

VIIRS in Action in Alaska

GINA Direct Broadcast Users and Partnerships

Carl Dierking, Jay Cable, Jennifer Delamere

Greg Wirth, Owen Larson, Matt Mockaitis, Hunter Barndt, Grace Veenstra,



Outline

- 1) Alaskan hazards & observation challenges
- 2) UAF/GINA Direct Broadcast resources
- 3) Direct Broadcast VIIRS product availability
- 4) Alaskan VIIRS partners and stakeholders
- 5) Suggestions for future VIIRS improvements

Short-fused Natural Hazards in Alaska



Sea Ice Movement



Avalanches



Volcanic Ash



River Ice Jam Flooding



Forest Fires



Coastal Storm Floods



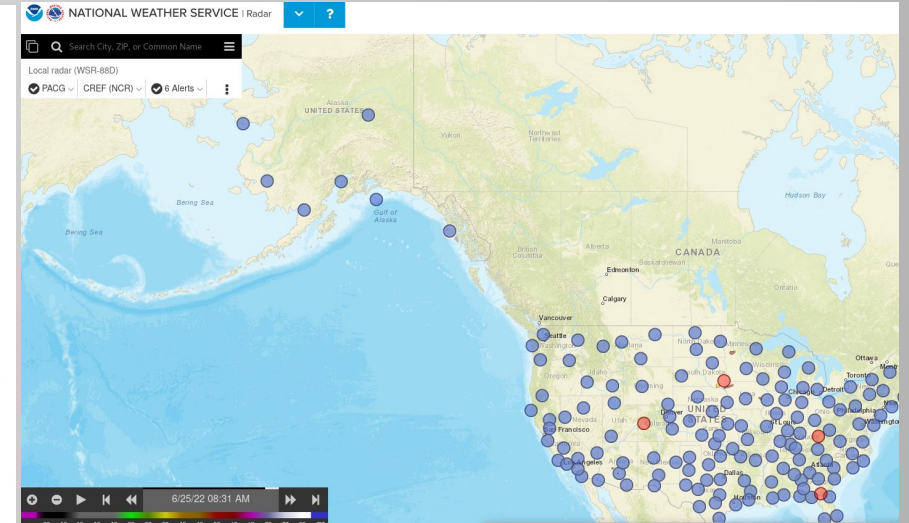
Smoke & Air Quality



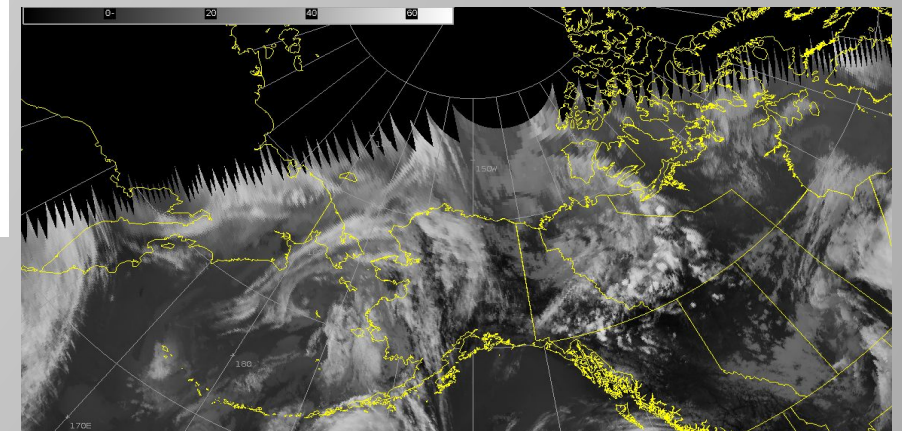
Heavy Precipitation

Limited Observations

4



WSR-88D radars - Alaska vs CONUS



GOES-17 – steep look angle

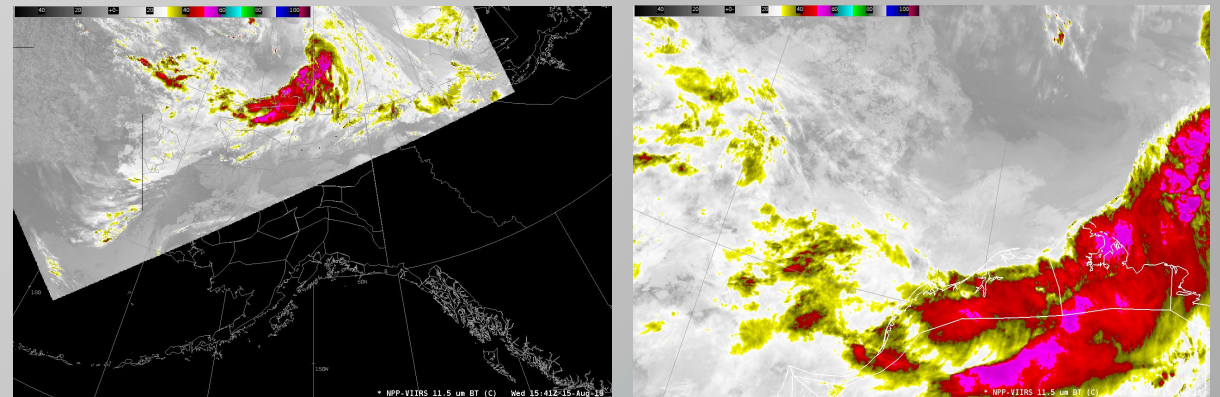
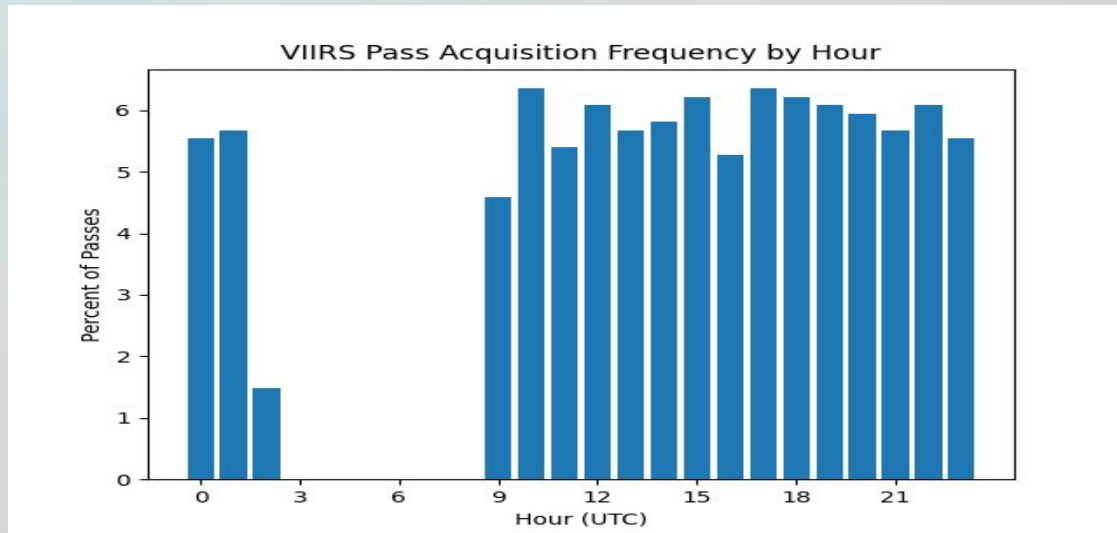
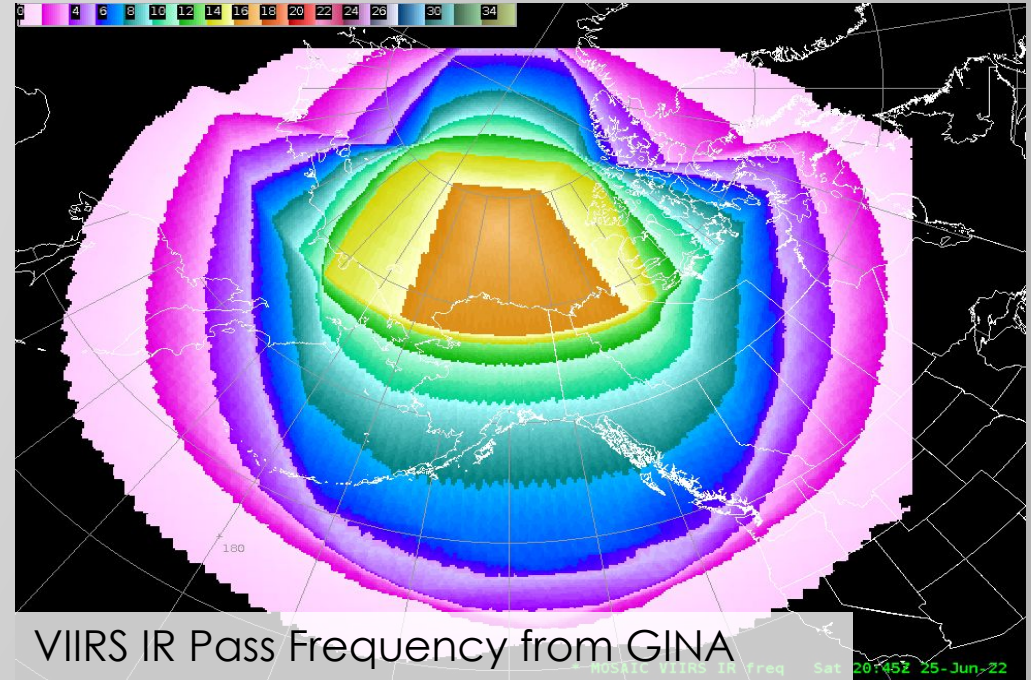
Alaska:

- ~ 18% of the entire US in area
- Limited road system (red lines)
- Dependent on air and sea for transportation & commerce

VIIRS Image Frequency (NOAA-20/SNPP)

5

- Two VIIRS satellites provide:
 - 16-18 passes/day (northern AK).
 - 6-8 passes/day (southeast AK).
 - Gap in VIIRS acquisition between 03-08 UTC.



Multiple Satellite Downlink Resources

6



UAF/GINA
"Sandy Dog"
Gilmore Creek



NESDIS FCDAS Gilmore Creek



UAF/GINA
"Big Dog"
UAF Campus



NESDIS
Utqiaġvik
(Barrow)
Antenna

Data unavailable due to
communications issue

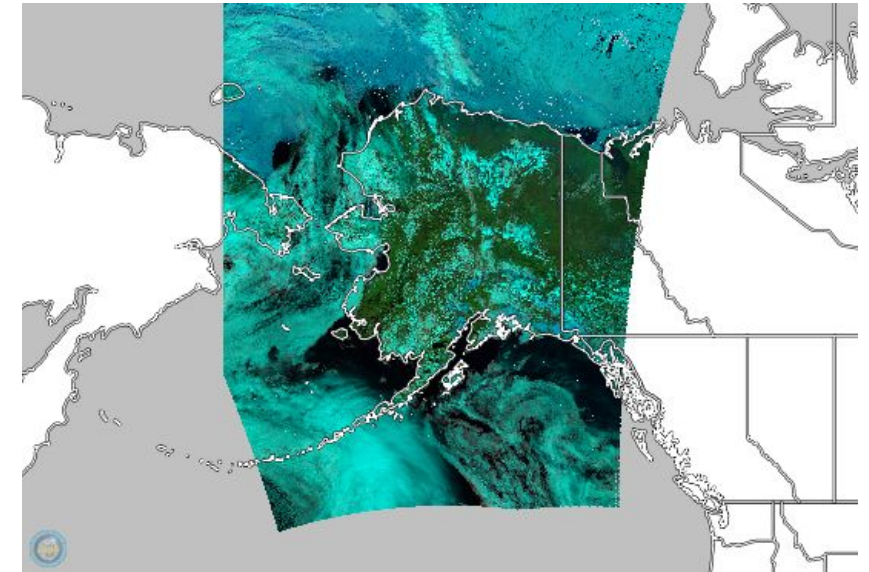
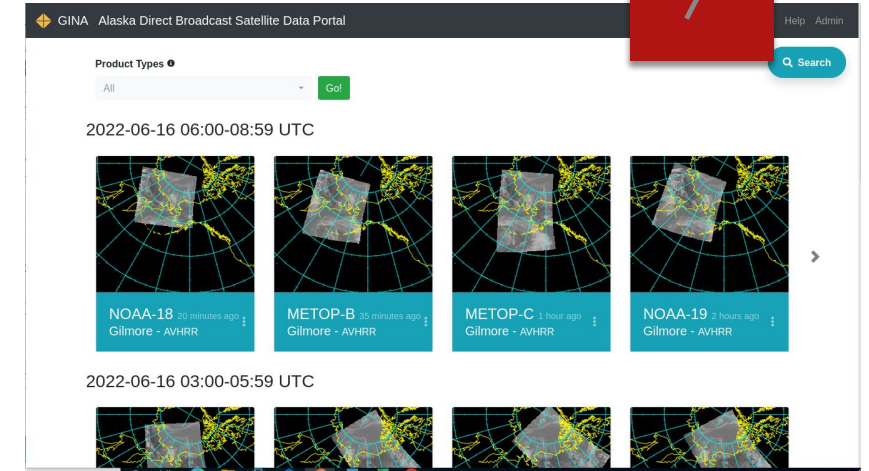
- ❑ Multiple antenna sites and resources
- ❑ Near Real Time (NRT) processing system
- ❑ CIMSS CSPP software
- ❑ Product Distribution via LDM and multiple web portals
- ❑ Geotiff products for GIS, netCDF for AWIPS
- ❑ Testing infrastructure
- ❑ **Products delivered to users within 15-35 min**

Antenna	Passes / Day
Sandy Dog	78
Big Dog	34
Total	112

VIIRS Image Distribution

- ▶ **GINA Feeder imager portal** <http://feeder.gina.alaska.edu/>
- ▶ **CIMSS RealEarth** <https://realearth.ssec.wisc.edu/>
- ▶ **GINA 24 Hours of Products** <http://hippy.gina.alaska.edu/distro/nrt/>
- ▶ **GINA Wildland Fire Information Map Series**
<https://www.arcgis.com/apps/MapSeries/index.html?appid=32ec4f34fb234ce58df6b1222a207ef1>
- ▶ **GINA Cyrosphere Products**
<http://hippy.gina.alaska.edu/distro/arctic/>
- ▶ **GINA Cloud Products**
<http://hippy.gina.alaska.edu/distro/aviation/>
- ▶ **GINA Aerosol Products** <http://hippy.gina.alaska.edu/distro/AOD/>
- ▶ **GINA Ash / SO2 Products** <http://hippy.gina.alaska.edu/distro/SO2/>

Social media: <https://twitter.com/uafgina>



VIIRS Product Distribution

GINA Product Request Form (All Data Levels)
Online at: <http://nrt-ops.gina.alaska.edu/products>

Dashboard Products Search Signin ▾

Products Query View results as ▾

* Facilities

Leave blank for all

* Satellites

Leave blank for all

* Sensors

Leave blank for all

* Levels

Leave blank for all

* Start date

* End date

1	2	3	4	5	...	Next >	Last =
UAF_AWIPS_npp_viirs_viirs_crefl09_203_20160531_132429.nc.gz							
UAF_AWIPS_npp_viirs_viirs_crefl04_203_20160531_132429.nc.gz							
UAF_AWIPS_npp_viirs_viirs_crefl03_203_20160531_132429.nc.gz							
UAF_AWIPS_npp_viirs_viirs_crefl08_203_20160531_132429.nc.gz							
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UAF_AWIPS_npp_viirs_m03_203_20160531_132429.nc.gz							

Questions & information email: satellite@gina.alaska.edu

VIIRS Users

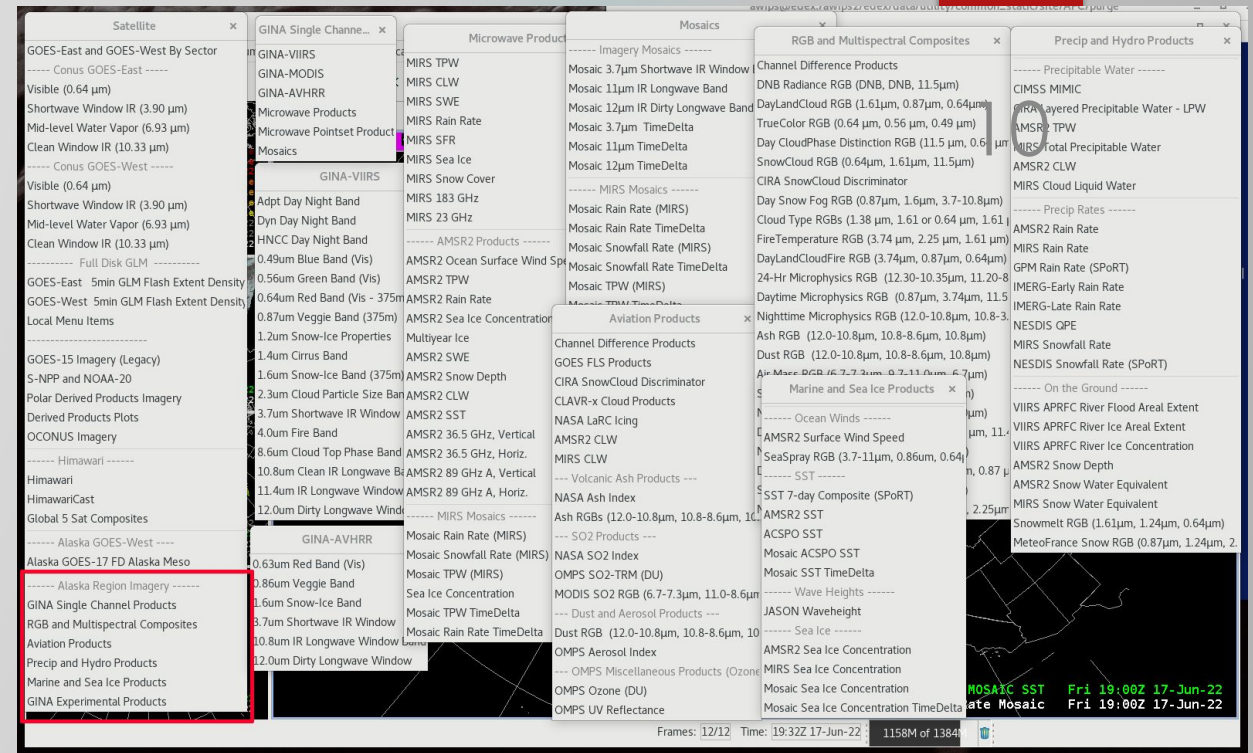
Partners & Stakeholders for Hazard Monitoring in Alaska

Weather

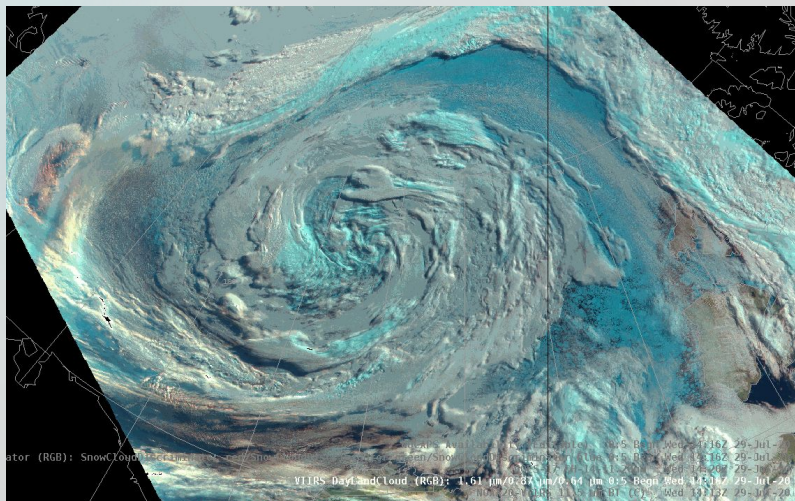
Partners and Stakeholders:

- National Weather Service (NWS)
- State of Alaska
- Environment Canada

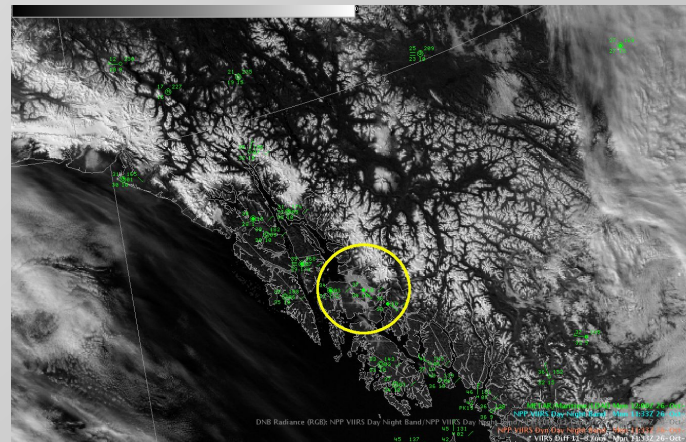
VIIRS product types:
Cyclogenesis, Frontal evolution, Clouds,
Visibility, Precipitation, Convection



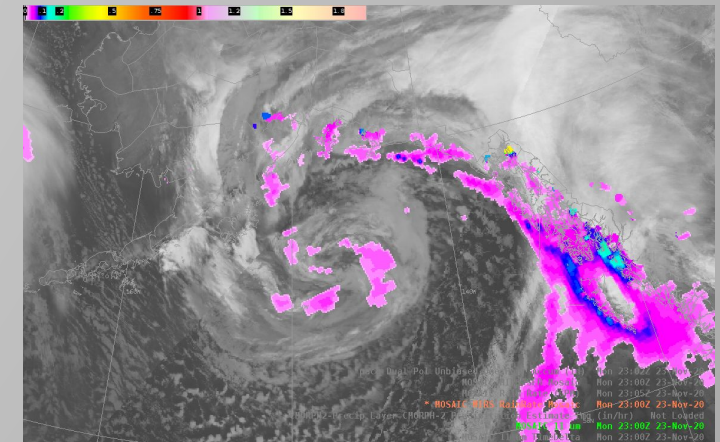
AWIPS – Alaska Region Imagery Menus



DayLandCloud RGB – Arctic Low



DNB - Fog in SE Alaska



11.5µm (i05)/ATMS-MiRS rain rate

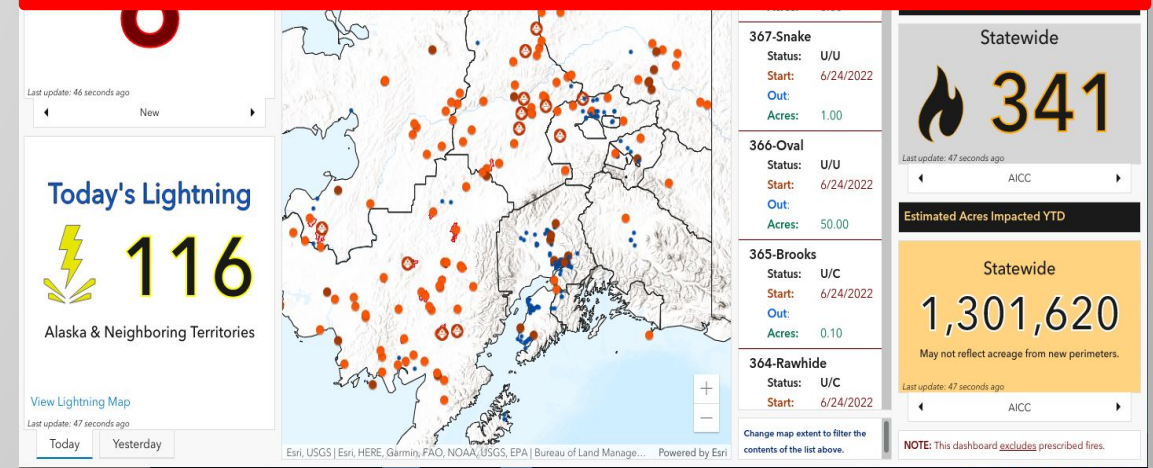
Wildland Fires

Partners and Stakeholders:

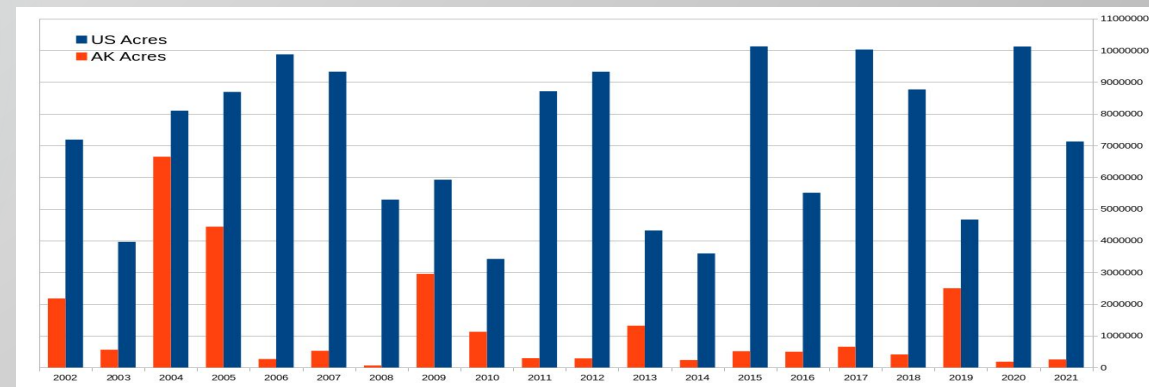
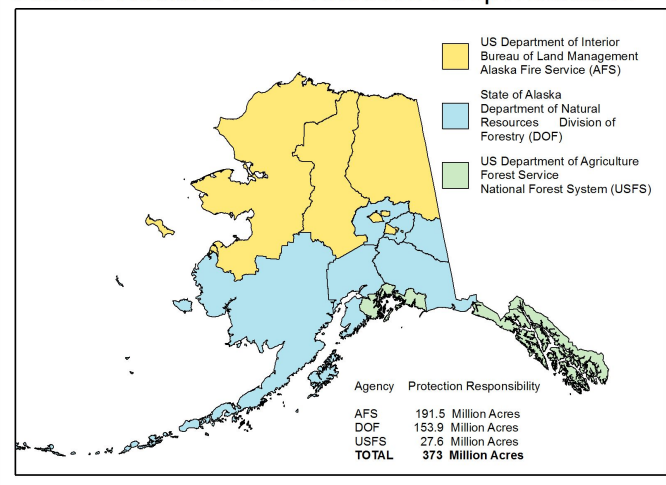
- Alaska Interagency Coordination Center (AICC)
 - Alaska Fire Service (BLM)
 - State of Alaska (DNR)
 - US Forest Service (USDA)
- NWS
- JPSS Fire & Smoke Initiative

ASF Dashboard: Alaska Fires as of 24 Jun 2022

Earliest date for reaching 1 million acres burned since statistic was first tracked in 1990.



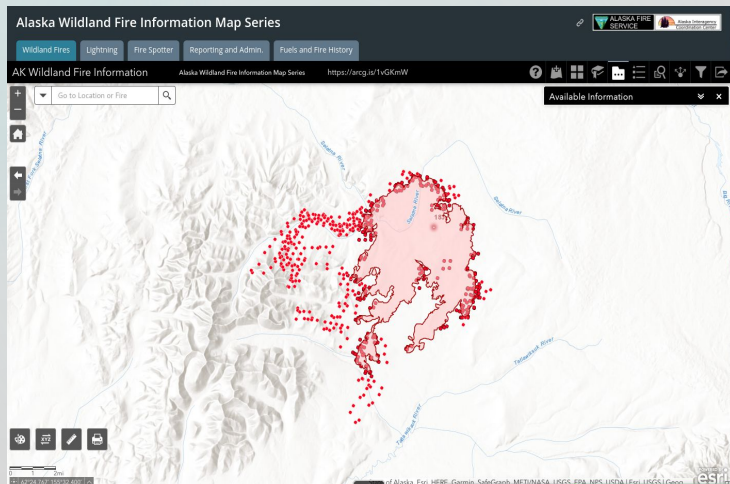
Alaska Wildland Fire Protection Responsibilities



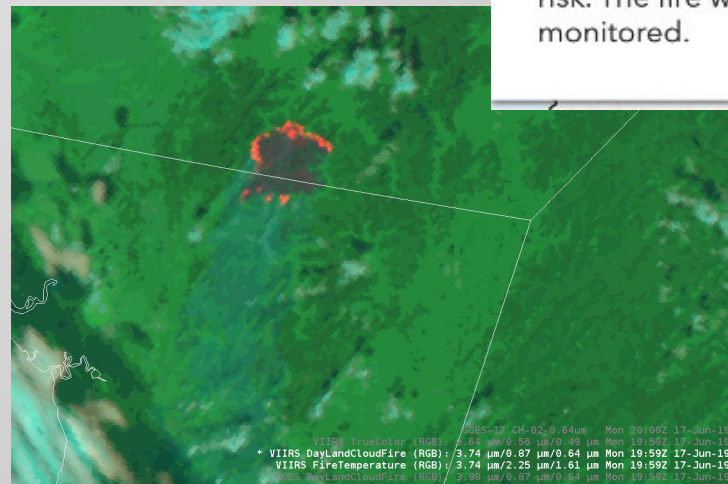
Wildland Fires

VIIRS Products:

- VAF heat points (VIIRS Active Fires)
- Imagery:
 - I04 (3.74 μm) i05 (11.5 μm) m13 (4.05 μm)
 - RGBs (DayLandCloudFire, FireTemperature)
- Uses: Fire detection, evolution, characteristics (perimeter, intensity, etc)



VIIRS-AF points



DayLandCloudFire RGB

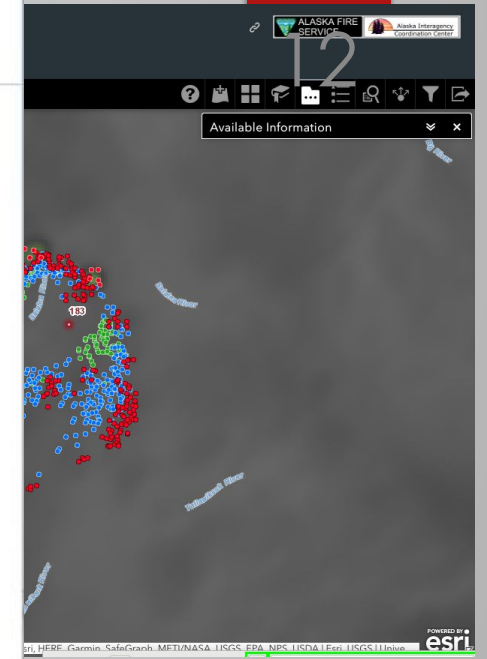


VAF heat points in AWIPS

🔍 ↻
✕

405-Whitefish Lake

Daily Report From: 8/3/2021
Status: Unstaffed / Uncontained (U/U)
Summary: Dispatch recieved a report of a VIIRS heat signature approximately 47 miles southeast of Chalkyitsik. Agency aircraft N9011N flew detection over the fire and reported it to be 25 acres with running and torching in black spruce, white spruce, and tundra. The fire plots in a limited suppression area with no values at risk. The fire will continue to be monitored.

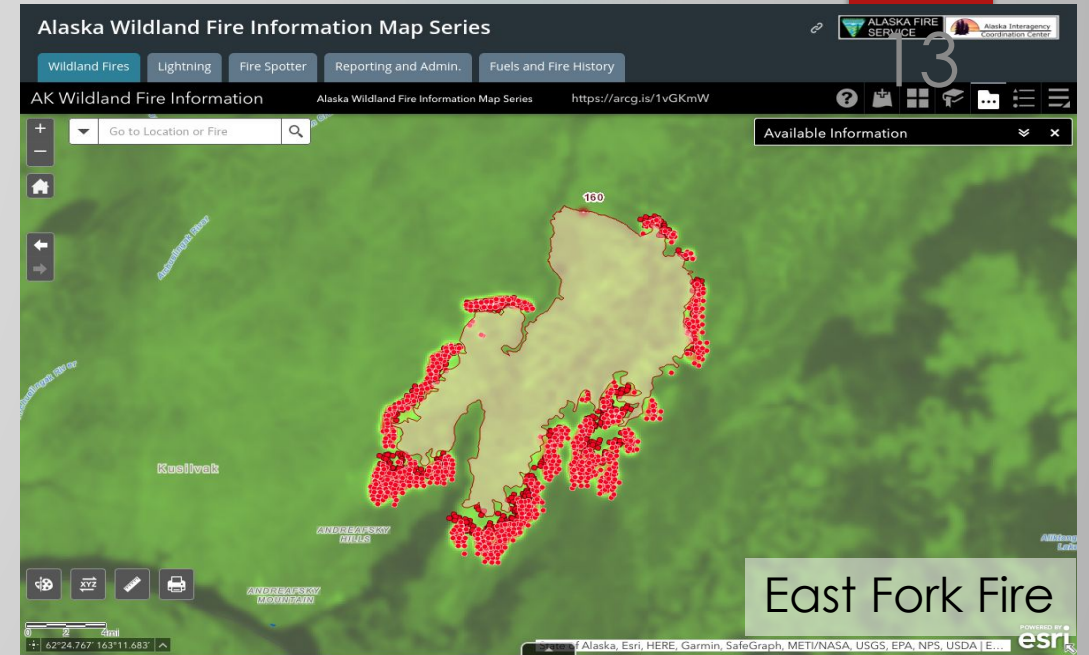


3.74 μm - 08 Jun 2022

Wildland Fires

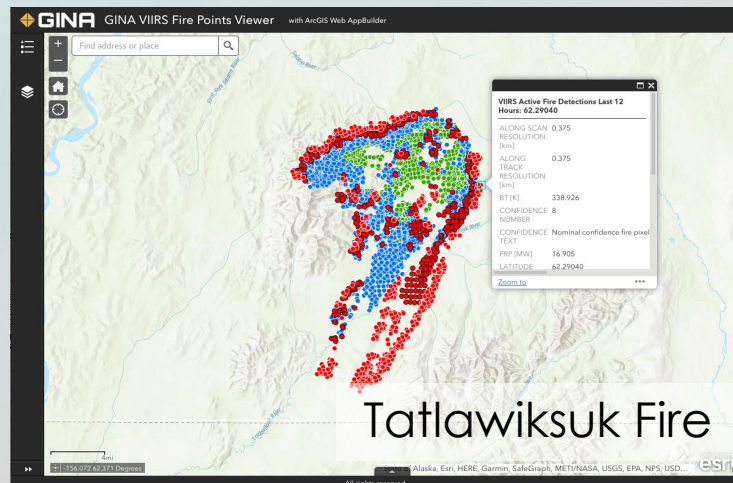
VIIRS Improvements:

- I04 (3.74 μm) band - Higher saturation tolerance
- Product with automated fire characteristics:
 - Perimeter mapping
 - Intensity trends

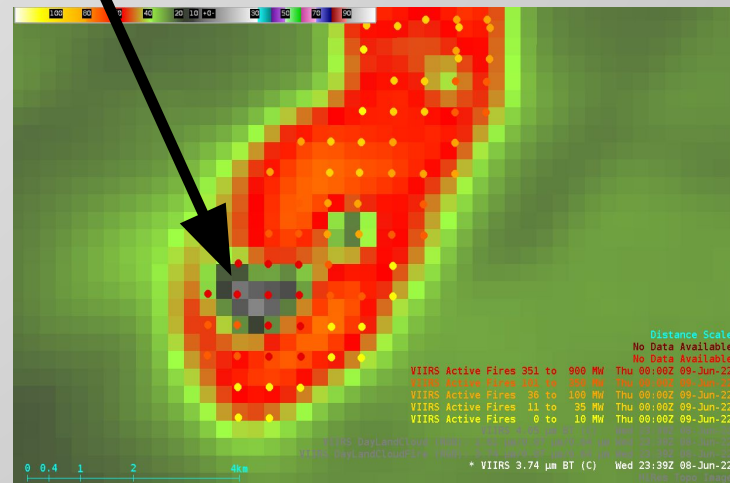


VIIRS-AF points with perimeter 10 Jun 2022

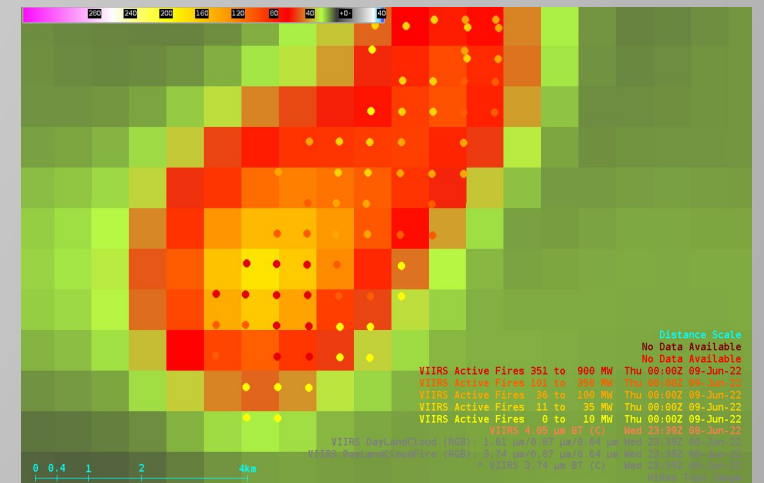
Saturated Pixels



VIIRS-AF points (trend) 10 Jun 2022



VIIRS 3.74 μm (i04) 08 Jun 2022

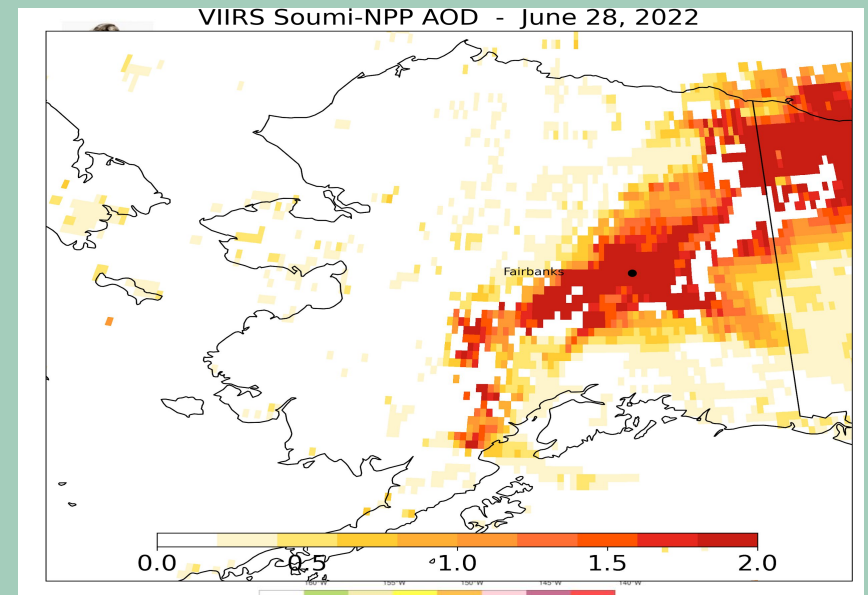
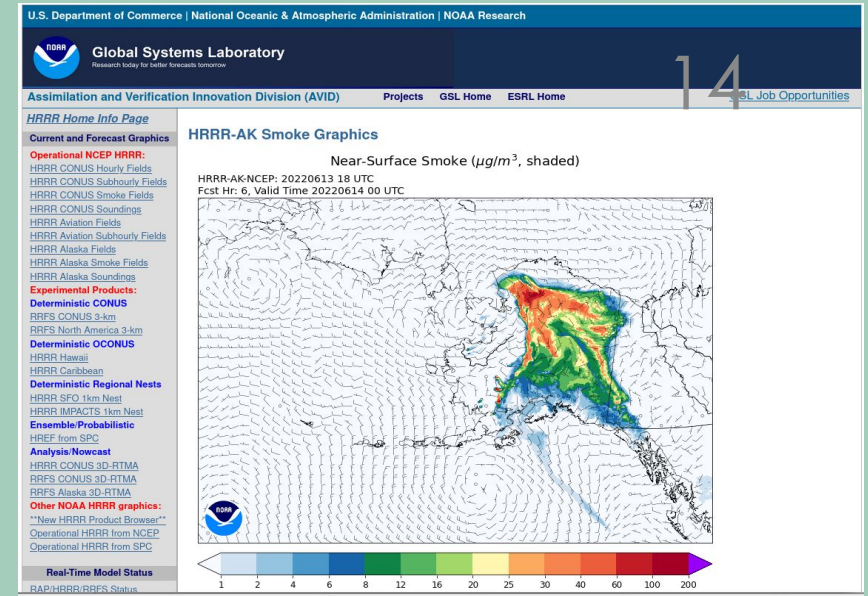
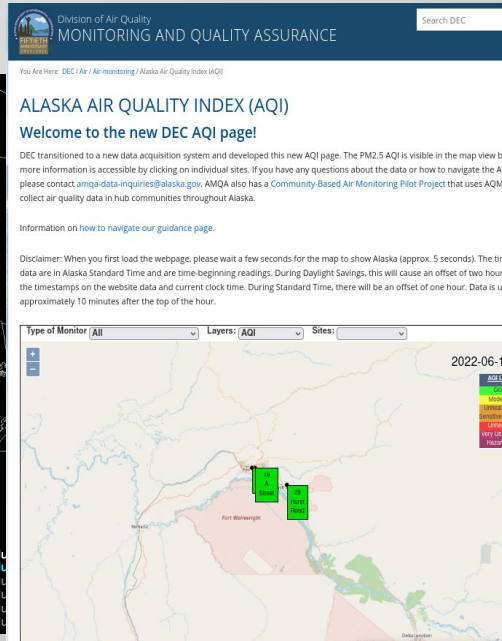
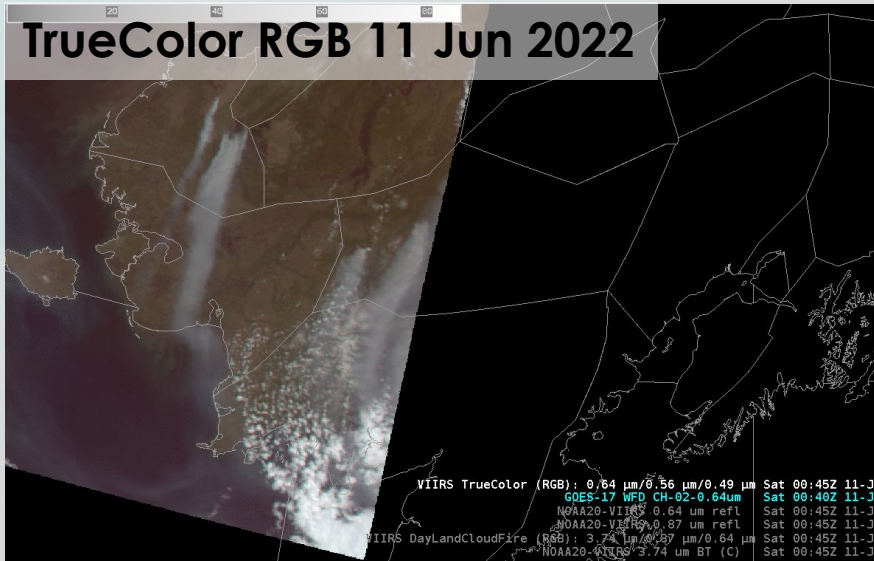


VIIRS 4.05 μm (m13) 08 Jun 2022

Air Quality and Smoke

Partners and Stakeholders:

- Alaska Dept. of Environ. Conservation (DEC)
- NWS
- UAF Geophysical Institute
- NOAA GSL/ERSL
- NOAA STAR
- AICC (AFS, AK-DNR, USFS)
- JPSS Fire & Smoke Initiative



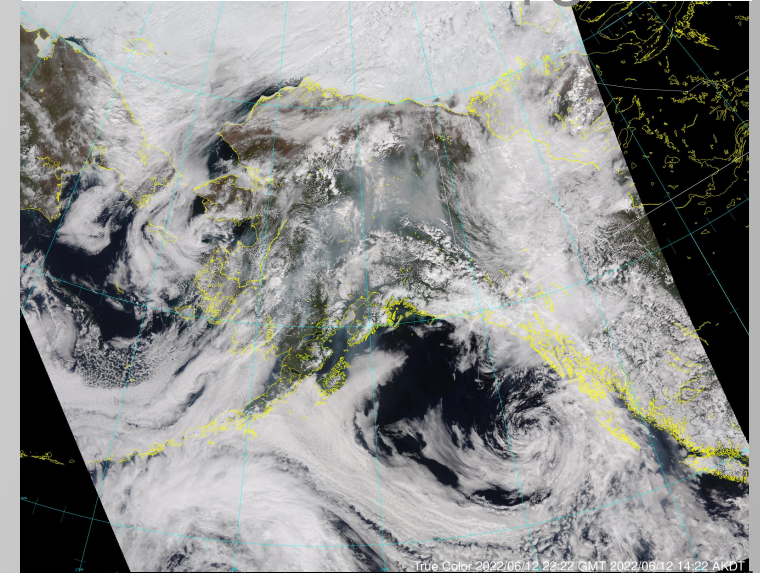
Air Quality and Smoke

VIIRS Products:

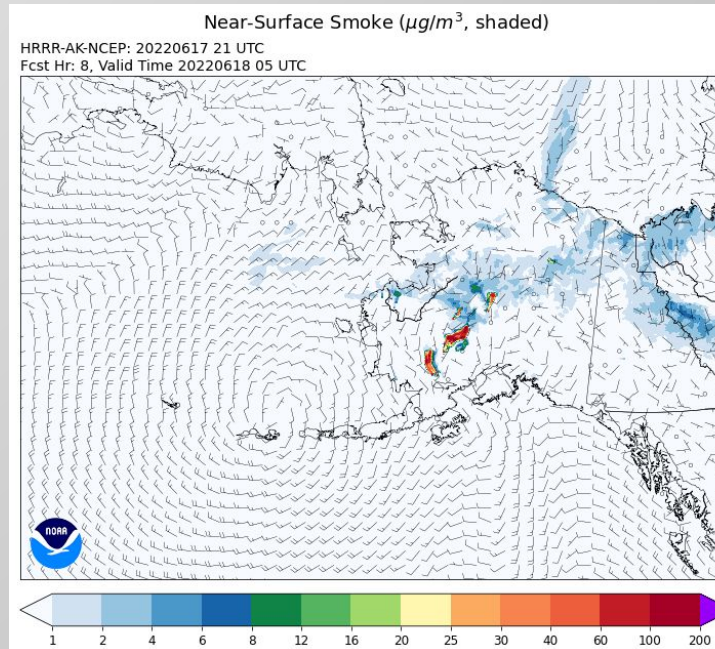
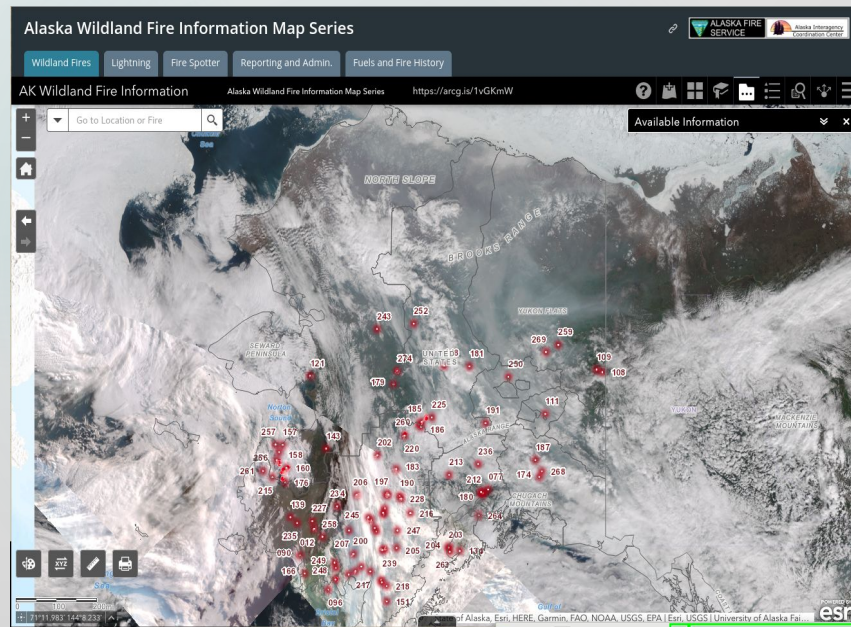
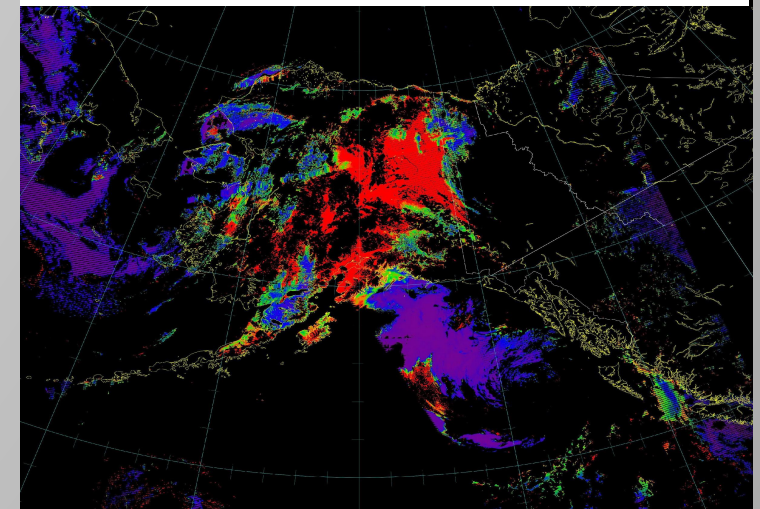
- VAF heat points (VIIRS Active Fires)
 - Input to smoke models
- TrueColor RGB and VIIRS 0.49 μm (m03)
- VIIRS Aerosol Optical Depth (AOD)
- Future uses include smoke assessment & AQI tracking



VIIRS TrueColor RGB 2222 UTC
12Jun22 15



VIIRS AOD
2222 UTC 12Jun22



Volcanic Ash and SO2

Partners and Stakeholders:

- Alaska Volcanic Ash Advisory Center (AVAAC)
- Alaska Volcano Observatory (AVO)
- NOAA/CIMSS Volcano Cloud Monitoring (VOLCAT)
- NASA Direct Readout Laboratory (DRL)
- Finnish Meteorological Institute (FMI)
- JPSS Aviation Initiative

WMO Header **VAA** **VAG**

FVAK21PAWU	X	X
FVAK22PAWU	X	X
FVAK23PAWU	X	X
FVAK24PAWU	X	X
FVAK25PAWU	X	X

<https://www.weather.gov/vaac/>

<https://avo.alaska.edu/>

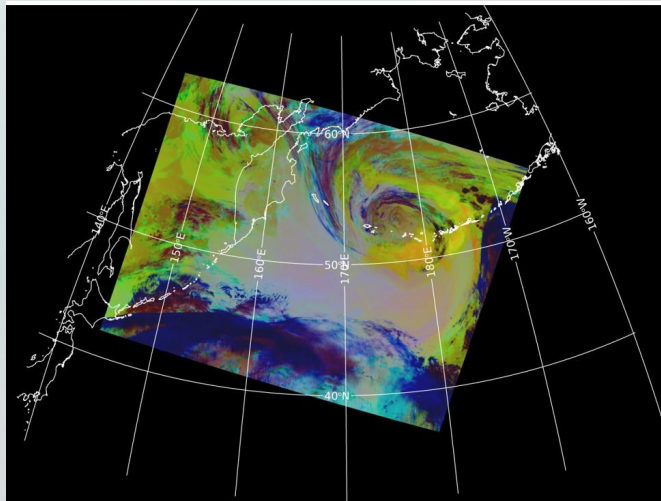


<https://volcano.ssec.wisc.edu/>

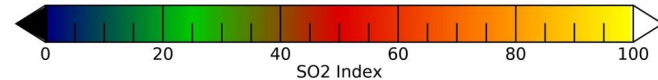
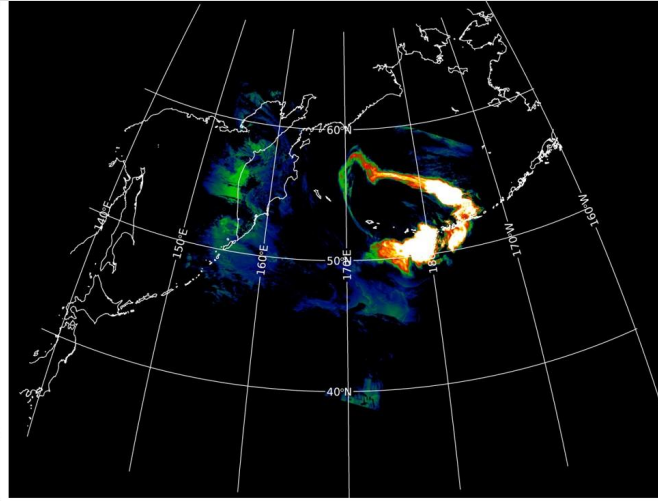
Volcanic Ash and SO2

VIIRS Products:

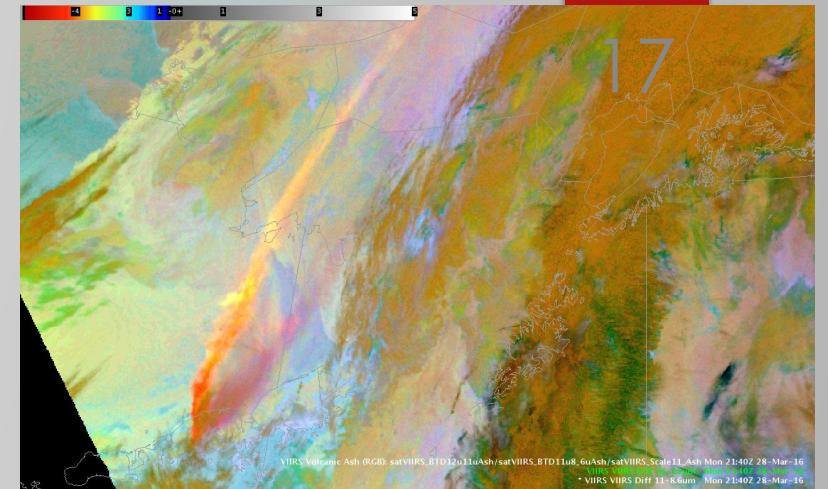
- Ash RGB
- VIIRS Ash index and SO2 index (NASA DRL)
- VIIRS Volcanic Ash EDR



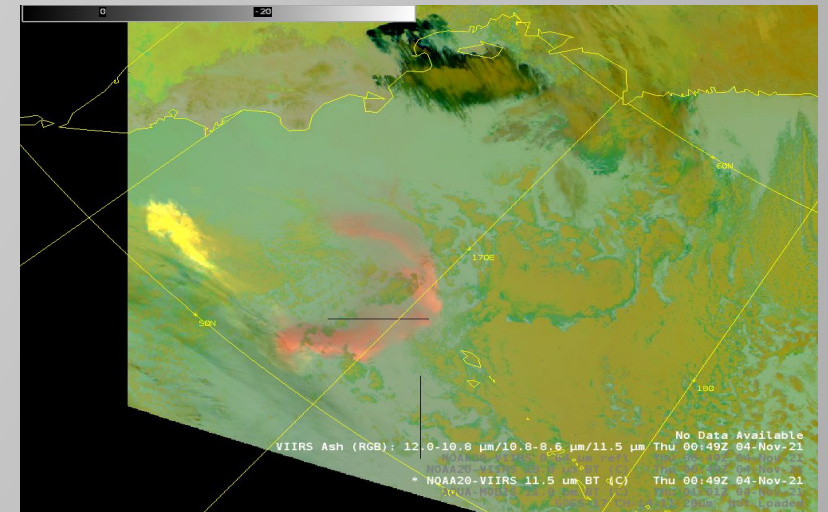
Thermal IR RGB (M14, M15, M16)



Raikoke Volcano – 23 Jun 2019



VIIRS Ash RGB
Pavlof Volcano – Mar 2016

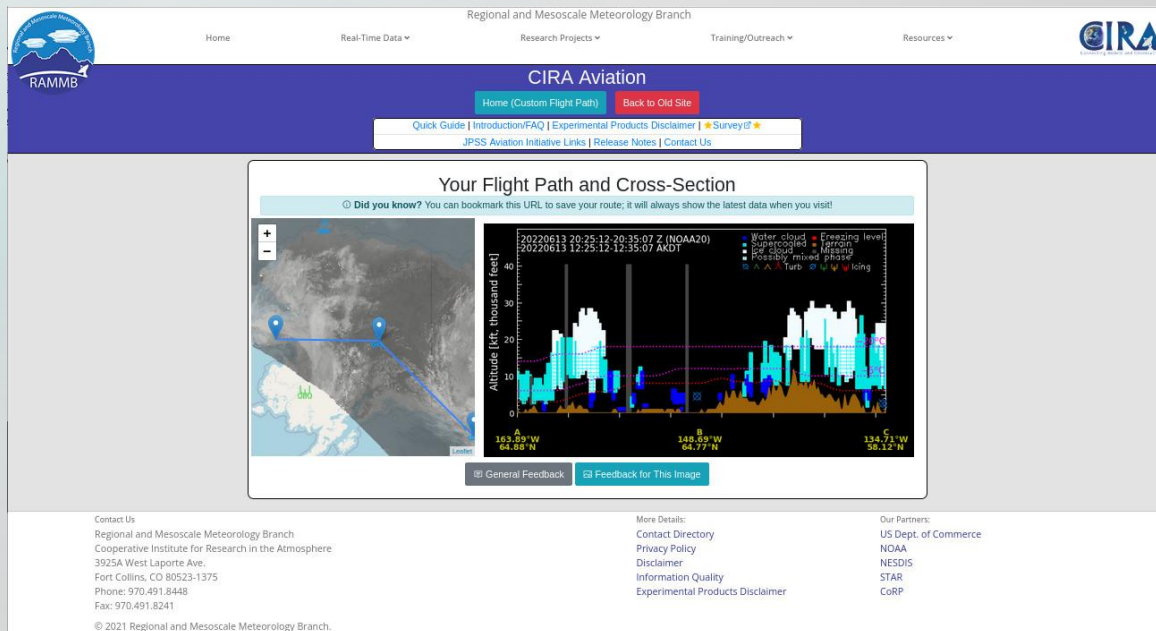


VIIRS Ash RGB
Karymsky Volcano – Nov 2021

Aviation Hazards

Partners and Stakeholders:

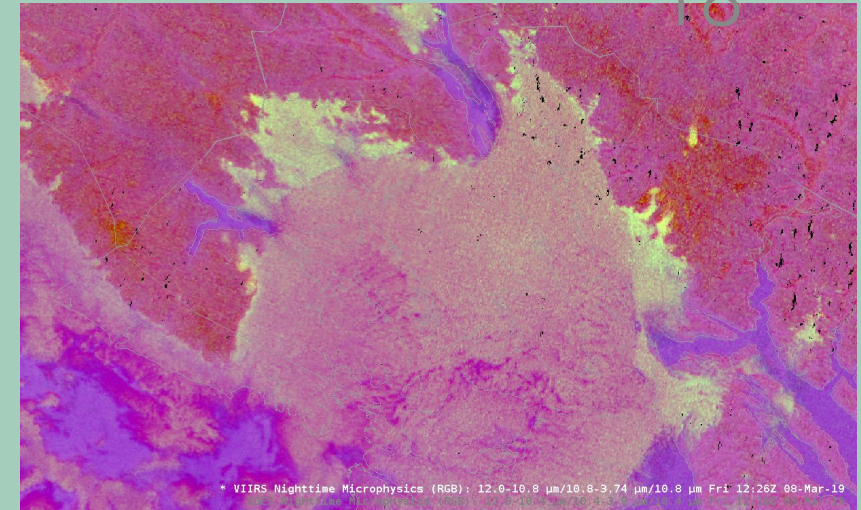
- NWS Alaska Aviation Weather Unit (AAWU)
- Federal Aviation Admin (FAA)
- CSU - CIRA
- Alaska Airmen's Assn.
- Alaska Owners & Pilots Assn.
- JPSS Aviation Initiative



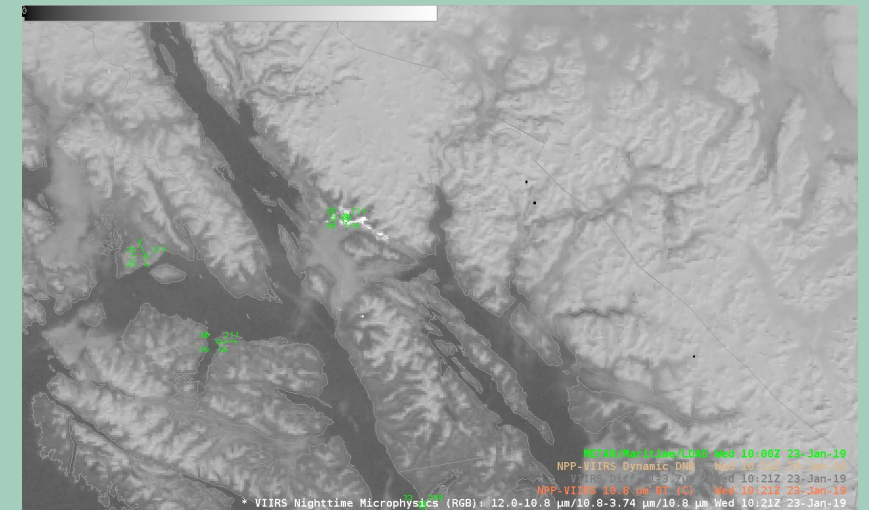
CIRA Cloud Cross-sections

Fog and Stratus

18



Nighttime Microphysics RGB

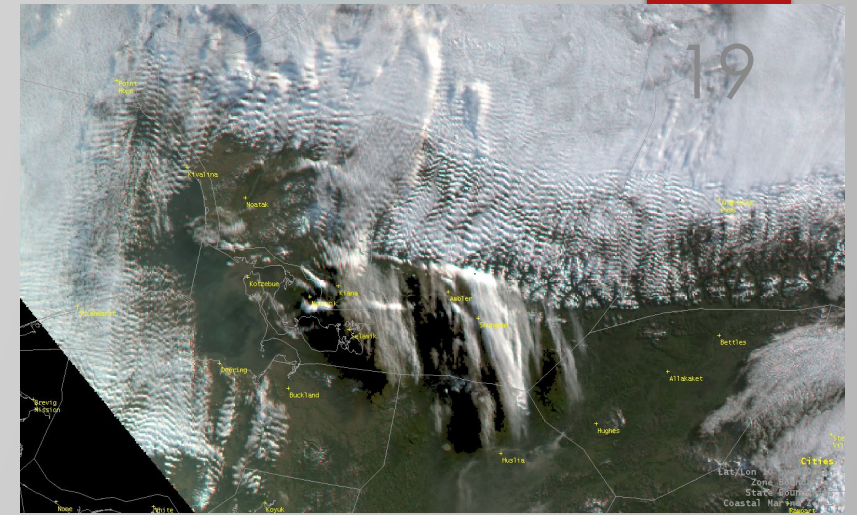


DNB

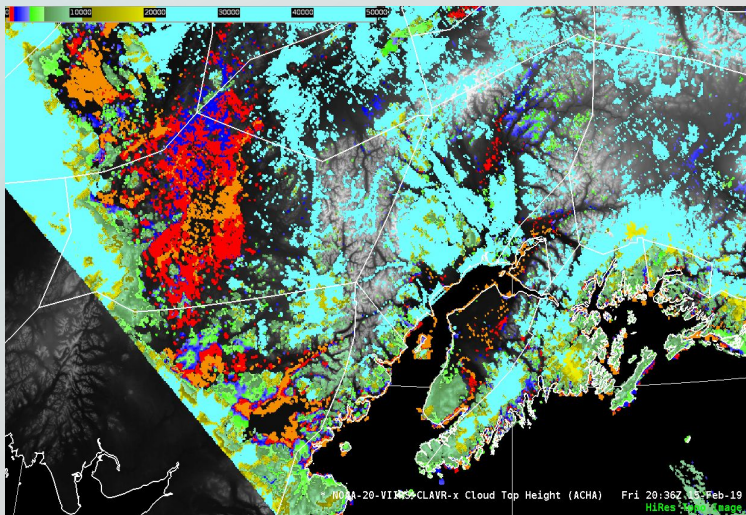
Aviation Hazards

VIIRS Products:

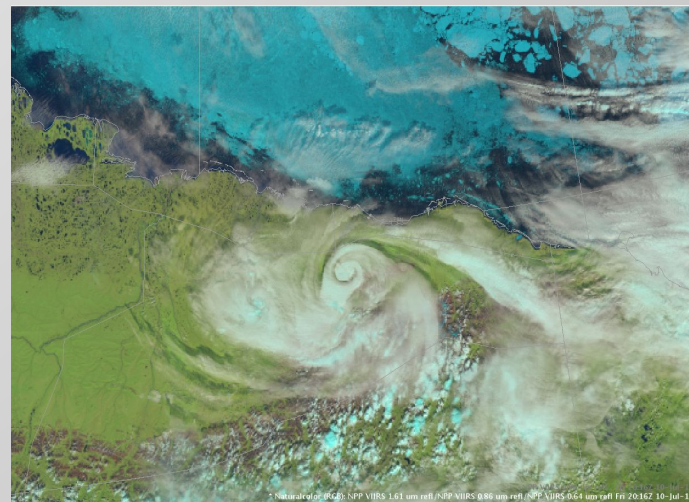
- CLAVR-X cloud products
- RGBs
- DNB



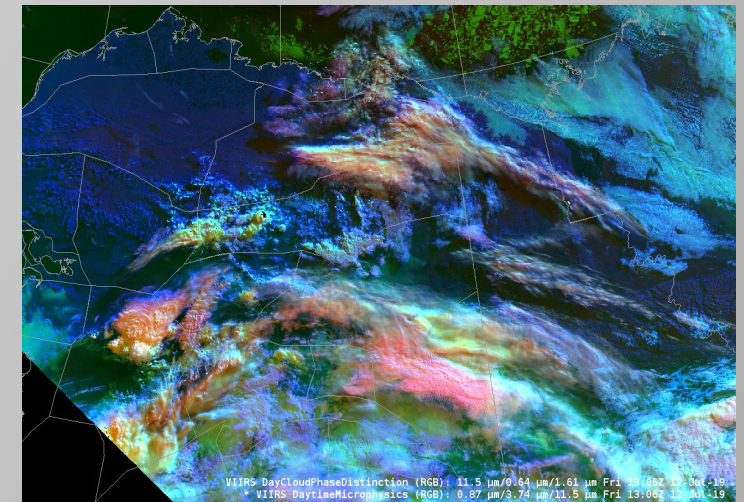
TrueColor RGB (mtn waves)



CLAVR-X (clouds/icing)



DayLandCloud RGB (Polar lows)



CloudPhaseDistinction RGB
(icing/convection)

Sea Ice

Partners and Stakeholders:

- NWS Alaska Sea Ice Program (ASIP)
- US National Ice Center (USNIC)
- NWS Forecast Offices
- US Coast Guard
- UAF School of Fisheries (R/V Sikuliaq)
- SSEC / CIMSS
- JPSS Arctic Initiative

NATIONAL WEATHER SERVICE
NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION

Local forecast by "City, St" or ZIP code
Enter location ... Location Help

News Headlines

- [Changes to the Alaska Weather Information Line Phone Number: Effective on or after August 5, 2022](#)
- [Anchorage International Airport Climate Highlights for May 2022](#)

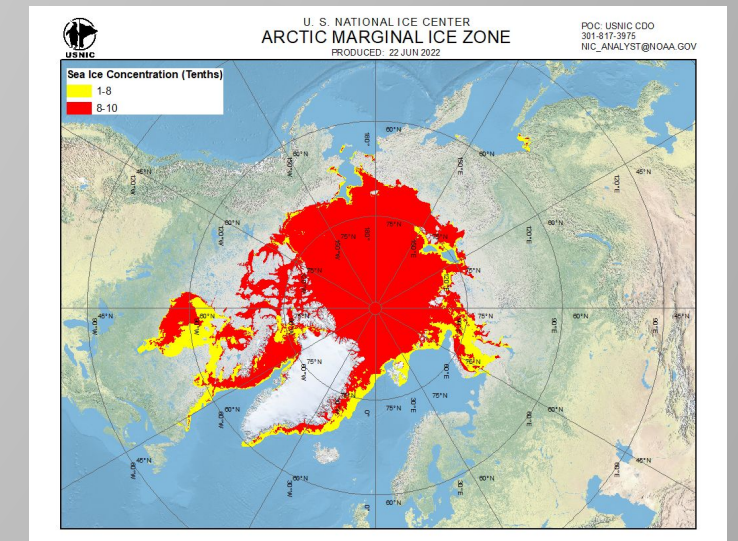
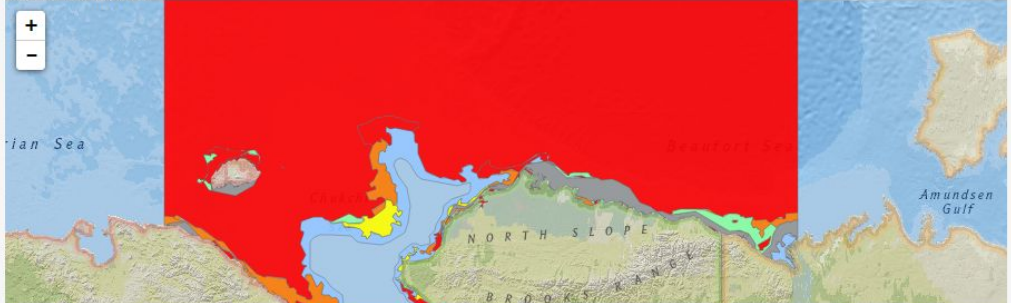
NWS Alaska Sea Ice Program (ASIP)
[Weather.gov](#) > [Anchorage, AK](#) > NWS Alaska Sea Ice Program (ASIP)

Anchorage, AK
Weather Forecast Office

Our ASIP is staffed 7 days a week from 6:30 am to 3:30 pm
Operations Phone Line: 907.266.5138
Operations Email: nws.ar.ice@noaa.gov

Zoomable Maps | Standard Ice Analysis & Forecast Maps | Sea Ice Forecast | 3 Month Sea Ice Outlook | Additional Satellite Resources

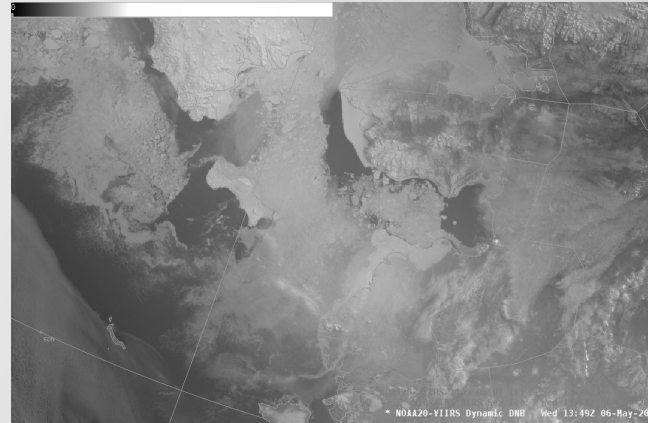
Ice Analysis Layer: Concentration Stage Forecast Legend
CT created: 03:50 Tue Jun 21



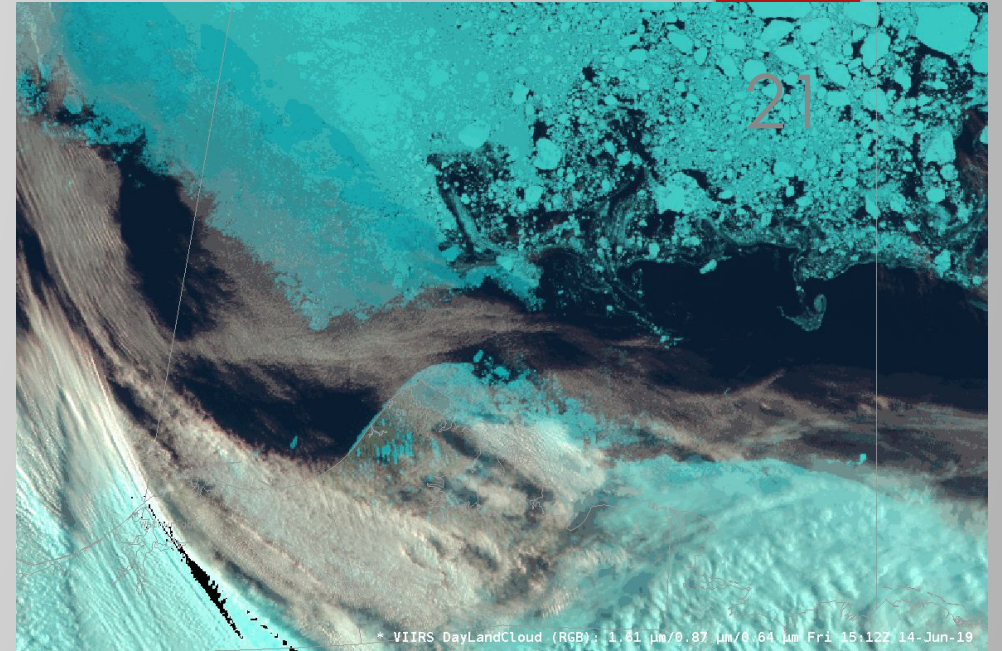
Sea Ice

VIIRS Products:

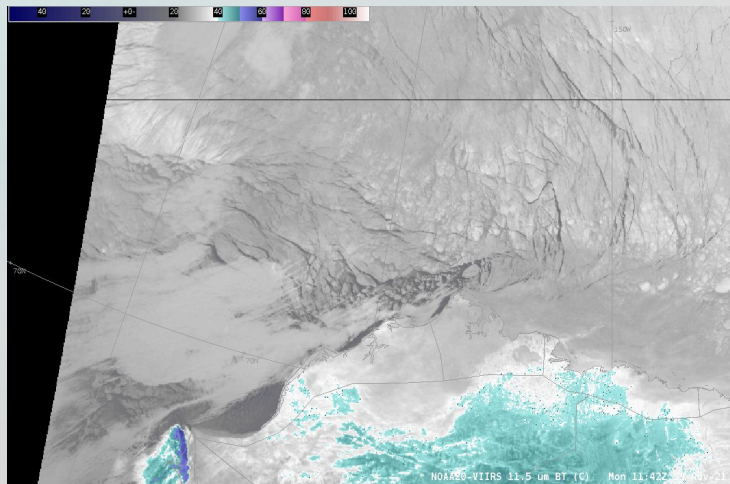
- 11.5 μm (i05)
- DNB
- DayLandCloud RGB
- CIMSS VIIRS Ice Product Suite
- ACSP0 SST
- Future enhancements:
 - Higher res DNB
 - Improved cloud mask



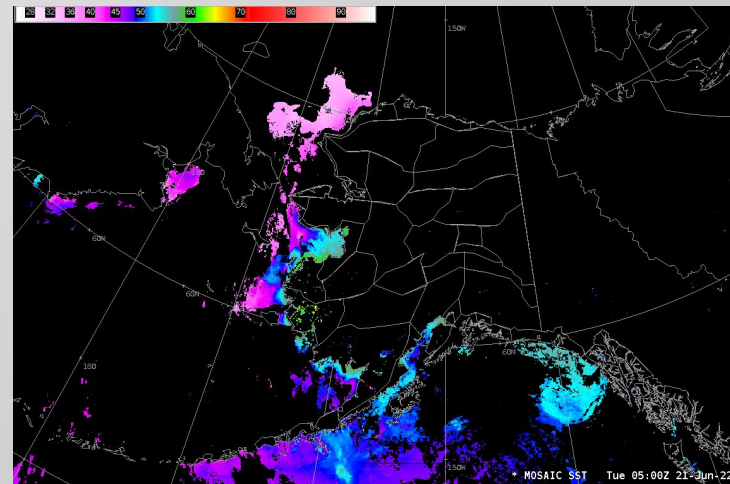
DNB 06 May 2020



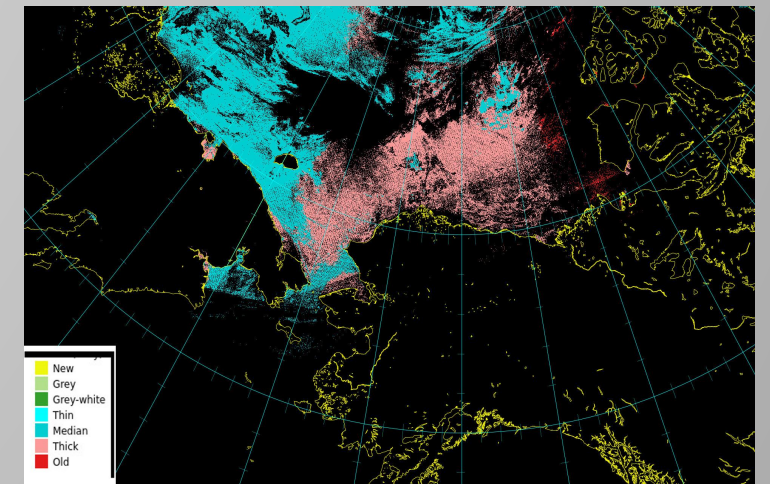
DayLandCloud RGB 14 Jun 2019



11.5 μm (i05) 06 May 2020



ACSP0 SST 21 Jun 2022



VIIRS Ice Age 14 Feb 2022

R/V Sikuliaq (UAF)

Partners and Stakeholders:

- UAF School of Fisheries
- NSF
- Supports sea ice research and is a critical user of VIIRS imagery for navigating ice floes
- Improvements:
 - higher resolution DNB
 - VIIRS sensitivity closer to the terminator

UNIVERSITY OF ALASKA FAIRBANKS

R/V *Sikuliaq* Science Operations

Cruise Planning Shipboard Services Shoreside Support Links About Contacts Search

MapServer

A Real-time, Web-based, GIS Mapping and Data Tool

MapServer is available to everyone aboard, via the ship's internal website.

- **Base Layers**
 - Bathymetry used: [The International Bathymetric Chart of the Arctic Ocean \(BCAO\)](#) and [TOPEX](#)
 - Gridded multi-beam data is from past *Sikuliaq* cruises and publicly available data bases.
 - Bathymetric data can be requested for regions not currently covered, if the data is available.
- Display **Multiple Layers** at the same time.
- Plot *Sikuliaq's Underway Data*
 - Sea-surface temp/salinity/chlorophyll are available when the uncontaminated seawater system is running.
 - Currents are available when the WH300 ADCP is installed and running
 - Other underway data layers may be requested and considered by the developer.
- **Route Planner**
- **Alaska Coastal Community maritime harvest/activity/resource areas**
 - Please read the [CECSOP document](#) for more information about this layer.

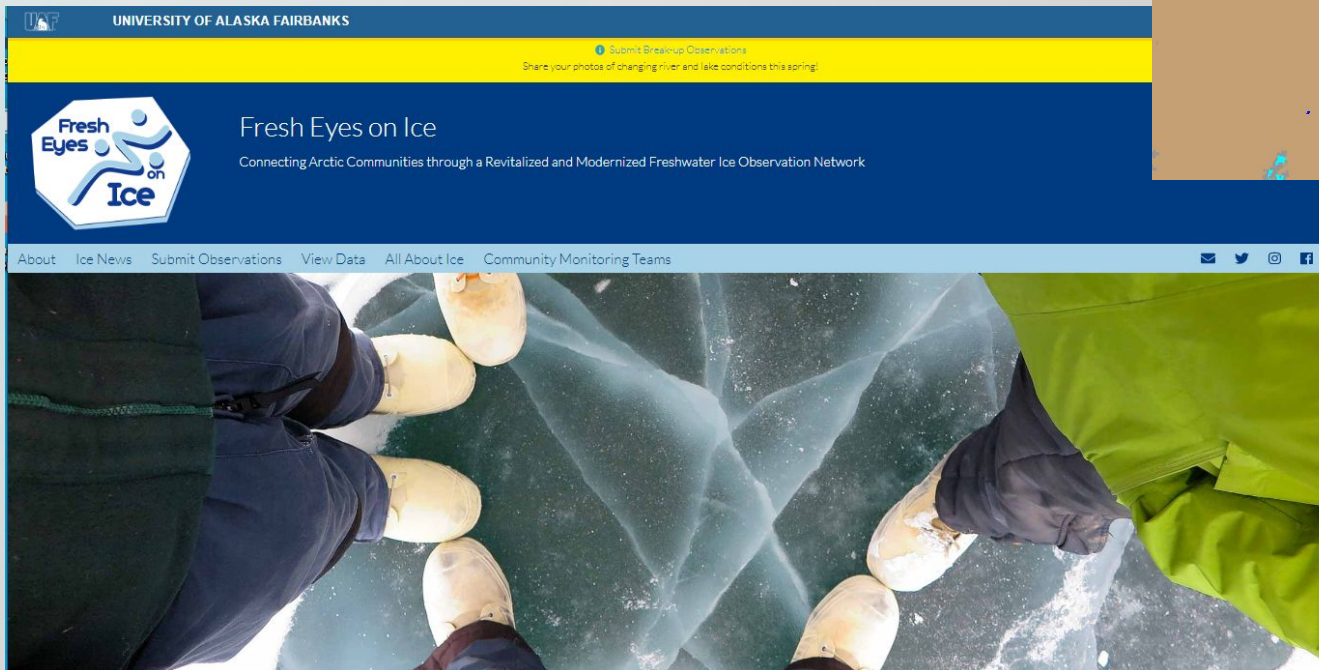
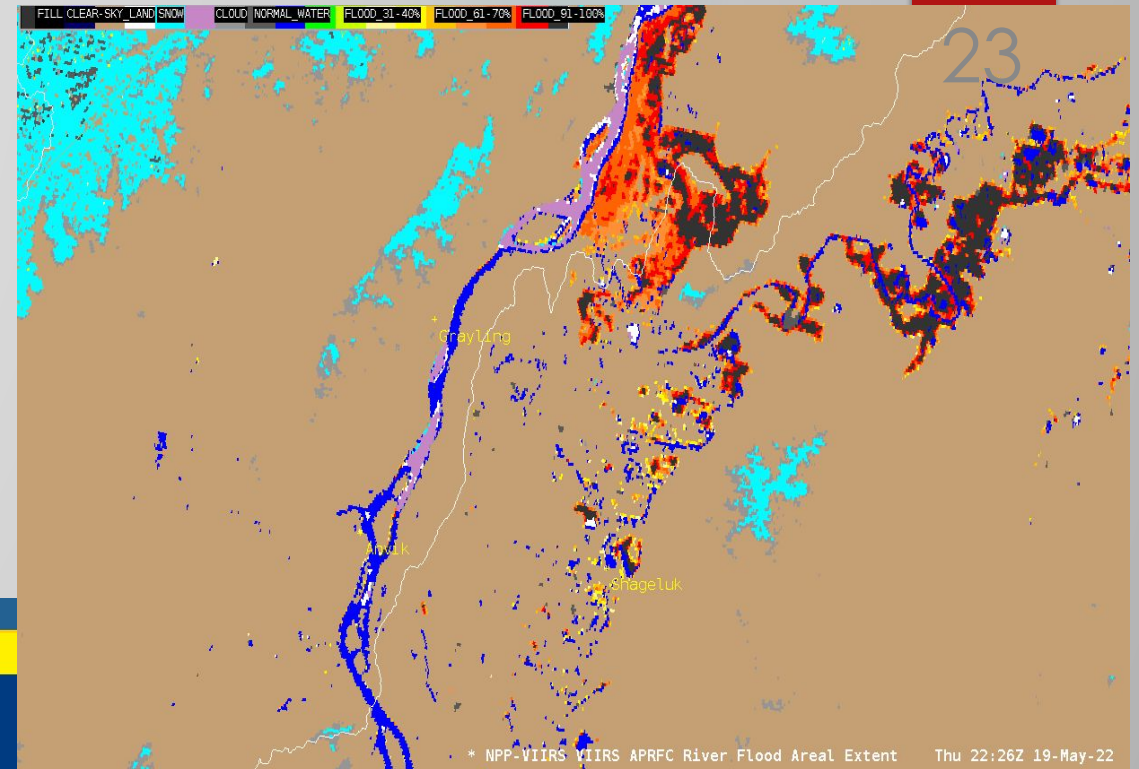
Satellite data displayed on overhead monitor



Flooding

Partners and Stakeholders:

- NWS River Forecast Center (APRFC)
- State of Alaska
- UAF/Geophysical Institute (Fresh Eyes on Ice)
- City and Village Emergency Managers
- *JPSS River Ice and Flood Initiative*



Summary

- VIIRS is critical to help fill Alaskan data voids from limited observations.
- Polar satellites pass more frequently over high latitudes providing enough VIIRS data for animations and trend analysis.
- Direct Broadcast and near real-time processing makes VIIRS data available for short fused hazard monitoring.
- VIIRS data is used by:
 - Federal, state and local government agencies
 - Emergency managers
 - Educational institutions and researchers
 - Alaskan citizens
- GINA is a High Latitude Proving Ground for testing new VIIRS products and soliciting feedback

Suggestions for Future VIIRS Enhancements

25

- Re-establish access to Utqigavik (Barrow) antenna
- Higher resolution DNB
- Higher saturation temperature for VIIRS i04 ($3.74 \mu\text{m}$)
- Improved cloud masking
 - WV band: VIIRS cloud masks suffer from lack of WV channel.
 - Exploit other sensors for moisture (ATMS, CrIS)
- Automated assessment of current fire perimeters and recently burned areas
- Include Direct Broadcast data input to smoke models
- Additional Training and case studies

Questions? satellite@gina.alaska.edu



<https://gina.alaska.edu/>