

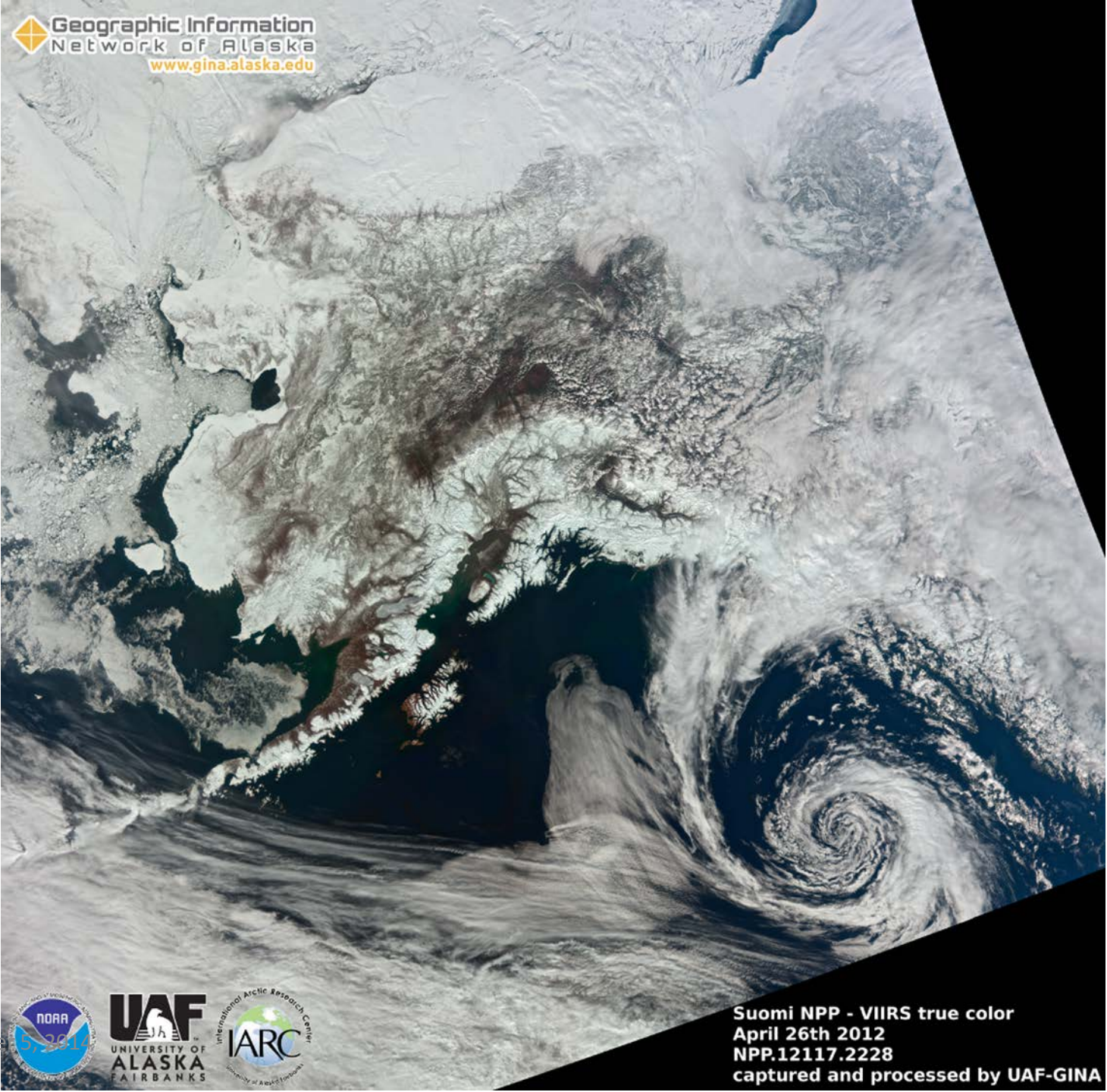
Update from the High Latitude Proving Ground

Eric Stevens, Scott Macfarlane, and Tom Heinrichs



Outline

- What is GINA, and what is High Latitude Proving Ground?
- Improvements to Hardware and Infrastructure in 2015:
 - The “Sandy Supplemental” at GINA
 - Bandwidth at National Weather Service Alaska Region
- Examples of Products



September



Suomi NPP - VIIRS true color
April 26th 2012
NPP.12117.2228
captured and processed by UAF-GINA

GINA: Geographic Information Network of Alaska

part of University of Alaska

September



Suomi NPP - VIIRS true color
April 26th 2012
NPP.12117.2228

captured and processed by UAF-GINA

**GINA succeeds best
when it collaborates
with other cooperative
institutes: CIMSS,
CIRA, SPoRT, etc, and
helps those CIs
succeed in Alaska**

September



Suomi NPP - VIIRS true color
April 26th 2012
NPP.12117.2228
captured and processed by UAF-GINA

High Latitude Proving Ground: What

- High Latitude Proving Ground – Improving Forecasts and Warnings by Leveraging GOES-R Investment to Deliver and Test NPP/JPSS Data in Support of Operational Forecasters
 - Uses Direct Broadcast Antenna(s)
 - Emphasis on minimizing latency
 - Emphasis on delivering products in formats useful to forecasters: AWIPS, GIS, web
 - Maximizing the upside of *“Alaska is Different”*

The “Sandy Supplemental”

- New hardware being deployed through September, 2015
 - Collaboration between GINA and NOAA/NESDIS, NOAA/NWS
- New antenna placed at NOAA’s Fairbanks Command and Data Acquisition Station (FCDAS)
- New machines to do processing

The New Antenna

- 3.0 meter from Orbital Systems
- X, L, and S band
- Named “Sandy Dog”
- In addition to GINA’s legacy antenna, 3.6m X-band “Big Dog”
- **Installed at NOAA/NESDIS last week!**



New Machines for Processing

- At GINA
- At NESDIS/FCDAS →
- At NWS in Anchorage



Enhanced Processing Environment

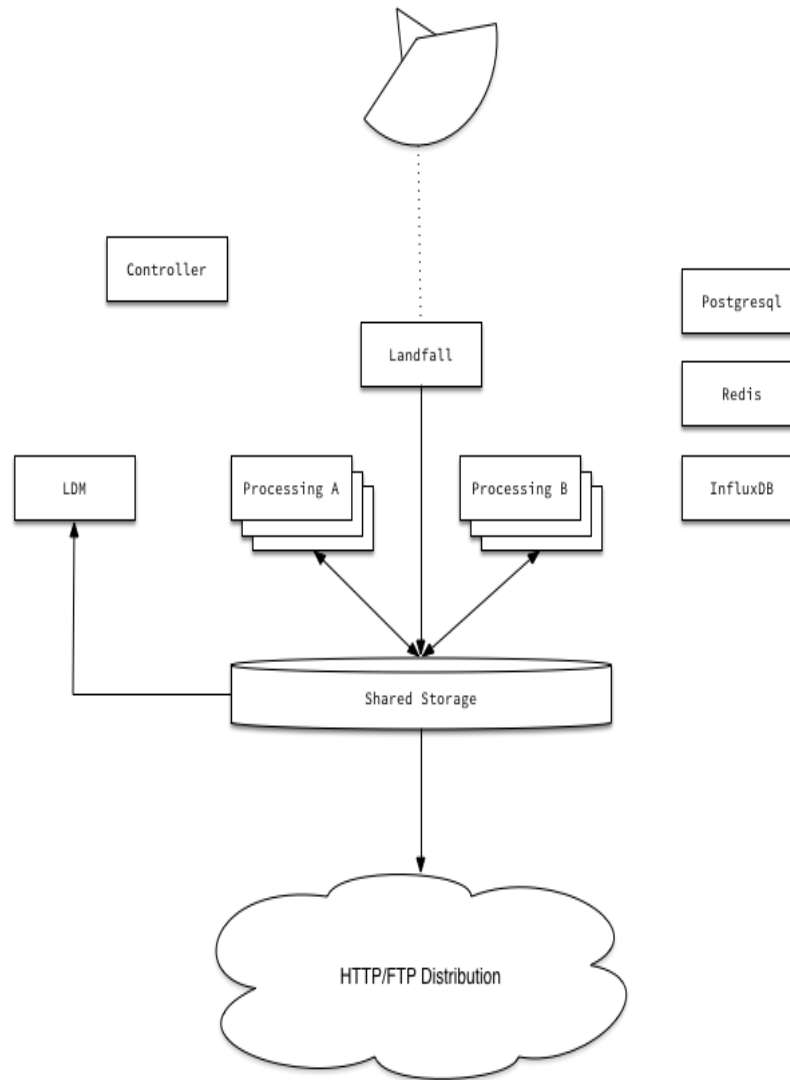
- “Investigator sandbox” at GINA, where scientists from Cooperative Institutes can test new algorithms/approaches in an environment identical to the operational environment feeding products to the National Weather Service (NWS) in Alaska.
- Follow-on upgrades to Virtual Machines hosted at GINA



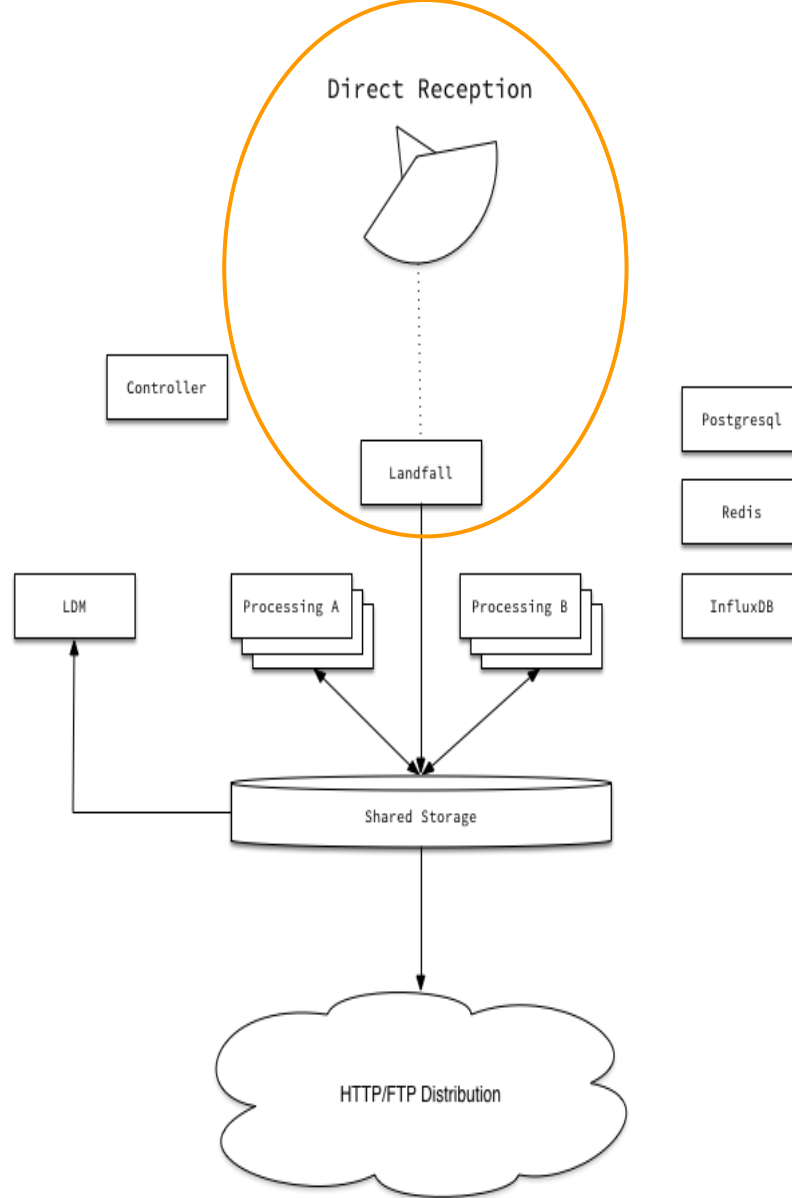
Sandy Systems Architecture: A Rough Overview

DRAFT

Direct Reception

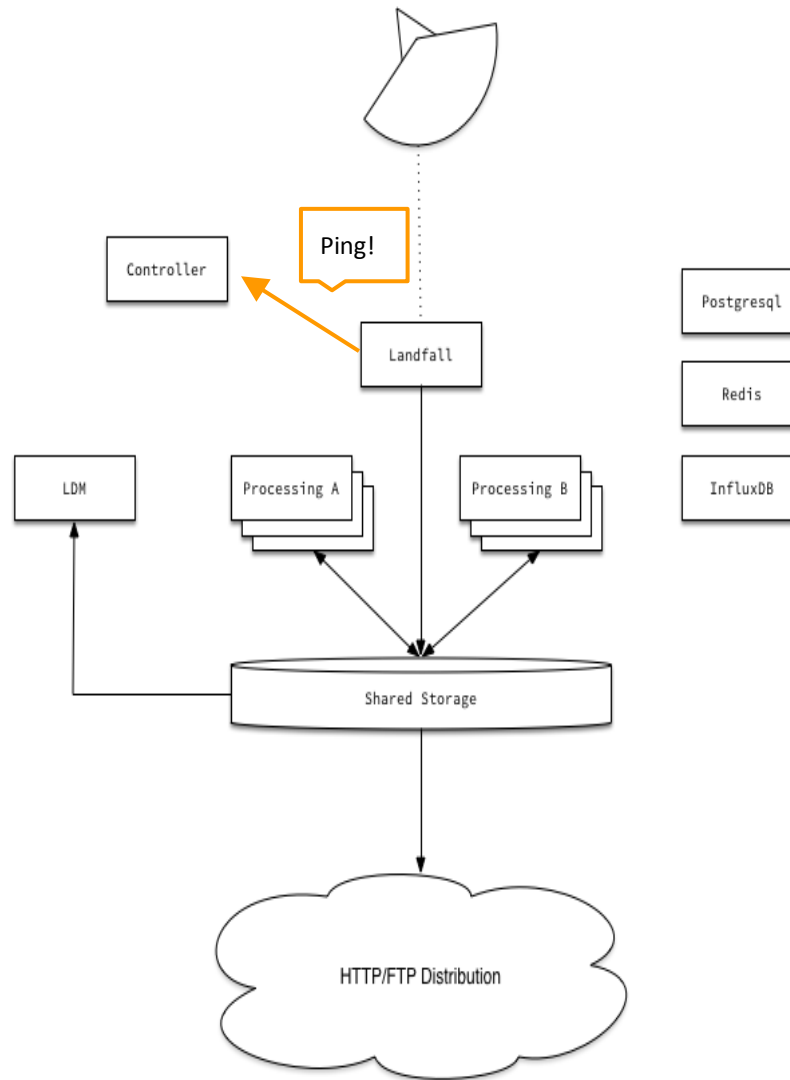


DRAFT



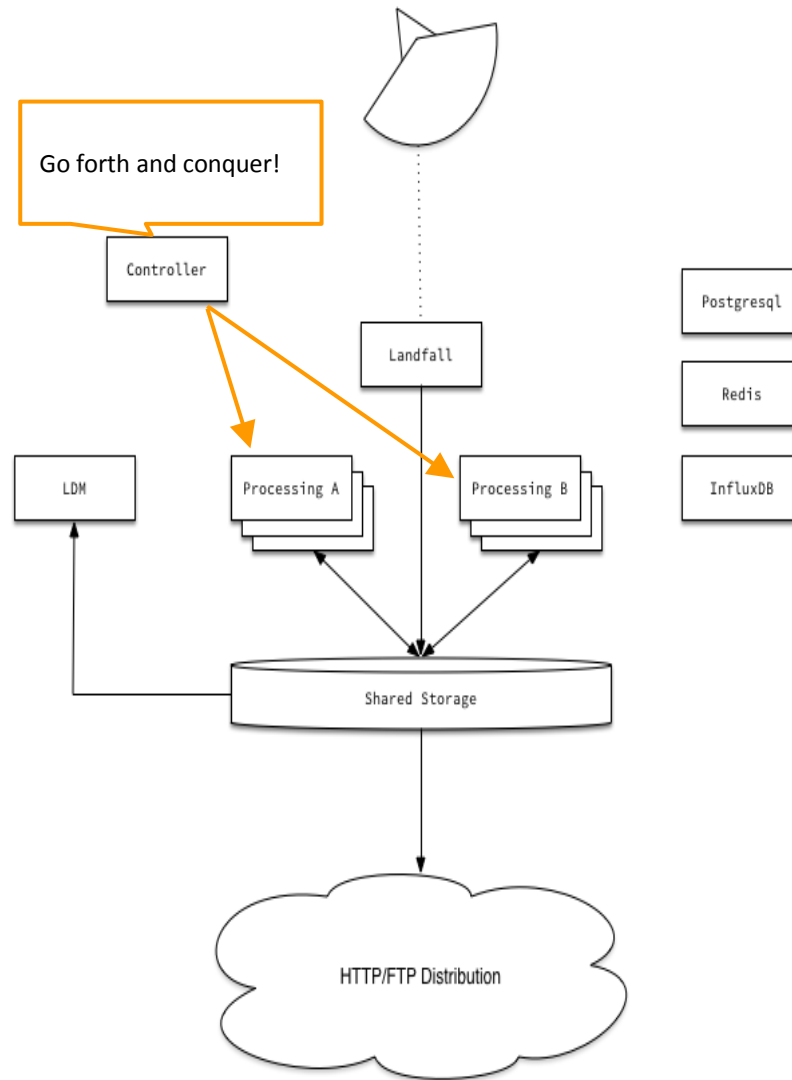
DRAFT

Direct Reception



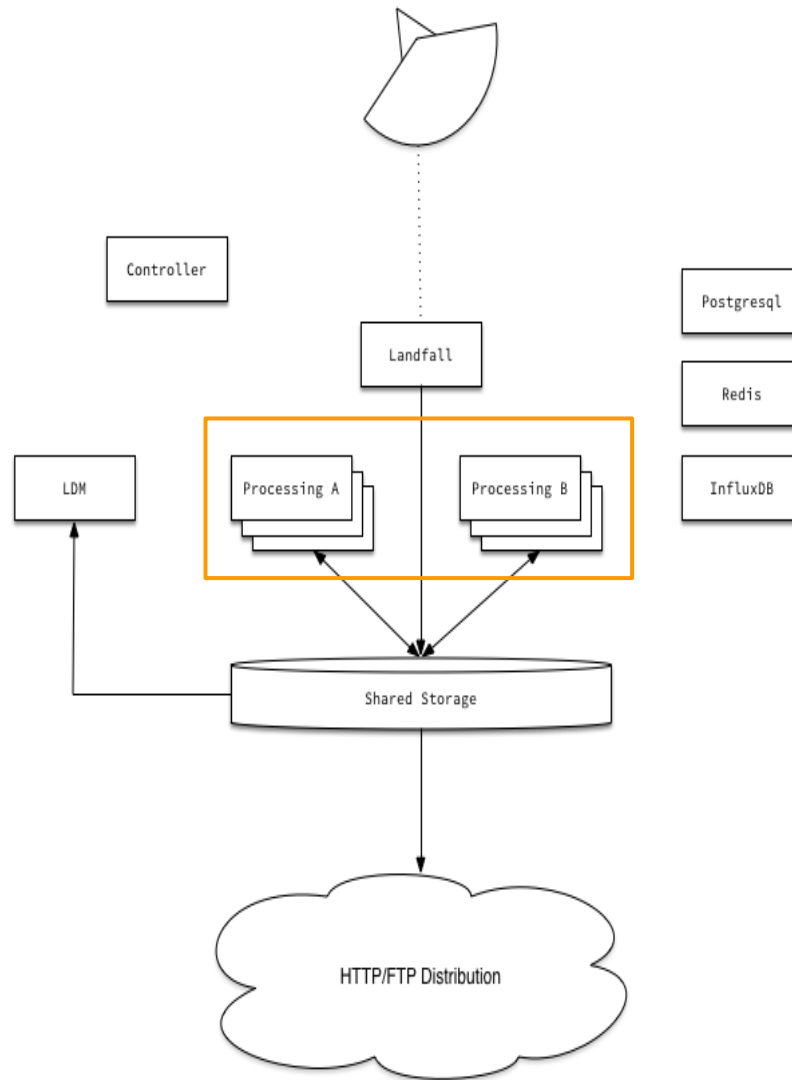
DRAFT

Direct Reception



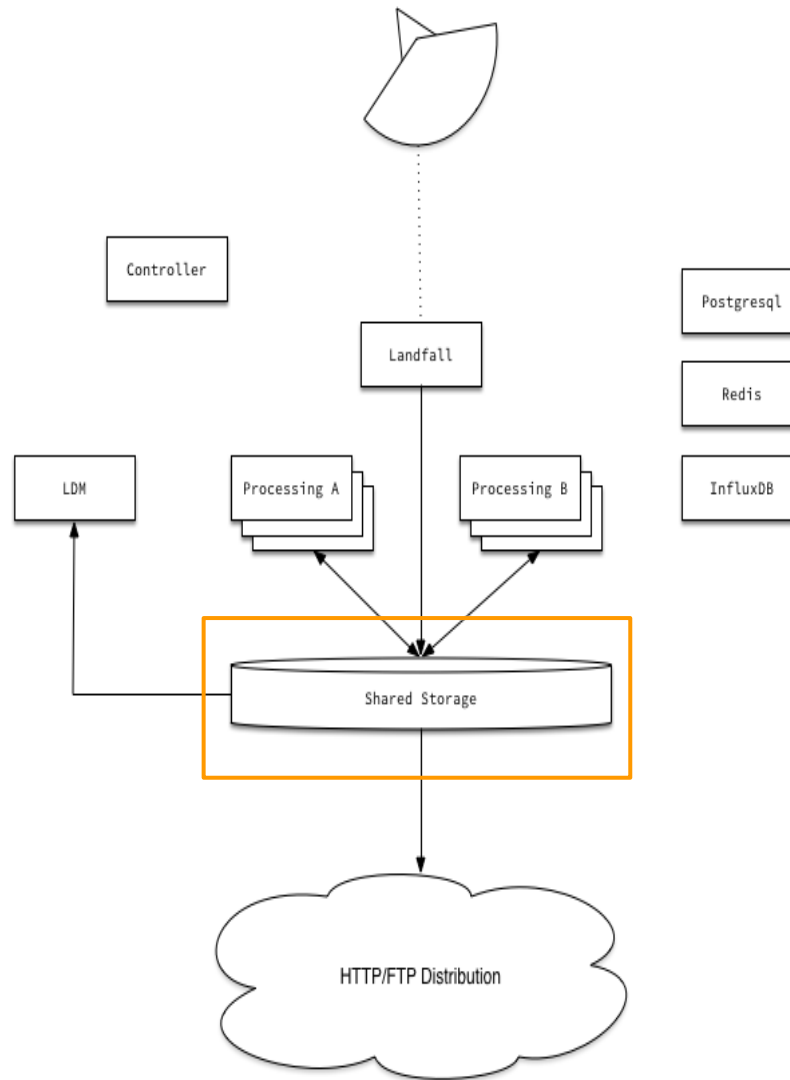
DRAFT

Direct Reception

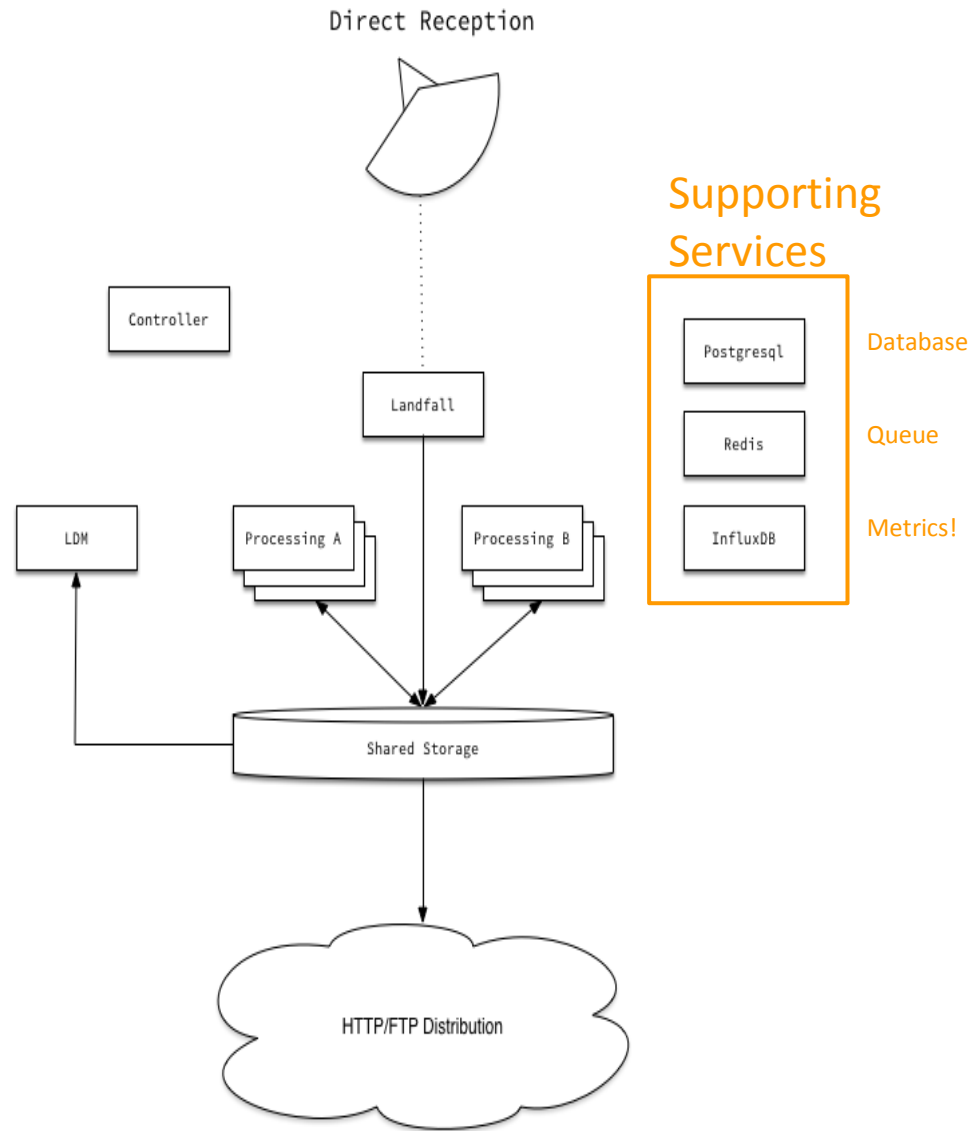


DRAFT

Direct Reception

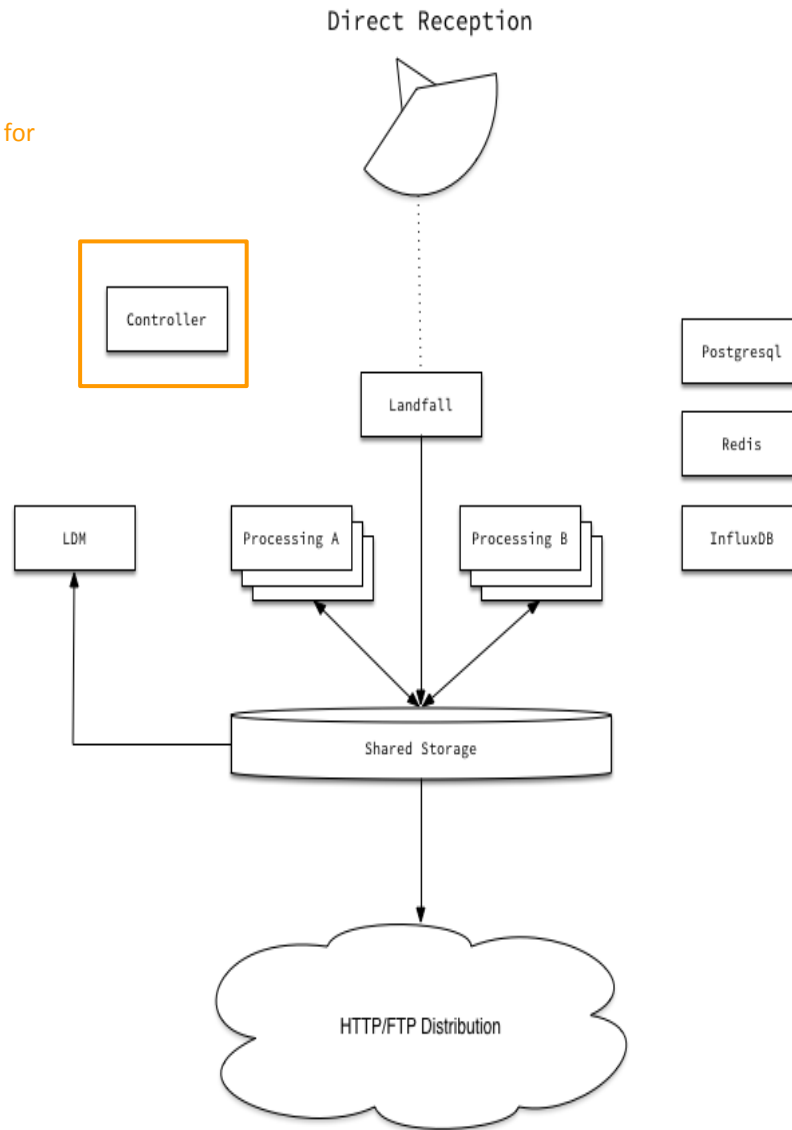


DRAFT



DRAFT

Also provides a dashboard for operators of the system



DRAFT

npp.15062.1401 ViirsSdrJob

2015-03-03 14:20:39 UTC Start Time
2015-03-03 14:27:01 UTC End Time
344 Execution Duration (sec)
0 Exit Status

STDOUT **STDERR** Logs

```
(INFO):adl_viirs_sdr.py:main:1134:product version: DPE_V
(INFO):adl_viirs_sdr.py:main:1149:CSPP execution work di
(INFO):adl_viirs_sdr.py:viirs_sdr_run:1060:allow_cache_up
(INFO):adl_viirs_sdr.py:setup_directories:610:Creating log
(INFO):adl_common.py:status_line:344:
( Unpack the supplied inputs )

Processing /gluster/cache/snpp/level0/2015/03/npp.15062.1401/RNSCA-RVIRS_npp_d20150303_t1402181_e1411386_b00001_c20150303141
_dev.h5...

Finished
(INFO):adl_common.py:status_line:344:
( Execution Time: 3.713750 Sec Cmd "/opt/cspp/SDR_2_0/common/ADL/tools/bin/ADL_Unpacker.exe /gluster/cache/snpp/level0/2015/03/npp.
RVIRS_npp_d20150303_t1402181_e1411386_b00001_c20150303141945184000_all-_dev.h5" )

(INFO):adl_common.py:status_line:344:
( Search through the inputs for legal granule combinations )

(INFO):adl_viirs_sdr.py:find_granules_and_build_xml:642:sifting through metadata to find VIIRS SDR processing candidates
(INFO):adl_viirs_sdr.py:sift_metadata_for_run_all_granules:288:Collecting information for S/C diary RDRs
(INFO):adl_common.py:status_line:344:
( Total Viirs Science RDRs: 7 )
```

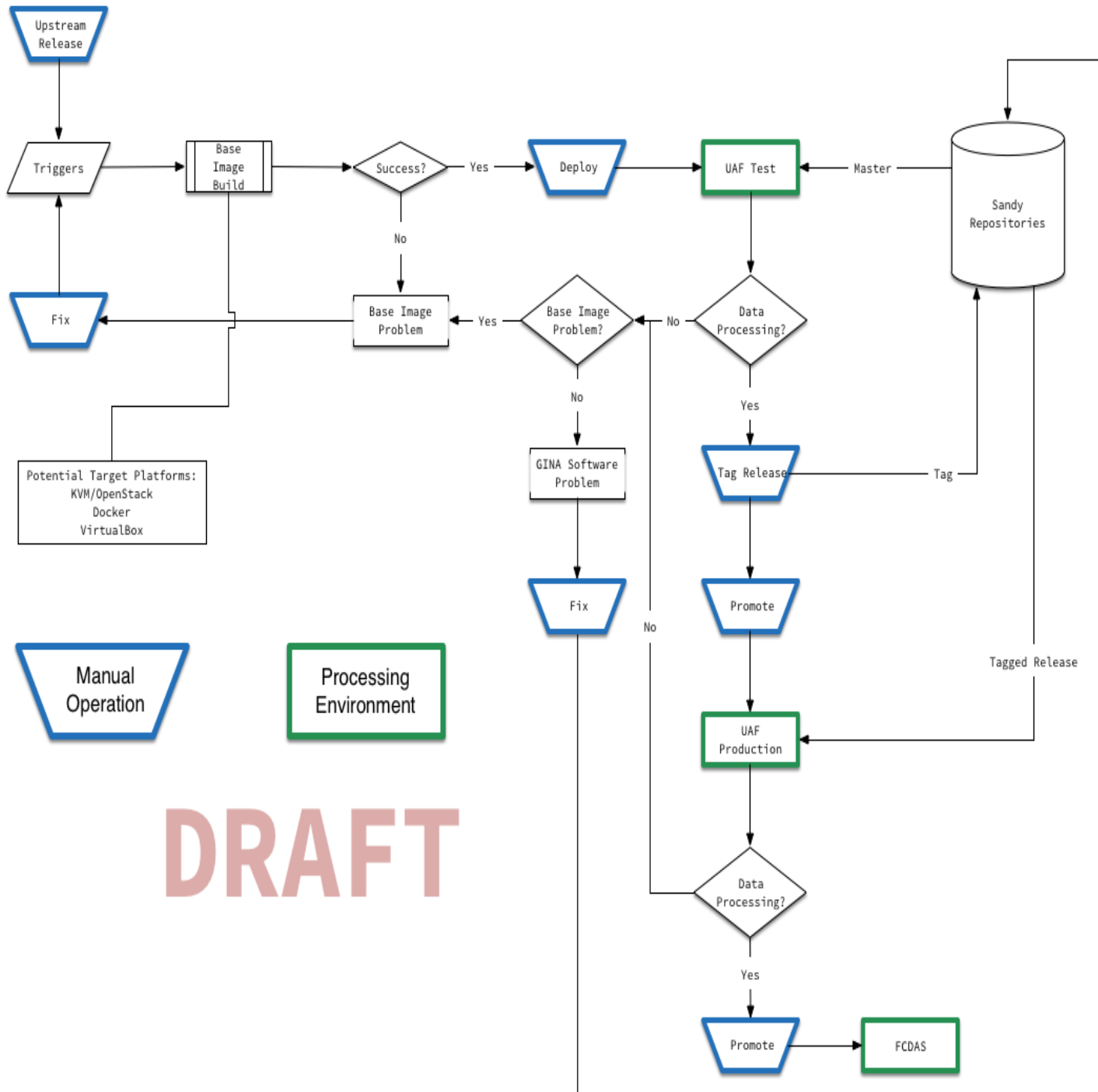
Implement just enough to watch the system. Processing robustness has been priority to this point.

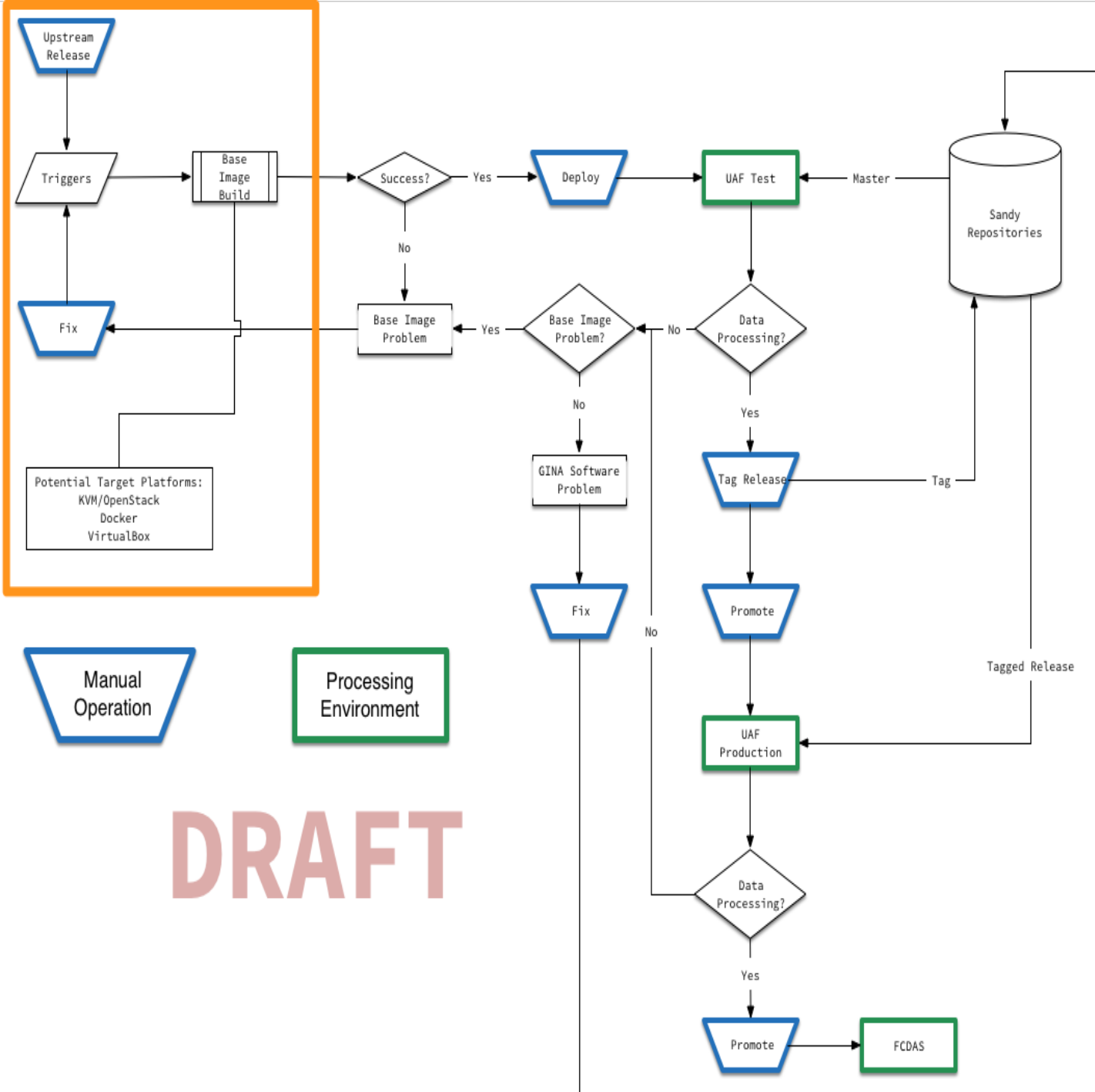
Improvements to be made:

- Restart failed jobs
- Block systems from processing (unhealthy, maintenance, etc.)
- Link to data
- Remove programmer art
- ???

Sandy Deployment

- How to get updates get onto the system?
- How to ensure it all works together?





Configuration Management

Describe machine state

- Install package X
- Run service y
- Add user 'oper'

```

4  ▾ node['cspp']['snpp-sdr']['dependencies'].each do |pkg|
5    package pkg
6  end
7
8  ▾ node['cspp']['snpp-sdr']['components'].each do |name, component|
9    cspp_component(component)
10 end
11
12 ▾ template "/etc/profile.d/cspp_sdr_env.sh" do
13   mode 0644
14   ▾ variables({
15     version: node['cspp']['snpp-sdr']['version']
16   })
17 end
18
19 ▾ cron "update ancillary data" do
20   minute "0"
21   hour "0"
22   day "*"
23   command "#{software_path('snpp-sdr')}/common/mirror_jpss_ancillary.bash"
24   user node['cspp']['user']
25   only_if { node['cspp']['snpp-sdr']['cron']['ancillary'] == true }
26 end
27
28 ▾ cron "update lookup tables" do
29   minute "0"
30   hour "0"
31   day "*"
32   command "#{software_path('snpp-sdr')}/common/mirror_jpss_luts.bash"
33   user node['cspp']['user']
34   only_if { node['cspp']['snpp-sdr']['cron']['luts'] == true }
35 end
36

```

Configuration Management

Describe system state

- 1 Database VM
- 2 Web VMs
- X Processing VMs

Move between environments/providers with minimal changes

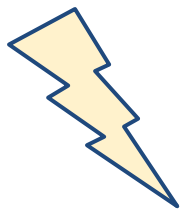
- Dev/Prod parity
- Workstation -> Docker -> Cloud Provider

End result:

- One VM capable of running RT-STPS
- Two VMs capable of running CSPP SDR
- Two VMs capable of running CSPP EDR
- Two VMs capable of running polar2grid
- One VMs capable of running LDM

Could run this on my workstation (If I had 512GB of memory)

Minimal changes this could run on AWS, Google Compute, OpenStack, etc. and end up with the same system.



1.0 was released two weeks ago, so we're still figure out how best to use this new tool.

```
1 require 'chef/provisioning'
2 |
3 machine 'rtstps' do
4   run_list ['role[sandy-rtstps-worker]']
5   add_machine_options vagrant_config: "
6     config.vm.provider :libvirt do |domain|
7       domain.memory = 4096
8     end"
9 end
10
11 machine_batch do
12   2.times do |count|
13     machine "cspp-sdr-#{count}" do
14       run_list ['role[sandy-sdr-worker]']
15       add_machine_options vagrant_config: "
16         config.vm.provider :libvirt do |domain|
17           domain.memory = #{8192 * 9}
18           domain.cpus = 9
19         end
20       "
21     end
22
23     machine "cspp-edr-#{count}" do
24       run_list ['role[sandy-edr-worker]']
25       add_machine_options vagrant_config: "
26         config.vm.provider :libvirt do |domain|
27           domain.memory = #{8192 * 9}
28           domain.cpus = 9
29         end
30       "
31     end
32
33     machine "polar2grid-#{count}" do
34       run_list ['role[polar2grid-worker]']
35       add_machine_options vagrant_config: "
36         config.vm.provider :libvirt do |domain|
37           domain.memory = #{8192 * 9}
38           domain.cpus = 9
39         end
40       "
41     end
42   end
43 end
44
45 machine 'ldm' do
46   run_list ['role[ldm]']
47   add_machine_options vagrant_config: "
48     config.vm.provider :libvirt do |domain|
49       domain.memory = 4096
50     end
51   "
52 end
53
```

Outline

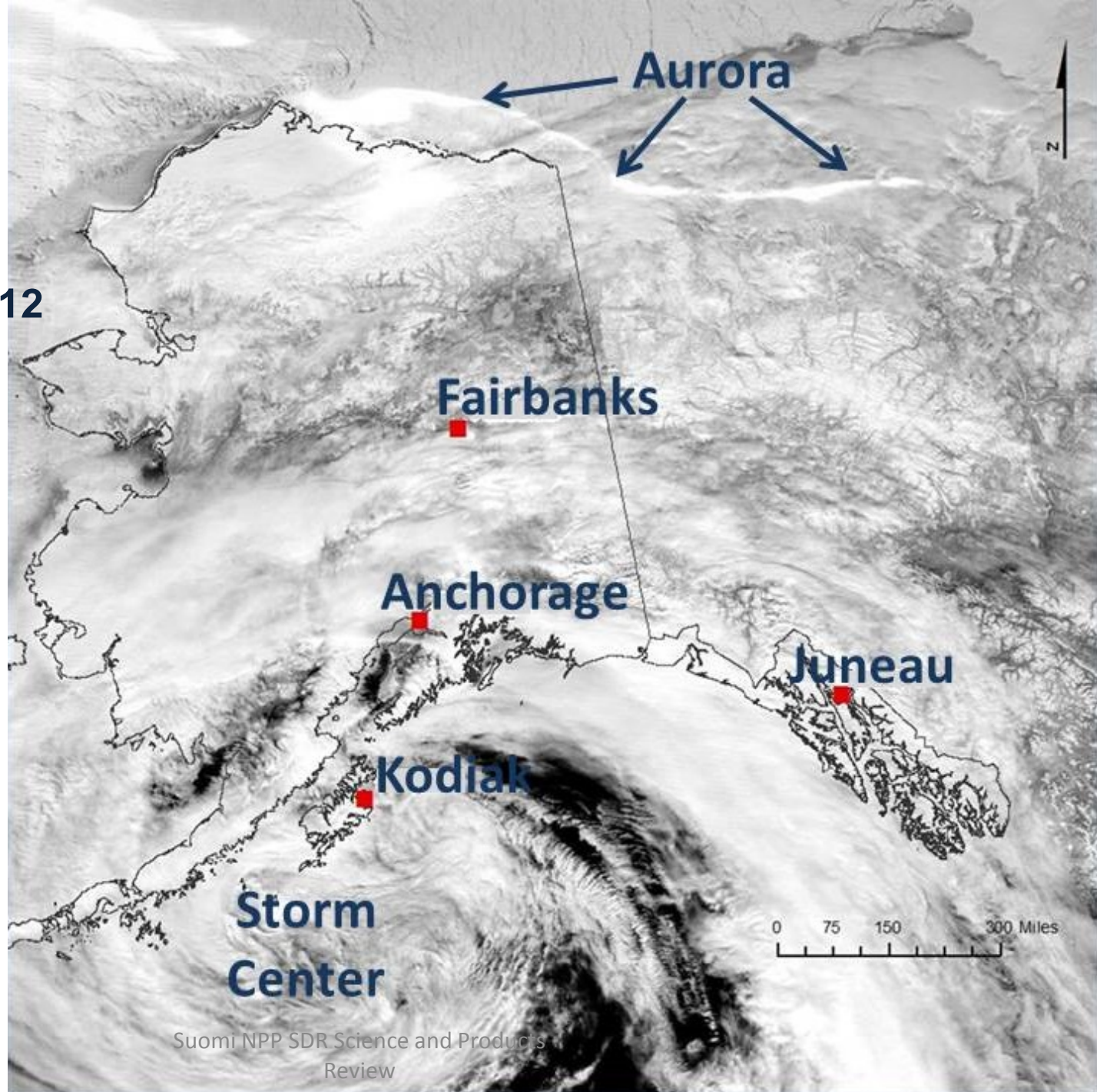
- What is GINA, and what is High Latitude Proving Ground?
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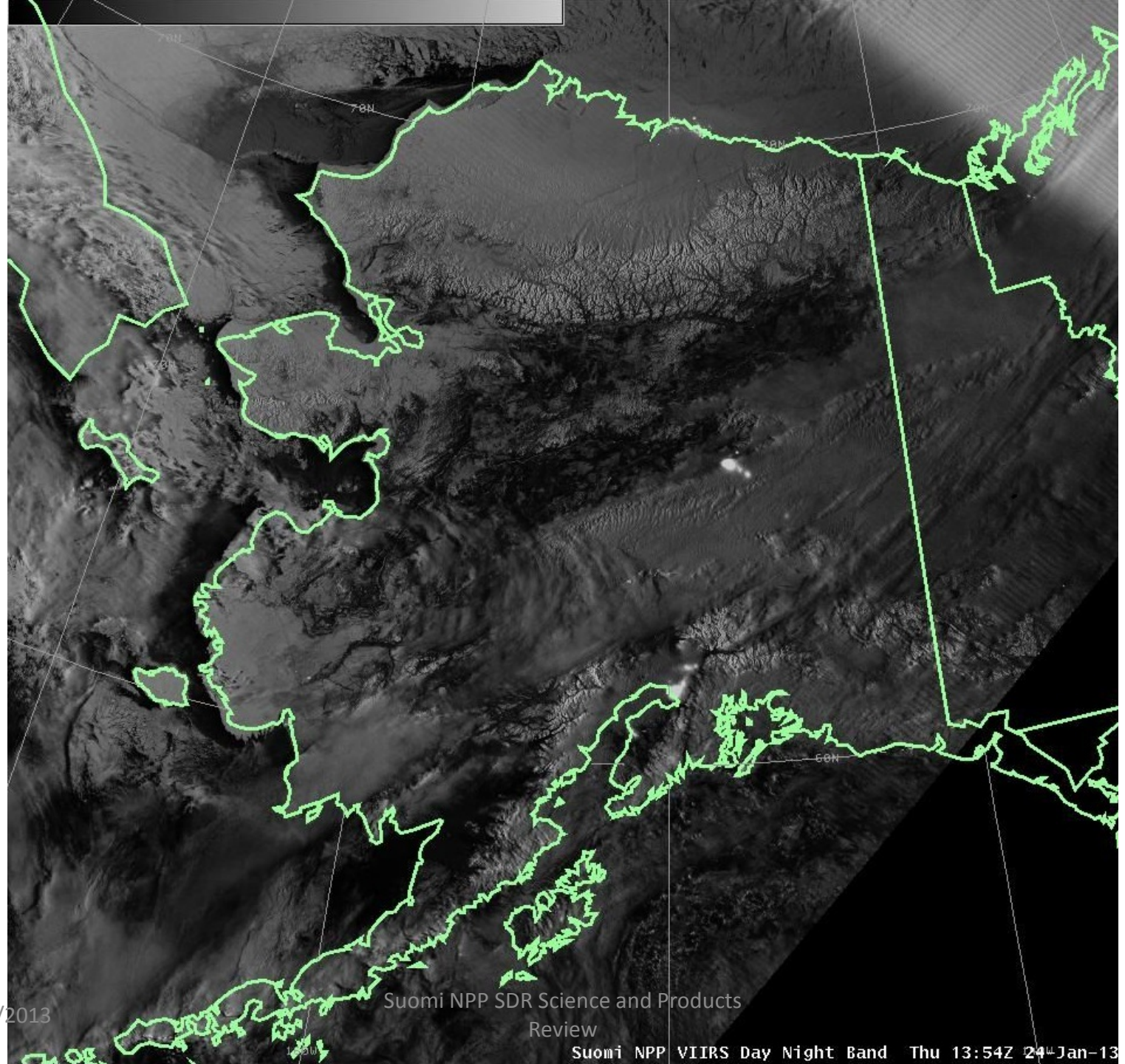
The "Kulluk" incident

Day-Night Band

2:41am Dec 30, 2012

Near Full Moon

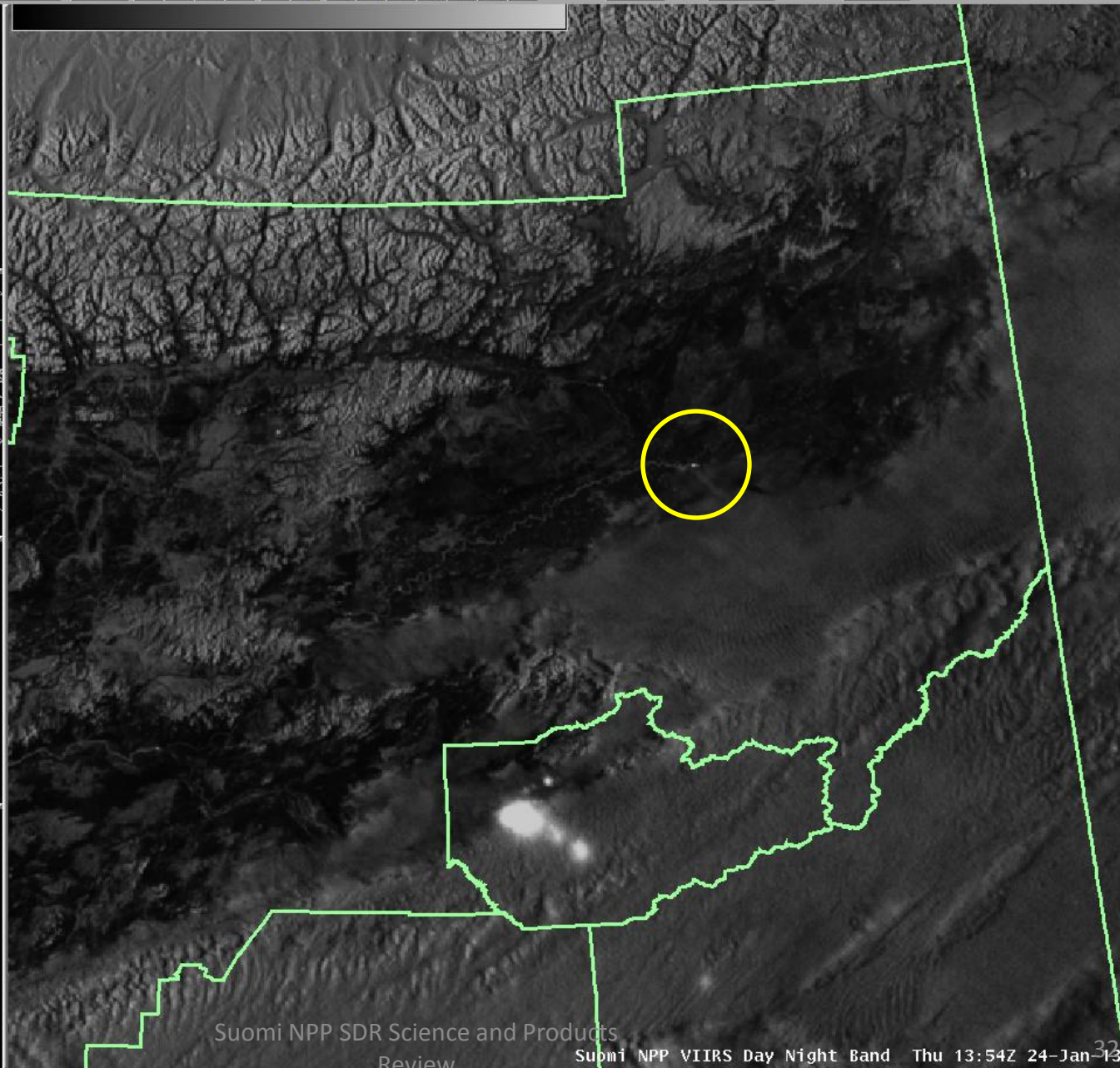
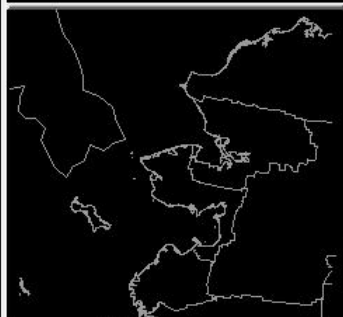
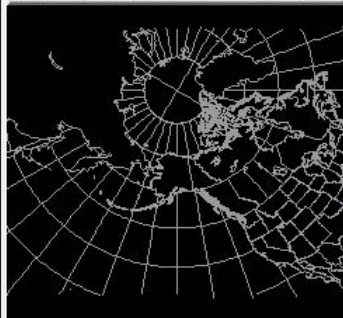
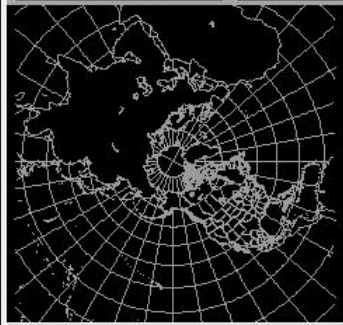




12/19/2013

Suomi NPP SDR Science and Products
Review

Suomi NPP VIIRS Day Night Band Thu 13:54Z 24 Jan-13



19:42 01/24/13

01/24/13

Suomi NPP SDR Science and Products
Review

Suomi NPP VIIRS Day Night Band Thu 13:54Z 24-Jan-13

32

Status: [dropdown]

Radar: [dropdown]

Frames: 17 Time: 19:41 Z 24-Jan-13

Aurora Borealis

Prudhoe Bay

Aurora Borealis

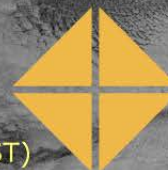
Pavlof's Volcanic Ash Plume November 15, 2014

22:44 UTC
Suomi-NPP Truecolor

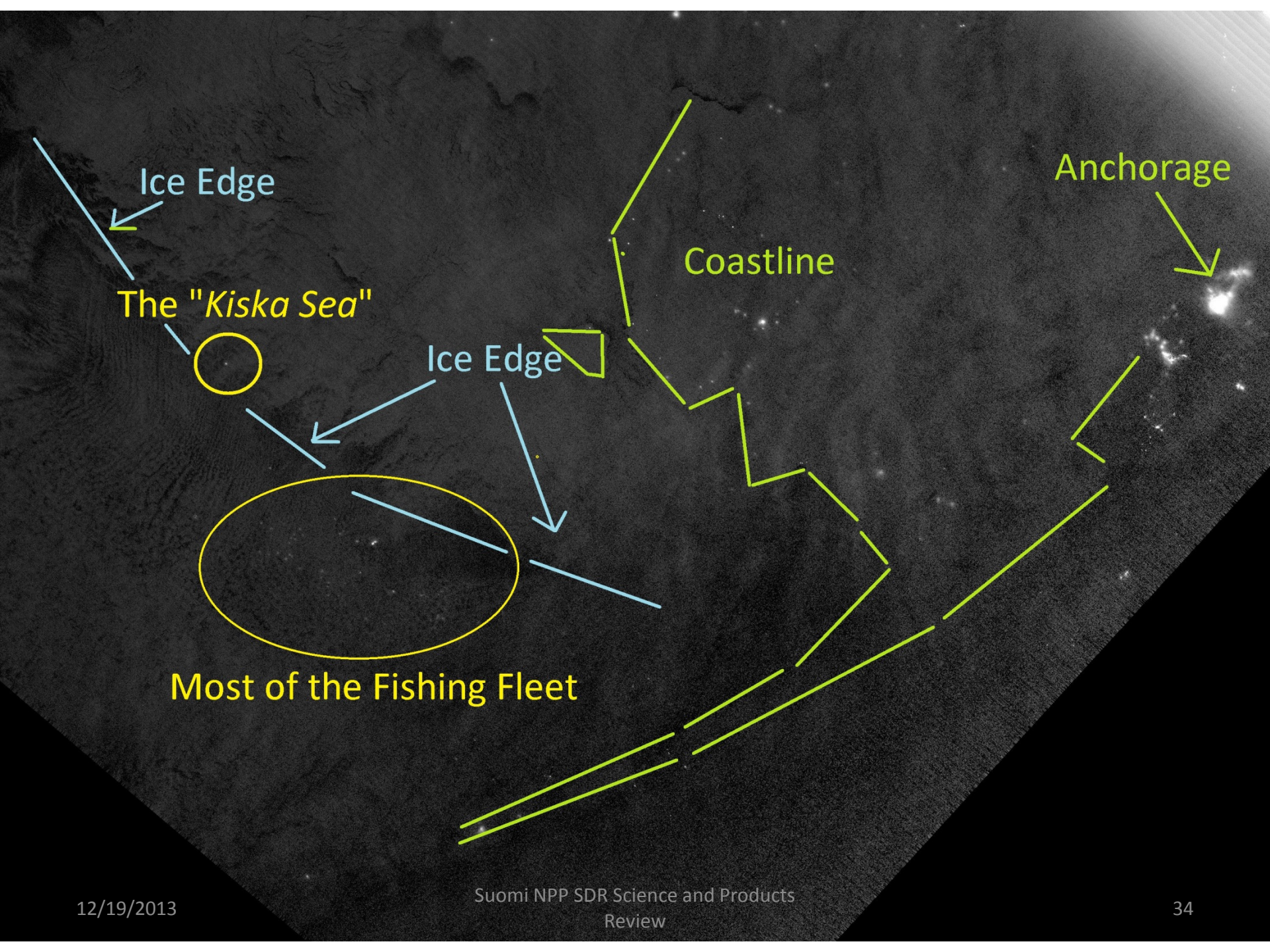
Anchorage

Pavlof Volcano
as seen by the

Suomi-NPP Day/Night Band
November 15, 2014 at 12:49 UTC (3:49 AM AST)



GINA
www.gina.alaska.edu



Ice Edge

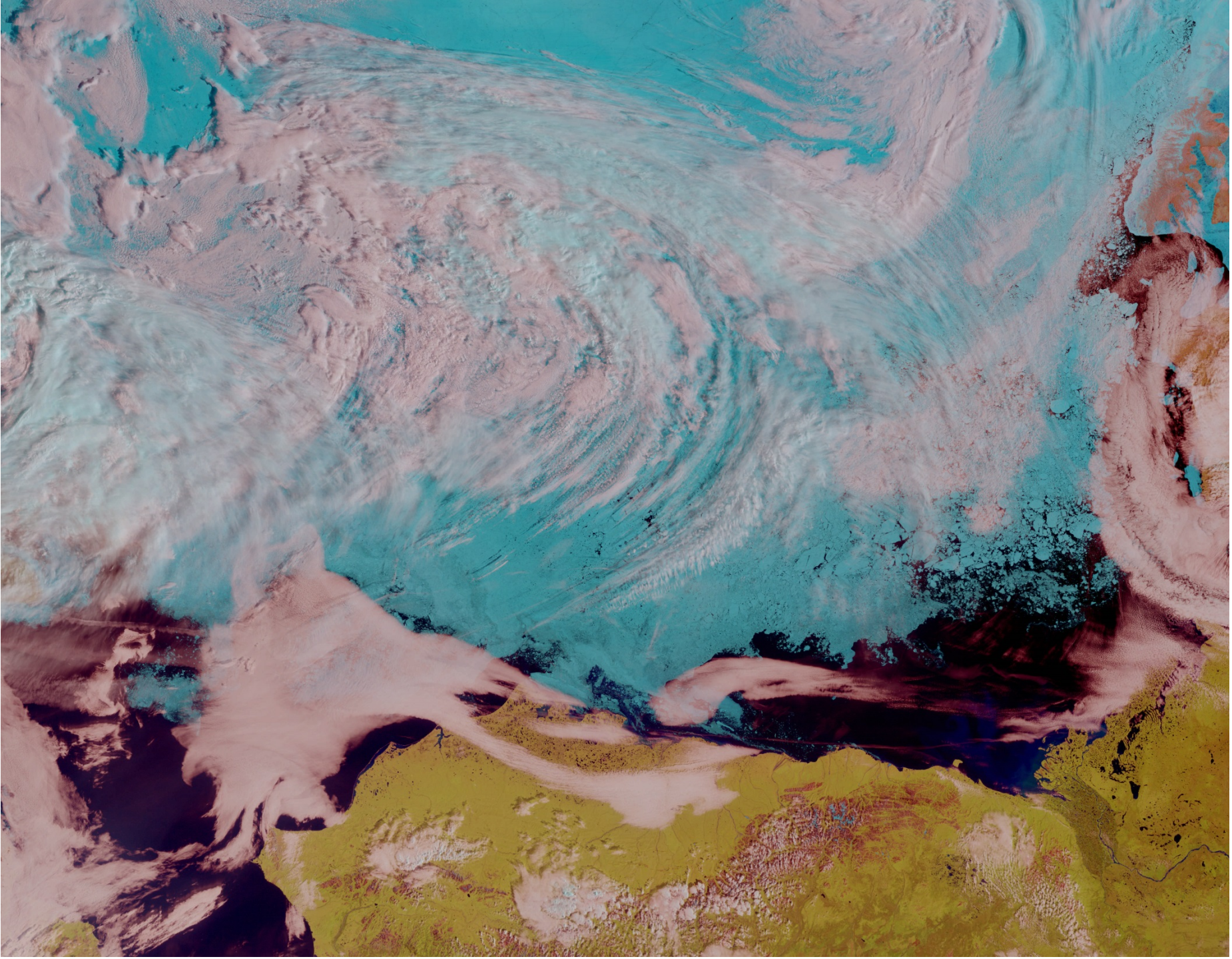
Anchorage

Coastline

The "Kiska Sea"

Ice Edge

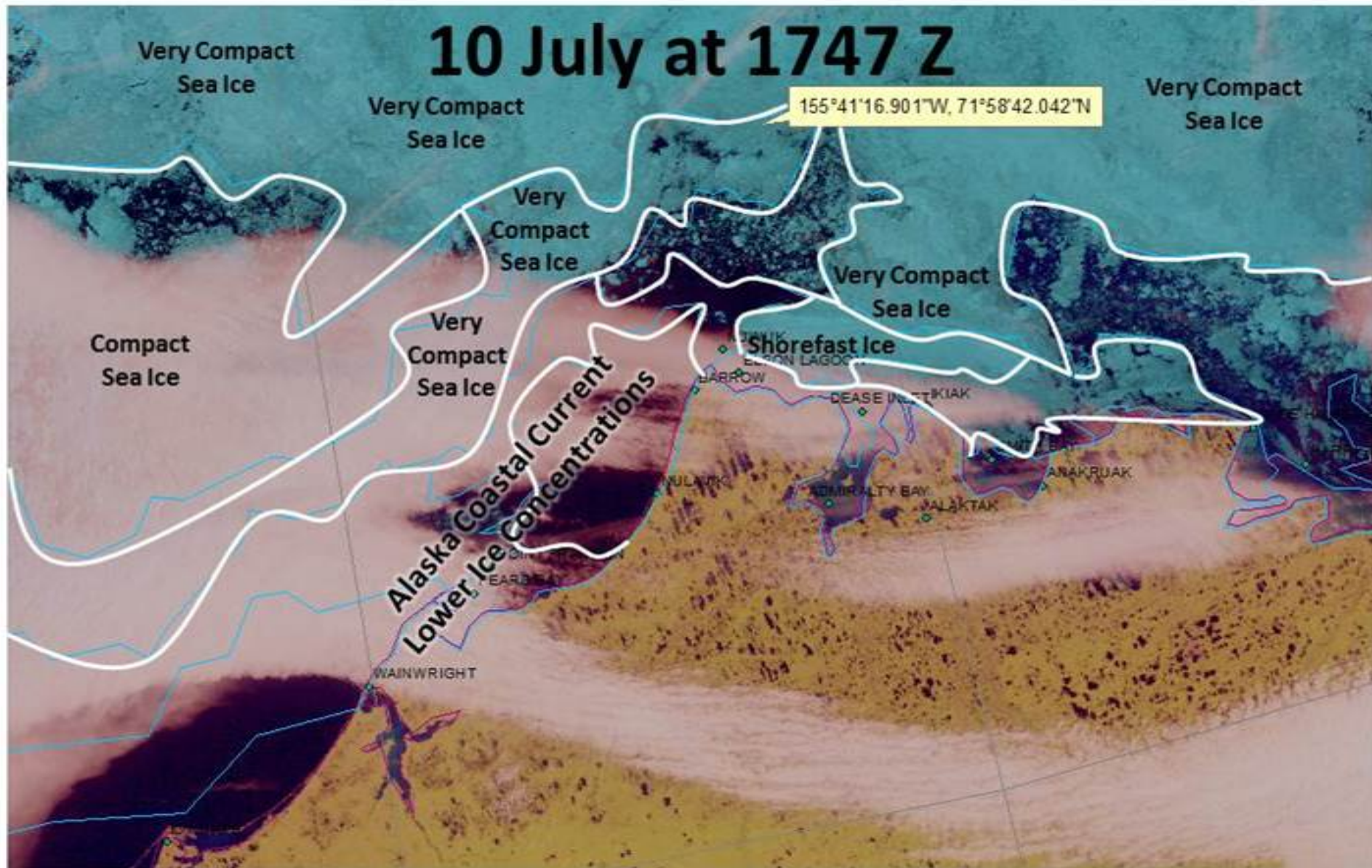
Most of the Fishing Fleet



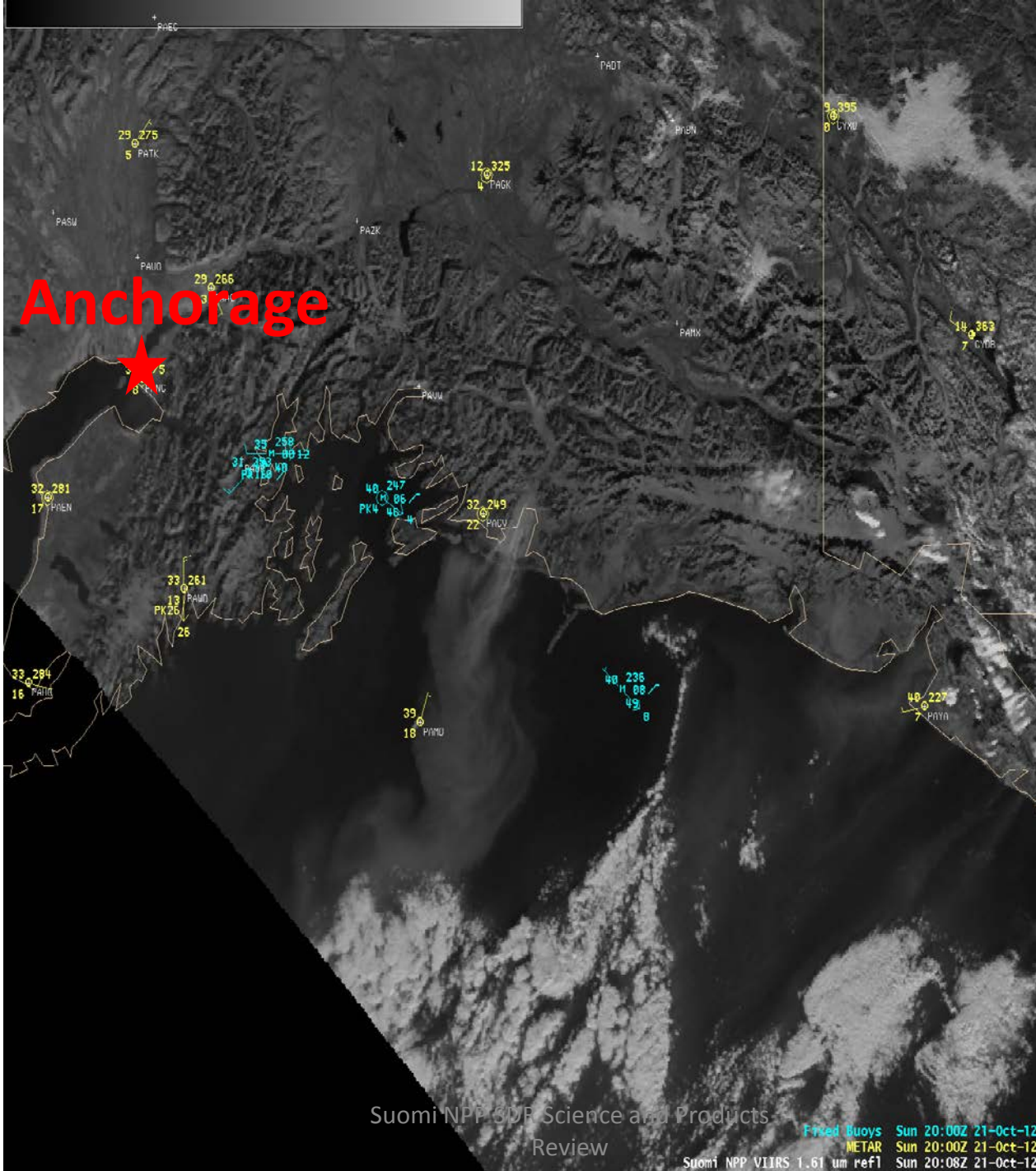
Suomi NPP False Color Satellite Image

10 July at 1747 Z

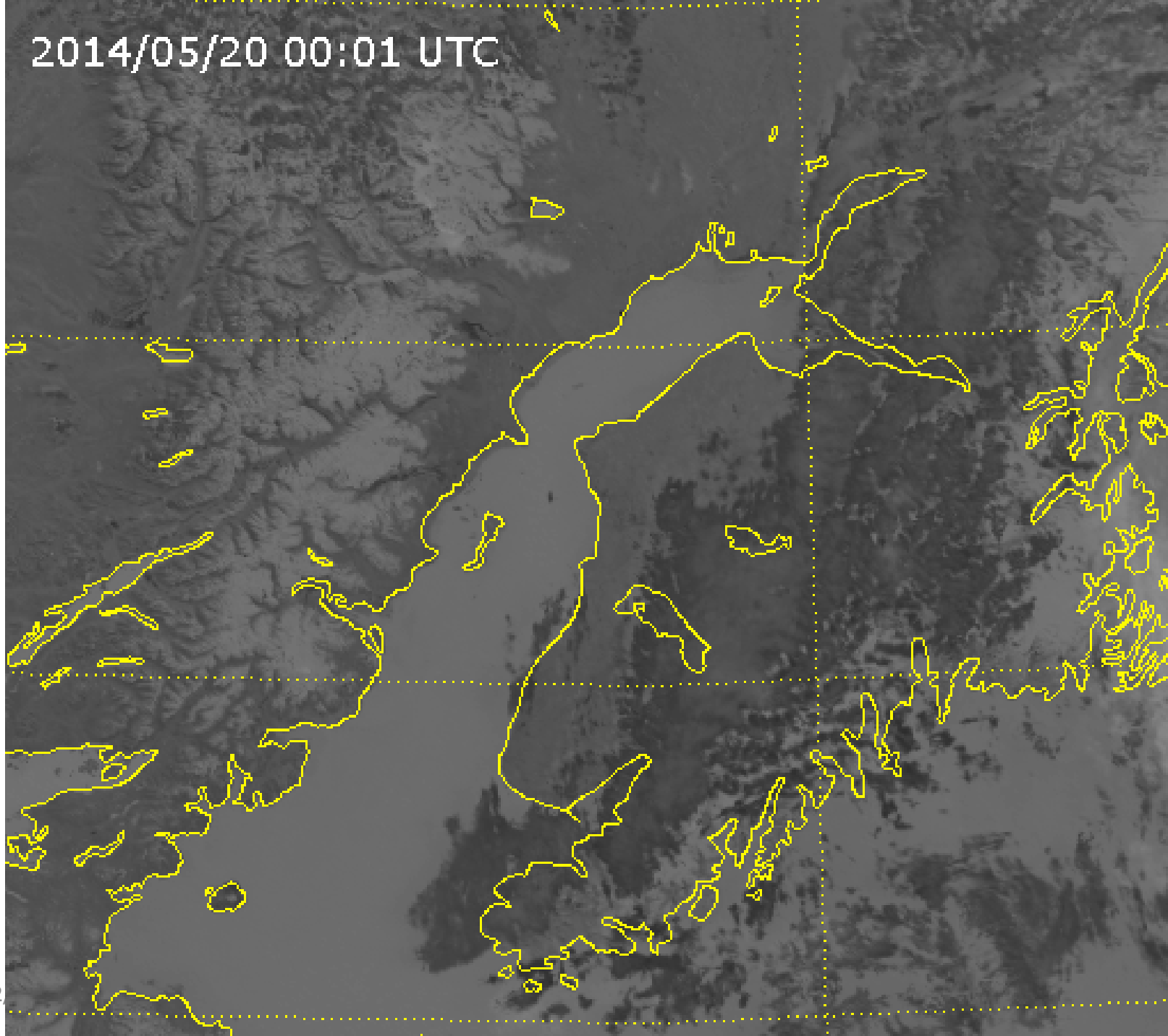
155°41'16.901"W, 71°58'42.042"N

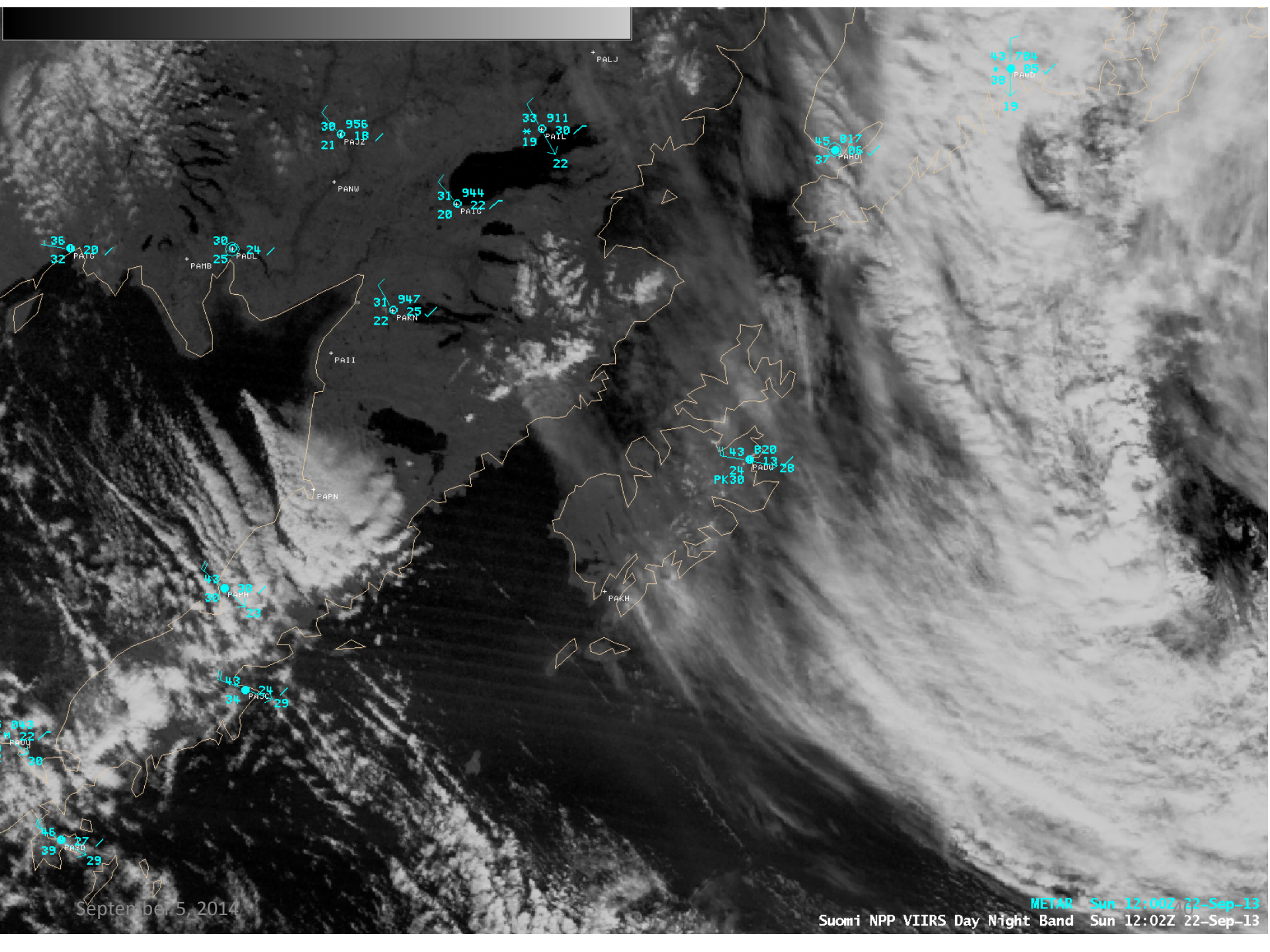






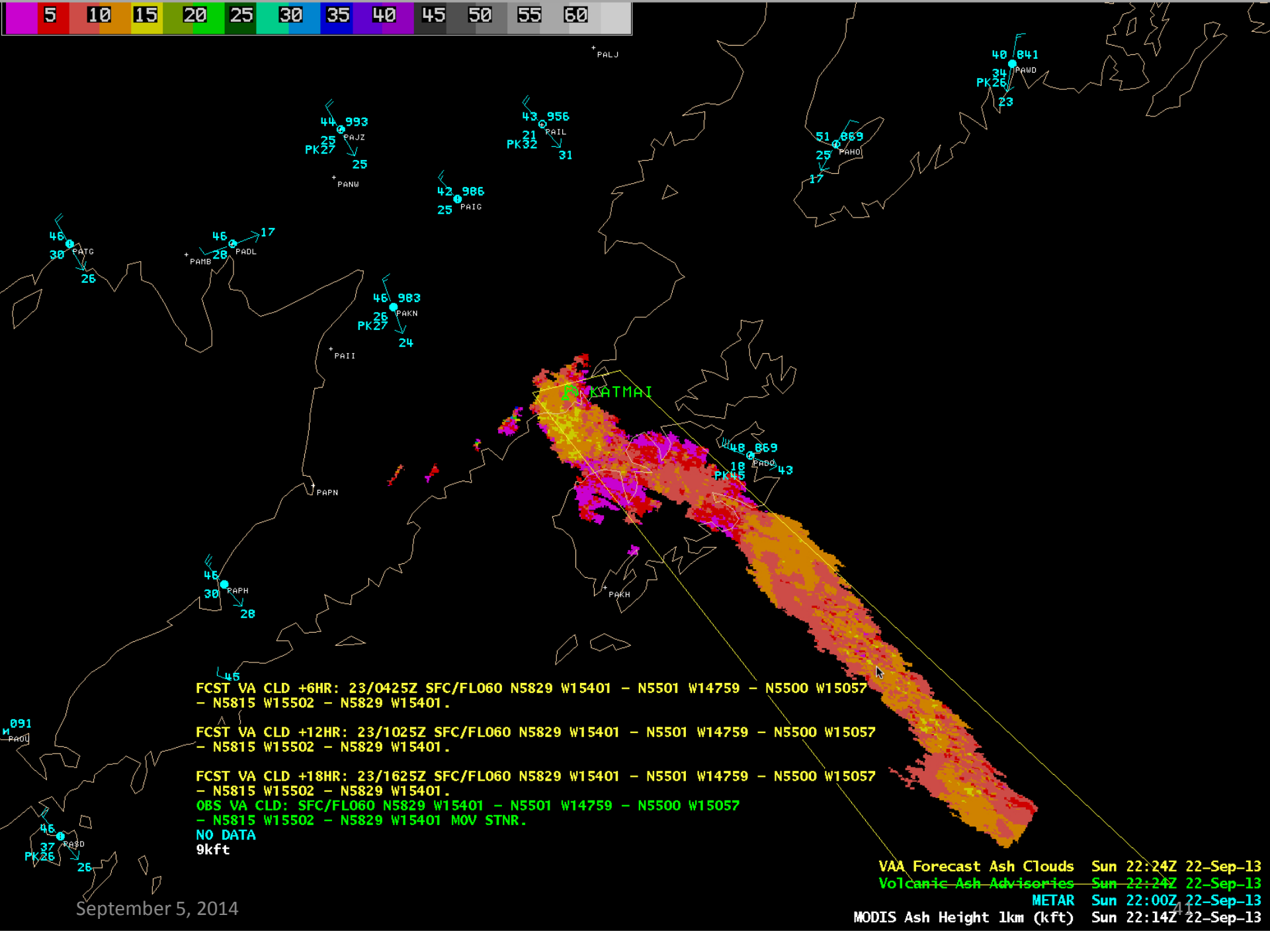
2014/05/20 00:01 UTC





September 5, 2014

METAR Sun 12:00Z 22-Sep-13
Suomi NPP VIIRS Day Night Band Sun 12:02Z 22-Sep-13



FCST VA CLD +6HR: 23/0425Z SFC/FL060 N5829 W15401 - N5501 W14759 - N5500 W15057
- N5815 W15502 - N5829 W15401.
FCST VA CLD +12HR: 23/1025Z SFC/FL060 N5829 W15401 - N5501 W14759 - N5500 W15057
- N5815 W15502 - N5829 W15401.
FCST VA CLD +18HR: 23/1625Z SFC/FL060 N5829 W15401 - N5501 W14759 - N5500 W15057
- N5815 W15502 - N5829 W15401.
OBS VA CLD: SFC/FL060 N5829 W15401 - N5501 W14759 - N5500 W15057
- N5815 W15502 - N5829 W15401 MOV STNR.
NO DATA
9kft

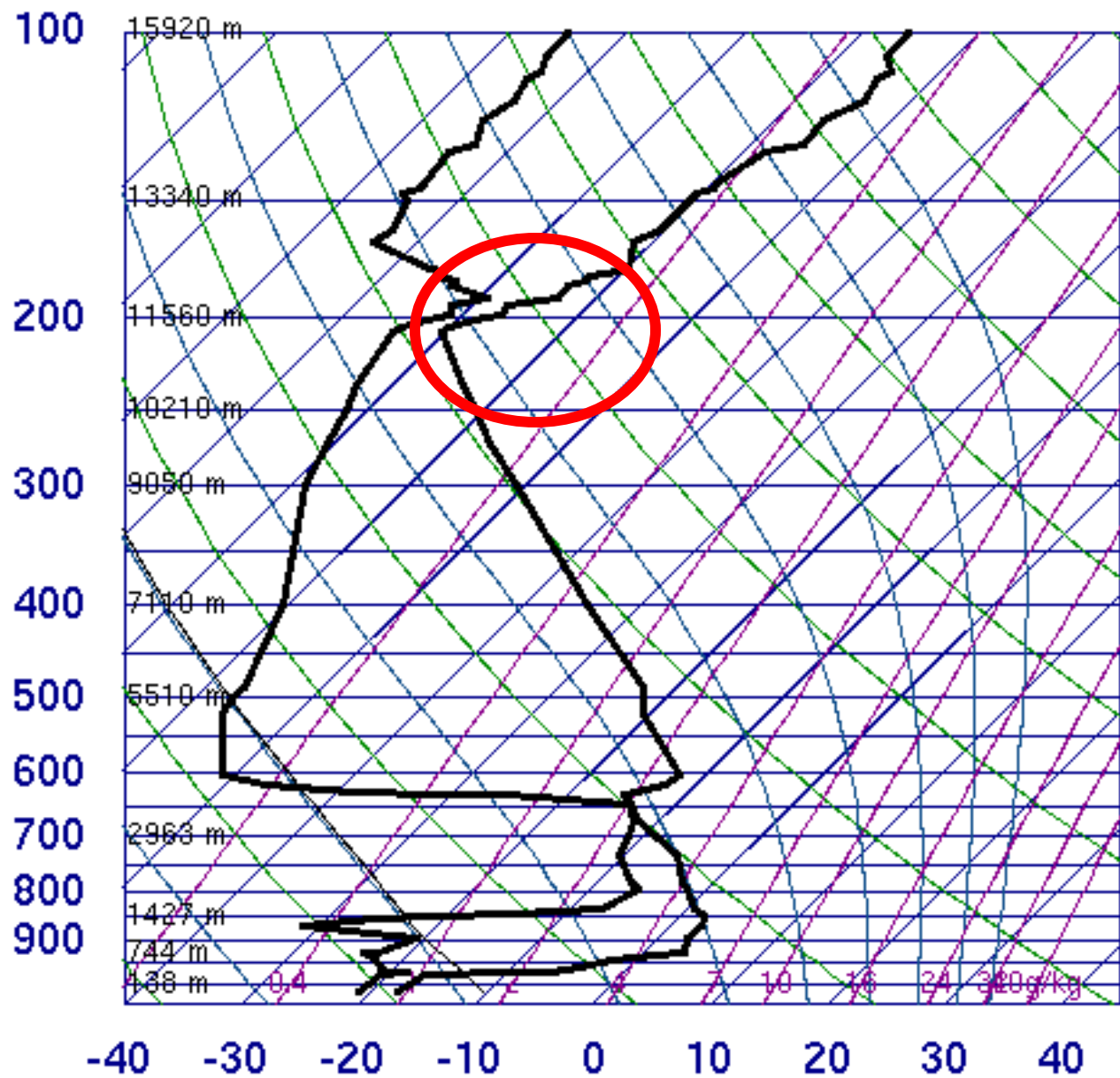
September 5, 2014

VAA Forecast Ash Clouds Sun 22:24Z 22-Sep-13
 Volcanic Ash Advisories Sun 22:24Z 22-Sep-13
 METAR Sun 22:00Z 22-Sep-13
 MODIS Ash Height 1km (kft) Sun 22:14Z 22-Sep-13

Cold Air Aloft

- The Problem: NWS Alaska needs a way to observe cold air aloft. Air $\leq -65\text{C}$ causes jet fuel to “gel,” a hazard for trans-arctic jets
- The Solution:
 - Use CrIS/AIRS to identify areas of cold air aloft
 - Present the data in a form useful to forecasters
 - Via Internet
 - Via AWIPS

70026 PABR Barrow



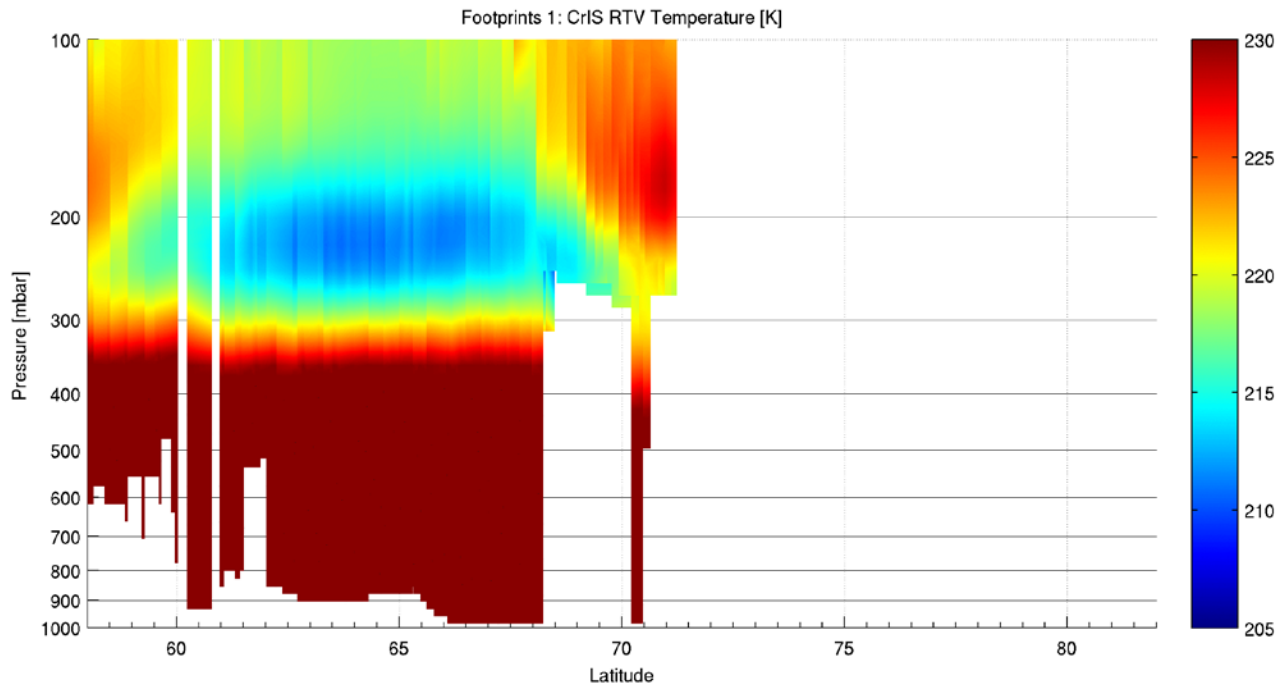
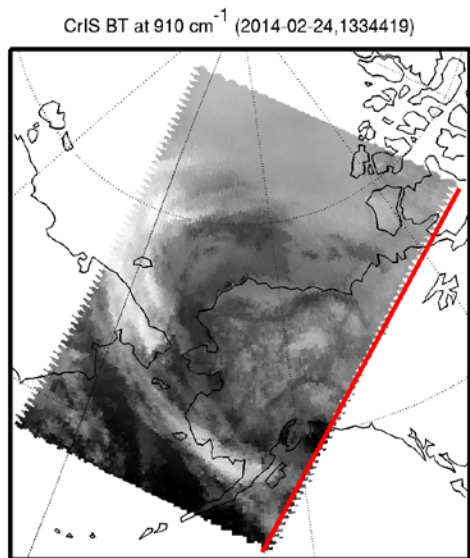
SLAT	71.28
SLON	-156.79
SELV	19.00
SHOW	13.61
LIFT	35.17
LFTV	35.17
SWET	236.1
KINX	0.60
CTOT	0.90
VTOT	23.90
TOTL	24.80
CAPE	0.00
CAPV	0.00
CINS	0.00
CINV	0.00
EQLV	-9999
EQTV	-9999
LFCT	-9999
LFCV	-9999
BRCH	0.00
BRCV	0.00
LCLT	250.8
LCLP	866.1
MLTH	261.4
MLMR	0.75
THCK	5372.
PWAT	6.59

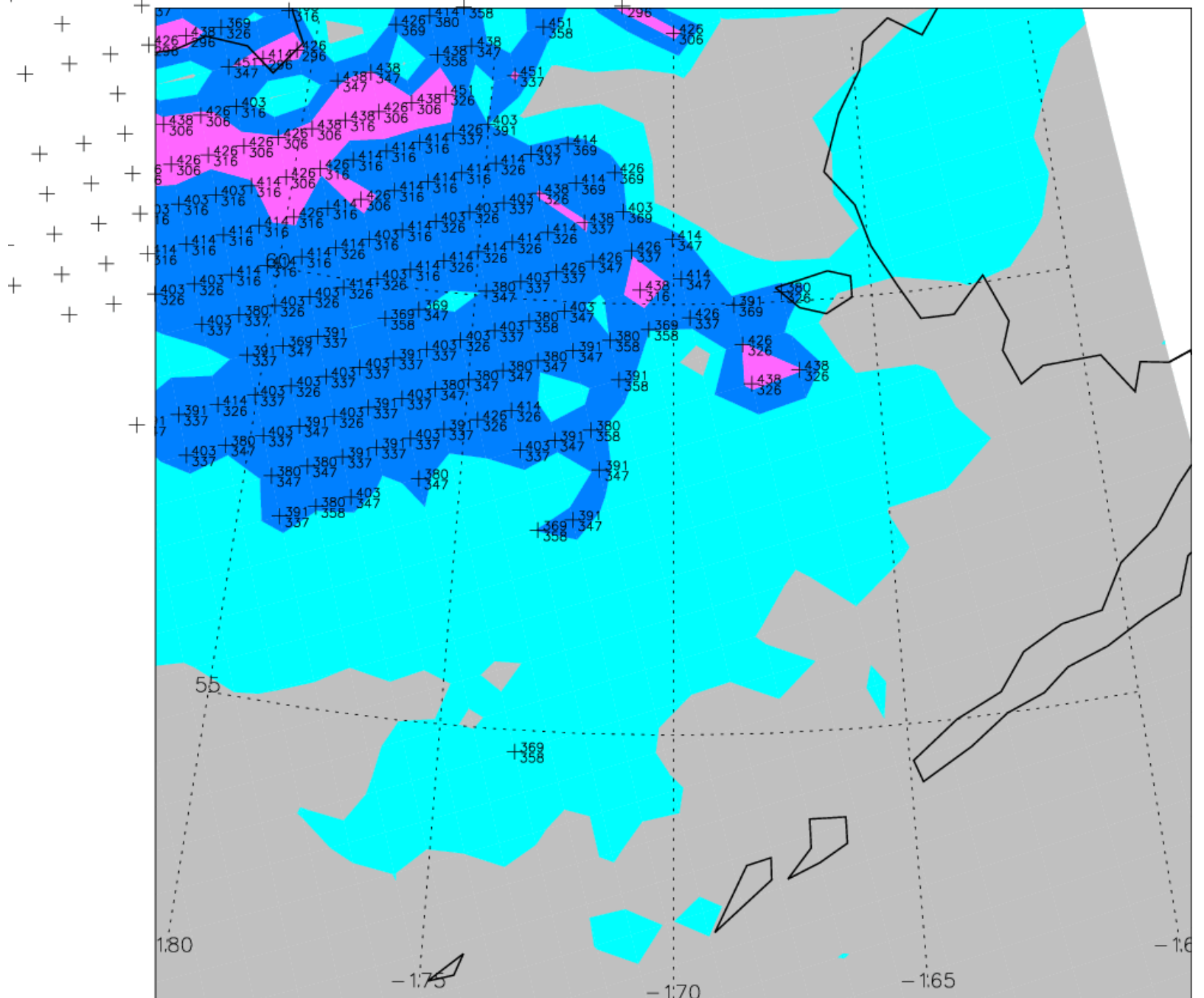
12Z 24 Feb 2014

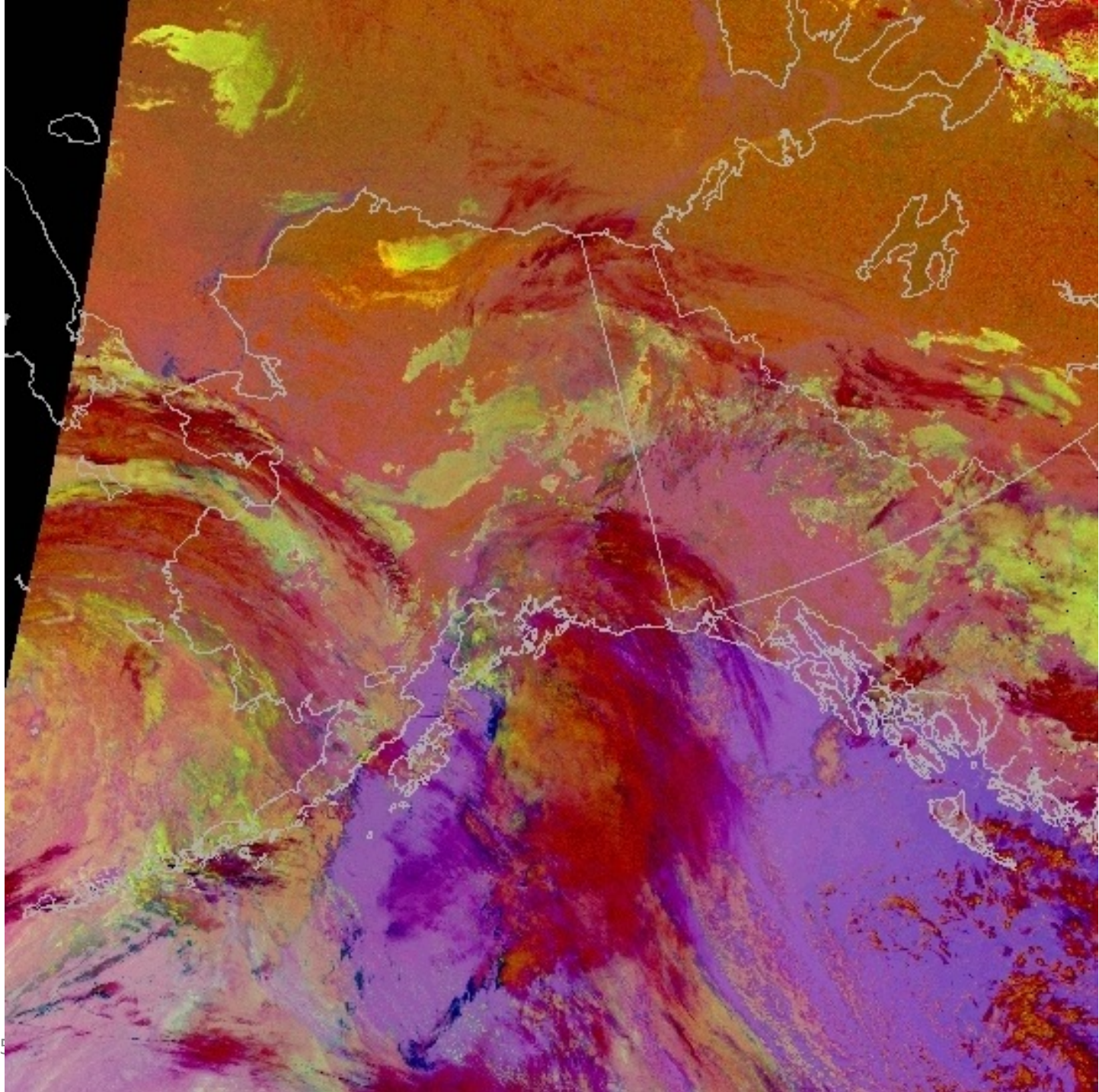
University of Wyoming

CrIS Temperature Cross-Sections (24 February 2014, 13:30 UTC) - Animation

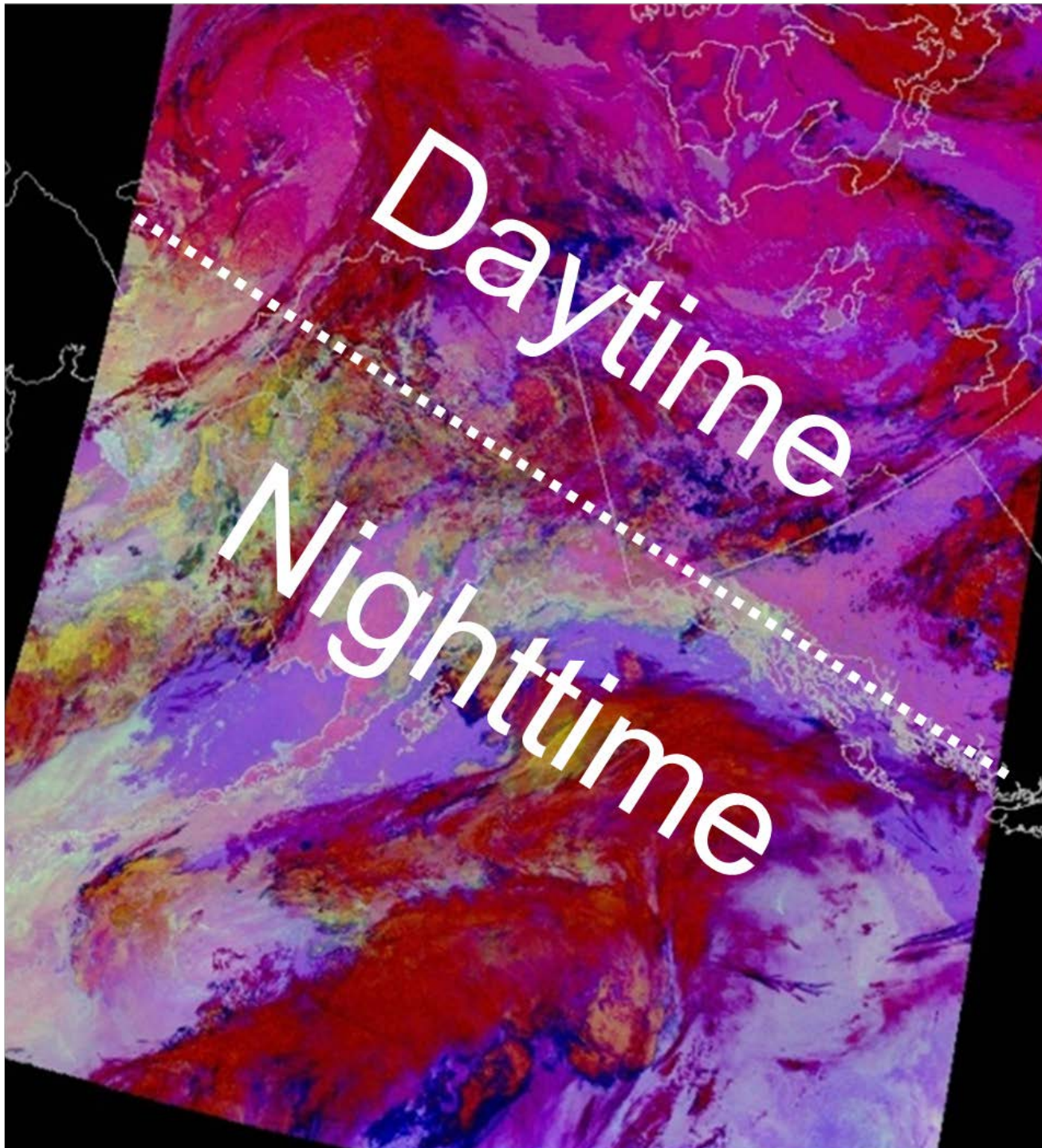
X-axis: Latitude

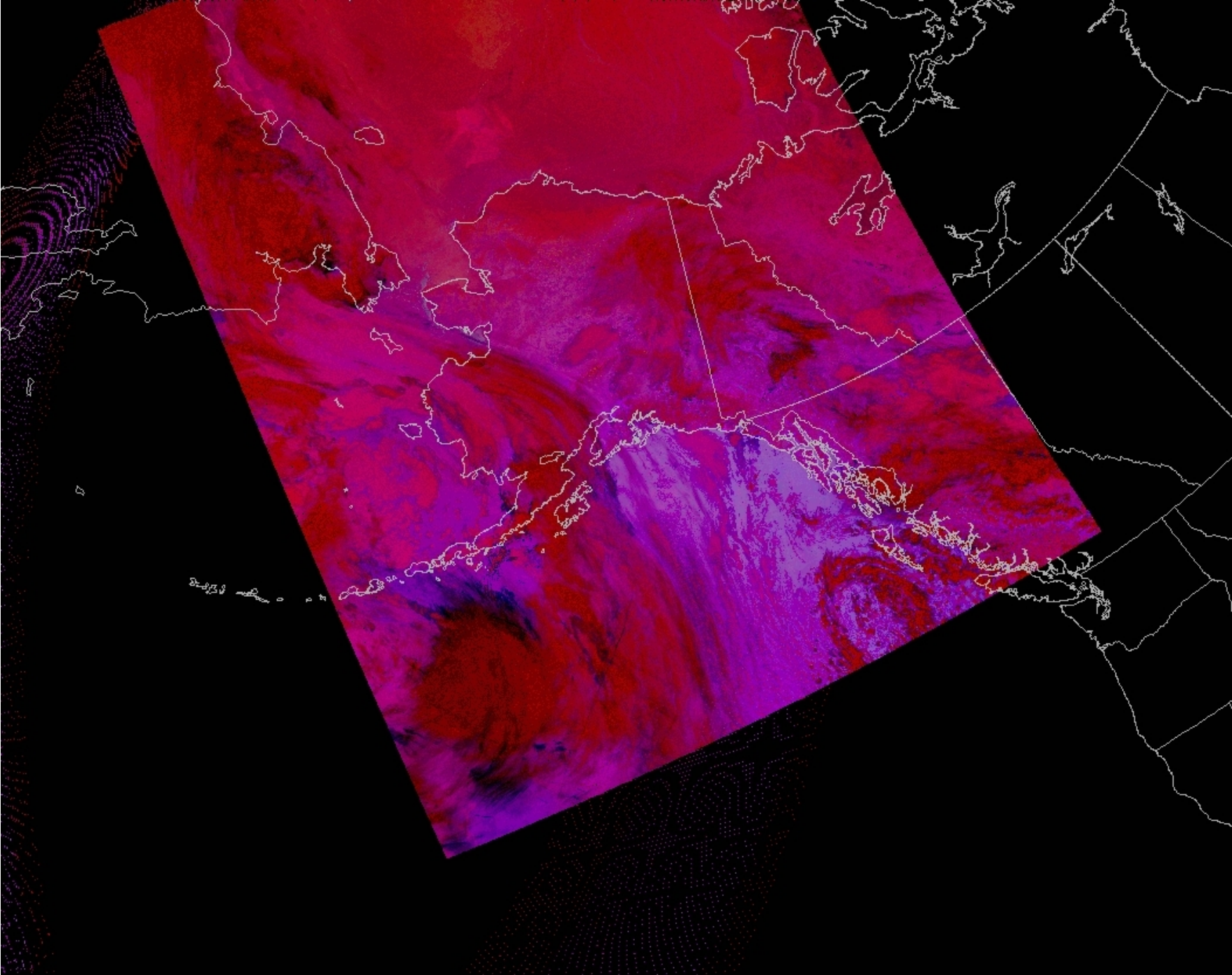


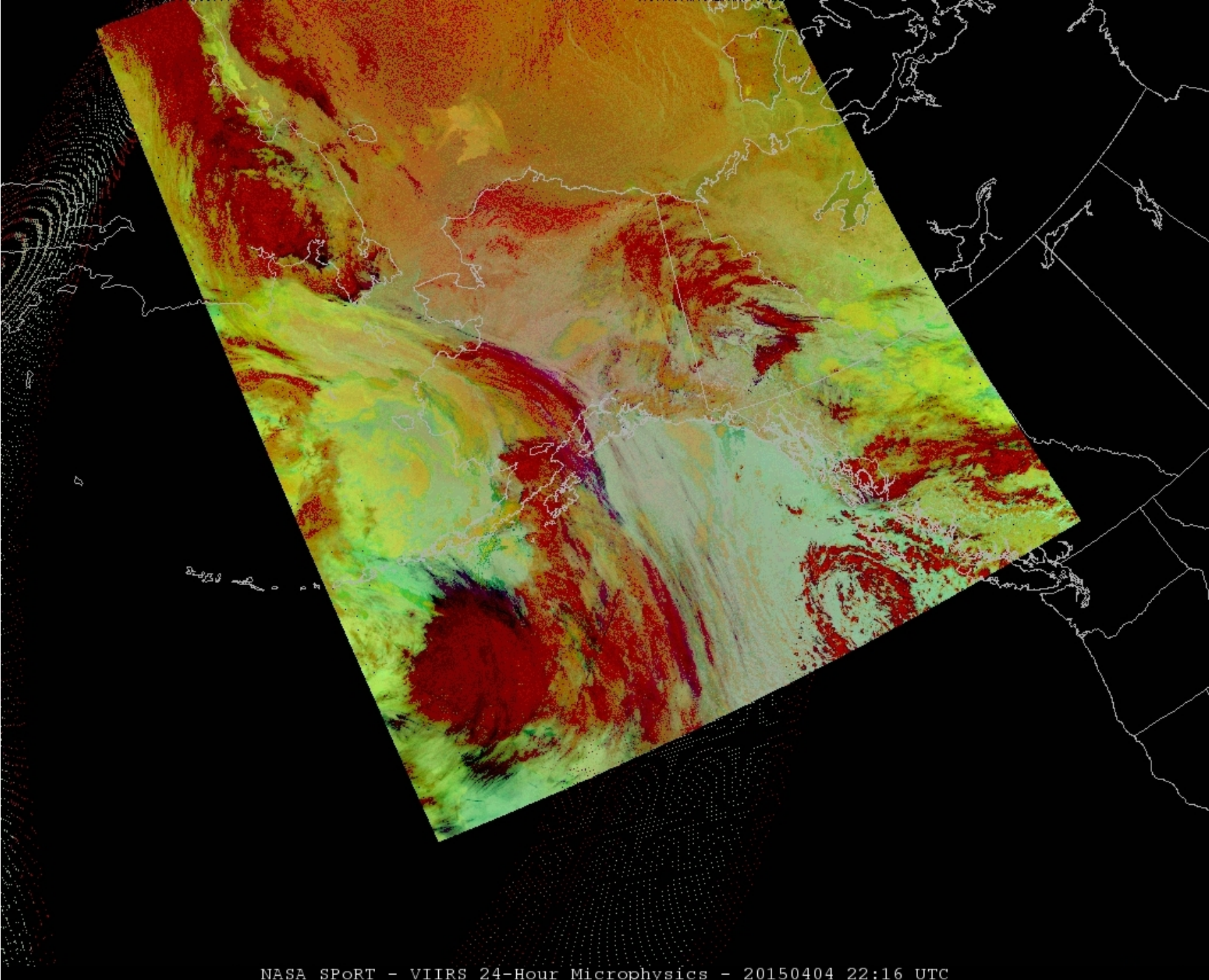




September 5







...And More...

- River Ice and Flooding products developed by George Mason University and City College of New York
- VIIRS-based wildfire hot-spots to Alaska Fire Service this season (hopefully)
- RGB Truecolor, RGB Snowcover
- ...etc...
- ***Satellite Proving Grounds have operational relevance in Alaska today***

NOAA Satellite Conference

- April 27th through May 1st, Greenbelt, Maryland
- GINA will have a booth, right next to CIMSS
- GINA will have two poster presentations
 - Sandy-associated upgrades
 - Use of NASA/SPoRT Microphysics RGBs by NWS Alaska



OCONUS Meeting 2015

- Anchorage, Alaska May 12-15, 2015
 - Alaska Weather Symposium May 11-12



Thank You!

- For more Information:
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 - Scott Macfarlane: scott@gina.alaska.edu
 - Tom Heinrichs: tom.heinrichs@alaska.edu

