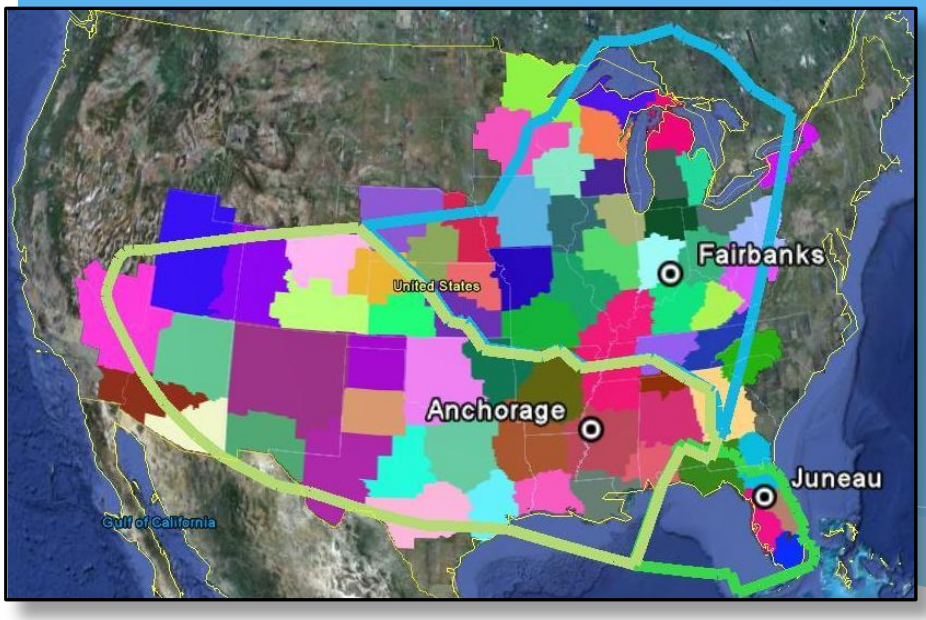
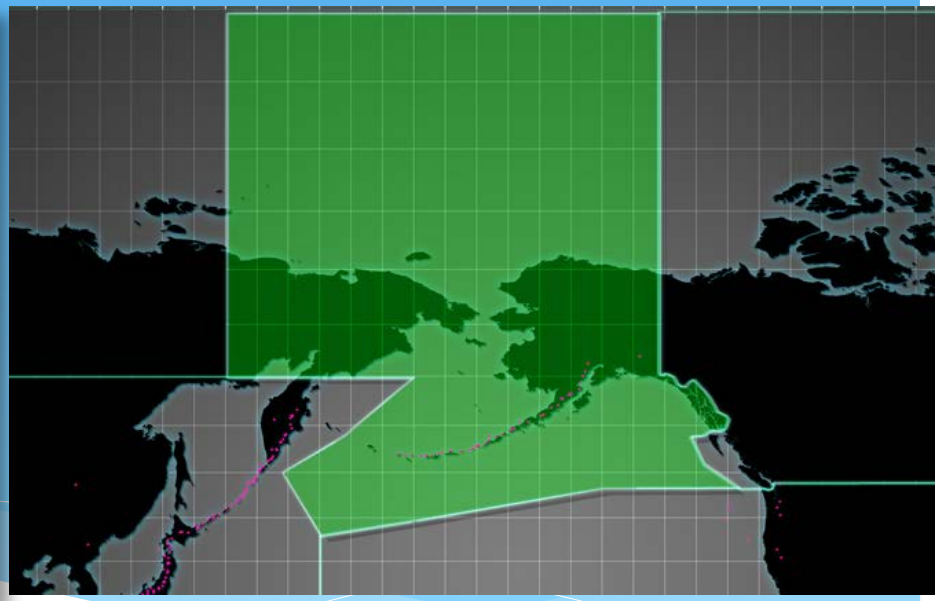
GOES-R/JPSS OCONUS R2O Interchange Meeting

NWS Alaska Region
Satellite Program and Requirements

July 29, 2014





These maps are to scale

Gene Petrescu
Regional Scientist
Alaska Region

OCONUS Proving Ground Alaska Region

* 3 WFOs
  * Anchorage
  * Fairbanks
  * Juneau
* Alaska Aviation Weather Unit
* Volcanic Ash Advisory Center
* Alaska-Pacific River Forecast Center
* North American Tsunami Warning Center
* 12 WSOs
* Electronics Maintenance Unit

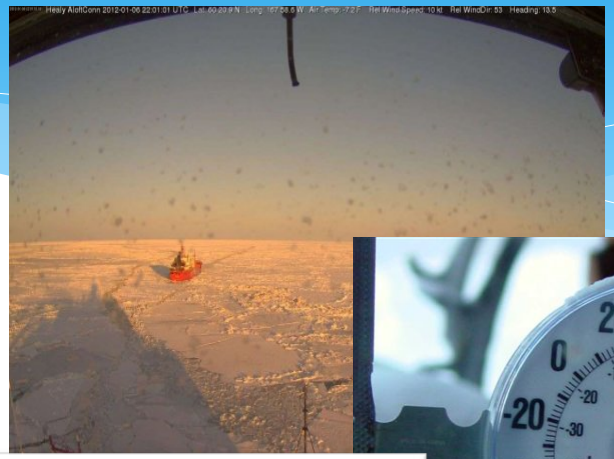
OCONUS Proving Ground

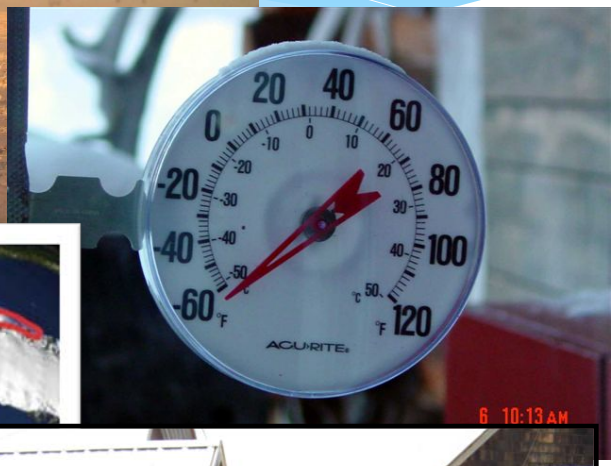
Driving Requirements - Alaska Challenges

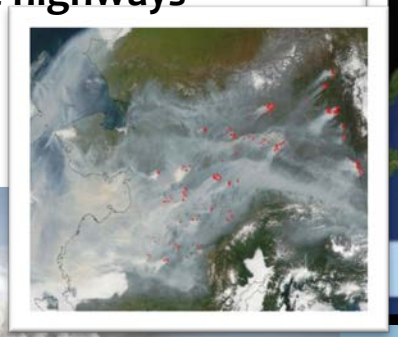
- High Wind (14 hurricane force storms/year)
- Ice Storms
- Volcanic Ash
- Aviation Concerns
- High Wind and Open Water (storm surge)
- Extreme Cold and High Pressure
- Blizzards
- Heavy Snow
- Space Weather
- Tsunami
- Flooding
  - Ice Jam/Breakup
  - Coastal Storm Surge / Erosion
  - Heavy Rainfall / Atmospheric Rivers
- Wild Fire
- Sea Ice
  - Resupply
  - Access
- Gloom of Night

Driving Requirements
Alaska Challenges

- Most of the weather phenomena are not, of course, unique to Alaska
- However, impacts of the phenomena are intensified by data gaps, the length of storm season, darkness, remoteness, supply chain management issues, and complex topography
- 93% of Alaska lives near water
- Few roads, rivers are highways



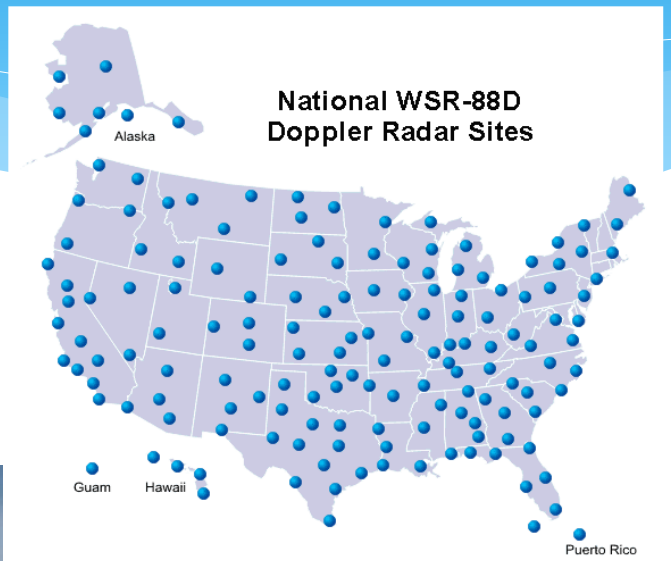




Driving Requirements
Alaska Data Gaps

For Observations and Dissemination

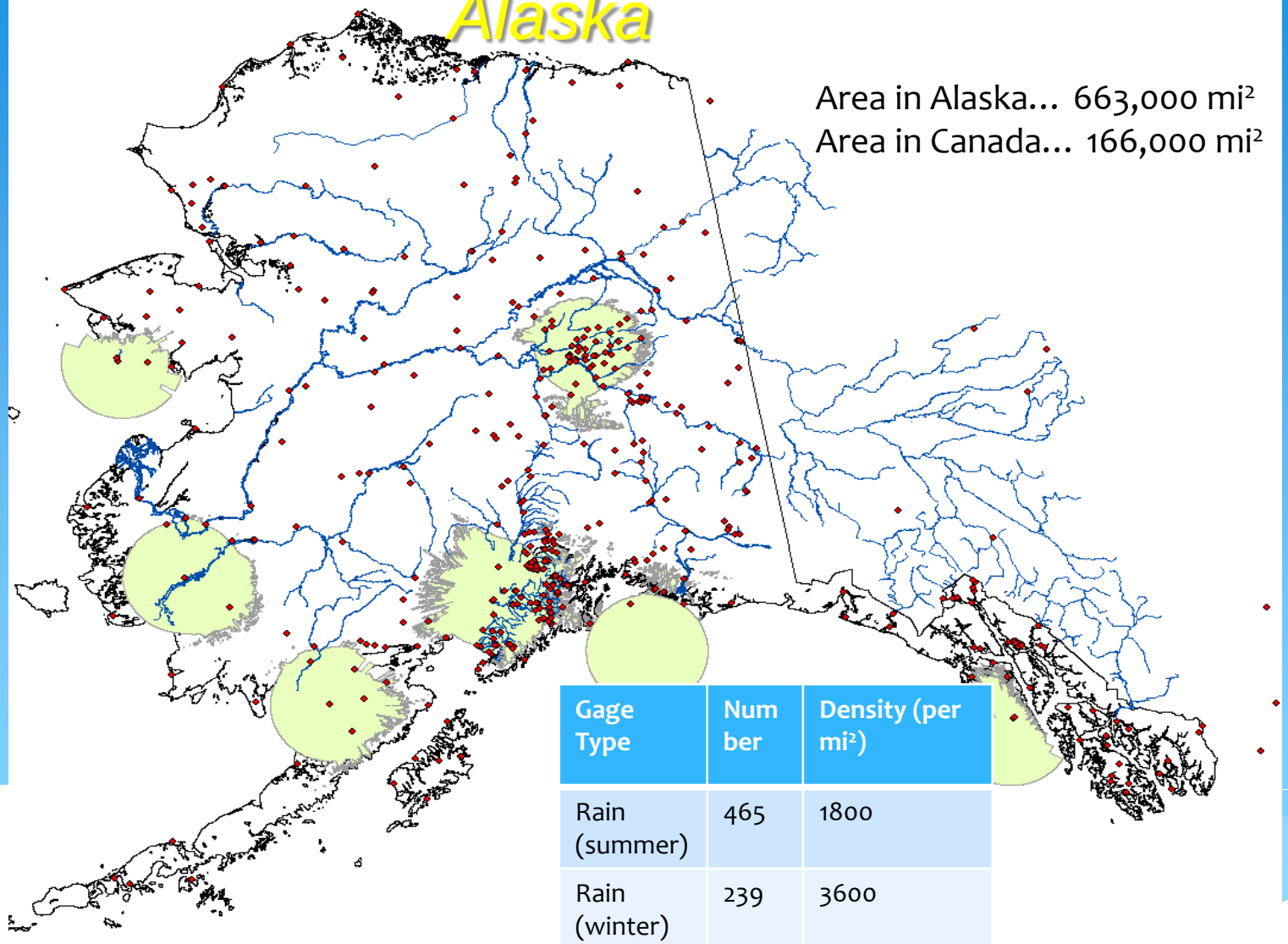
- **Surface Obs: ASOS (44), Handars/MAWS/LARC (57)**
- **Doppler Radars (7 - FAA owned and maintained)**
- **Upper Air Soundings (13), Wind Profilers (3)**
- **River Gages (155)**
- **Seismic Stations (15)**
- **Water Level Stations (6)**
- **NOAA Weather Radio (25 NOAA + 25 USCG +1 USDA)**
- **HF Radios (7)**



Not to scale

Summer Precipitation and River Gages

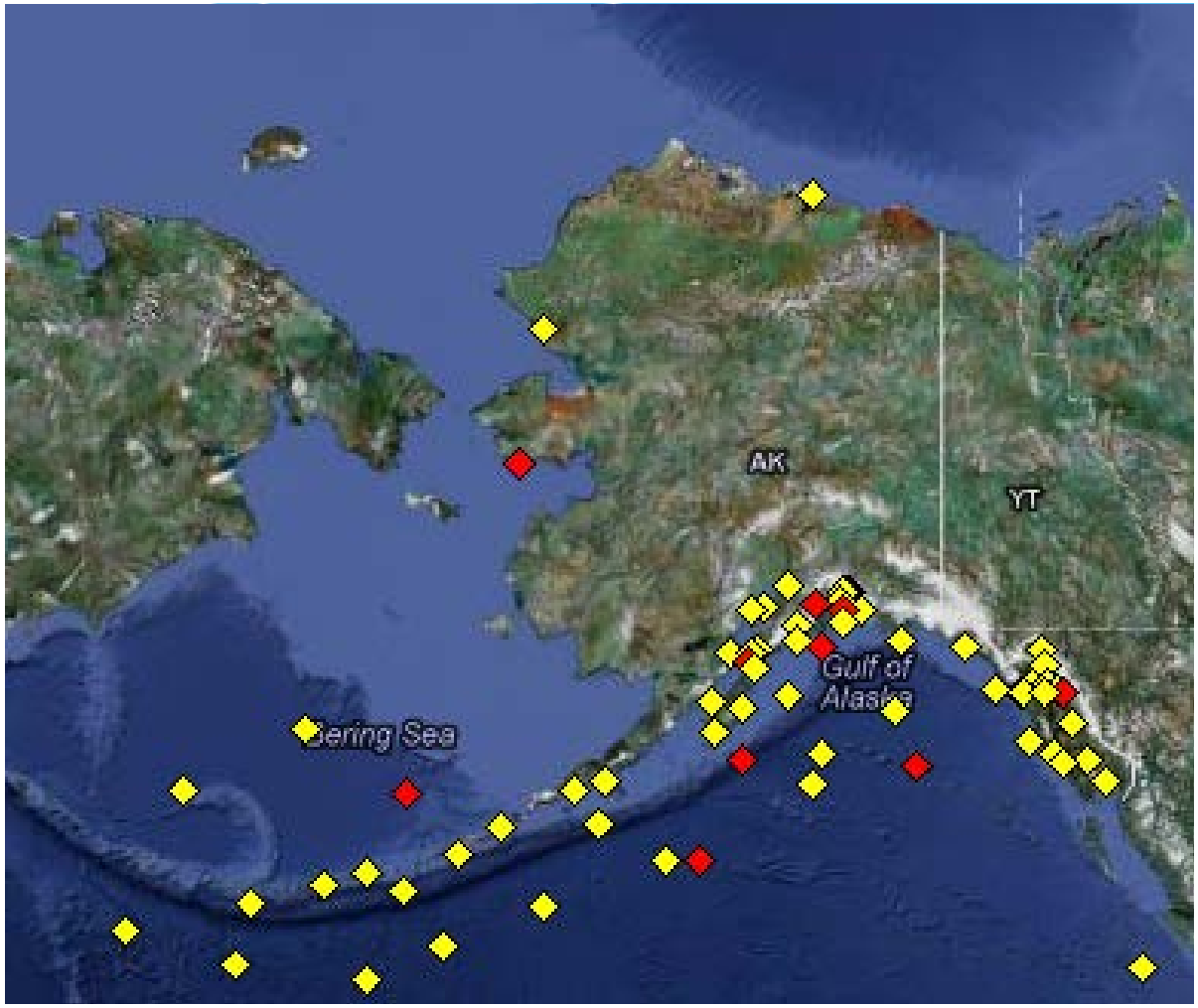
Alaska



Area in Alaska… 663,000 mi²
Area in Canada… 166,000 mi²

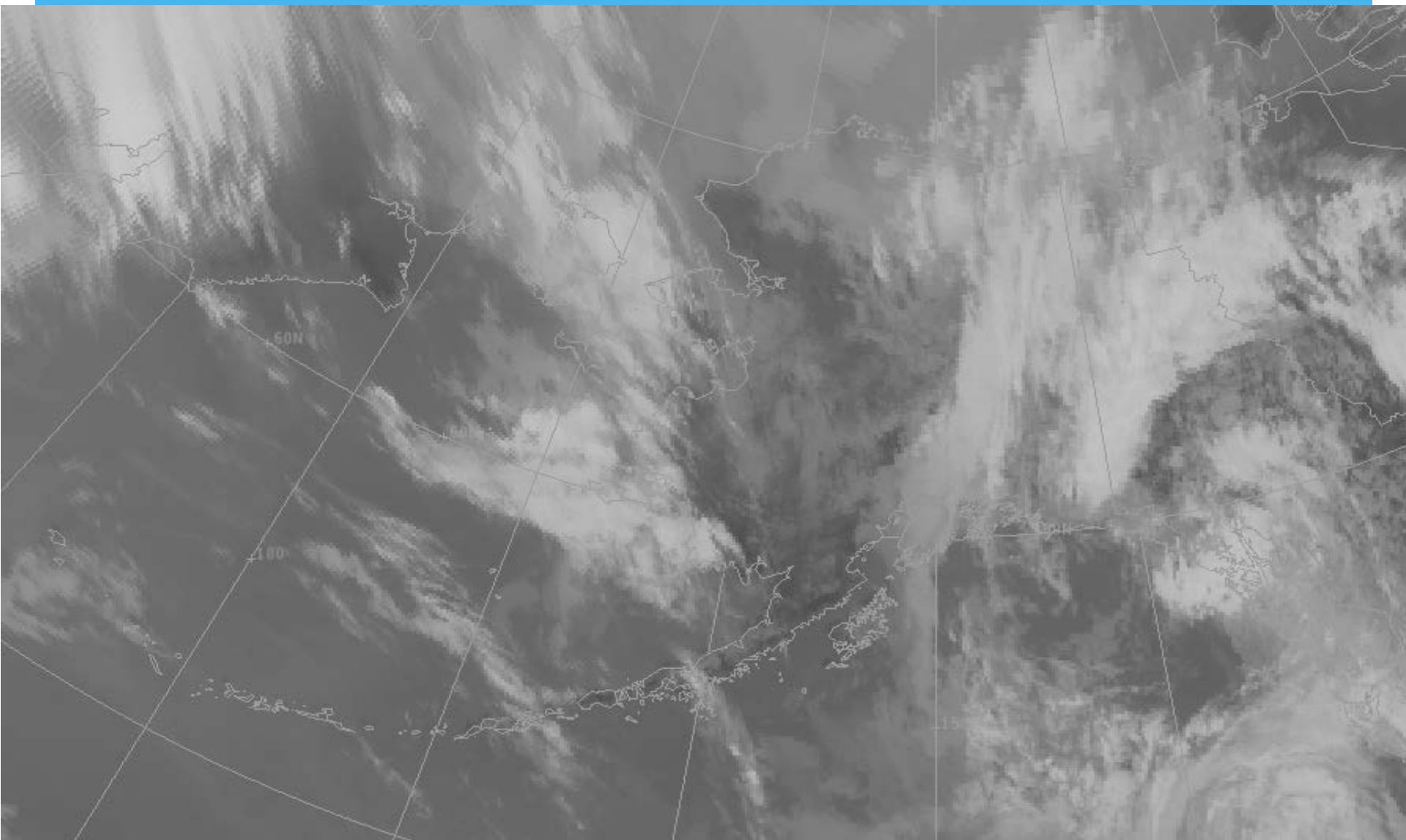
Gage Type	Number	Density (per mi²)
Rain (summer)	465	1800
Rain (winter)	239	3600
River	155	5400
SNOTEL	57	14700

Buoys
Alaska

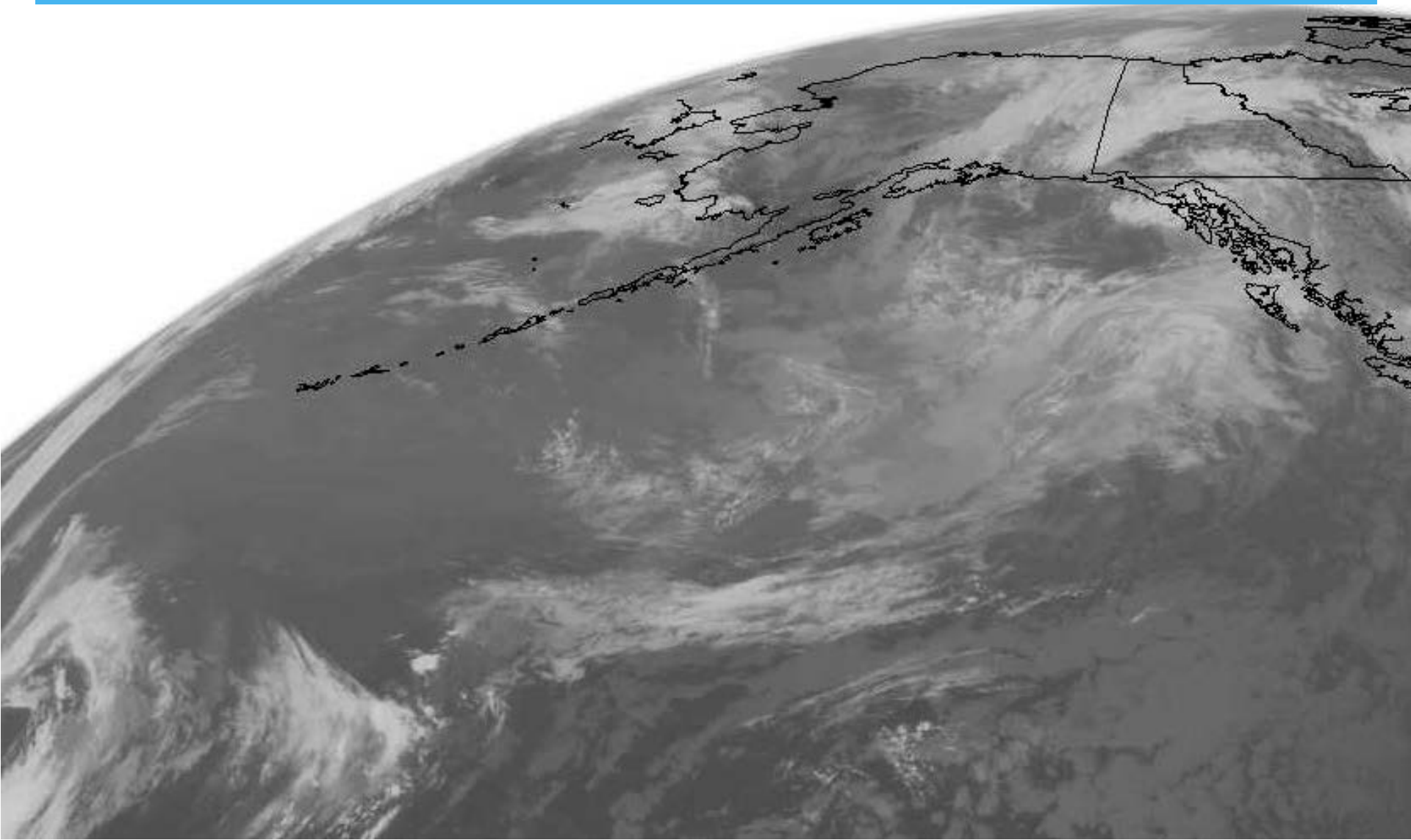


NOAA Assets
Jul 2012

GEO – Latitude Challenge - AWIPS



GEO – Latitude Challenge

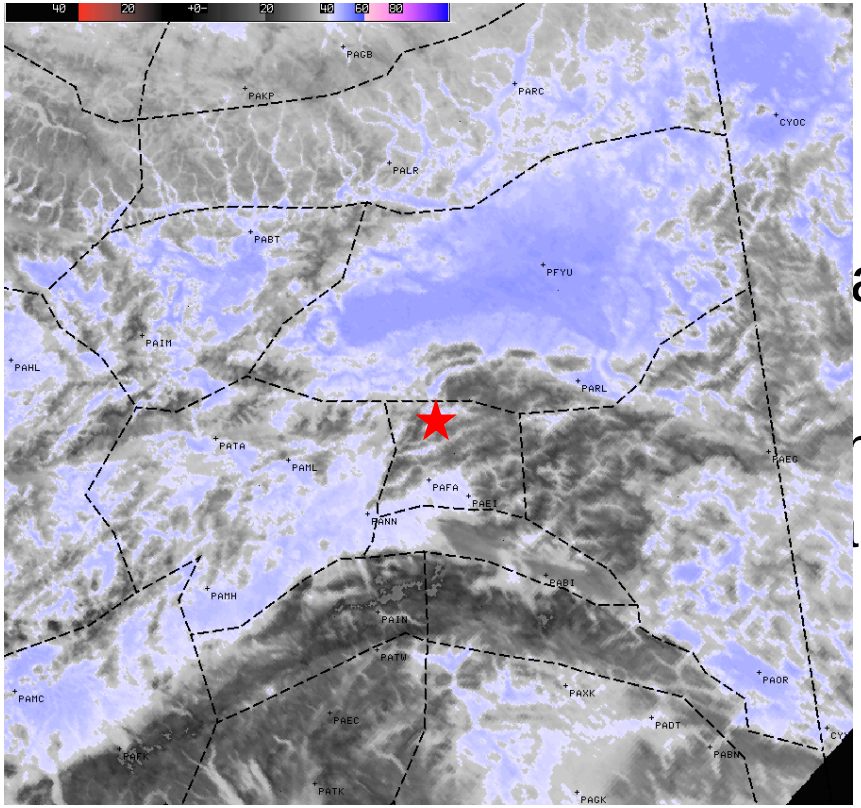


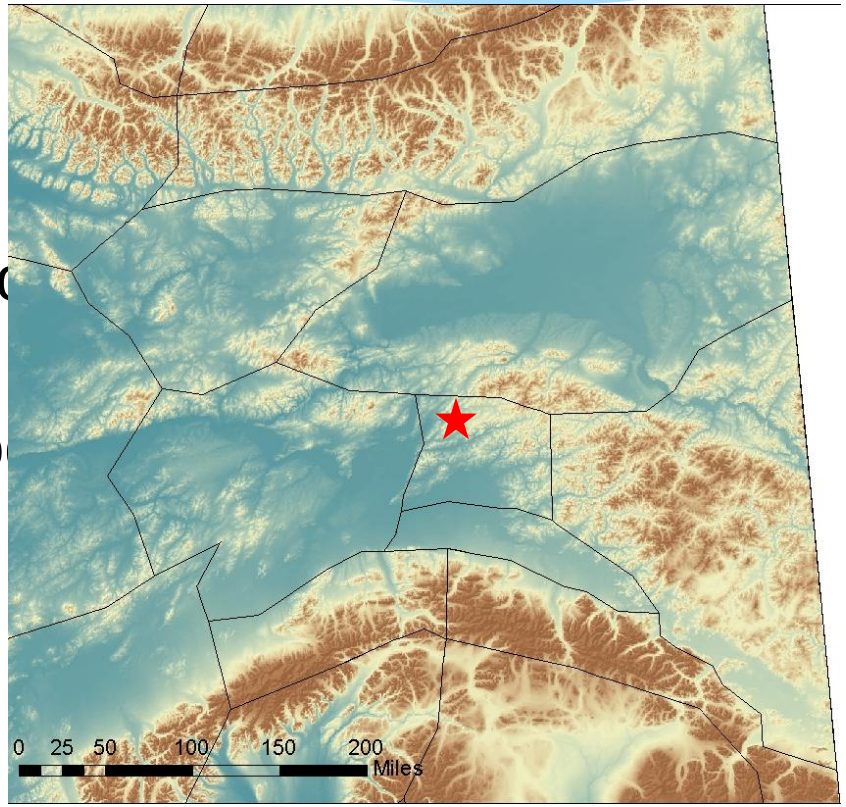
OCONUS Proving Ground
Driving Requirements – Satellites

- Geostationary Earth Orbit (GEO) Satellites
  - GOES-W / Goes-R
  - MTSAT / Himiwari
- Low-Earth Orbit (LEO) Satellites
  - NOAA POES (16, 18, and 19)
  - SNPP
  - DMSP (15-18)
  - MODIS (Aqua/Terra)
  - METOP-A/B
  - WindSAT
  - RADARSAT 1 and 2

OCONUS Proving Ground

Driving Requirements – Satellites

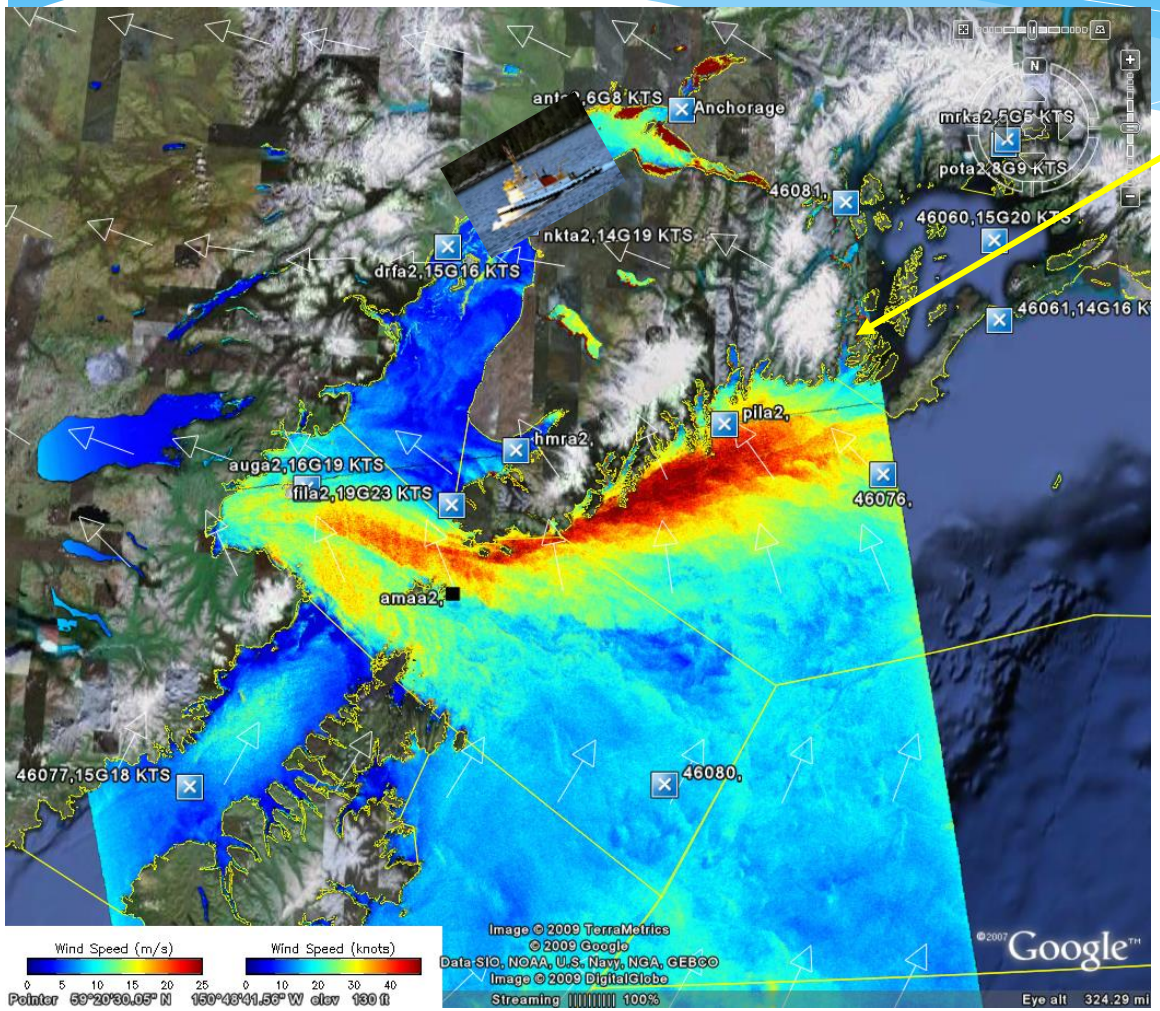




OCONUS Proving Ground

Requirements – Satellites

RADARSAT



Tug travelling out of Port of Anchorage to Seward reads a Coastal Waters Forecast of 20 kts. He can't handle an extended period of winds > 25 kts. The tug also has a low ice tolerance (frazil only).

Tug wants to know:

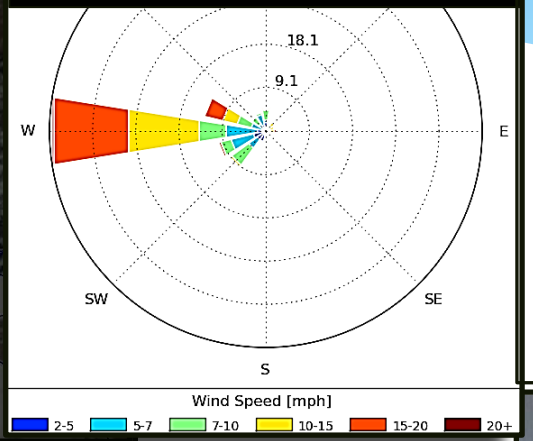
- Can I go?
- What is the best route to avoid the strongest winds and also sea ice?
- Will I encounter 25+ knots along my route and if so, for how long, from which direction and where?
- What is the best time to travel?

OCONUS Proving Ground

Driving Requirements – Satellites

May 27, 2011 - Shorefast locked in place

May 28 – Jun 2, 2011
Windrose Kotzebue, AK



Ice Breakup in Kotzebue can turn damaging when winds combined with high tide push ice onshore

Damage can occur with normal tides and west or northwest winds of 10 to 20 mph.

Similar threats across the Arctic

May 31, 2011 - Melting ice on the move from wind & tides

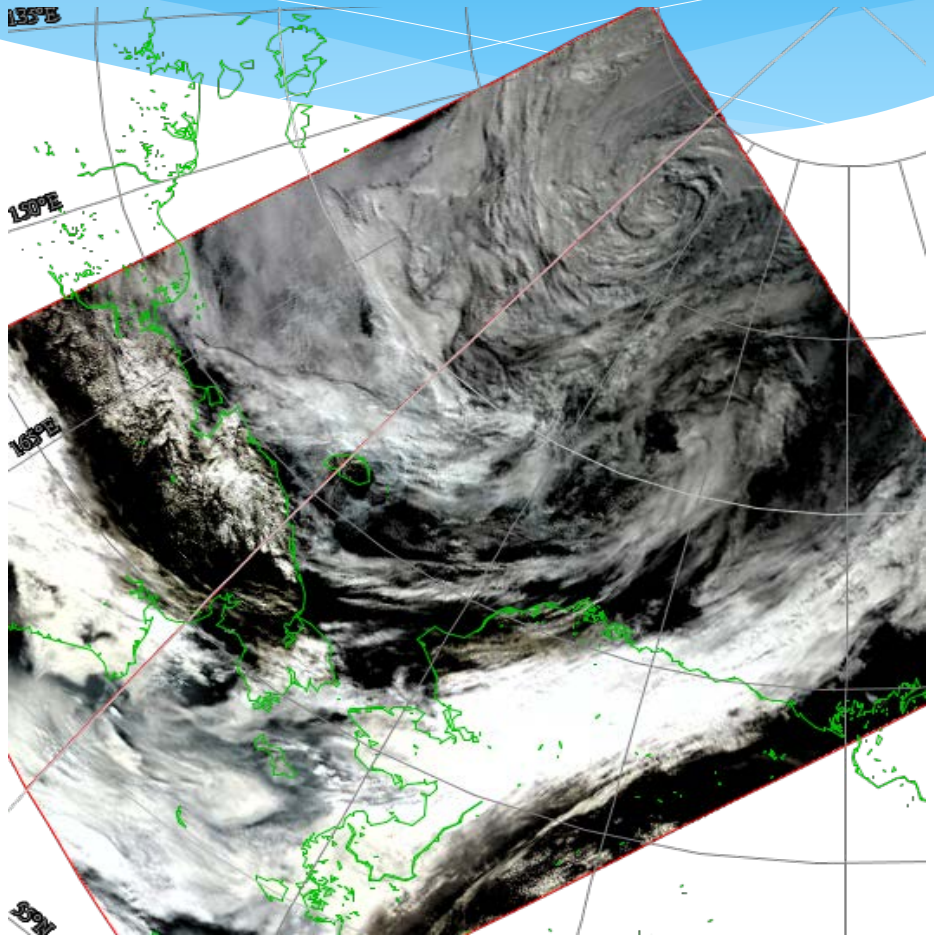
MODIS - VIS

May 30, 2011 - Sea ice damages structures in Kotzebue, AK

OCONUS Proving Ground

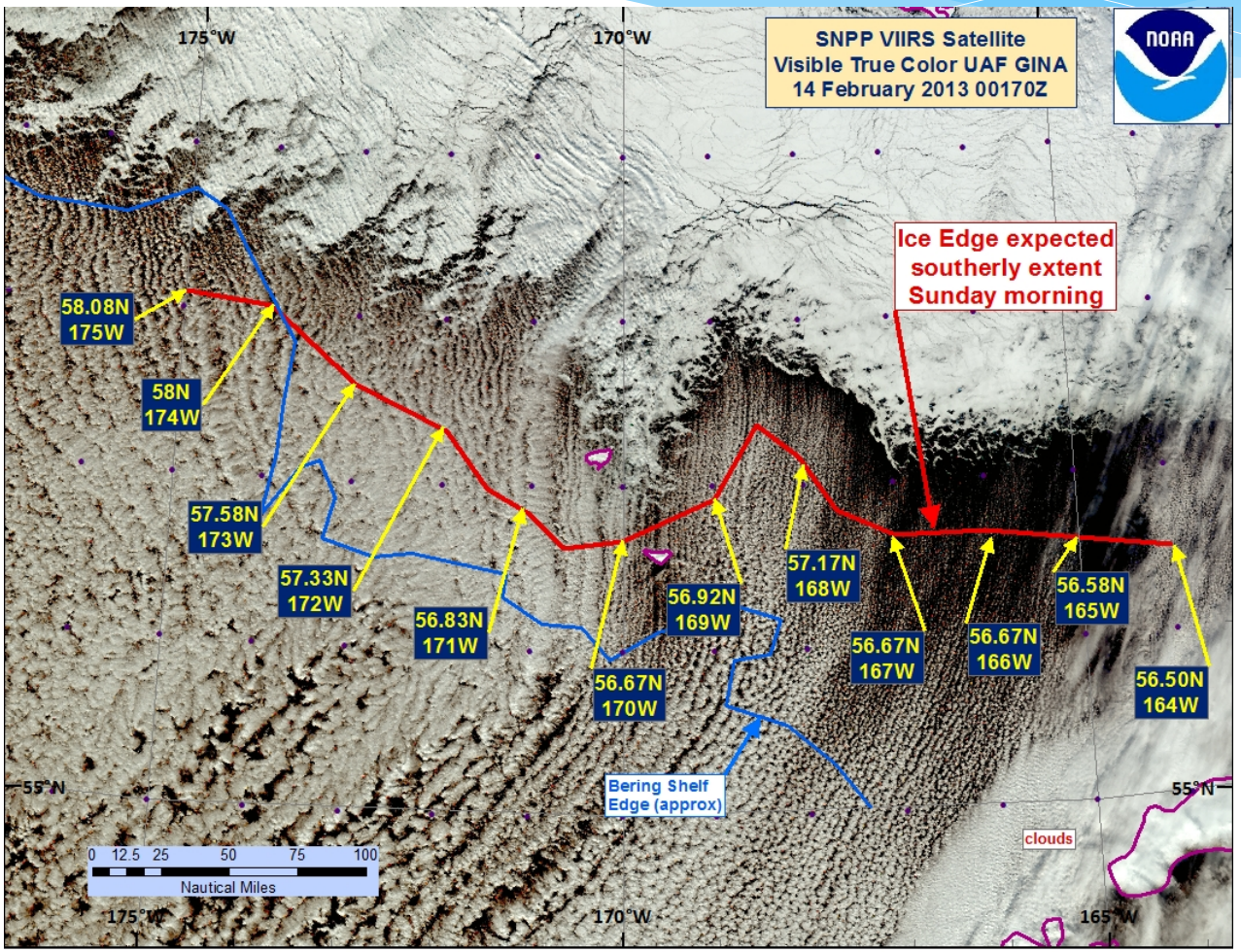
Driving Requirements – Satellites

- Arctic Hurricane, August 2012
- One of the strongest summer storms to have affected the Arctic Ocean in recent decades occurred in early August.
- The storm's central pressure was comparable to a Category-1 hurricane.
- The storm dispersed an already sparse ice cover, and waves from the storm propagated through the open water to the northern Alaskan coast, producing flooding in some villages.



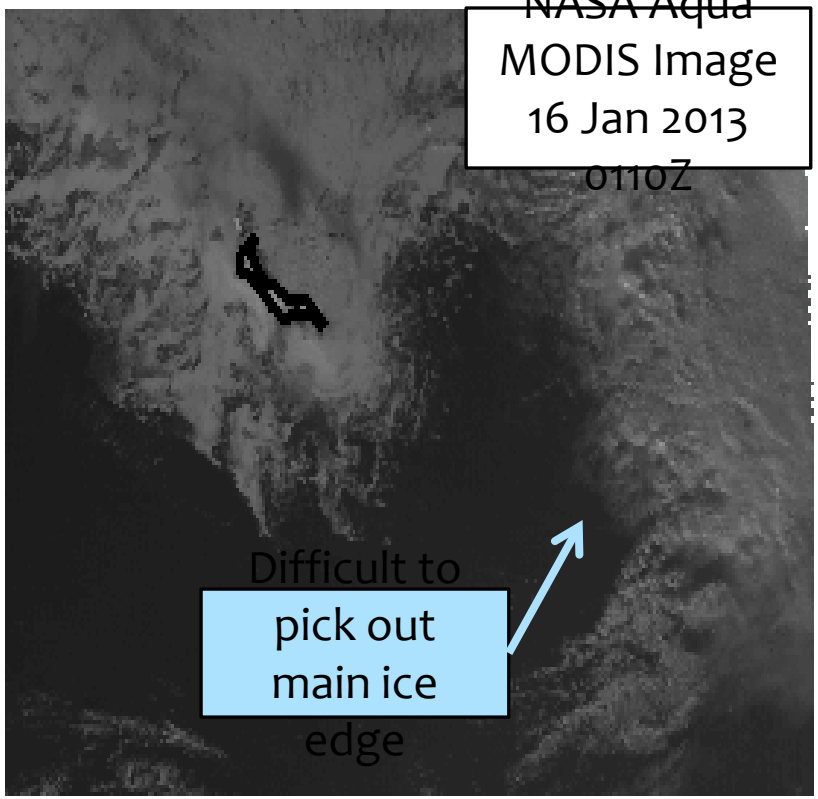
OCONUS Proving Ground

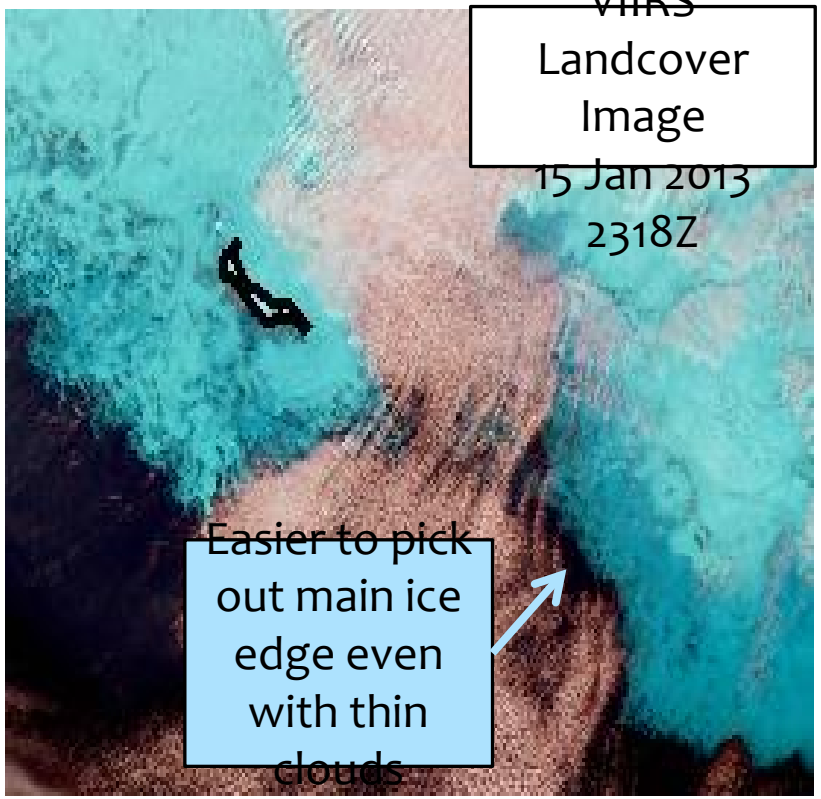
Driving Requirements – Satellites



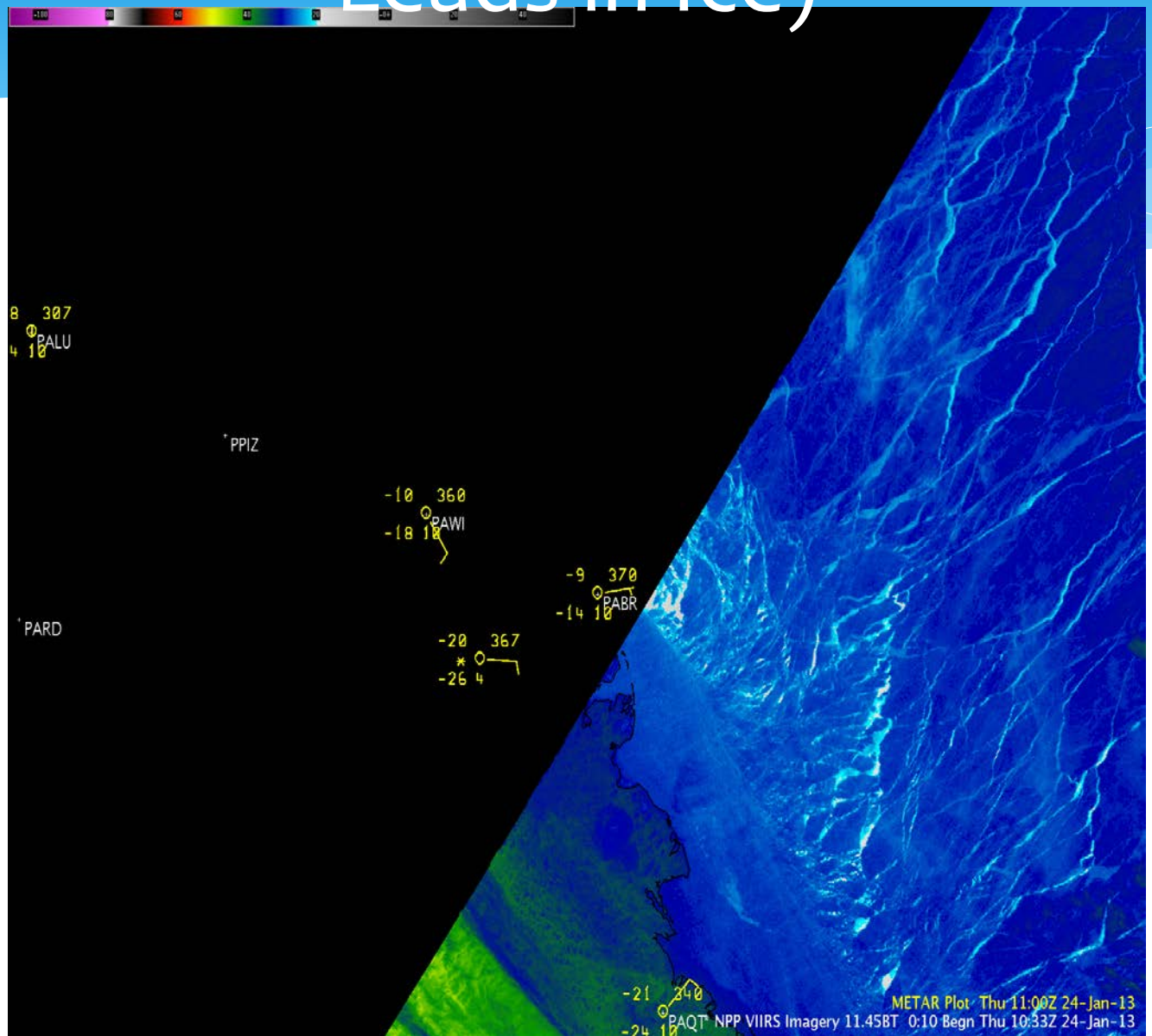
SNPP
VIIRS DNB

NPP Suomi VIIRS Landcover Images allow for an enhanced ability to look through thin cloud cover





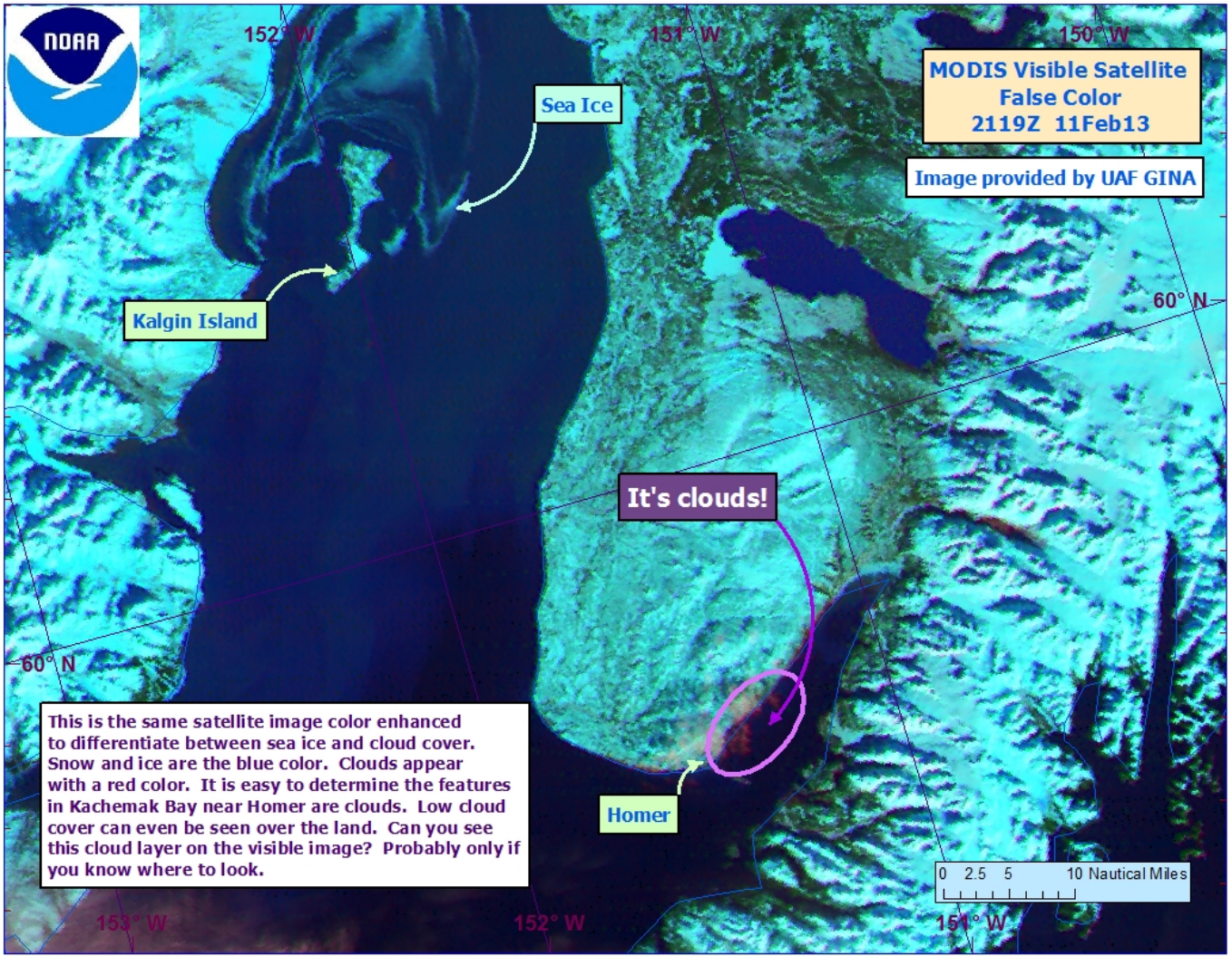
Strong Easterly Flow (Polynyas and Leads in Ice)



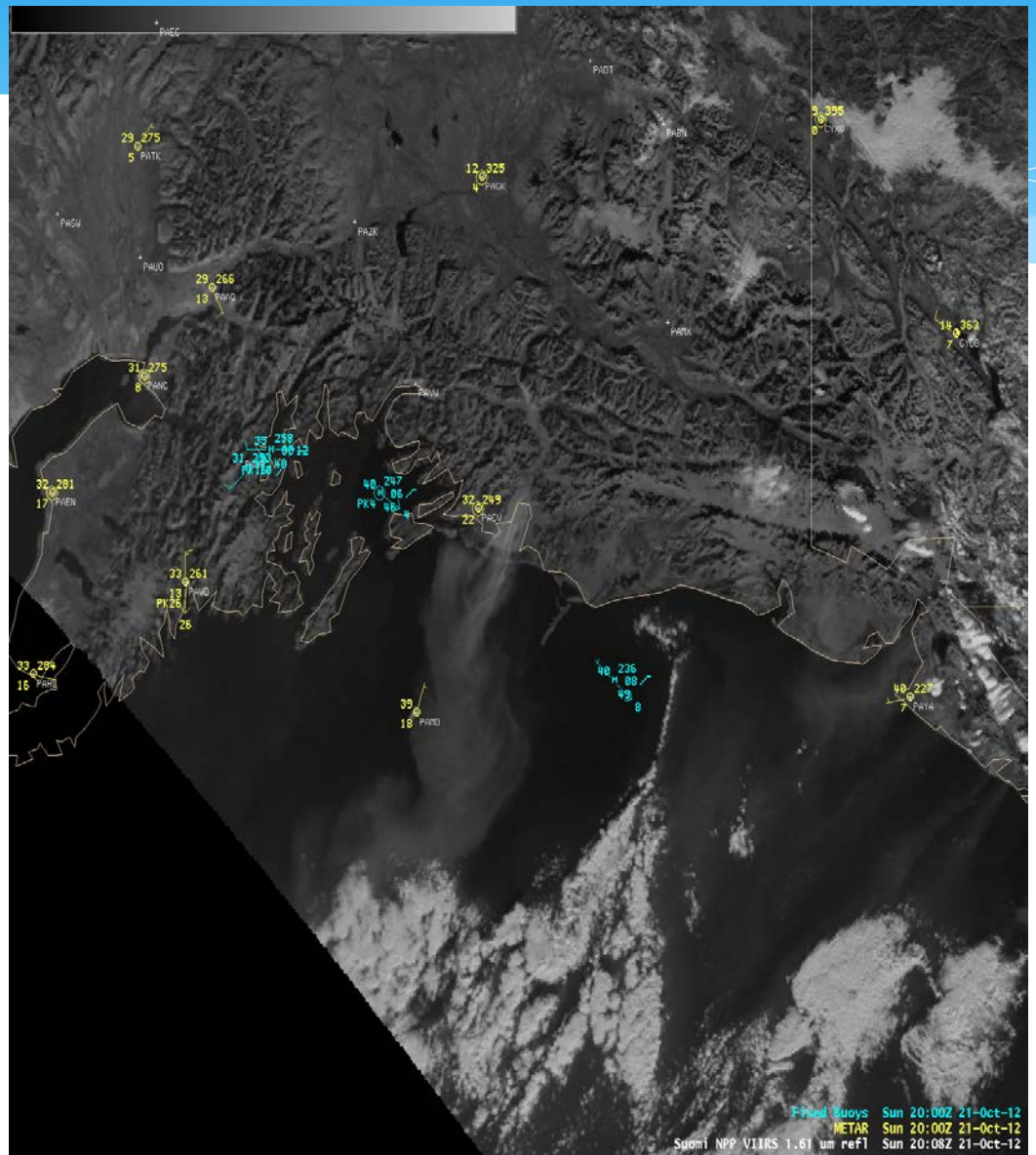
OCONUS Proving Ground

Driving Requirements – Satellites

MODIS VIS False and True Color

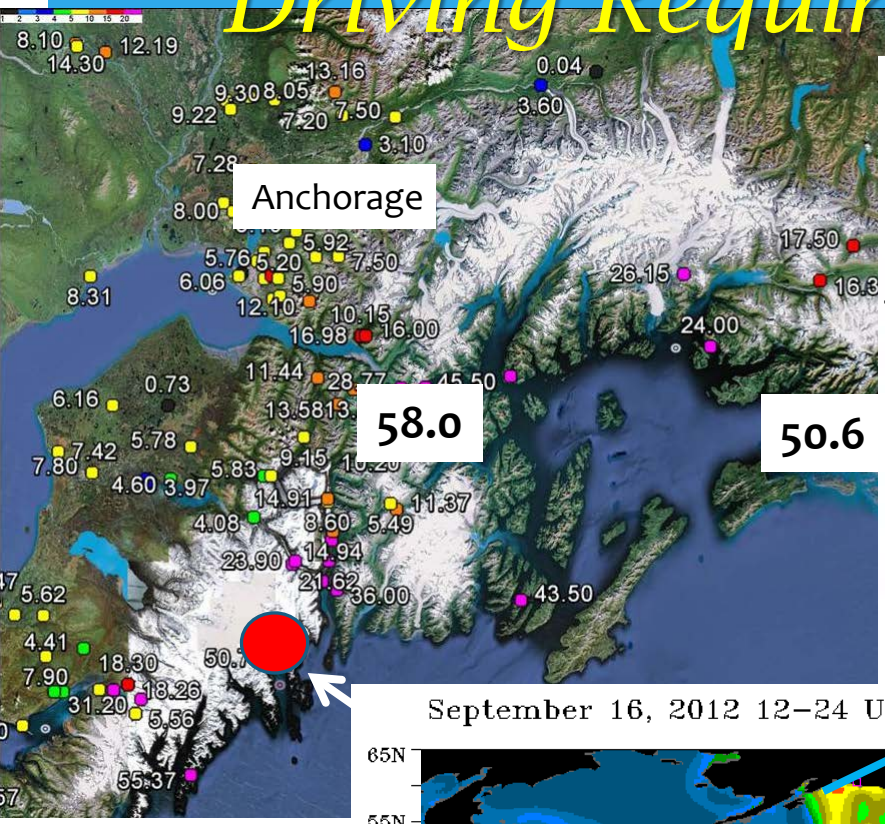


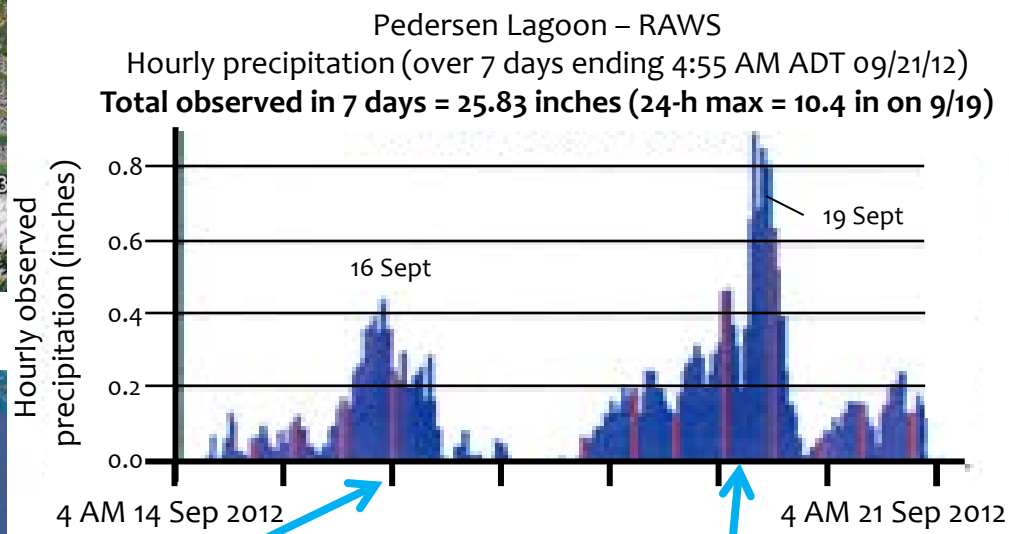
Strong Outflow from Land (Dust)

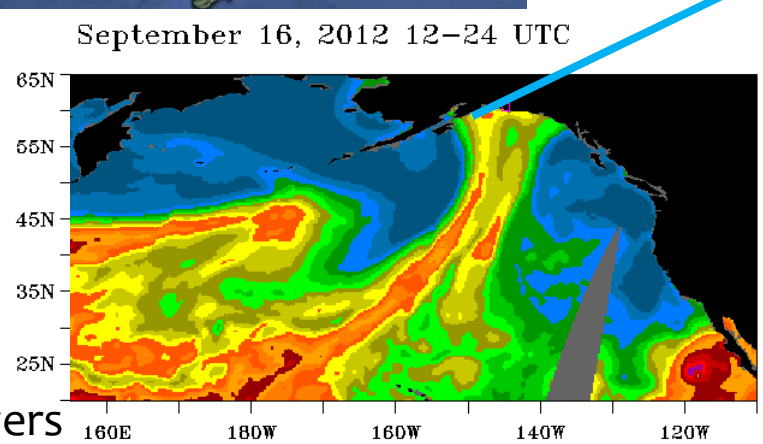


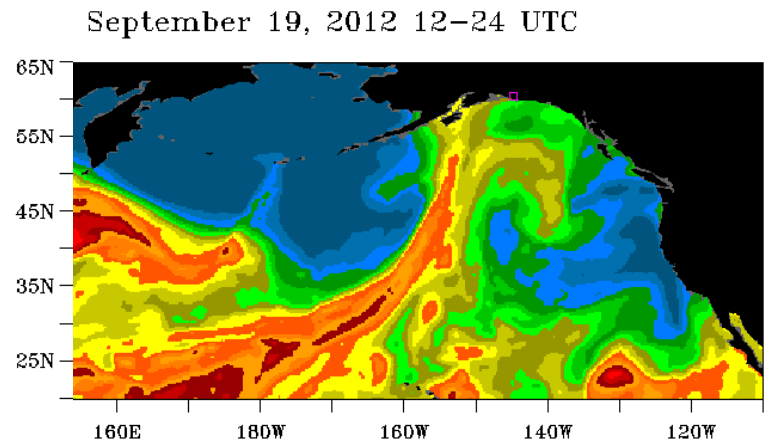
OCONUS Proving Ground

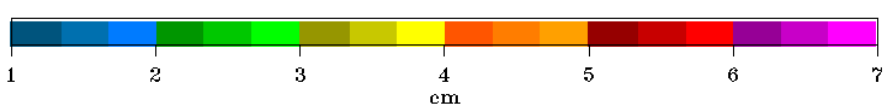
Driving Requirements – Satellites







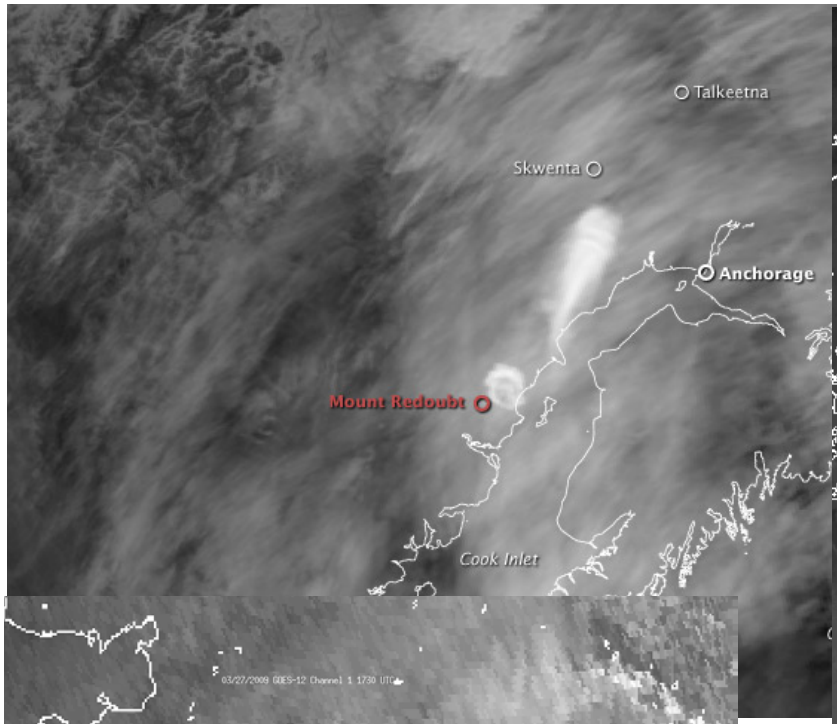


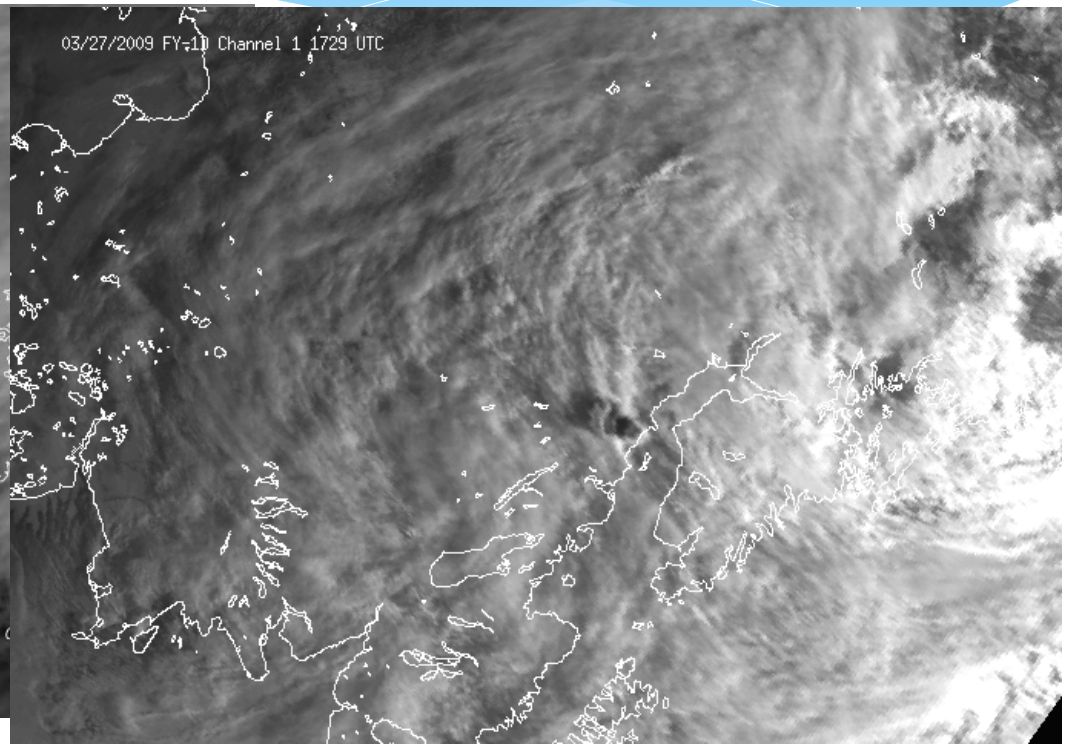


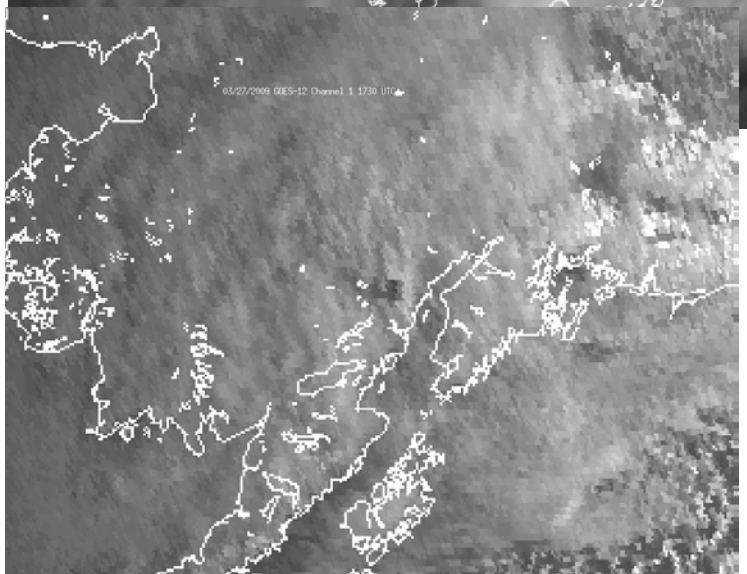
Atmospheric Rivers
September 2012
Courtesy Marty Ralph

OCONUS Proving Ground

Driving Requirements – Satellites



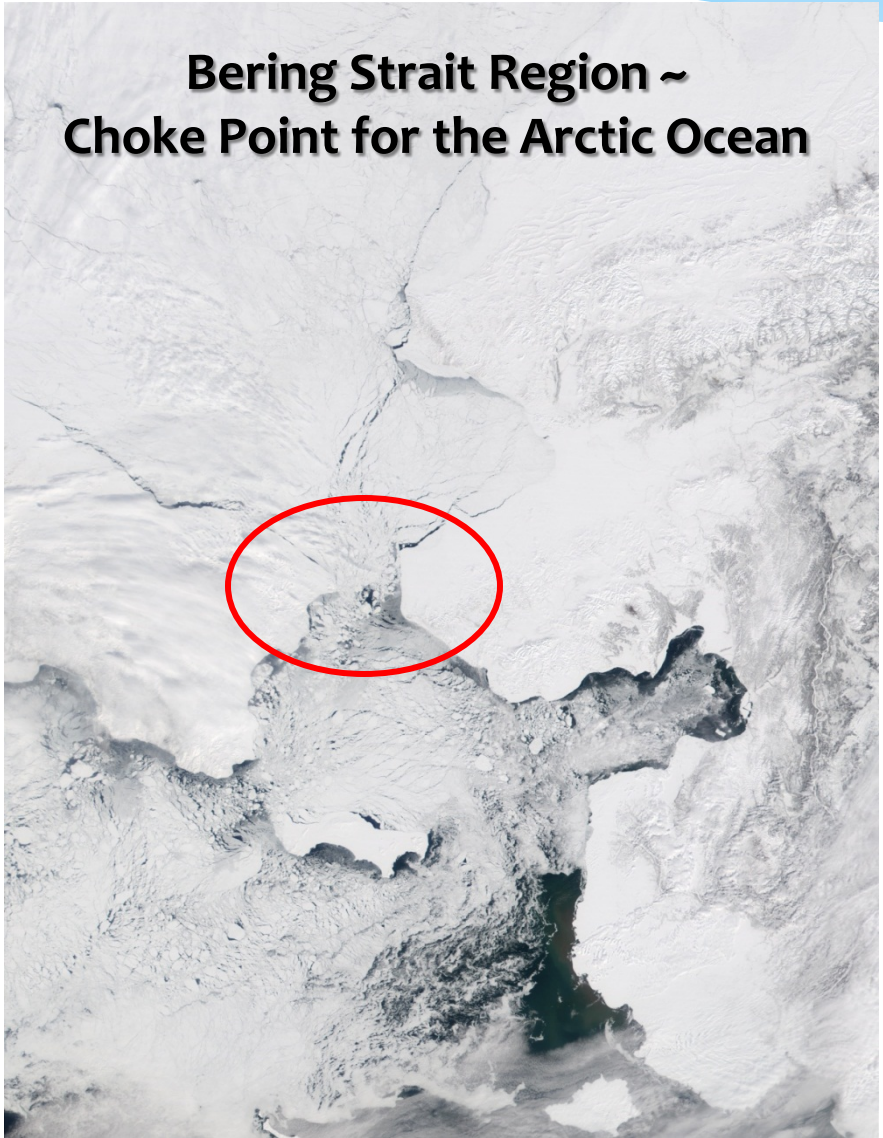




Volcanic Ash
FY1C, GOES 12, and MODIS

OCONUS Proving Ground

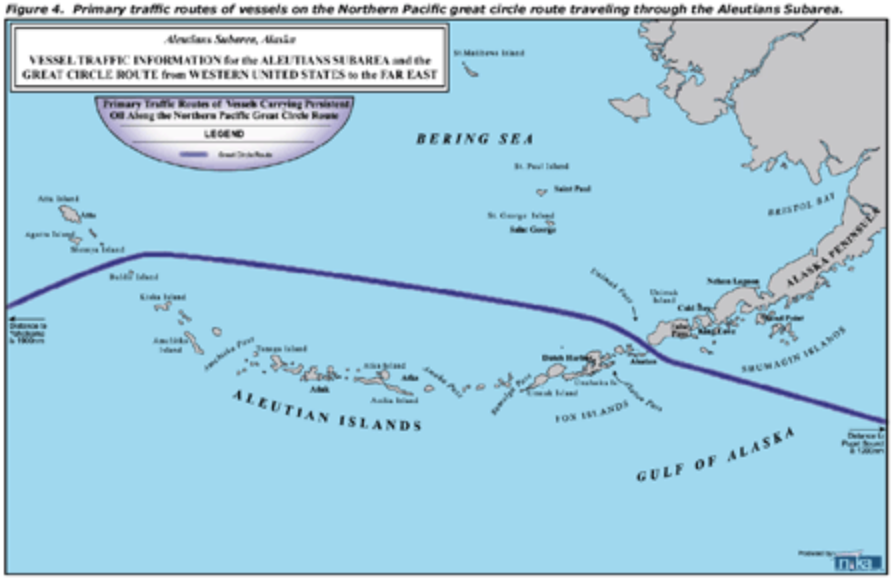
It's Alaska. Why Should You Care?

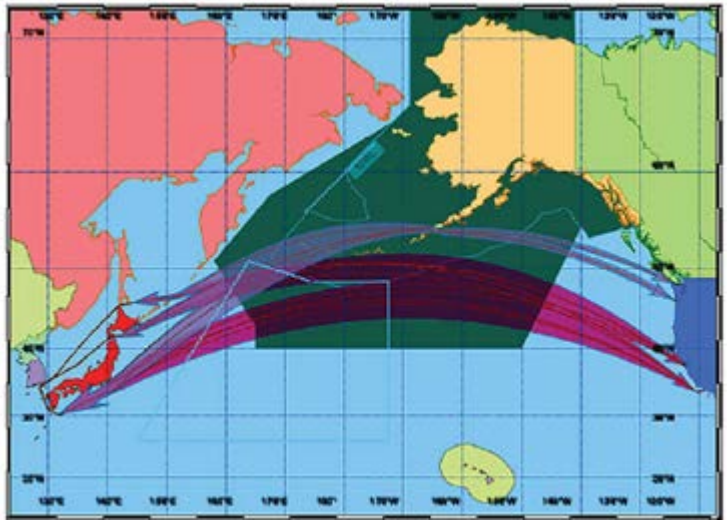


OCONUS Proving Ground

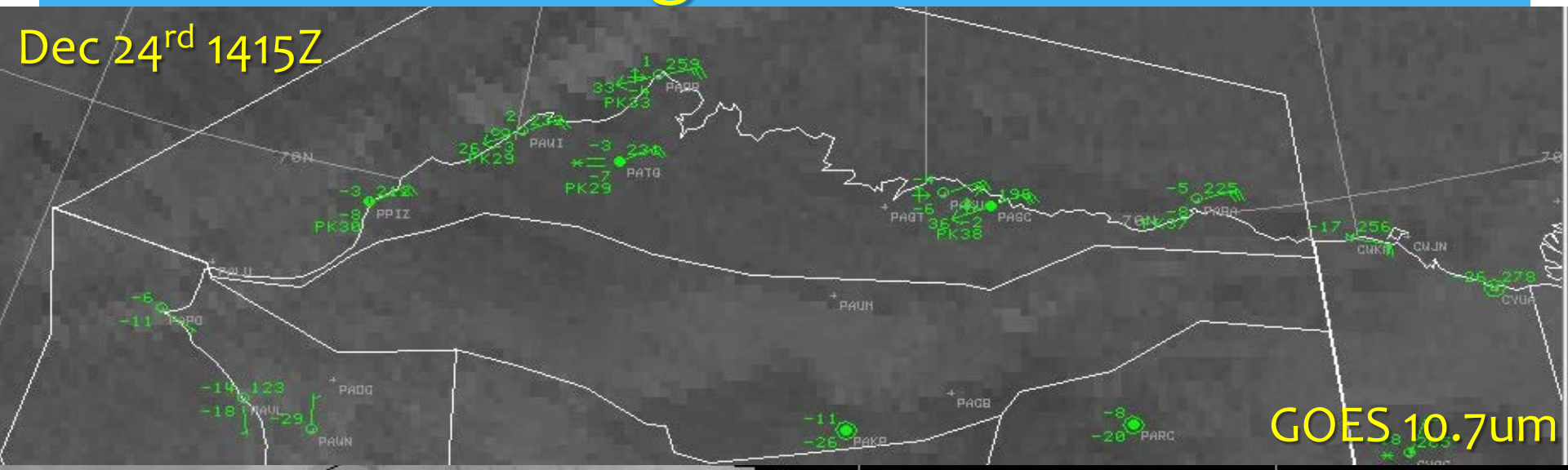
It's Alaska. Why Should You Care?

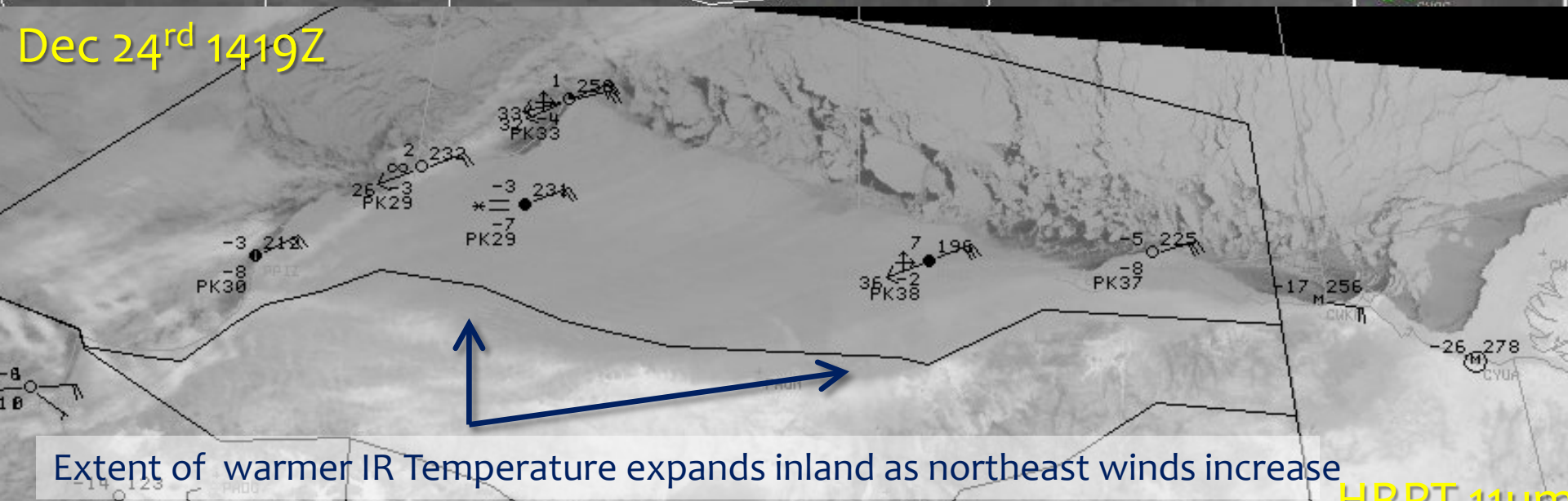
Figure 4. Primary traffic routes of vessels on the Northern Pacific great circle route traveling through the Aleutians Subarea.





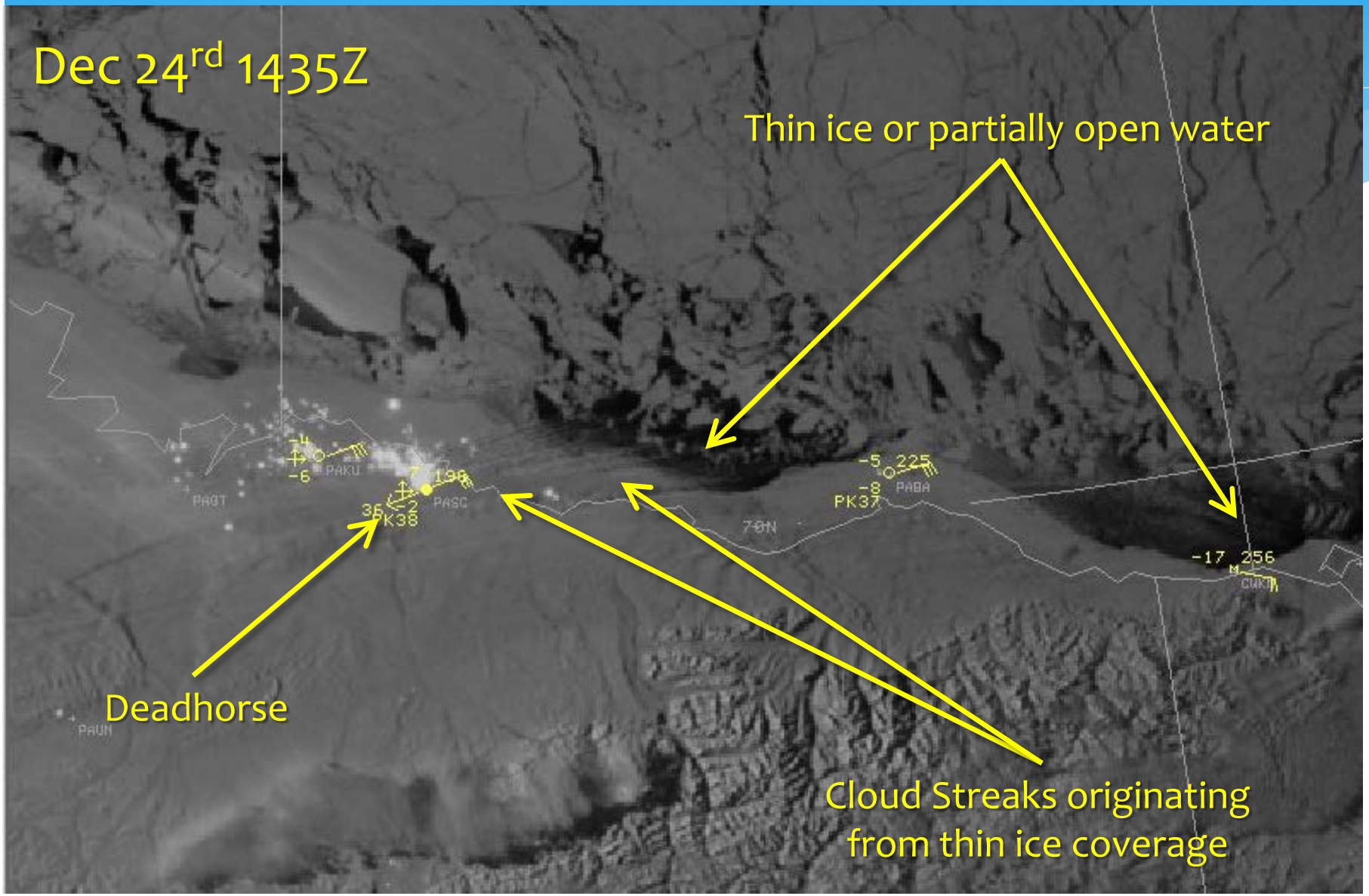
Warmer because of winds and better mixing or Clouds??



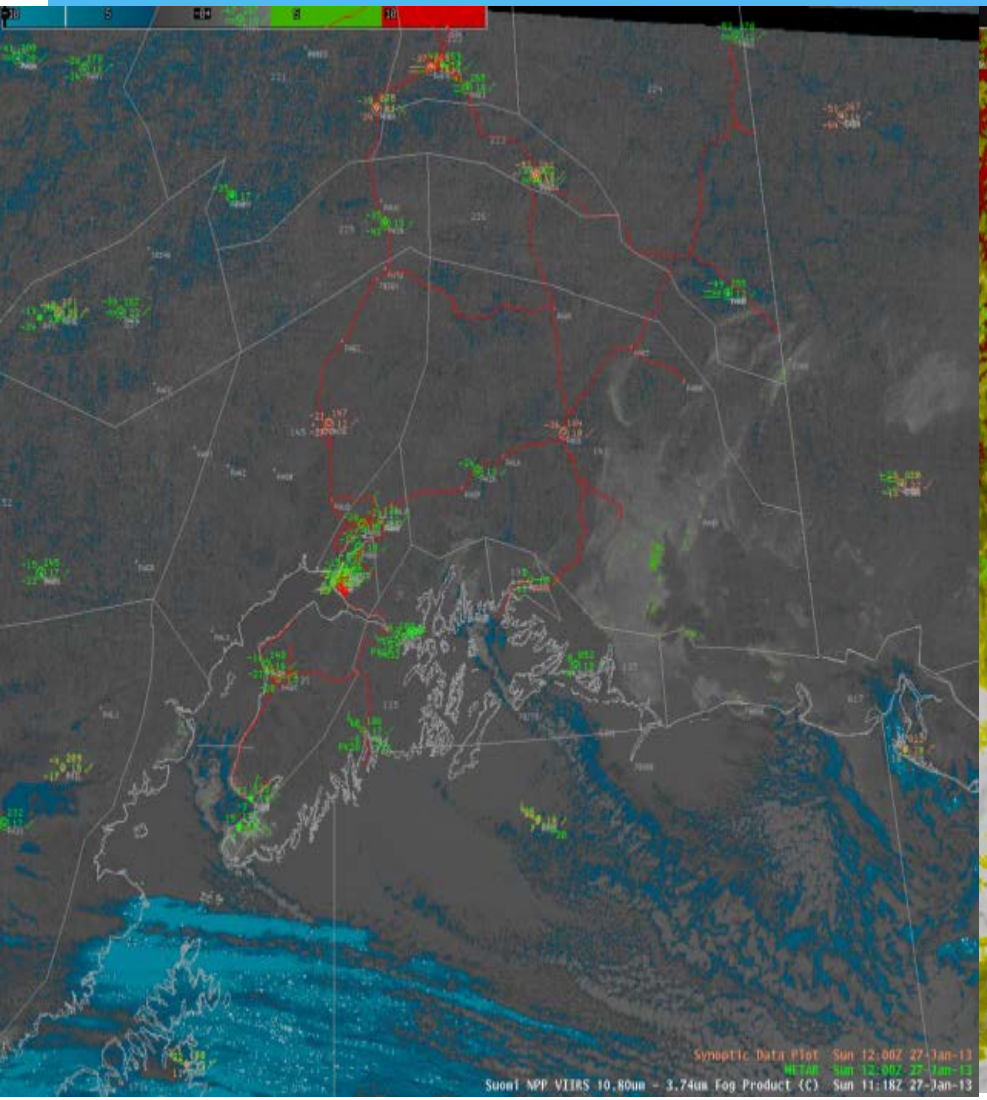


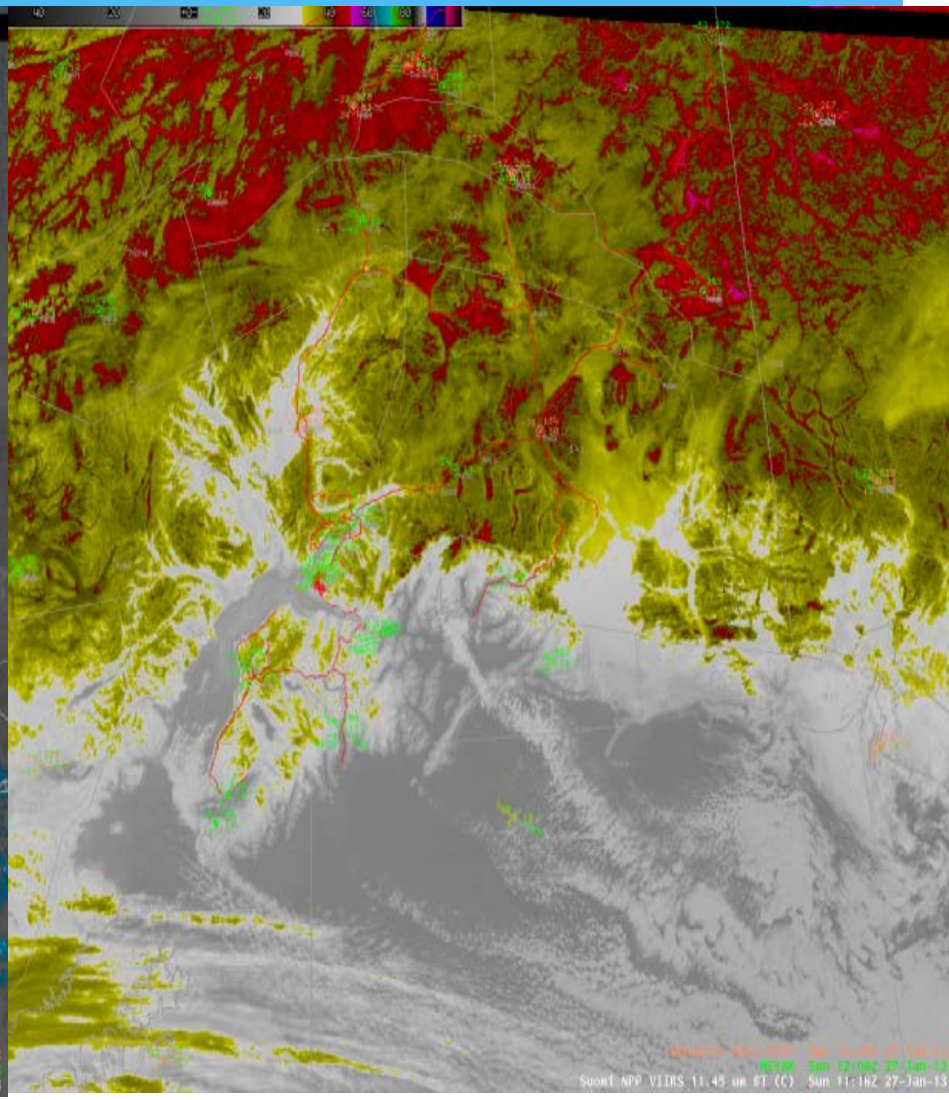
Extent of warmer IR Temperature expands inland as northeast winds increase

VIRS Day/Night Band reveals cloud streaks



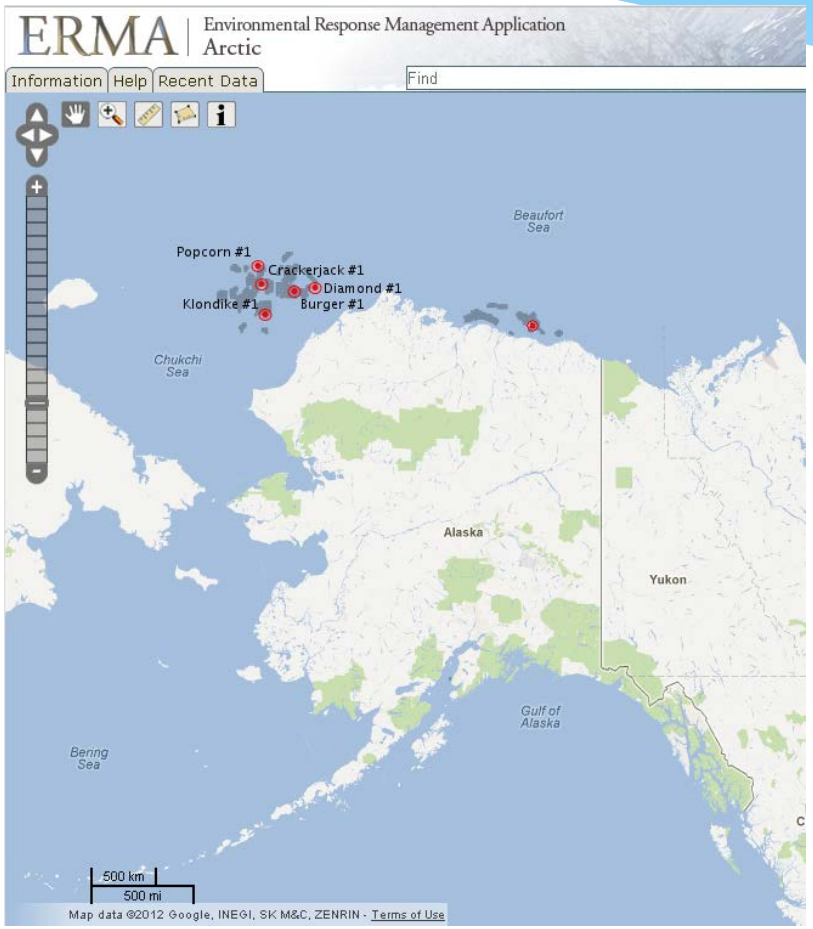
VIIRS Fog .vs. IR (Cold Surface)





OCONUS Proving Ground

It's Alaska. Why Should You Care?



- Drilling in the Chukchi and Beaufort Seas
- Leases worth over $2.6B
- Shell has spent $1B
- Cononco-Phillips and StatOil will join in drilling summer of 2014
- Gas reserves equal to Saudi Arabia
- Oil reserves greater than the North Slope

OCONUS Proving Ground
Unfinished Business

* RGB Air Mass Microphysics
* QPE Estimation
* Snow Hydrology
* Volcanic Ash – Waiting for an event!
* Icing Potential

OCONUS Proving Ground
The Future

Satellites

* Himawara?
* RADARSAT?
* Canadian Polar Communication Weather Satellite (PCW)?
* GOES-R DNB in Anchorage
* LEO DNB at Gilmore Creek

Problems

* Sea Ice
* Inundation Maps
* Currents
* Volcanic Ash Concentration
* Snow Depth

OCONUS Proving Ground In Conclusion…

* Observational density is an order of magnitude less (or worse) than CONUS
* Satellite imagery is mission critical to NWS Alaska operations
* Mix of LEO and GEO
* GEO is helpful even in the high latitudes
* LEO – for the latidunally challenged