIGH PRESSURE REMAINS WITHIN THE AREA. BY WEDNESDAY MORNING THE SURFACE PRESSURE GRADIENT BEGINS TO TIGHTEN...PROVIDING AN INCREASE IN WINDS AND PERHAPS A BREAK IN SOME OF THE FOG.

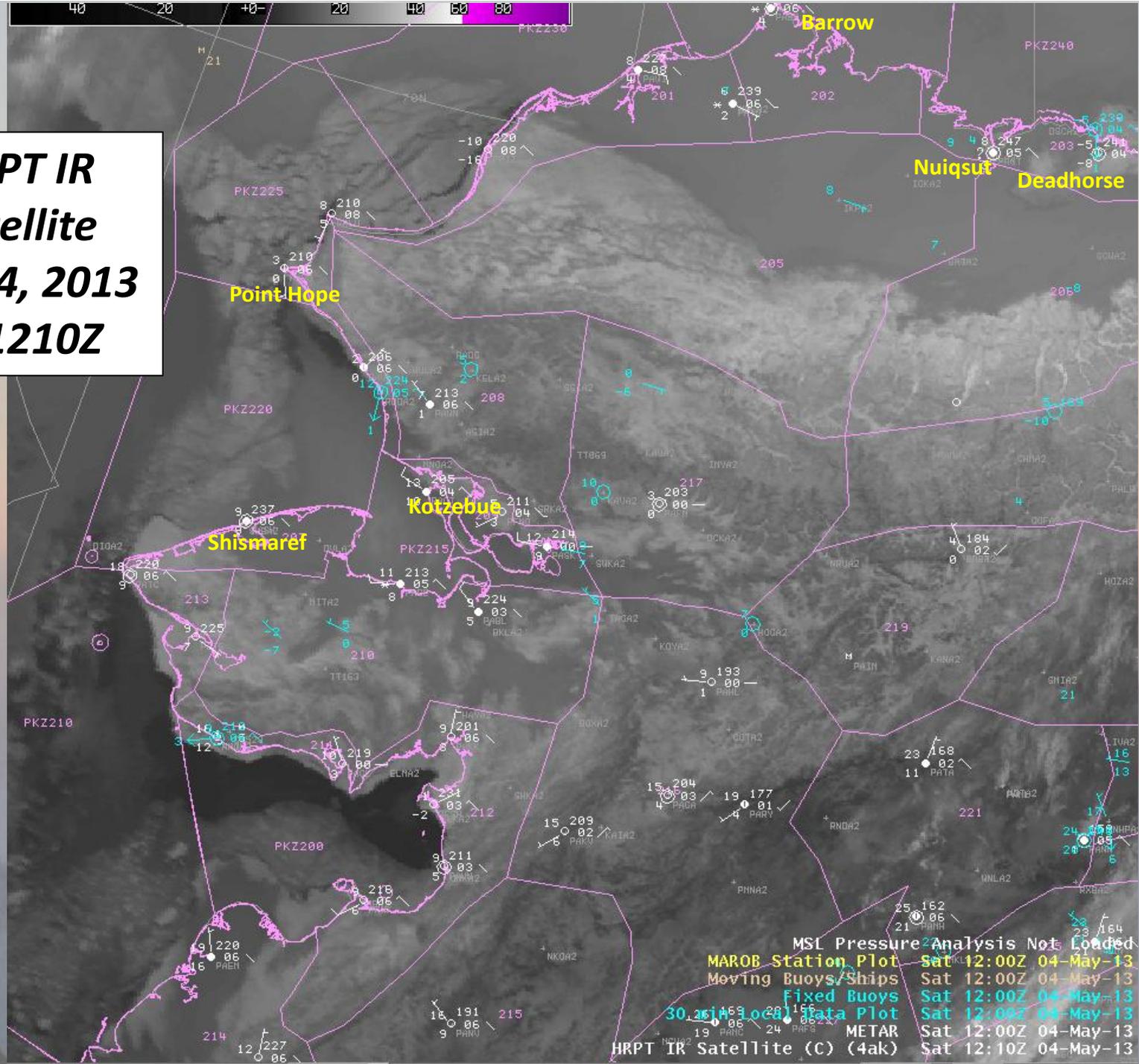


**MODIS IFR Probability Product**

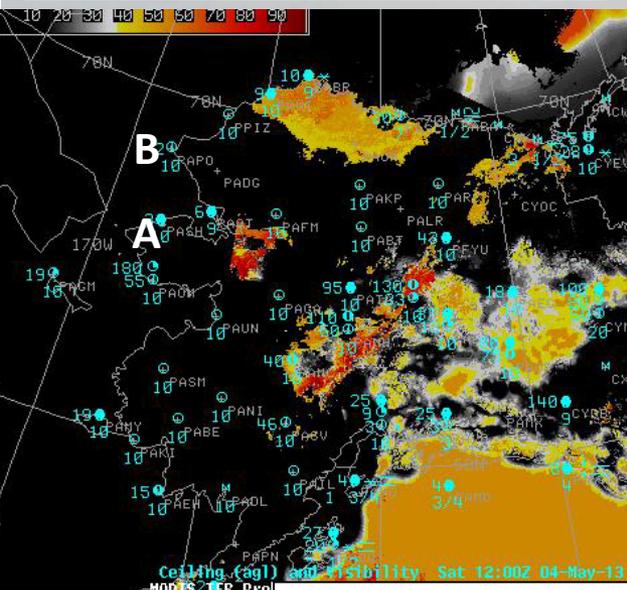


**SNPP VIIRS IR Brightness Temperature Difference**

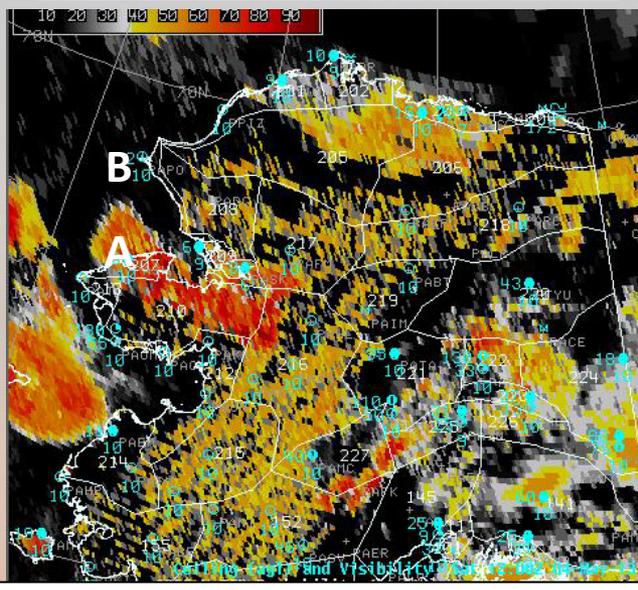
**HRPT IR  
Satellite  
May 4, 2013  
at 1210Z**



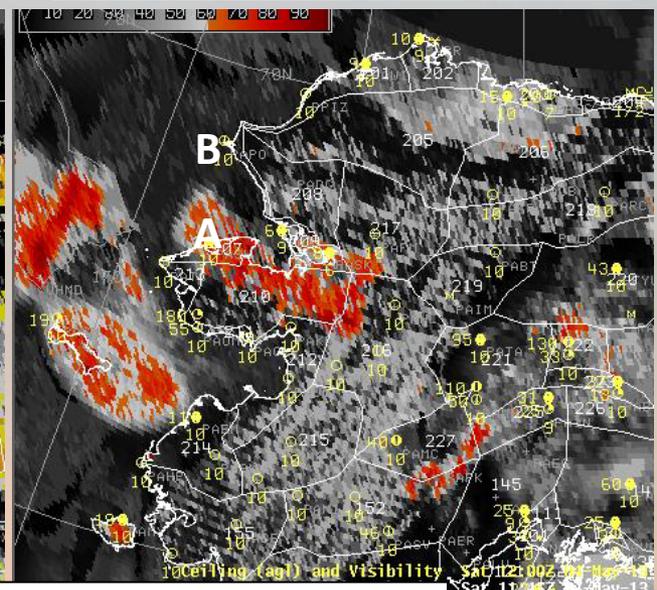
**MODIS IFR Prob**



**GOES-W IFR Prob - Original**

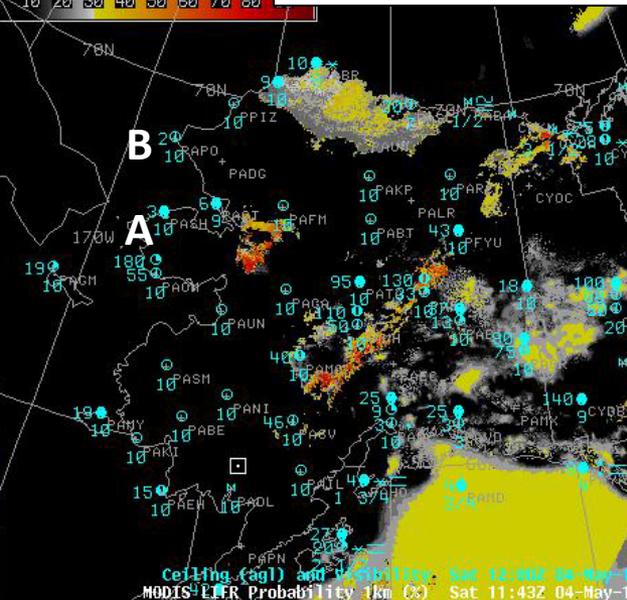


**GOES-W IFR Prob - Modified**

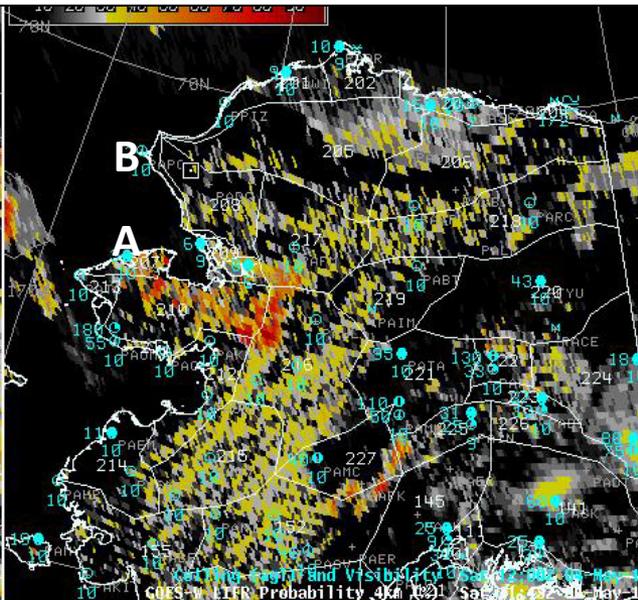


**1145Z on May 4, 2013: Shismaref (Point A) and Point Hope (Point B)**

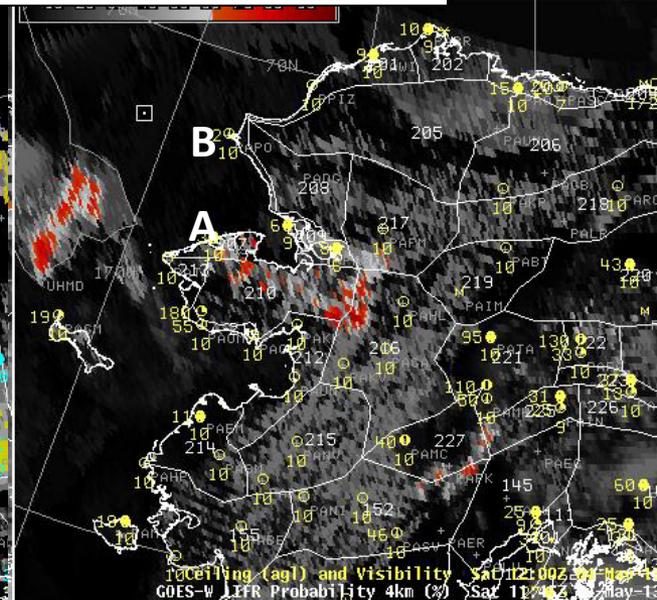
**MODIS LIFR Prob**



**GOES-W LIFR Prob - Original**



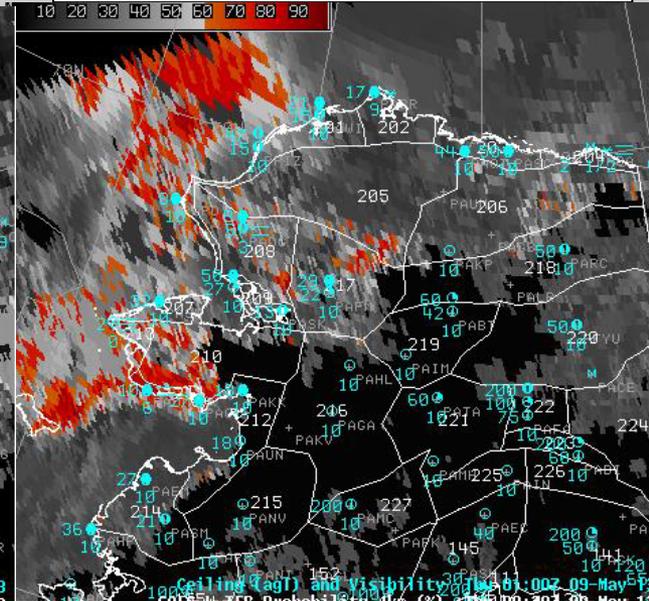
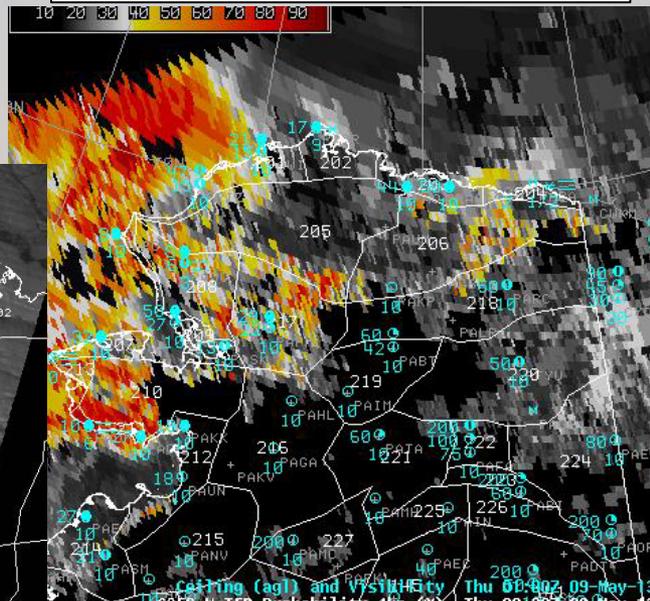
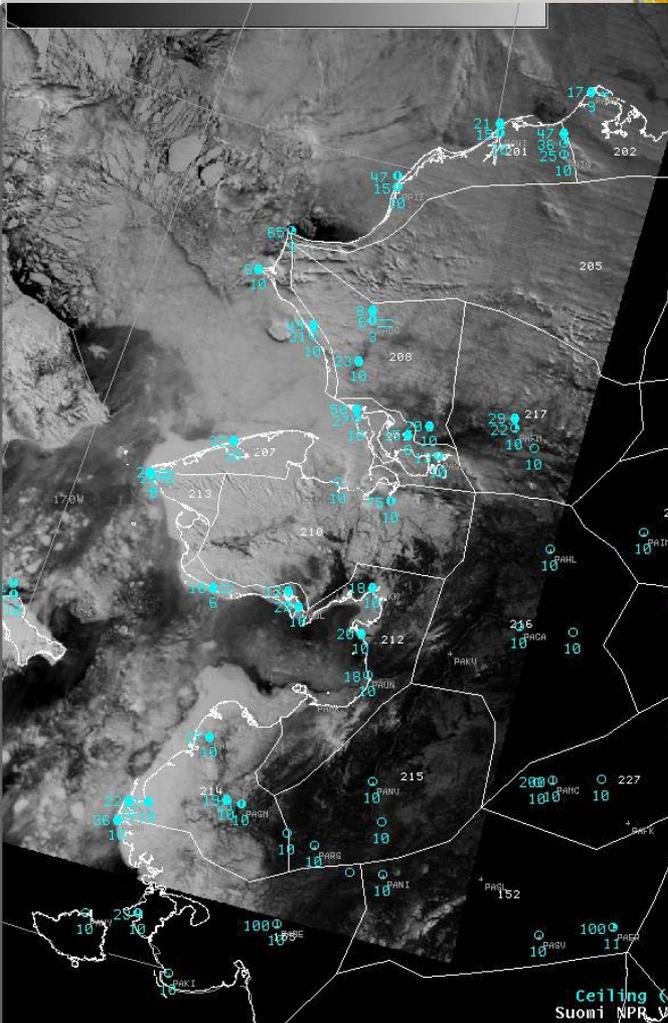
**GOES-W LIFR Prob - Modified**



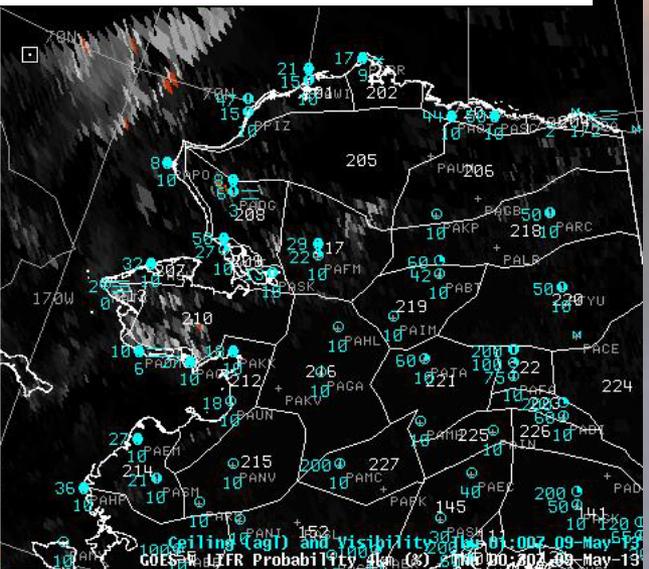
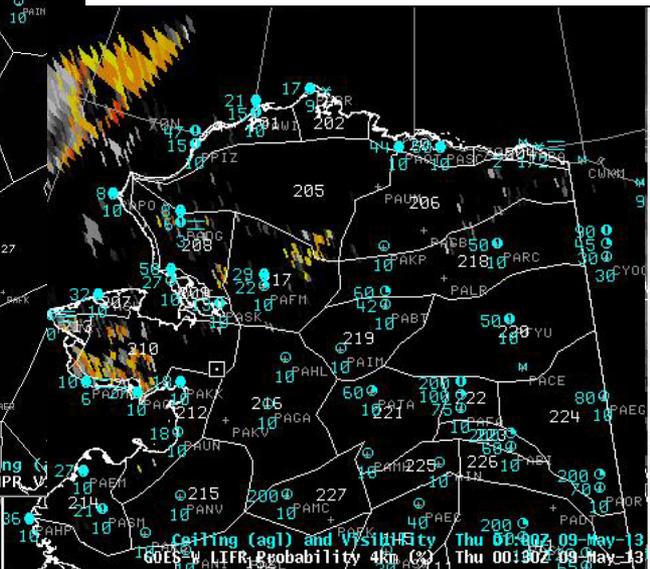
**GOES-W IFR Prob - Original**

**GOES-W IFR Prob - Modified**

**SNPP VIIRS DNB**



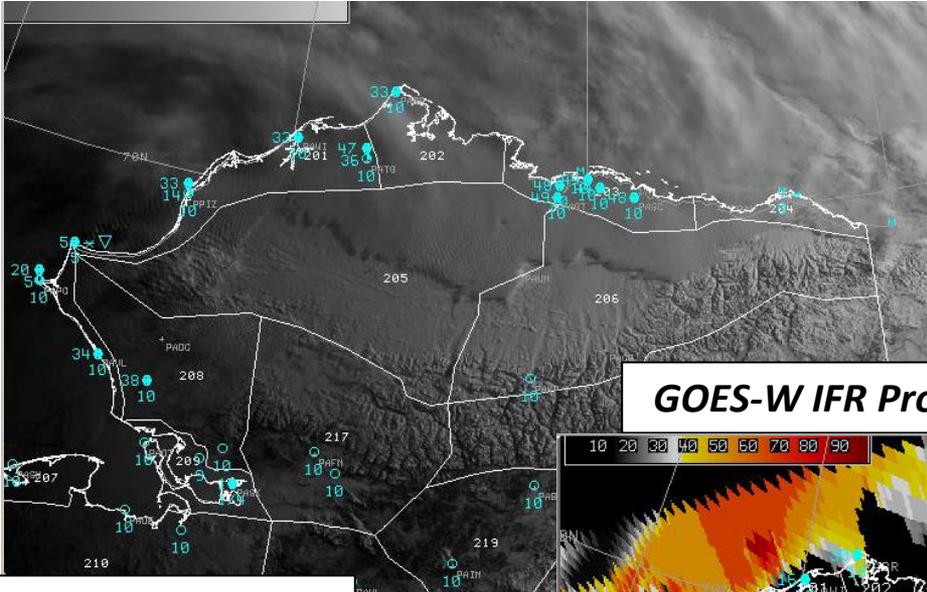
**0030Z on May 9, 2013**



**GOES-W LIFR Prob - Original**

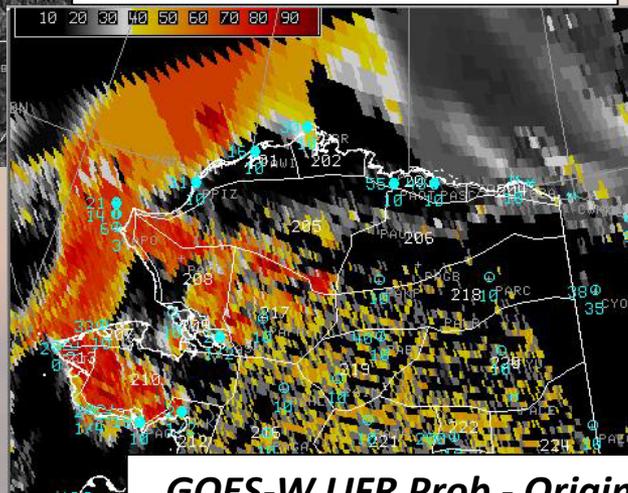
**GOES-W LIFR Prob - Modified**

**1430Z on May 9, 2013**

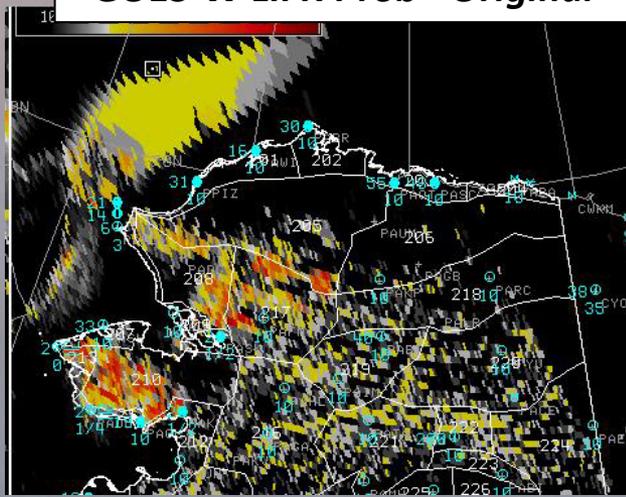


**SNPP VIIRS DNB**

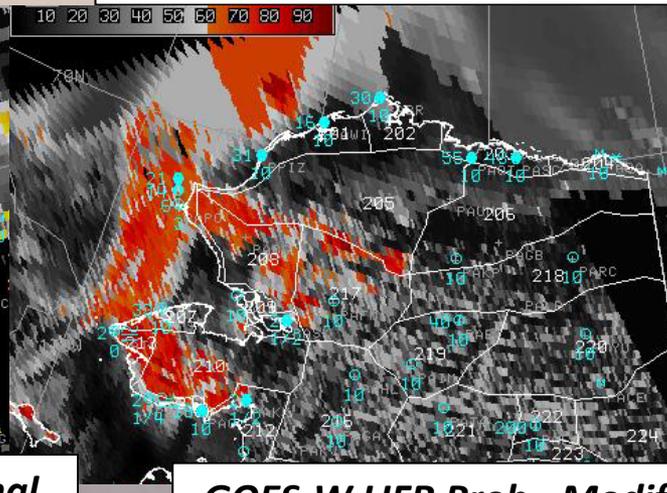
**GOES-W IFR Prob - Original**



**GOES-W LIFR Prob - Original**



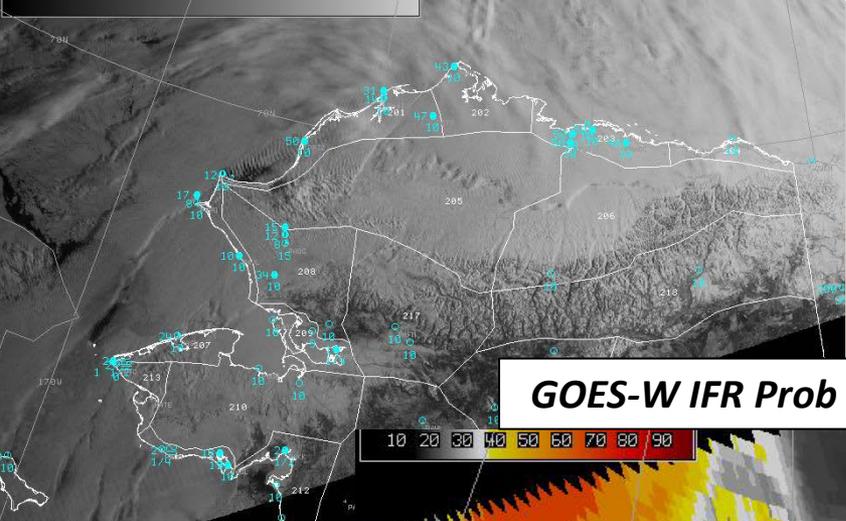
**GOES-W IFR Prob - Modified**



**GOES-W LIFR Prob - Modified**

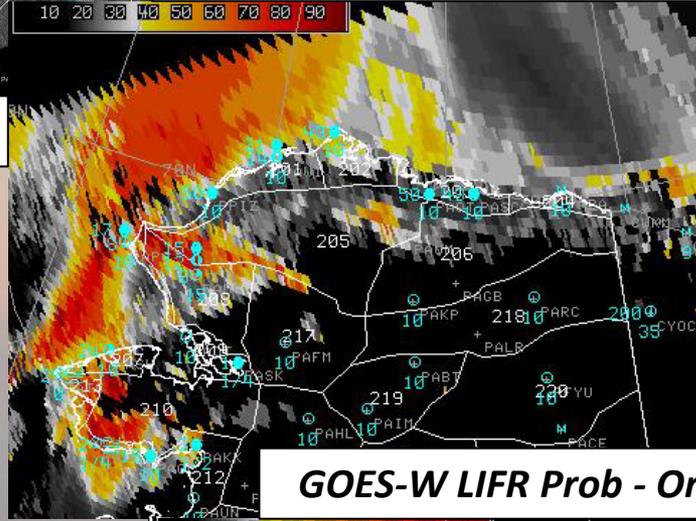


**1615Z on May 9, 2013**



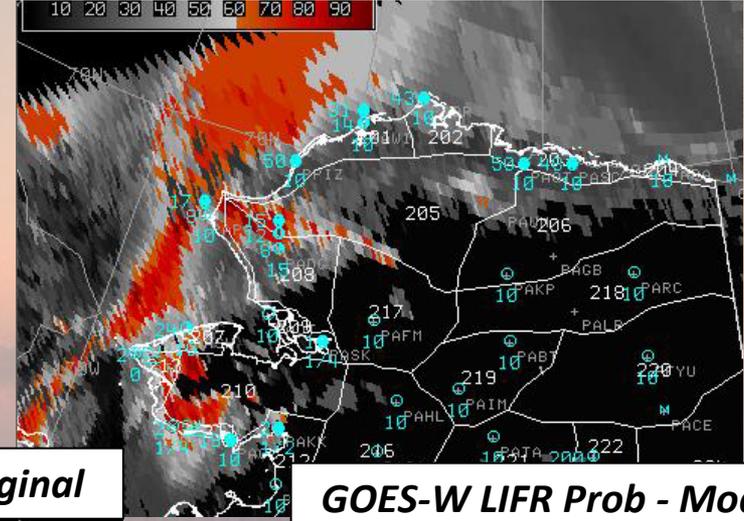
**SNPP VIIRS DNB**

**GOES-W IFR Prob - Original**



**GOES-W LIFR Prob - Original**

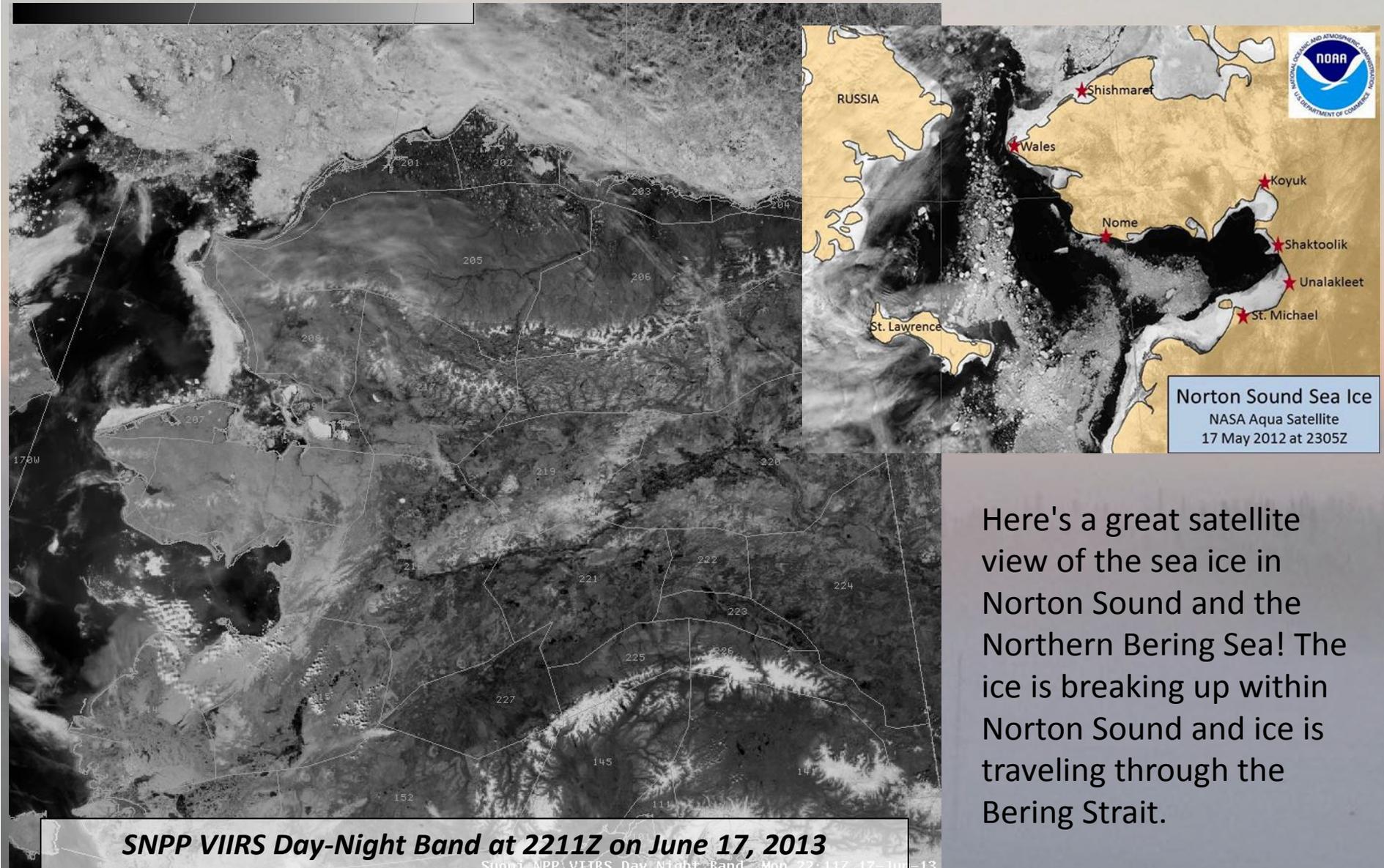
**GOES-W IFR Prob - Modified**



**GOES-W LIFR Prob - Modified**



# SEA ICE

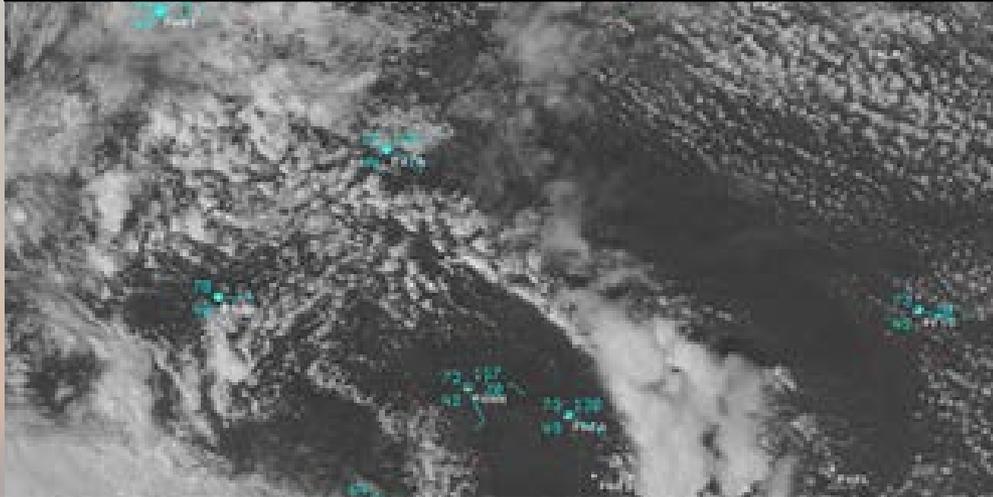


SNPP VIIRS Day-Night Band at 2211Z on June 17, 2013

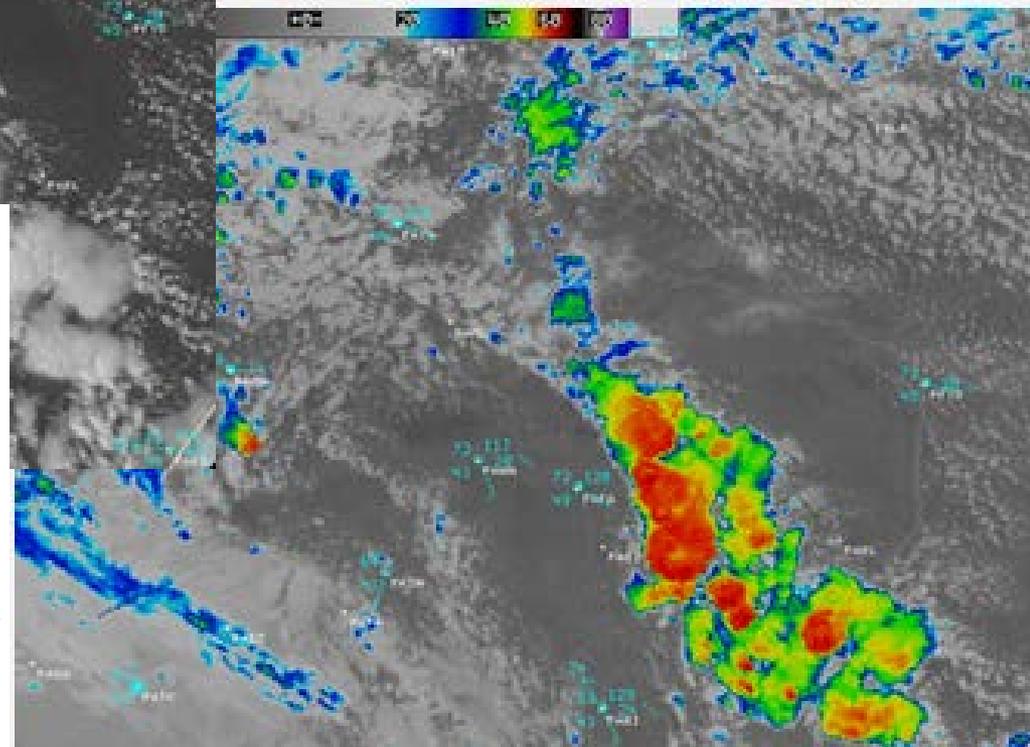
Here's a great satellite view of the sea ice in Norton Sound and the Northern Bering Sea! The ice is breaking up within Norton Sound and ice is traveling through the Bering Strait.

# CONVECTIVE WEATHER

**SNPP VIIRS 0.64um VIS at 2341z on June 4, 2012**



- North Pole and Chena Hot Springs Road received 0.50 size hail
- VIIRS IR brightness temperature of -64C



SPECIAL WEATHER STATEMENT  
NATIONAL WEATHER SERVICE FAIRBANKS AK  
507 PM AKDT MON JUN 4 2012

...THUNDERSTORMS WITH HAIL IN THE INTERIOR...

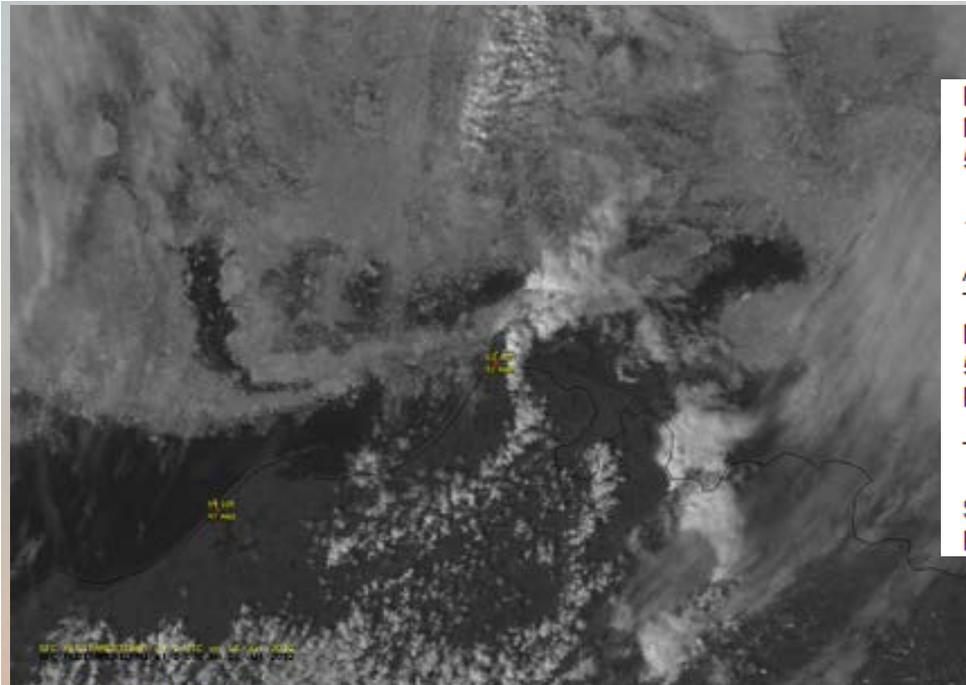
A LINE OF THUNDERSTORMS OVER THE TANANA YUKON UPLANDS JUST NORTHEAST OF FAIRBANKS ARE CAUSING HAIL AS LARGE AS ON HALF INCH ALONG WITH BRIEF HEAVY RAIN AND WINDS GUSTING TO 30 MPH. THE HAIL COULD COVER THE GROUND AND RAIN COULD BE UP TO ONE HALF INCH. THE HAIL AND WINDS COULD CAUSE DAMAGE. THERE HAVE BEEN NUMEROUS REPORTS OF ONE HALF INCH SIZE HAIL IN NORTH POLE AND ALONG CHENA HOT SPRINGS ROAD.

AT 500 PM THE THUNDERSTORMS WERE IN A BAND STRETCHING FROM CHICKEN TO NORTH POLE TO LIVNGOOD. THIS BAND IS MOVING WEST AT ABOUT 15 MPH AND WILL MOVE WEST ACROSS THE CITY OF FAIRBANKS IN THE NEXT HOUR.

THE THUNDERSTORMS HAVE HAD TOPS AS HIGH AS 40,000 FEET WHICH IS VERY HIGH FOR INTERIOR ALASKA THUNDERSTORMS.

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**SNPP VIIRS 11.45um IR at 2341z on June 4, 2012**



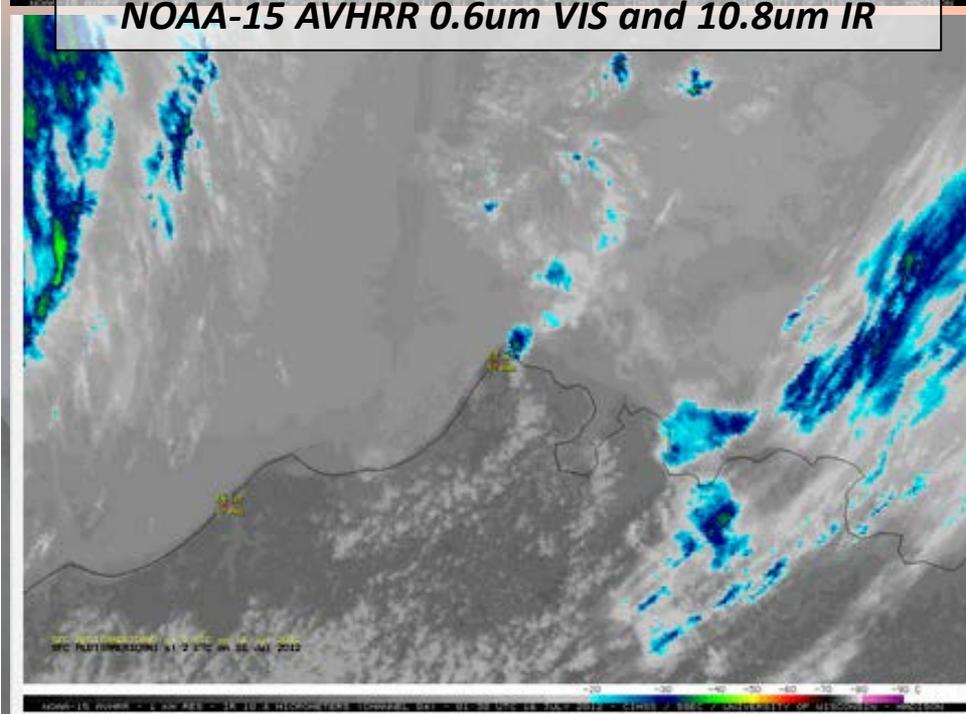
PUBLIC INFORMATION STATEMENT  
NATIONAL WEATHER SERVICE FAIRBANKS AK  
556 PM AKDT SUN JUL 15 2012

...FIRST THUNDERSTORM IN BARROW SINCE 2004...

A LINE OF THUNDERSTORMS DEVELOPED JUST EAST OF BARROW LATE THIS AFTERNOON. A FEW RUMBLES OF THUNDER WERE HEARD AT THE NATIONAL WEATHER SERVICE OFFICE IN BARROW BETWEEN 515PM AND 535PM. THE ALASKA FIRE SERVICES LIGHTNING DETECTION NETWORK RECORDED FEW STRIKES JUST SOUTHEAST OF DEASE INLET.

THIS IS THE FIRST THUNDERSTORM AT BARROW SINCE JULY 3RD 2004.

\$\$  
RT JUL 12



PUBLIC INFORMATION STATEMENT  
NATIONAL WEATHER SERVICE BARROW AK  
1206 PM AKDT FRI JUN 14 2013

...THUNDERSTORM OCCURRED AT BARROW...

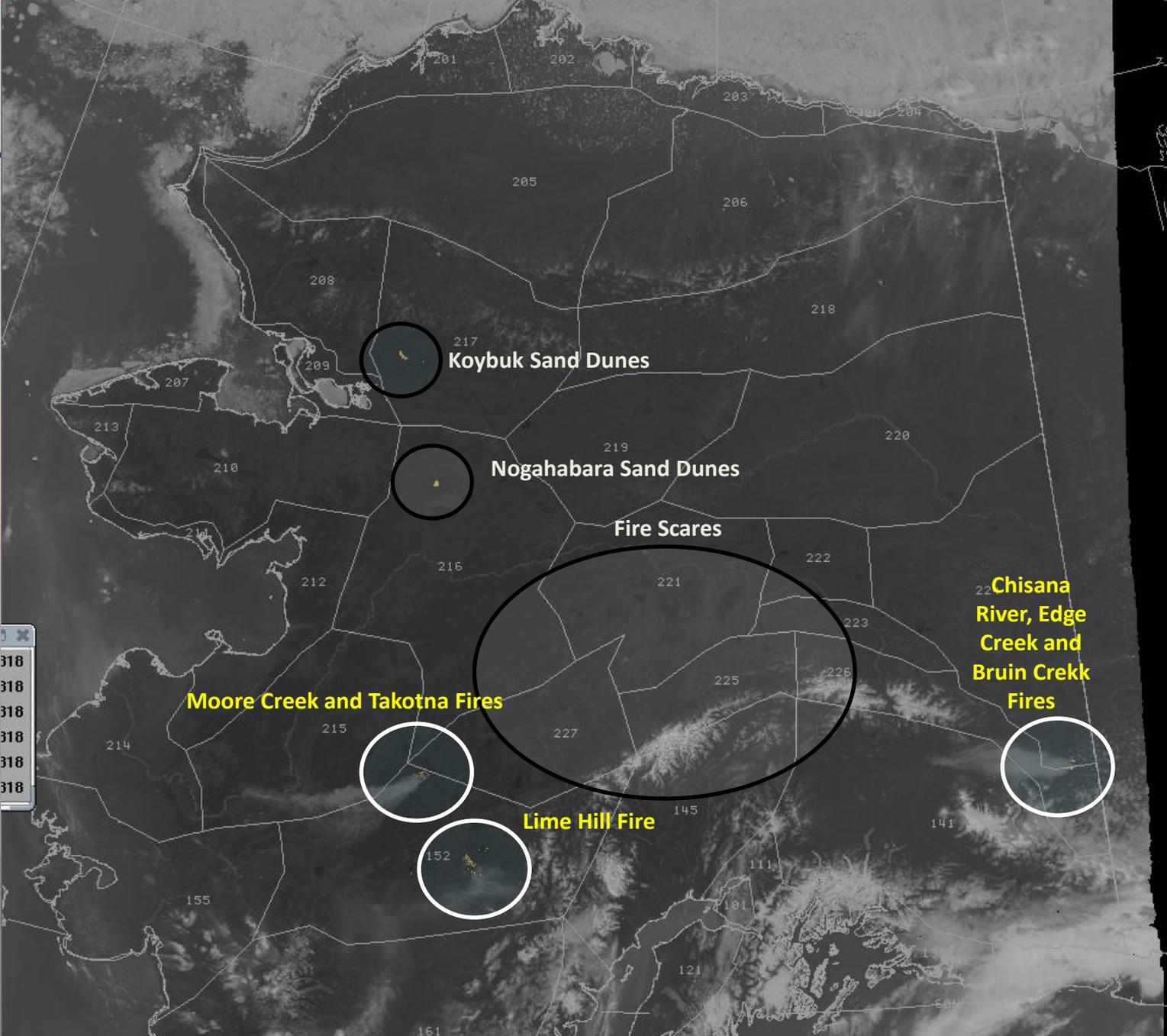
HIGH TEMPERATURE OF 66 DEGREES HELPED FUEL A THUNDERSTORM AT 1105 PM AKDT UNTIL 1132 PM AKDT ON JUNE 13.

THE LAST THUNDERSTORM IN BARROW WAS JULY 15 2012 WITH A HIGH TEMPERATURE FOR THE DAY OF 65 DEGREES.

OVER THE LAST TEN YEARS MOST THUNDERSTORMS OCCURRED DURING JULY. THE YEAR 2003 WAS THE BIG YEAR FOR STORMS WITH ONE OCCURRING IN EACH MONTH OF JUNE... JULY...AND AUGUST.

\$\$  
DZB JUN 13

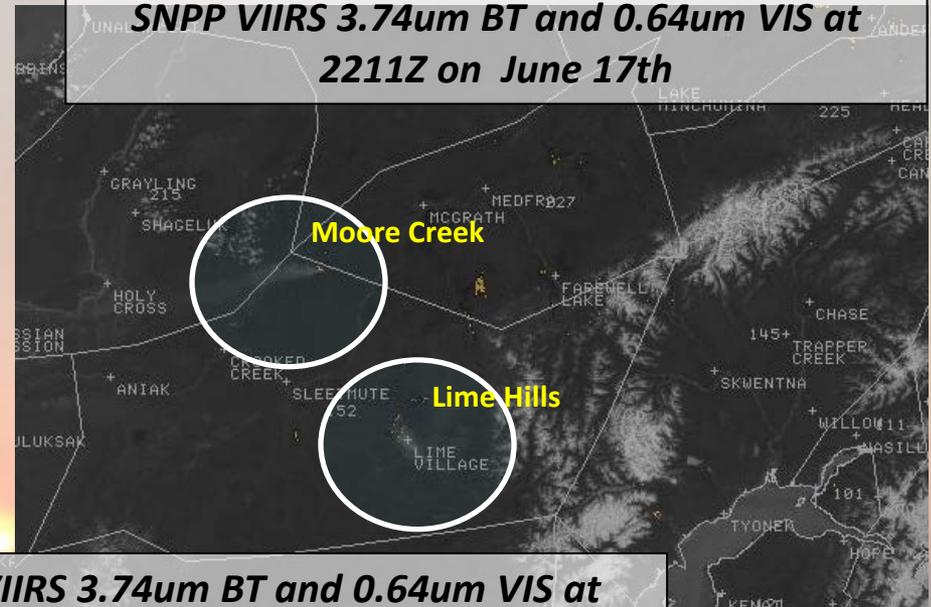
**NOAA-15 AVHRR 0.6um VIS and 10.8um IR**



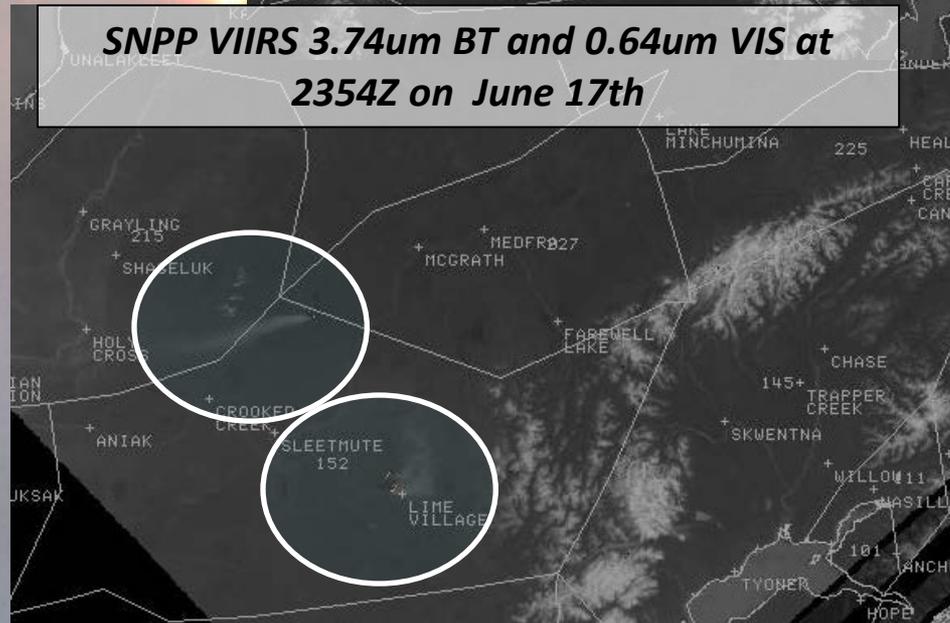
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# FIRE WEATHER

**SNPP VIIRS 3.74um BT and 0.64um VIS at  
2211Z on June 17th**

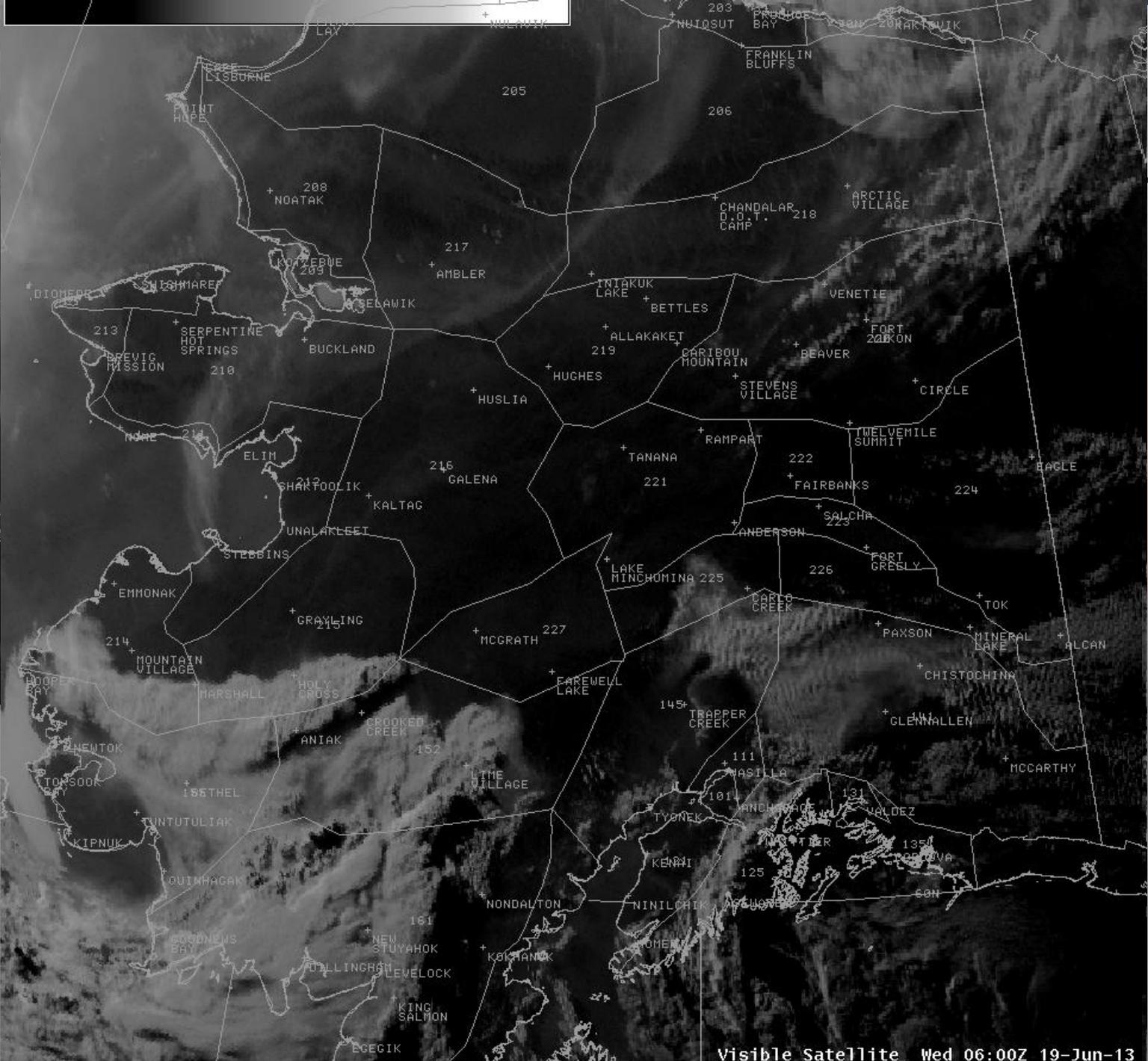


**SNPP VIIRS 3.74um BT and 0.64um VIS at  
2354Z on June 17th**



## Lime Hills Wildfire

*June 18, 2013: Image courtesy Ivan Rinck via Alaska News Source, Lightning and growing to more than 12K acres and located 12 miles north of Lime Village*



Wed 19 Jun 2013 12:38:43 UTC  
Wed 19 Jun 2013 04:38:43 AKDT

Northway - SouthWest  
See <http://avcams.faa.gov> for more information



FAA supplementary weather product.

**SNPP VIIRS 3.74um BT and 0.64um VIS at 2211Z on June 17th**

Wed 19 Jun 2013 15:58:30 UTC  
Wed 19 Jun 2013 07:58:30 AKDT

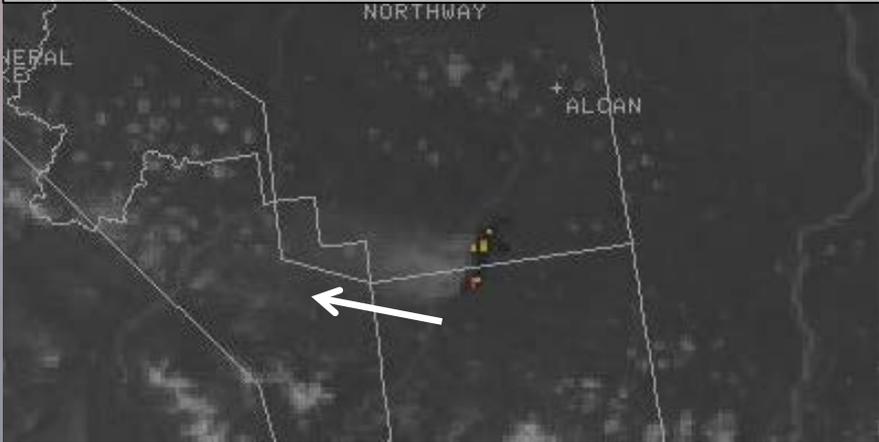
Northway - SouthWest  
See <http://avcams.faa.gov> for more information



FAA supplementary weather product.



**SNPP VIIRS 3.74um BT and 0.64um VIS at 2013Z on June 18th**



Chisana River Wildfire and newly Edge Creek and Bruin Creek Wildfires  
*June 17, 2013: Chisana River is 25K acres and grew 17K in size between June 17<sup>th</sup> and June 18<sup>th</sup>.*

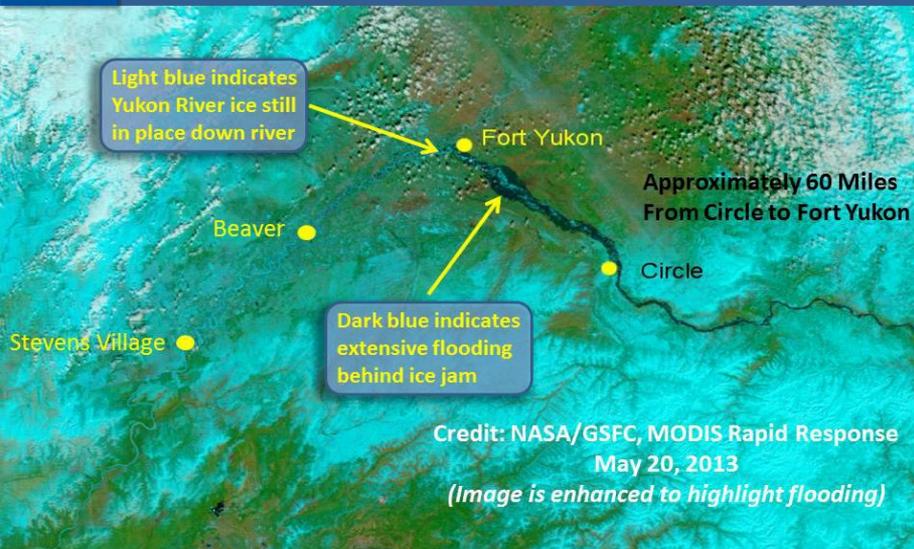
# RIVER FLOODING

**Yukon River at Ft Yukon on May 20, 2013**

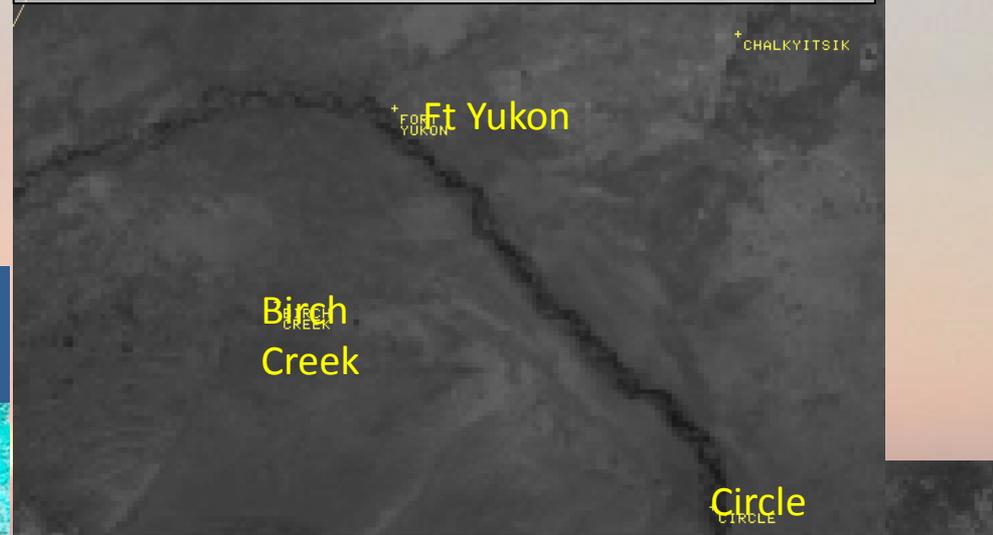
## Ice Jam Continues to Block the Yukon River



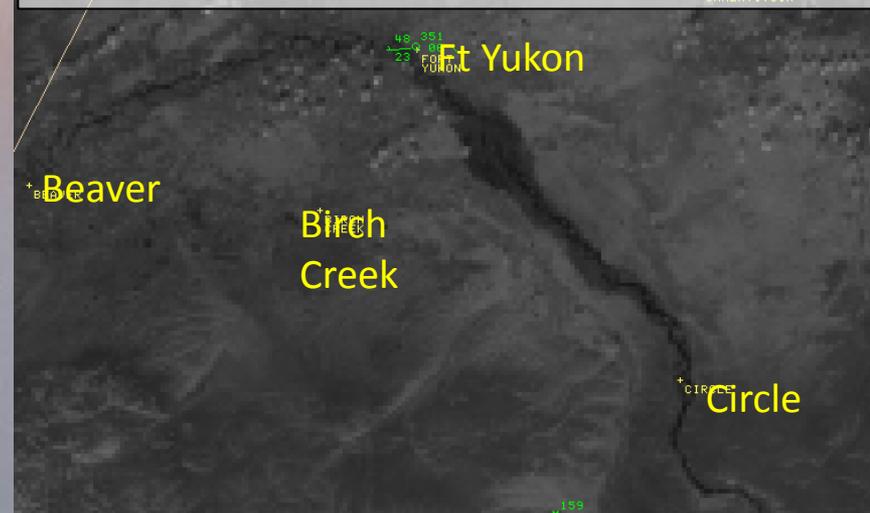
Alaska



**SNPP VIIRS 0.64um VIS at 2255Z on May 19th**



**SNPP VIIRS 0.64um VIS at 2056Z on May 20th**



# RIVER FLOODING



Alaska

## Flood Warnings in Effect for Galena, Koyukuk, and Nulato on the Yukon River

### River Watch Team Report:

- As of 9pm yesterday, the entire ice jam was moving downstream with the ice stretched from Bishop Rock and Galena.
- The highest water was with the heavy run of ice and estimated moving down Yukon River past Koyukuk and Nulato through the morning.

### Galena

- Major flooding continues with water up to 6 feet deep.
- Water levels will slowly fall.

### Koyukuk

- Water will continue to rise through the morning.
- Some houses and low lying areas of Koyukuk will be flooded.

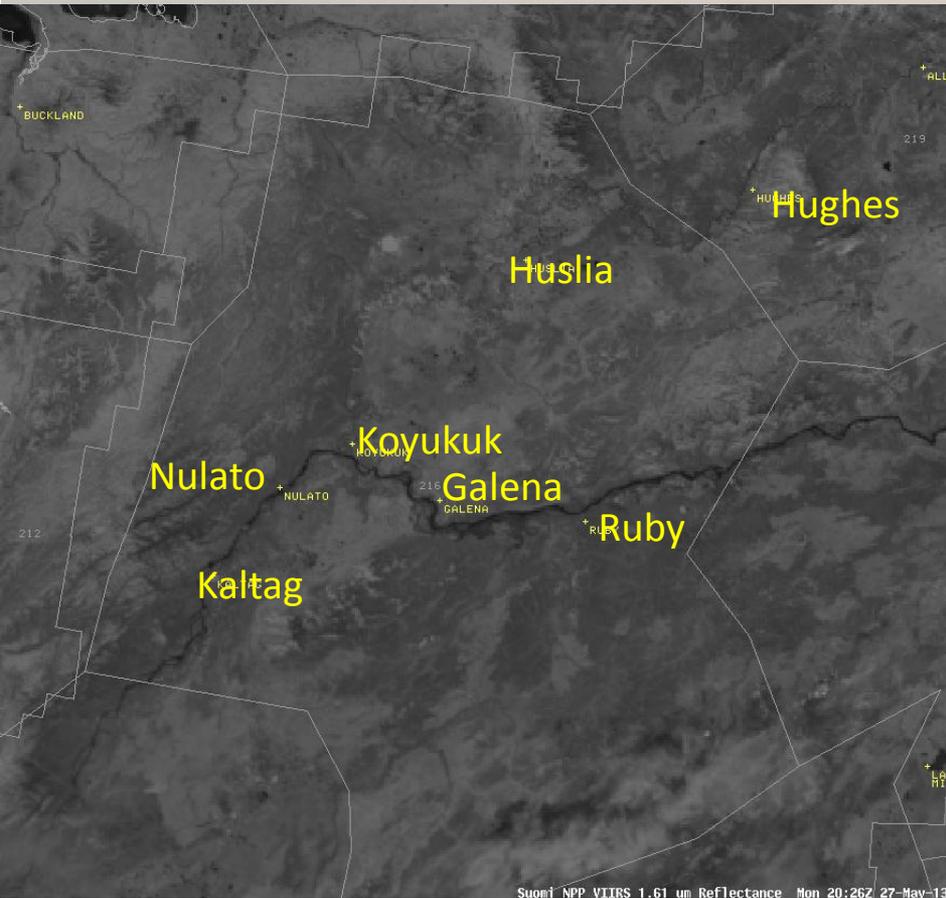
### Nulato

- Water levels will continue to rise through the afternoon.
- Houses and roads in low lying areas of Nulato will be flooded.

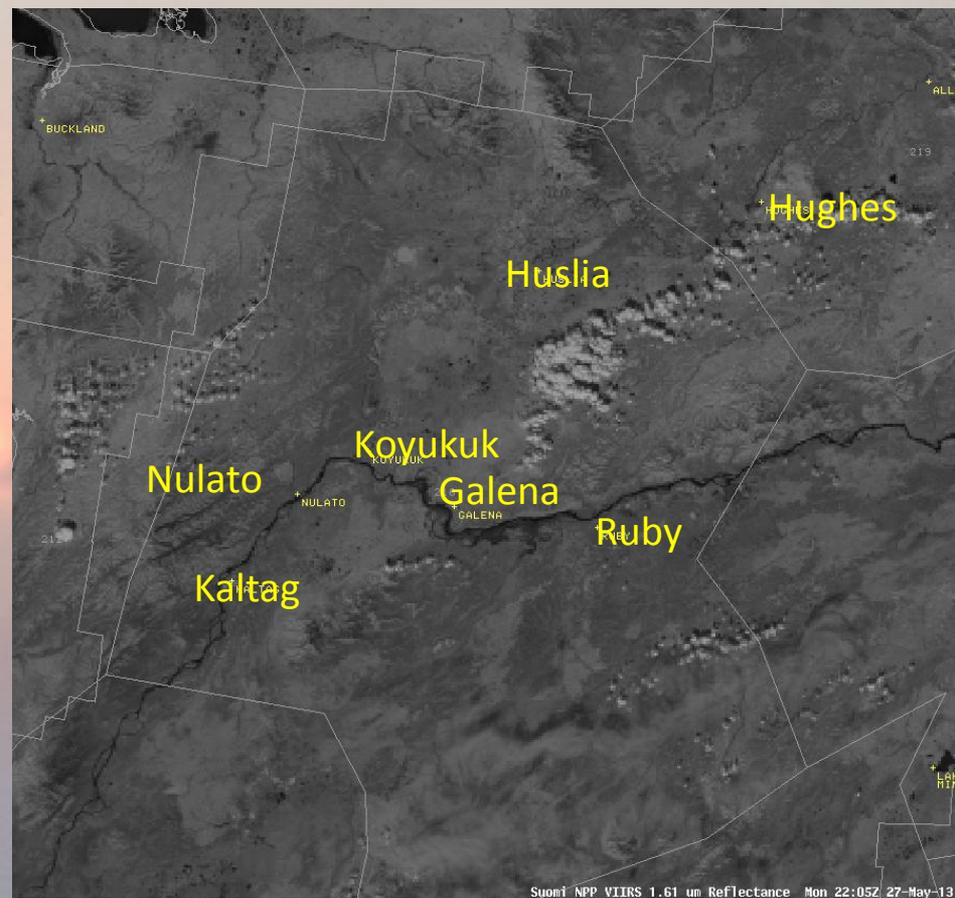
Know **BEFORE** You Go!  
Stay Tuned for Weather Updates:  
[www.weather.gov/fairbanks](http://www.weather.gov/fairbanks)

Image from May 29, 2013 from the  
Suomi NPP VIIRS Satellite

# RIVER FLOODING



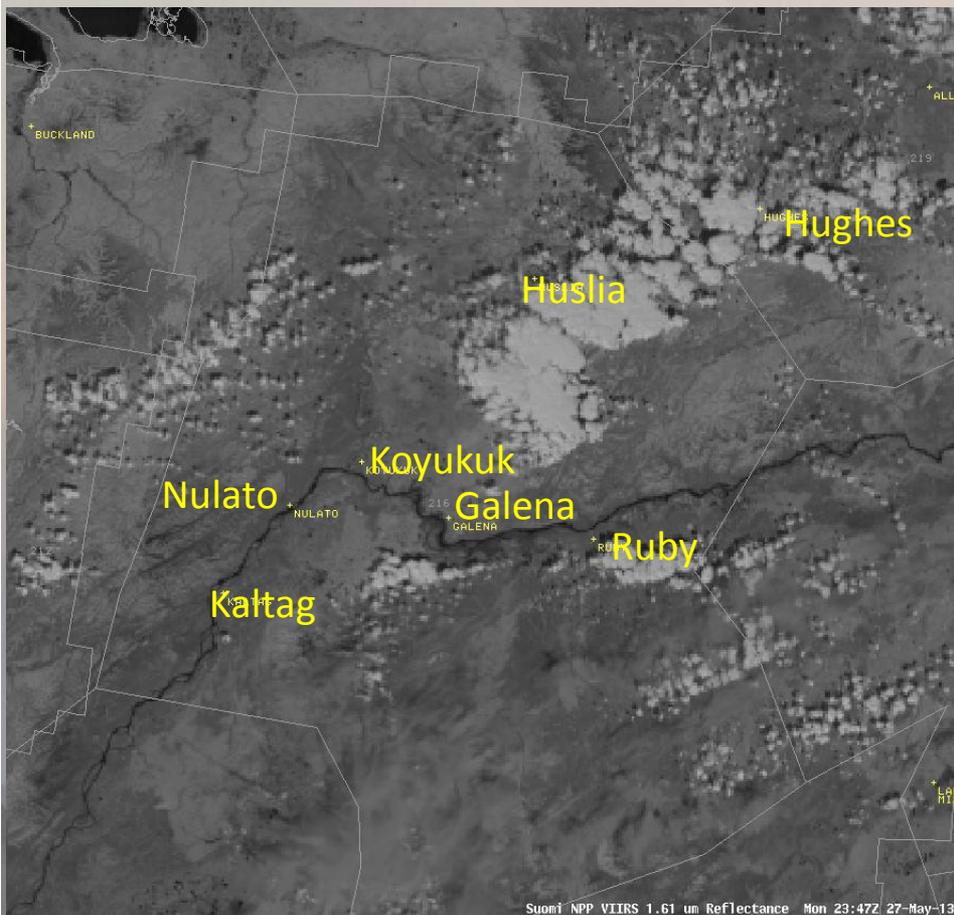
May 27, 2013 at 2026Z



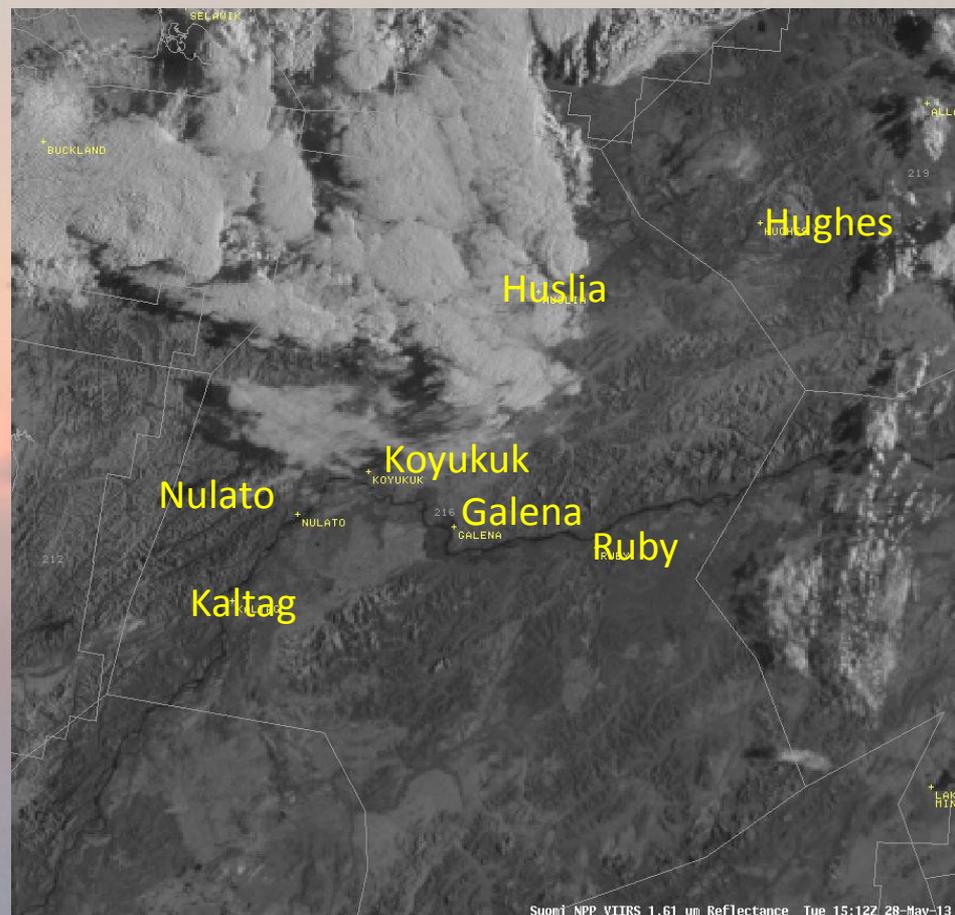
May 27, 2013 at 2205Z

*SNPP VIIRS 1.61um Reflectance*

# RIVER FLOODING



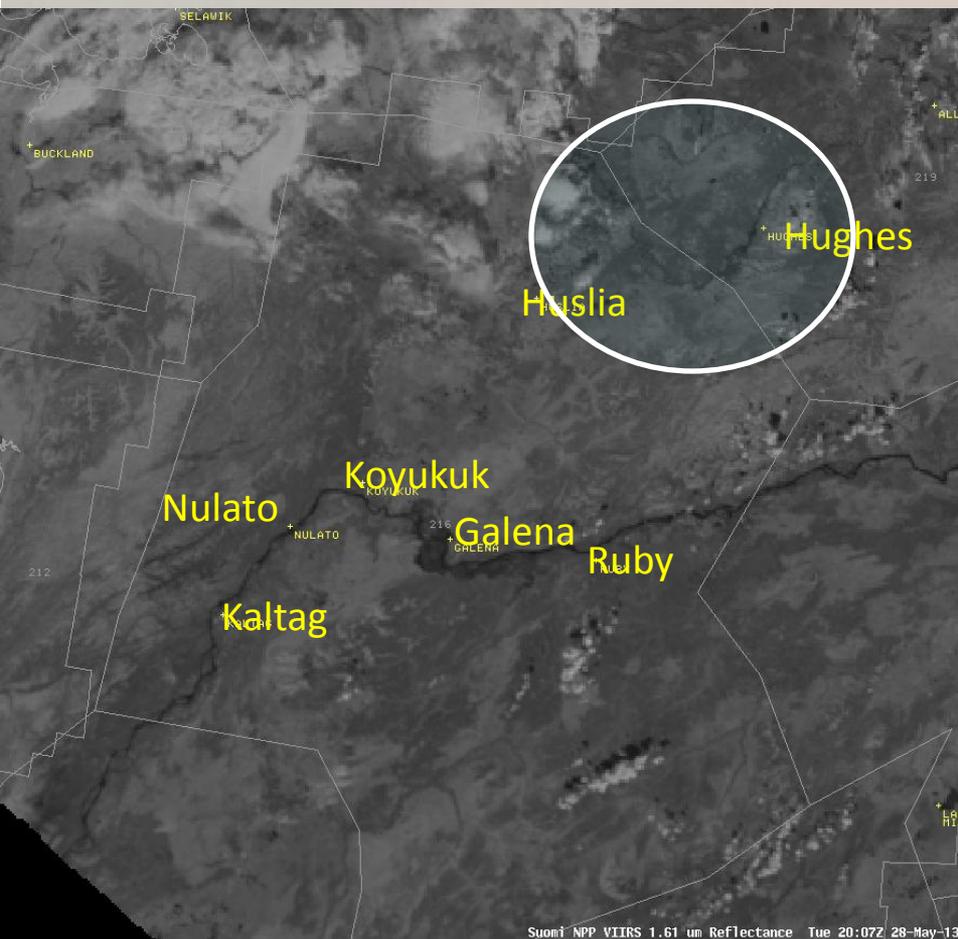
May 27, 2013 at 2347Z



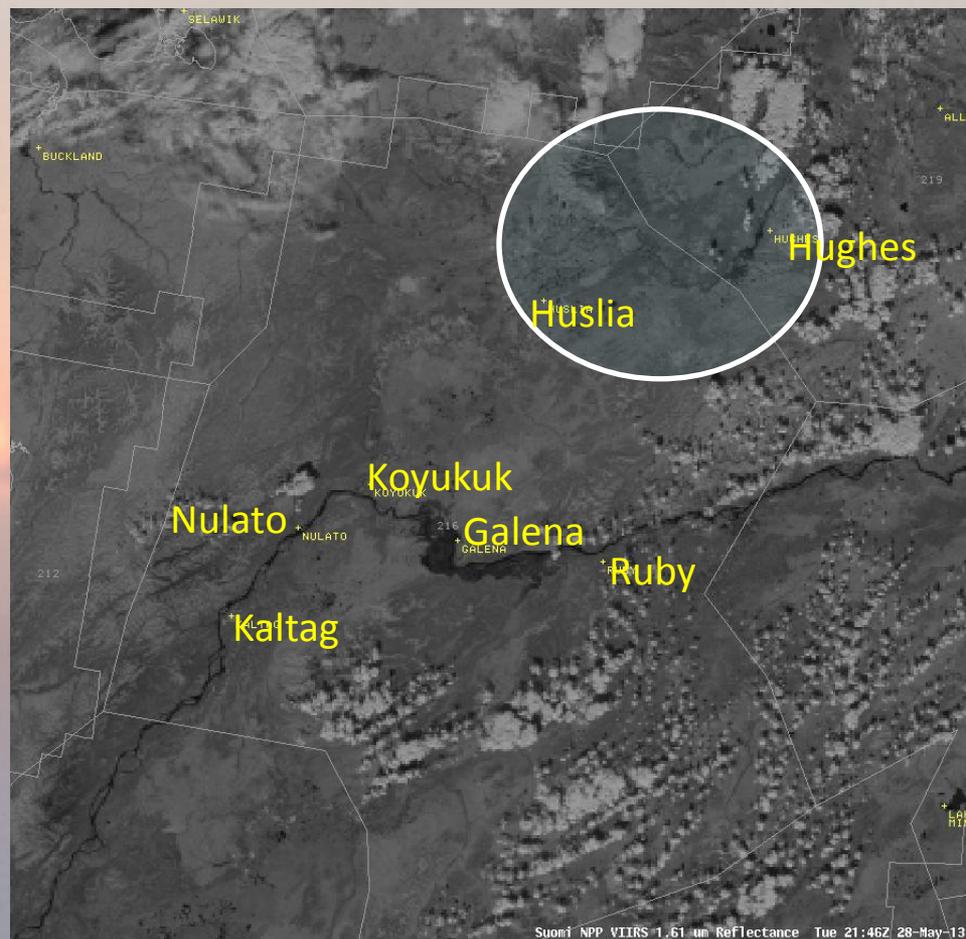
May 28, 2013 at 1512Z

*SNPP VIIRS 1.61um Reflectance*

# RIVER FLOODING



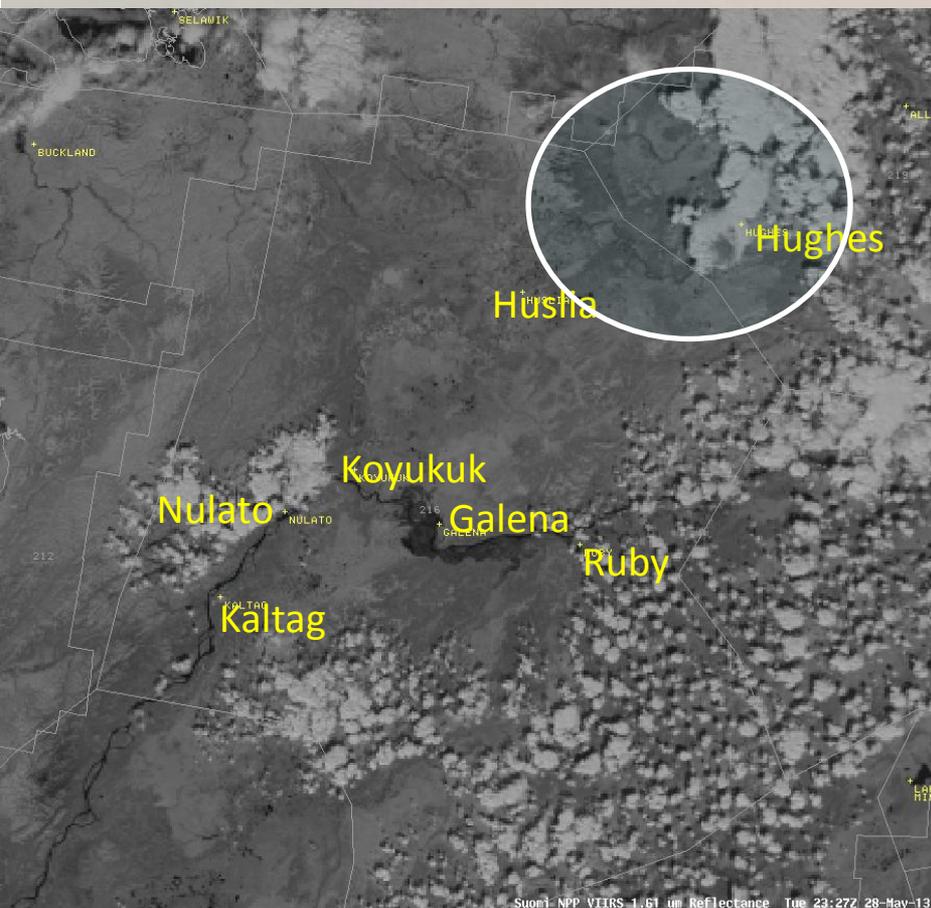
May 28, 2013 at 2007Z



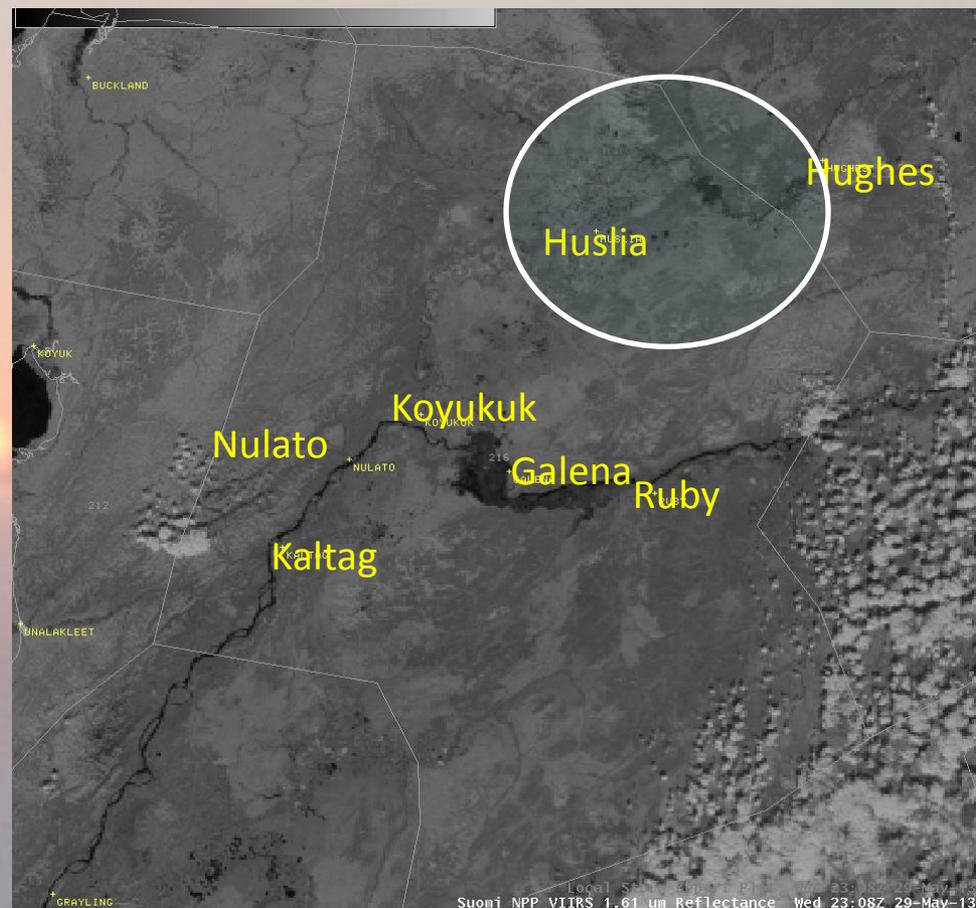
May 28, 2013 at 2146Z

*Suomi NPP VIIRS 1.61um Reflectance*

# RIVER FLOODING



May 28, 2013 at 2327Z



May 29, 2013 at 2308Z

*Suomi-NPP VIIRS 1.61um Reflectance*

# FORECAST: NUMERICAL GUIDANCE

Limited numerical weather guidance and can be poor:

- Temperatures – Models handle the best among other elements, but models and guidance struggle in winter and year-round with minimum temperature.
- Dew Point Temperatures and Relative Humidity – all guidance is poor.
- Wind – guidance tends to be poor. Statistics show consensus model beats individual guidance.
- QPF – NAM12 is overdone and GFS40 is underdone for winter time precipitation. However, the models tend to do better in winter season due to the synoptic scale events

## MinRH Verification Summary for Wed, Jun 5:

Grid Time: start: Wed, Jun 5 12Z end: Thu, Jun 6 11Z

Edit Area: AFG (24799 gridpoints)

Period	Forecast Made	MAE	Official Bias	Official Percent >30%; Err	Official Percent <8%; Err	Official Rank among Guidance	Best Guidance	2nd Best Guidance	3rd Best Guidance	Worst Guidance
1	12-hr Wed 6/5 mid	7.42	-0.34	0.5%	64.1%	5 out of 26	CONSAII 69.9%	AllBlend 69.6%	RawBlend 69.1%	SREFBC 23.9%
2	24-hr Tue 6/4 day	7.42	-0.34	0.5%	64.1%	3 out of 30	CONSAII 68.0%	CONSMOS 65.2%	AllBlend 60.5%	SREFBC 24.0%
3	36-hr Tue 6/4 mid	10.40	-0.09	4.6%	50.0%	6 out of 26	CONSAII 58.2%	AllBlend 55.1%	CONSMOS 55.0%	SREFBC 21.6%
4	48-hr Mon 6/3 day	10.40	-0.09	4.6%	50.0%	3 out of 30	CONSMOS 54.6%	ADJMAV 50.5%	ADJMEX 49.9%	NAM12BC 22.6%
5	60-hr Mon 6/3 mid	14.65	-3.78	10.2%	35.6%	12 out of 26	CONSMOS 49.6%	ADJMEX 49.4%	AllBlend 49.3%	SREFBC 20.4%
<b>Average over past 7 days:</b>										
1	12-hr	11.98	-0.3	8.1%	48.1%	3 out of 26	BCRawBlend 48.4%	BCAIBlend 48.2%	BCCONSAll 46.5%	ECMFHIRes 25.5%
2	24-hr	11.68	0.1	7.0%	48.5%	1 out of 30	BCAIBlend 46.0%	BCRawBlend 46.0%	BCCONSAll 45.9%	ECMFHIRes 25.0%
3	36-hr	12.82	-0.9	8.1%	43.6%	4 out of 26	BCRawBlend 44.8%	BCAIBlend 44.7%	BCCONSAll 43.6%	ECMFHIRes 24.9%
4	48-hr	12.90	-1.0	8.3%	43.4%	1 out of 30	BCCONSAll 42.5%	BCAIBlend 41.8%	BCRawBlend 41.5%	ECMFHIRes 24.2%
5	60-hr	14.38	0.9	9.7%	36.2%	11 out of 26	BCCONSAll 41.2%	BCCONSRaw 40.2%	BCCONSMS 39.3%	ECMFHIRes 23.9%
<b>Average over past 15 days:</b>										
1	12-hr	11.25	-0.2	6.1%	49.2%	1 out of 26	BCAIBlend 49.0%	BCRawBlend 48.9%	BCCONSAll 48.3%	SREF 19.1%
2	24-hr	11.22	0.3	5.5%	48.7%	1 out of 30	BCCONSAll 47.1%	BCRawBlend 47.0%	BCAIBlend 46.6%	SREF 20.0%
3	36-hr	12.05	0.5	6.2%	44.5%	4 out of 26	BCRawBlend 45.6%	BCAIBlend 45.1%	BCCONSAll 44.8%	SREF 19.6%
4	48-hr	12.28	0.5	6.6%	43.8%	3 out of 30	ADJECSBC 44.2%	ADJECEBC 43.9%	BCCONSAll 43.6%	SREF 20.2%
5	60-hr	13.44	1.8	7.8%	38.0%	9 out of 26	BCCONSAll 40.9%	BCCONSRaw 40.8%	BCRawBlend 40.1%	SREF 19.7%
<b>Average over past 30 days:</b>										
1	12-hr	11.36	2.1	5.0%	46.0%	8 out of 26	BCCONSAll 49.9%	BCRawBlend 48.9%	BCAIBlend 48.9%	SREF 15.8%
2	24-hr	11.24	1.8	4.3%	45.6%	9 out of 30	BCCONSAll 49.2%	BCCONSRaw 47.5%	BCRawBlend 47.1%	SREF 16.1%
3	36-hr	12.63	3.6	6.2%	40.4%	11 out of 26	BCCONSAll 47.6%	BCCONSRaw 46.4%	BCRawBlend 45.2%	SREF 16.2%
4	48-hr	12.66	3.2	6.1%	40.0%	11 out of 30	BCCONSAll 45.7%	BCCONSRaw 45.4%	ADJECSBC 44.9%	SREF 16.5%
5	60-hr	13.87	5.1	7.5%	35.0%	13 out of 26	BCCONSRaw 43.8%	BCCONSAll 43.8%	ECMFHIResBC 43.3%	SREF 16.2%

# FORECAST PROCESS: GFE TOOLS



- **GFE Smart Tools and Ingest Satellite Data**
  - Sky Grid Element
    - use latest satellite data for short/near term forecasting and interpolate to synthetic satellite imagery
      - KEY is good modeling of RH field!
  - Wx Grid Element
    - better methods using satellite data to generate Fog and Stratus weather grid.

# FORECASTER COMMENTS/QUESTIONS

- Looping images from polar orbiting satellites are great, but need to be able to distinguish the real satellite image from the blended 'reality' images.
- *Water Vapor Imagery previously taught was not useful for 60N due to parallax or other issues. Still the case?*
- SNPP VIIRS VIS/IR channels are very useful!
  - *How accurate are the temperatures in IR Channel?*
- HRPT images over the pole are very useful for tracking storms and stratus/fog in that data void region.
  - *Does the IR images have issues with temperatures?*
- GOES products: This seems to be the most useful tool due to the animations, but have limitations due to the latitude.
  - *Many of these the parallax issues have may have been overcome with computer software....what are limitations to keep in mind?*