# NWS Ice Desk
# Ice Analysis Overview

Becki Legatt
NWS Ice Desk
Anchorage, Alaska

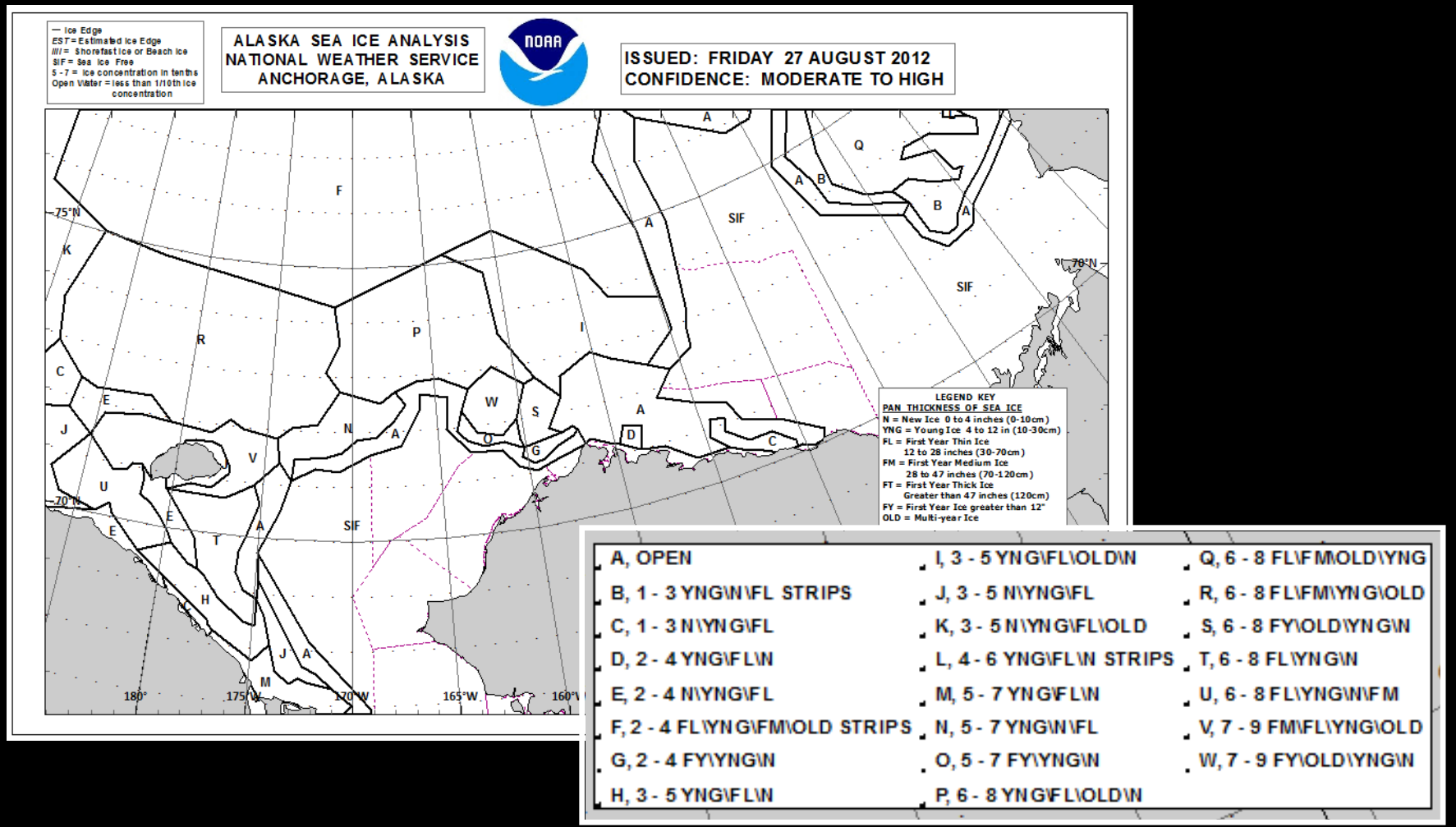
# NWS Ice Desk Overview

**What resources are utilized in an Ice Analysis?**

**How do we determine ice concentration and stage?**

**What do those letters mean?**

# NWS Ice Desk Services



# NWS Ice Desk Products

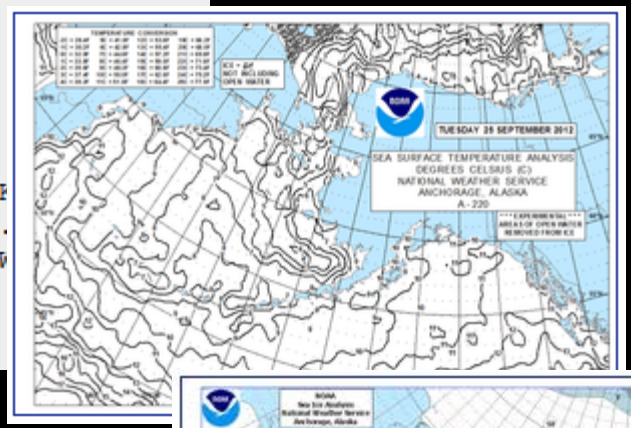
**Sea Ice Advisory:**

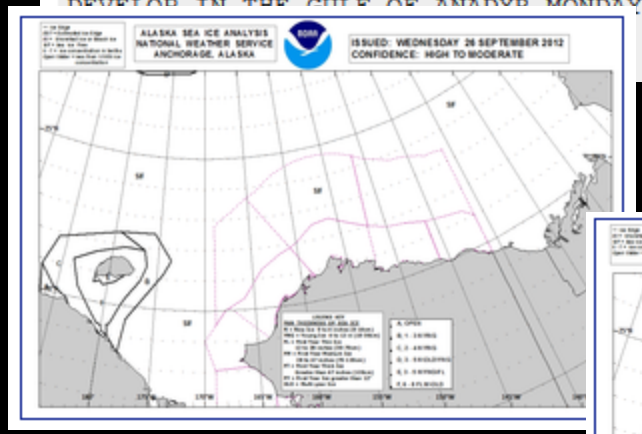
SEA ICE ADVISORY FOR WESTERN AND ARCTIC ALASKAN COASTAL WATERS
NATIONAL WEATHER SERVICE ANCHORAGE ALASKA
105 PM AKDT WEDNESDAY SEPTEMBER 26 2012

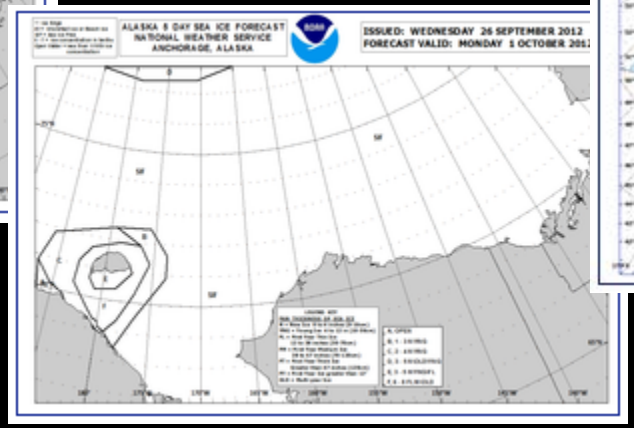
FORECAST VALID...MONDAY OCTOBER 1 2012

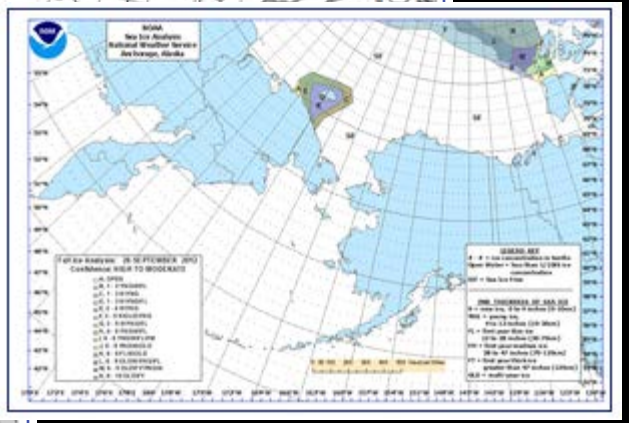
ANALYSIS CONFIDENCE...HIGH TO MODERATE.

SYNOPSIS...A LOW IN THE CHUKCHI SEA WILL SLOWLY WEAKEN AND
SATURDAY. A RIDGE OF HIGH PRESSURE WILL BUILD INTO THE CHUK
SATURDAY AND SLOWLY MOVE EAST INTO THE BEAUFORT SEA SUNDAY.
WILL REMAIN IN THE BEAUFORT SEA THROUGH MONDAY. ANOTHER LOW
DEVELOP IN THE GULF OF ANADYR MONDAY.



# Products

- Sea Ice Advisory
  - Text
- Ice Analysis
  - Shapefiles, Full Color, Marine Fax, Graphic
- 5 Day Sea Ice Forecast
  - Graphic (png)
- Monthly Outlook
- Special Marine Statements for dangerous Ice Conditions
- No Sea Ice Warning Products

# Sea Ice Advisory

- Details the ice edge and concentrations along the edge.
- Weather synopsis and 5-day ice forecast of ice movement.

- ❑ Text Product
- ❑ Issued M/W/F
- ❑ More detail than graphic products

Synopsis of expected weather pattern for forecast period

Forecast often offers more detail than possible in graphic product

FZAK80 PAFC 020044
ICEAFC

SEA ICE ADVISORY FOR WESTERN AND ARCTIC ALASKAN COASTAL WATERS
NATIONAL WEATHER SERVICE ANCHORAGE ALASKA
450 PM AKDT WEDNESDAY JULY 1 2009

FORECAST VALID...MONDAY JULY 6 2009

ANALYSIS CONFIDENCE...MODERATE TO LOW.

SYNOPSIS...A RIDGE OF HIGH PRESSURE STRETCHING FROM FAR NORTH OF ALASKA TO THE GULF OF ALASKA WILL WEAKEN LATE SATURDAY THROUGH MONDAY. A COLD LOW WILL DEVELOP TO THE NORTHEAST OF BANKS ISLAND OVER THE WEEKEND.

-ARCTIC OCEAN-
-BEAUFORT SEA-
-CHUKCHI SEA-
PKZ245-FLAXMAN ISLAND TO DEMARCATION POINT-
PKZ240-CAPE HALKETT TO FLAXMAN ISLAND-
PKZ235-POINT FRANKLIN TO CAPE HALKETT-
PKZ230-CAPE BEAUFORT TO POINT FRANKLIN-
PKZ225-CAPE THOMPSON TO CAPE BEAUFORT-

Marine Zone Identifiers

THE MAIN ICE EDGE...EXCLUDING OPEN WATER...LIES FROM NEAR POINT HOPE TO 68.6N 168.1W TO 68.3N 170.6W TO 68.7N 172.2W TO 70.3N 174.7W TO 70.9N 174.2W TO 71.1N 175.5W TO 69.7N 178.9W TO 68.1N 174.8W TO 67N ALONG THE RUSSIAN COAST. THE EASTERN EDGE IS 1 TO 5 TENTHS NEW...YOUNG AND FIRST YEAR THIN ICE. MOST OF THE REMAINDER OF THE CHUKCHI SEA IS OPEN WATER.

OPEN WATER LIES OFF THE NORTHERN ALASKA COAST NEAR DEMARCATION POINT. OPEN WATER 20 TO 60 NM WIDE LIES OFF THE SHOREFAST ICE ALONG THE ALASKA NORTH COAST BETWEEN 154.5W AND 132W. OPEN WATER 30 TO 45 NM WIDE LIES OFF THE NORTH WEST ALASKA COAST FROM BARROW TO 15 NM NORTH OF ICY CAPE. OPEN WATER 20 TO 80 NM WIDE LIES OFF THE COAST BETWEEN CAPE LISBURNE AND POINT LAY.

FORECAST THROUGH MONDAY...WARMER TEMPERATURES WILL DIMINISH ICE ALONG THE ALASKA NORTHWEST COAST AND THE CHUKCHI SEA. IN THE BEAUFORT SEA WEAK NORTHEAST FLOW WILL MOVE ICE CLOSER TO THE ALASKA COAST BETWEEN 141W AND 145W SATURDAY THROUGH MONDAY. SHOREFAST ICE ALONG THE NORTH COAST WILL SLOWLY DIMINISH.

Marine areas can be separated for clarification or emphasis.

PKZ220-WALES TO CAPE THOMPSON-
PKZ215-KOTZEBUE SOUND-

THE SHALLOW EASTERN PORTION OF KOTZEBUE SOUND IS ICE FREE. THE REMAINDER OF KOTZEBUE SOUND IS 1 TO 6 TENTHS YOUNG...NEW AND FIRST YEAR THIN ICE. 4 TO 6 TENTHS YOUNG AND NEW ROTTING FAST ICE LIES WITHIN 5 NM OF THE NORTH COAST OF THE SEWARD PENINSULA.

FORECAST THROUGH MONDAY...ICE WILL CONTINUE TO DIMINISH.

KCOLE 2009

$$

The Sea Ice Advisory is available on the web at

http://pafc.arh.noaa.gov/marfcst.php?fcst=FZAK80PAFC

or from the main ice page at

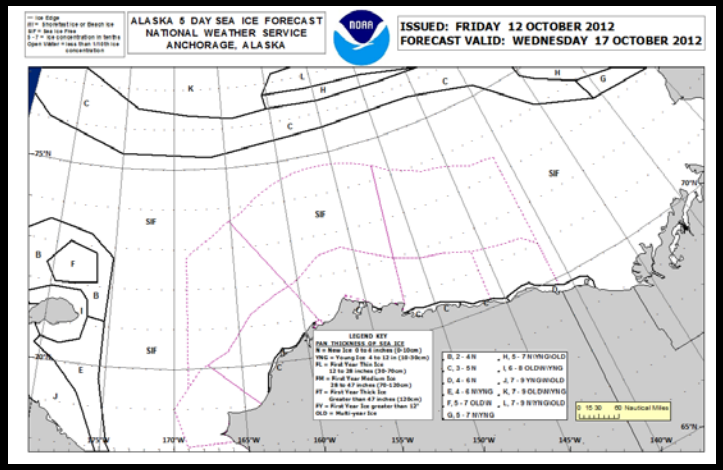
http://pafc.arh.noaa.gov/ice.php

# Special Marine Statements

- Ivu or Ice Shove are usually handled with SMS
- Kotzebue Ice Shove

# 5-day Sea Ice Forecasts

- Graphic is 5 day endpoint
  - More info is available in Sea Ice Advisory Product

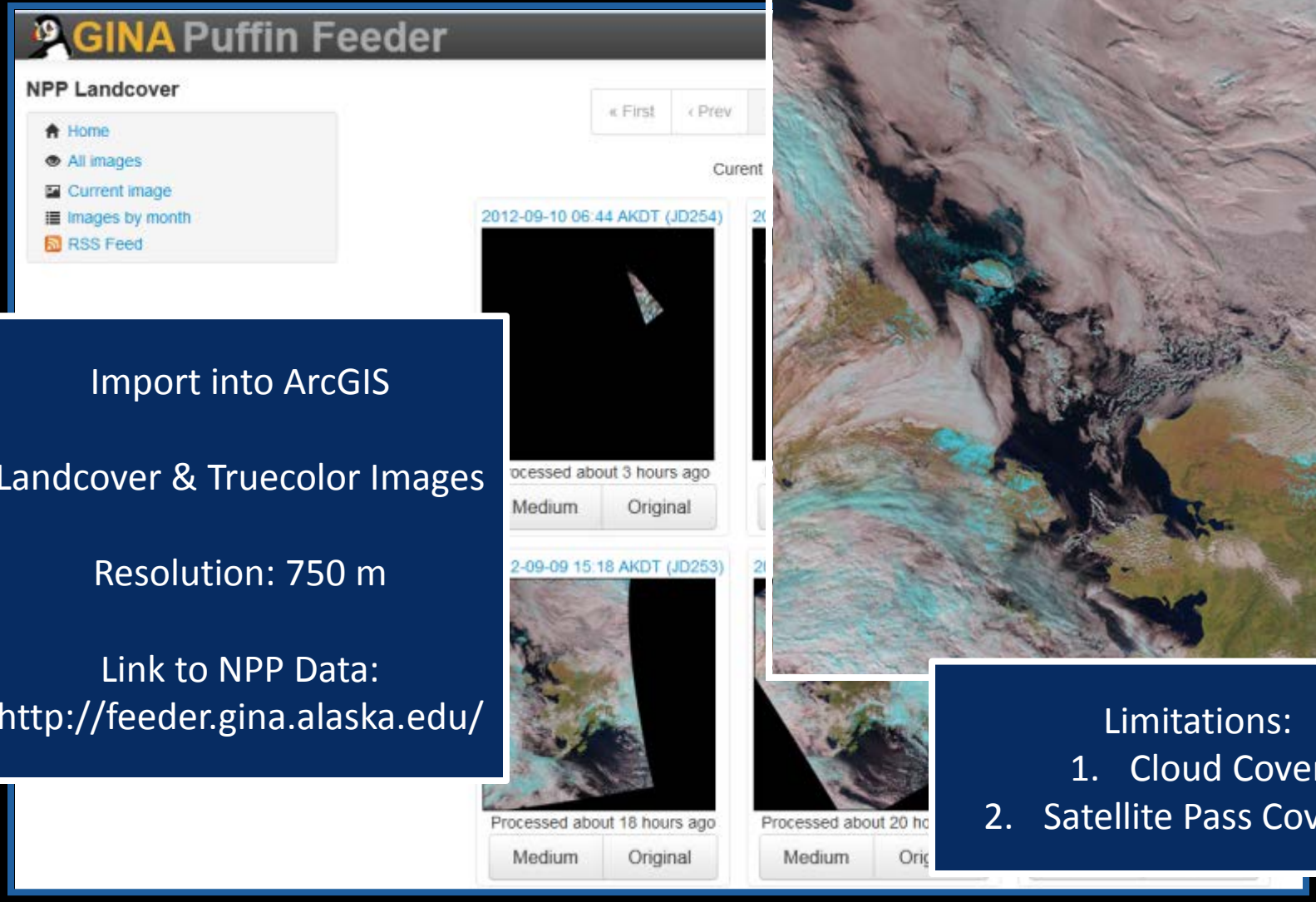



- Dangerous changes in Ice shorter than 5 days are included on the graphic if space allows

# NWS Ice Desk Products

**What resources are utilized in an Ice Analysis?**

# Suomi NPP VIIRS (Through UAF GINA)






Import into ArcGIS

Landcover & Truecolor Images

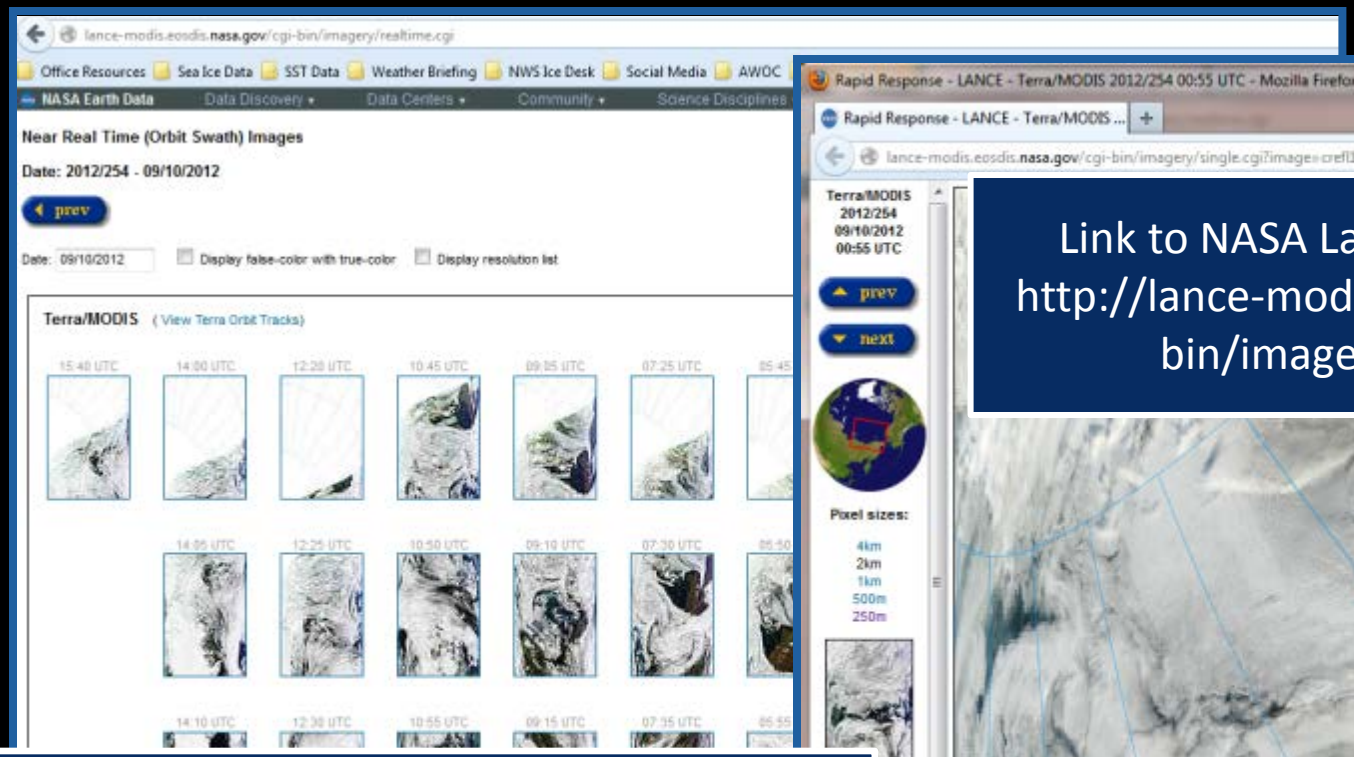
Resolution: 750 m

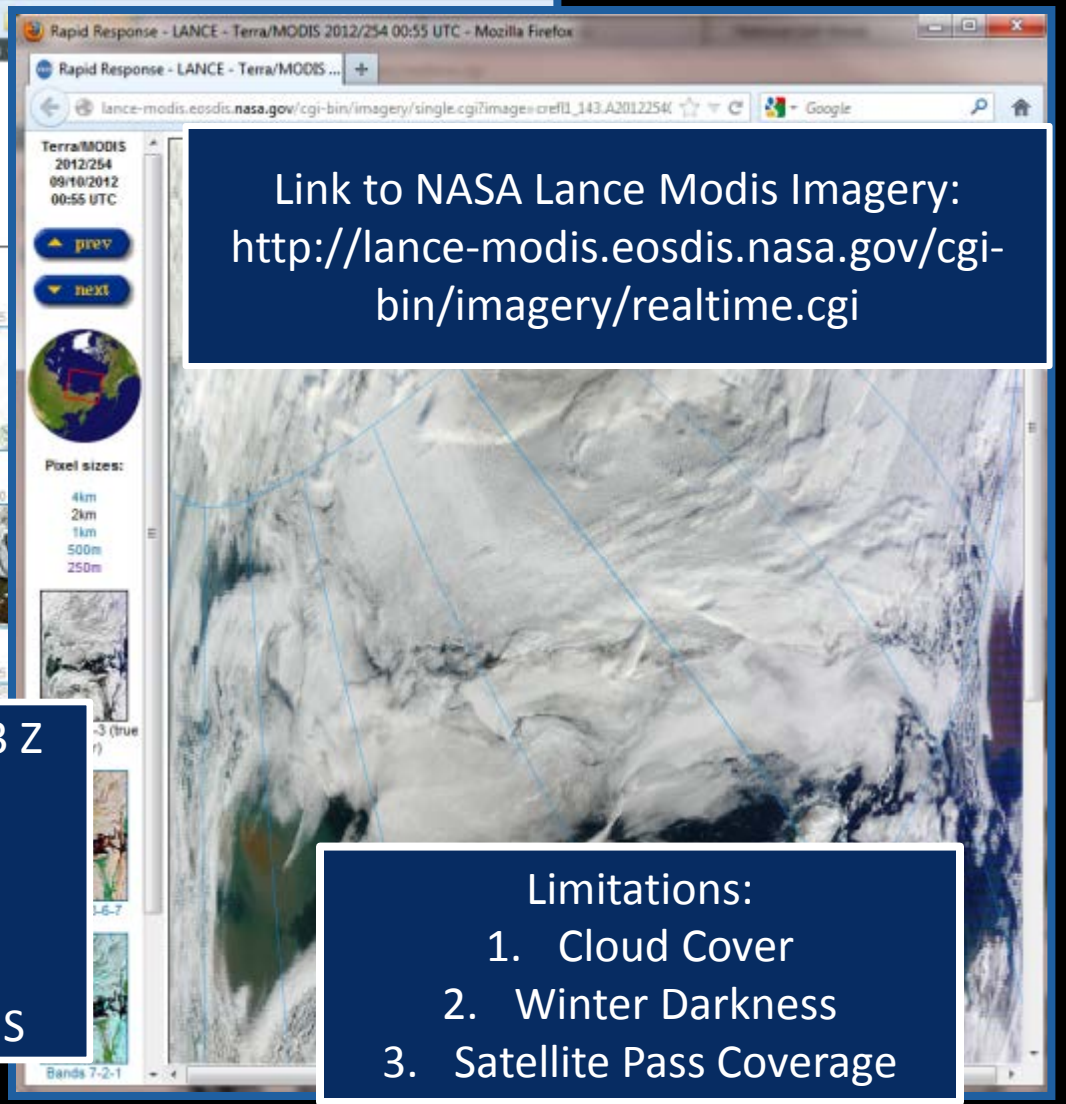
Link to NPP Data:
http://feeder.gina.alaska.edu/

Limitations:

1. Cloud Cover
2. Satellite Pass Coverage

# MODIS Visible Imagery (Aqua & Terra)




Link to NASA Lance Modis Imagery:
http://lance-modis.eosdis.nasa.gov/cgi-bin/imagery/realtime.cgi

Typical passes over our region 18 to 03 Z

Download image at 250m resolution

Color image from NASA website
Greyscale image through FTP -> ArcGIS

Limitations:

1. Cloud Cover
2. Winter Darkness
3. Satellite Pass Coverage

# SAR Winds (RadarSAT1 & 2 via Environment Canada)

Lat/Lon pairs are used to identify major ice floe boundaries as well ice strips
Very useful underneath cloud cover

Limitations:

1. Spatial Coverage
2. Unknown future Images
3. Not Geo-Located

# SAR (RadarSAT2 via National Ice Center)

Typically 1 to 4 SAR images over the region per day

Resolution = 100m

Very high resolution and great for identifying ice underneath cloud cover

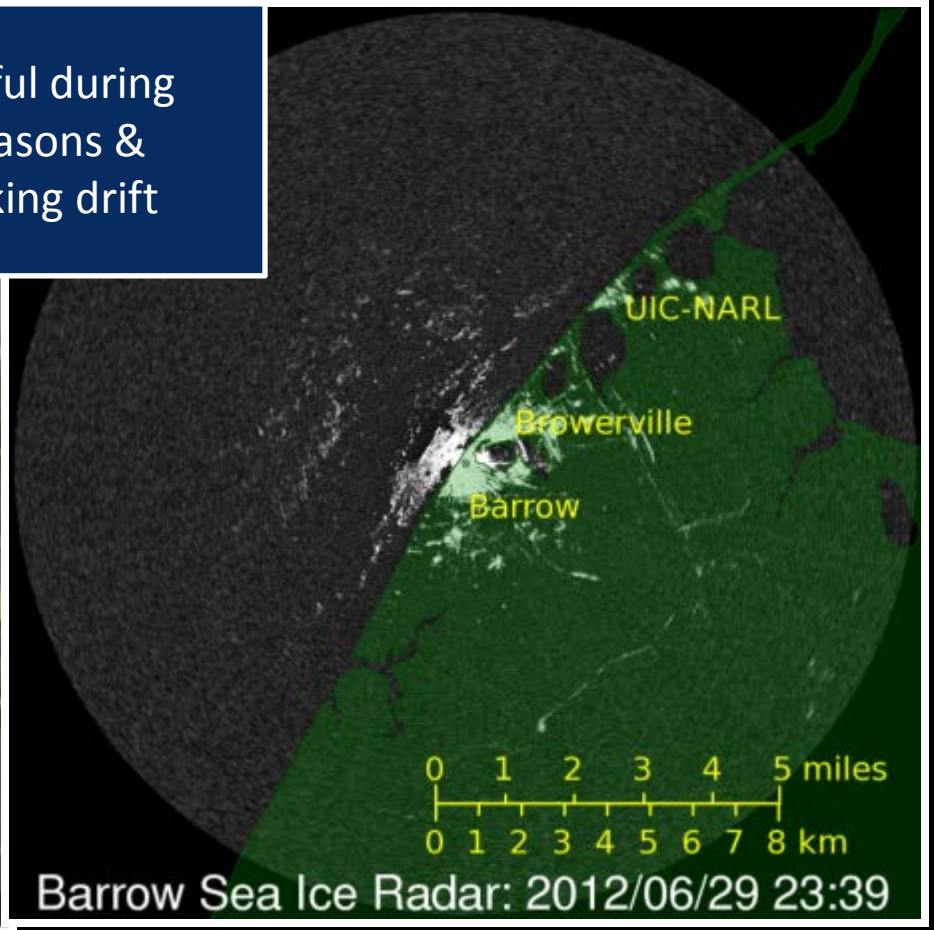
Limitations:

1. Very Limited Spatial Cover
2. Only Ice Desk Use (MOU)

# USCG Healy Ship Cam

# Barrow Webcam & Radar (UAF GINA)

Especially Useful during Transition Seasons & useful in tracking drift

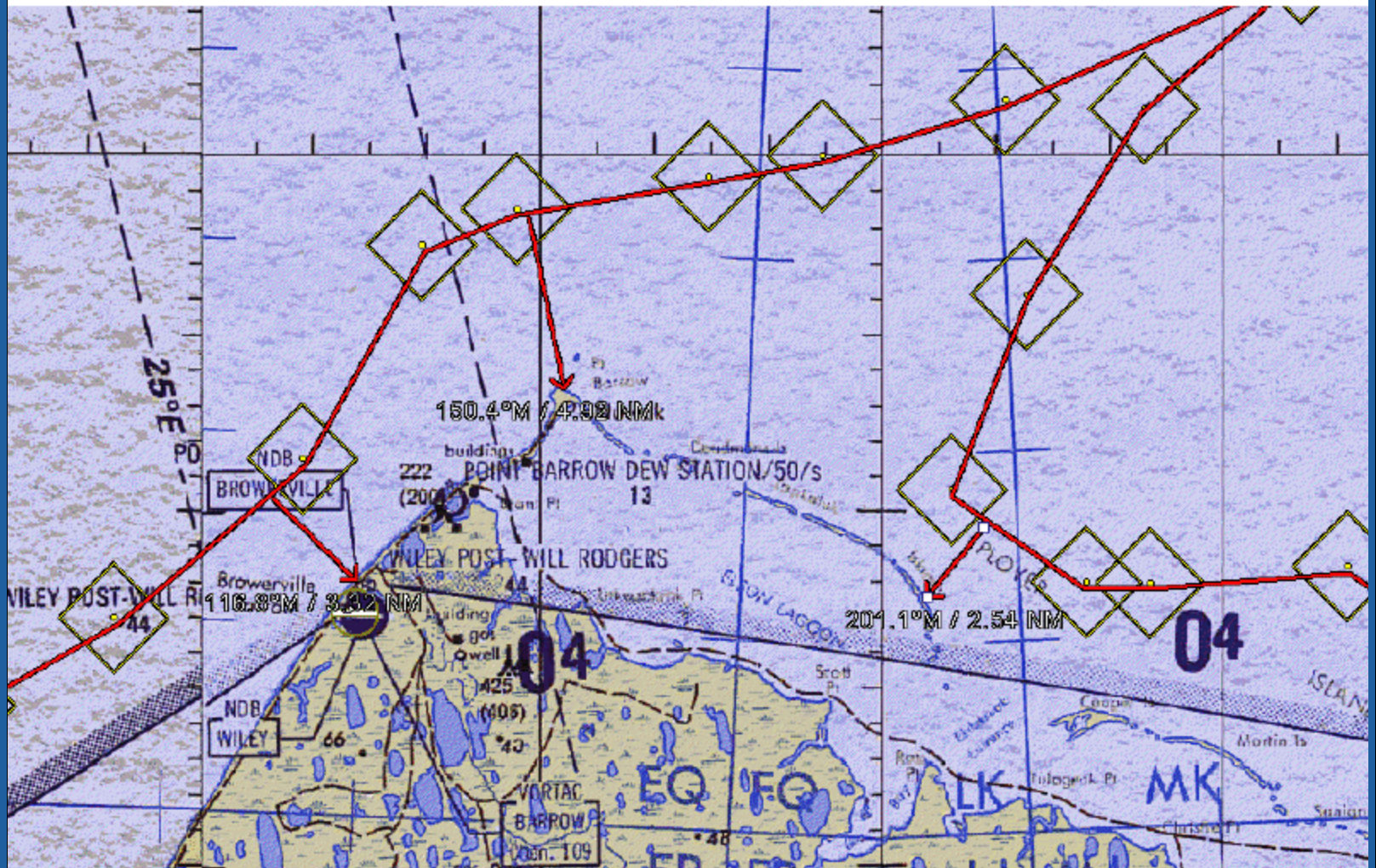



# USCG Aerial Observations


# USCG Overflight

## Ice Edge ivo Barrow 29 July 2012

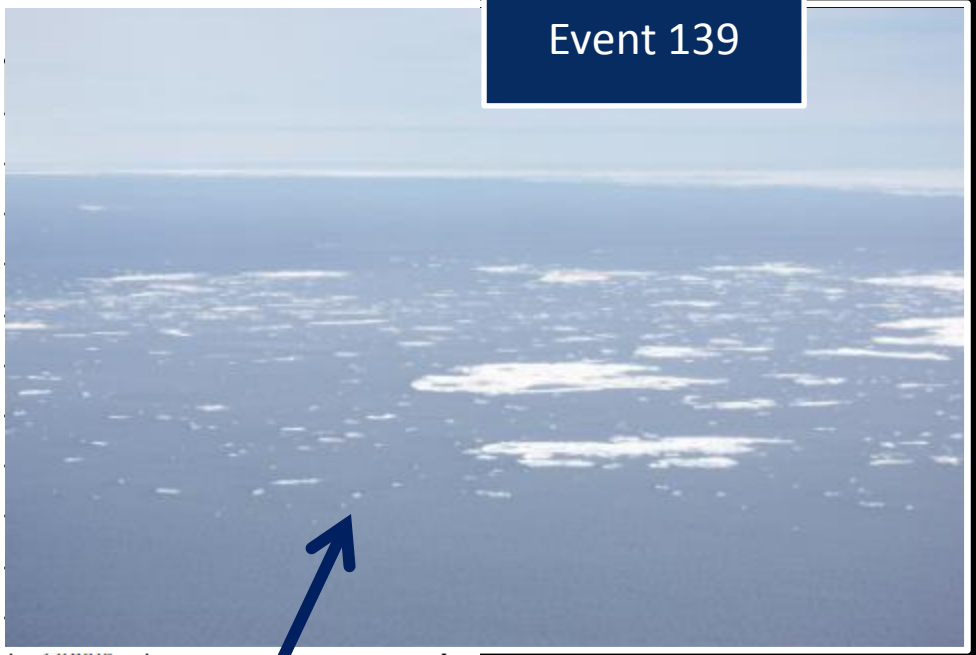
**Note distances from shore in map below. Some areas south of the ice edge contain up to 2/10 ice coverage. East of depicted area to Prudhoe Bay is clear of ice.**



# Aerial Surveys of Arctic Marine Mammals project

Meteorological/Oceanographic Summary, Flight 221 Date: 8/5/2012

| Event | Lat | Long | Time | Type | % Ice | SeaState | | | |
|---|---|---|---|---|---|---|---|---|---|
| 1 | 71.28 | -156.76 | 9:48:40 AM | n/a | n/a | n/a | | | |
| 11 | 71.22 | -156.15 | 9:53:54 AM | n/a | n/a | n/a | | | |
| 22 | 71.12 | -155.3 | 9:58:54 AM | n/a | n/a | n/a | | | |
| 33 | 71.02 | -154.45 | 10:03:55 AM | n/a | n/a | n/a | | | |
| 44 | 70.92 | -153.6 | 10:08:55 AM | n/a | n/a | n/a | | | |
| 55 | 70.81 | -152.76 | 10:13:55 AM | n/a | n/a | n/a | | | |
| 66 | 70.7 | -151.92 | 10:18:56 AM | n/a | n/a | n/a | | | |
| 77 | 70.59 | -151.1 | 10:23:56 AM | n/a | n/a | n/a | | | |
| 88 | 70.53 | -150.31 | 10:28:55 AM | n/a | n/a | n/a | | | |
| 93 | 70.55 | -150.09 | 10:30:39 AM | broken floe | 12 | B3 scattered caps, 7-10 kt | | | |
| 96 | 70.58 | -150.09 | 10:31:39 AM | broken floe | 12 | B3 scattered caps, 7-10 kt | | | |
| 107 | 70.76 | -150.09 | 10:36:39 AM | broken floe | 20 | B4 numerous caps, 11-16 kt | partly cloudy | 5-10 km | |
| 115 | 70.89 | -150.08 | 10:40:05 AM | broken floe | 30 | B5 many caps, 17-21 kt | partly cloudy | 5-10 km | |
| 122 | 71 | -150.07 | 10:43:05 AM | broken floe | 30 | B5 many caps, 17-21 kt | partly cloudy | 5-10 km | |
| 126 | 71.05 | -150.07 | 10:44:37 AM | broken floe | 35 | B5 many caps, 17-21 kt | partly cloudy | 5-10 km | |
| 129 | 71.11 | -150.06 | 10:46:00 AM | broken floe | 40 | B2 sm waves, 4-6 kt | partly cloudy | 5-10 km | |
| 132 | 71.14 | -150.06 | 10:46:51 AM | broken floe | 40 | B3 scattered caps, 7-10 kt | partly cloudy | 5-10 km | |
| 134 | 71.17 | - | 10:47:34 AM | broken | 40 | B4 numerous caps, | partly | 5-10 km | |
| 139 | 71.23 | -150.06 | 10:49:10 AM | broken floe | 40 | B4 numerous caps, 11-16 kt | partly cloudy | 5-10 km | 5-10 km |
| 141 | 71.26 | 150.06 | AM | floe | 60 | B2 sm waves, 4-6 kt | cloudy | 5-10 km | 5-10 km |
| 143 | 71.28 | - | 10:50:26 | broken | 60 | B2 sm waves, 4-6 kt | partly | 5-10 km | 5-10 km |

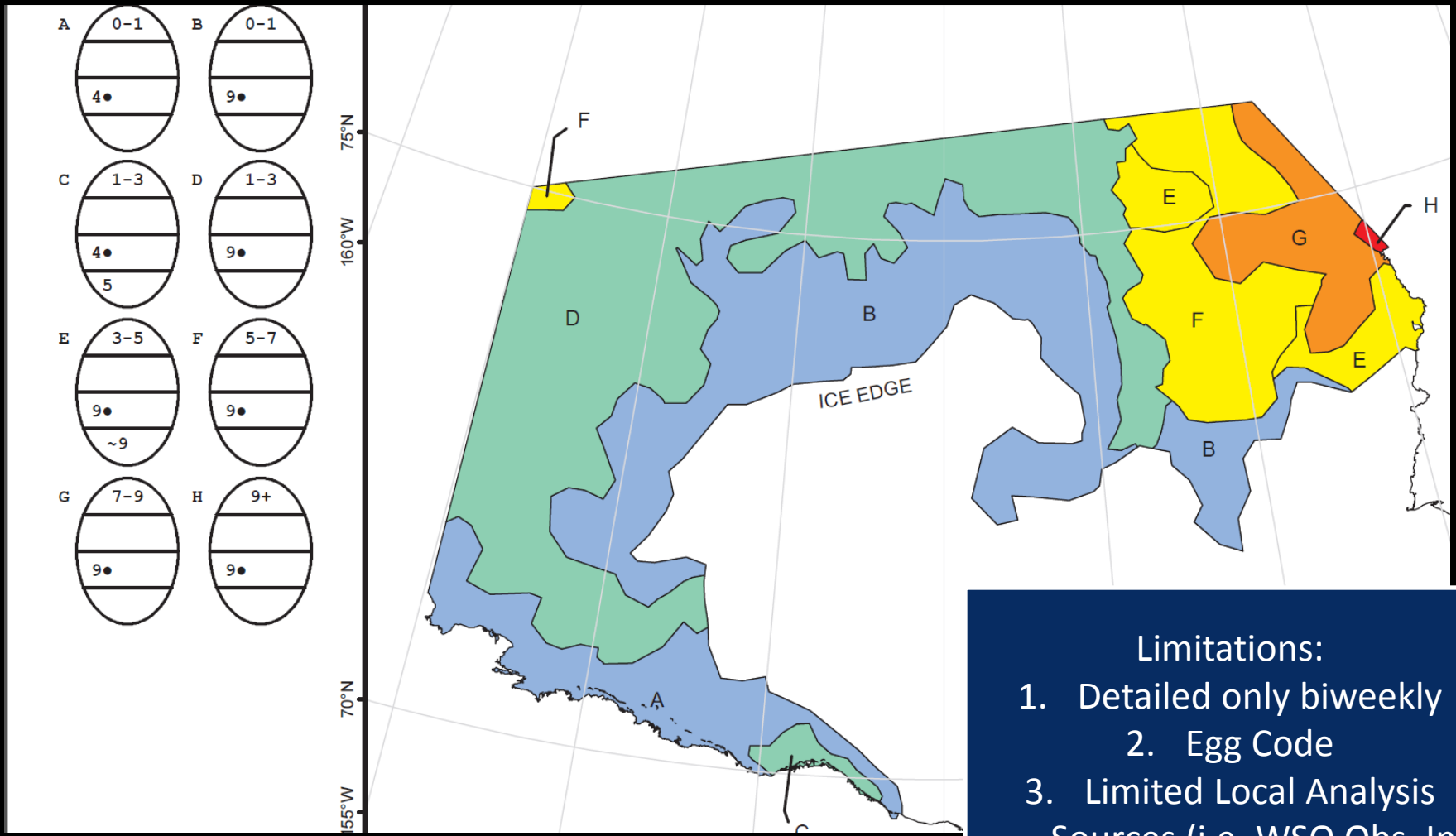


Event 139

Useful for validating sea ice type and concentration

Limited coverage
Part of MOU

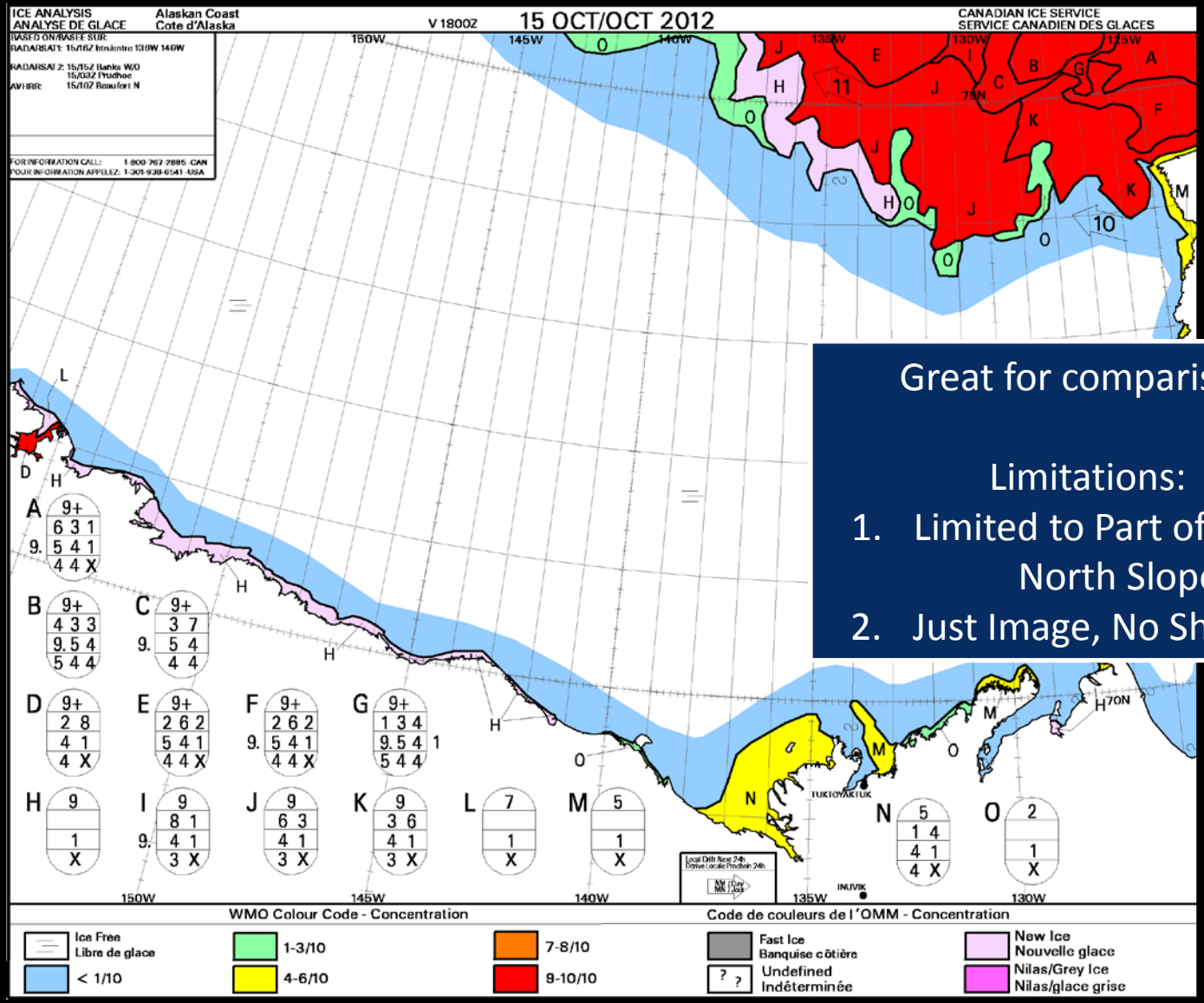
# National Ice Center




Limitations:

1. Detailed only biweekly
2. Egg Code
3. Limited Local Analysis Sources (i.e. WSO Obs, In-Situ Obs)

# Canadian Ice Service




Great for comparisons

Limitations:

1. Limited to Part of Alaska North Slope
2. Just Image, No Shapefile

# WSO Observations

- Reports of:
  - New ice formation
  - Ice movement
  - Near shore ice concentrations
  - Ice distance from shore
  - Ice breakup

# Vessel Observations

**O'Donnell, Wayne LT** Wayne.T.O'[ Sep 2
to Mark, Daniel, Leilani, Anthony, Douglas, Frank,

OPS,

Barrow ICE recon complete. Largest concentration of ice to the NW of Barrow remains in similar position as 31 AUG, approximately following the 72 degree latitude line east to west, with scattered ice extending 3-5 miles to the south.

**USCG Air Station Kodiak** airstatic Aug 16
to Kodiak, D17, mark.vislay, Dallas.J.Shaw, daniel

All,

The ice edge ivo Barrow is becoming less and less identifiable. Several times we followed a rough edge and ended up heading directly North until we saw more ice to the east. There are long narrow ice flows running from North to South. As you head East you cant hit the tips of these fingers from 10 to 15 miles off shore. The closest ice to Barrow is approximately 12 miles north. There is no firm ice line within 90 miles North or East of point Barrow.

Respectfully,
Scott M. Woodcock
LT USCG

**Subject:** FOL Barrow ICE Report: 31 AUG 2012

OPS,

Completed Barrow ICE Patrol today. No ice observed west of the 156 degree longitude line and south of the 72 degree lattitude line IVO of Barrow.

Large ice concentration observed approximately 80 miles WNW of Barrow. Ice commenced at 72-08.8N/158-44.7W, extended in a line for more than 70 miles on an approximate 230 degree magnetic heading. The north-east portion of the ice line was approximately 1 mile across, widening to over 10 miles at the south-western end. Scattered patch of ice also observed in position 71-49.7/160-26.6.

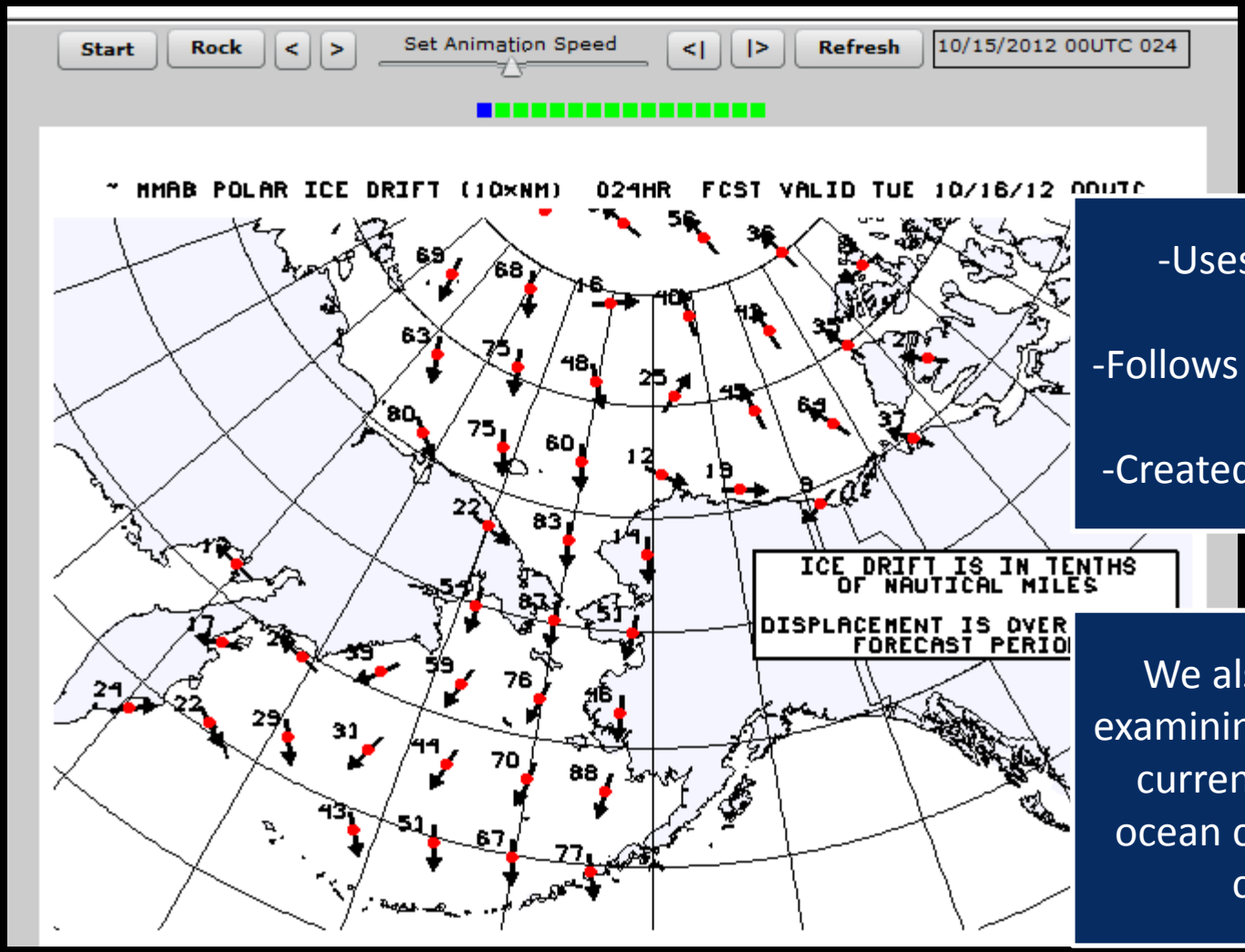
No vessels observed in the vicinity of the ice.

V/r,
LT Wayne O'Donnell

**Pletnikoff, Robert BM3** Robert.G.Pletnikoff@uscg.mil
to nws.ar.ice, Daniel

BBXX NAZJ 01144 99570 71665
41/96 82130 10078 2////
49293 56000 7//55 886//
22243 04078 20102 321// 40105
501// 6//// 8//// ICE 0000/=

# Ice Drift Model (NCEP MMAB)




-Uses a simple drift law relation
-Follows Thorndike and Colony [1982]
-Created by Robert Grumbine

We also utilize AWIPS for examining all weather models, current observations, and ocean currents using a Navy current model.

# Customers

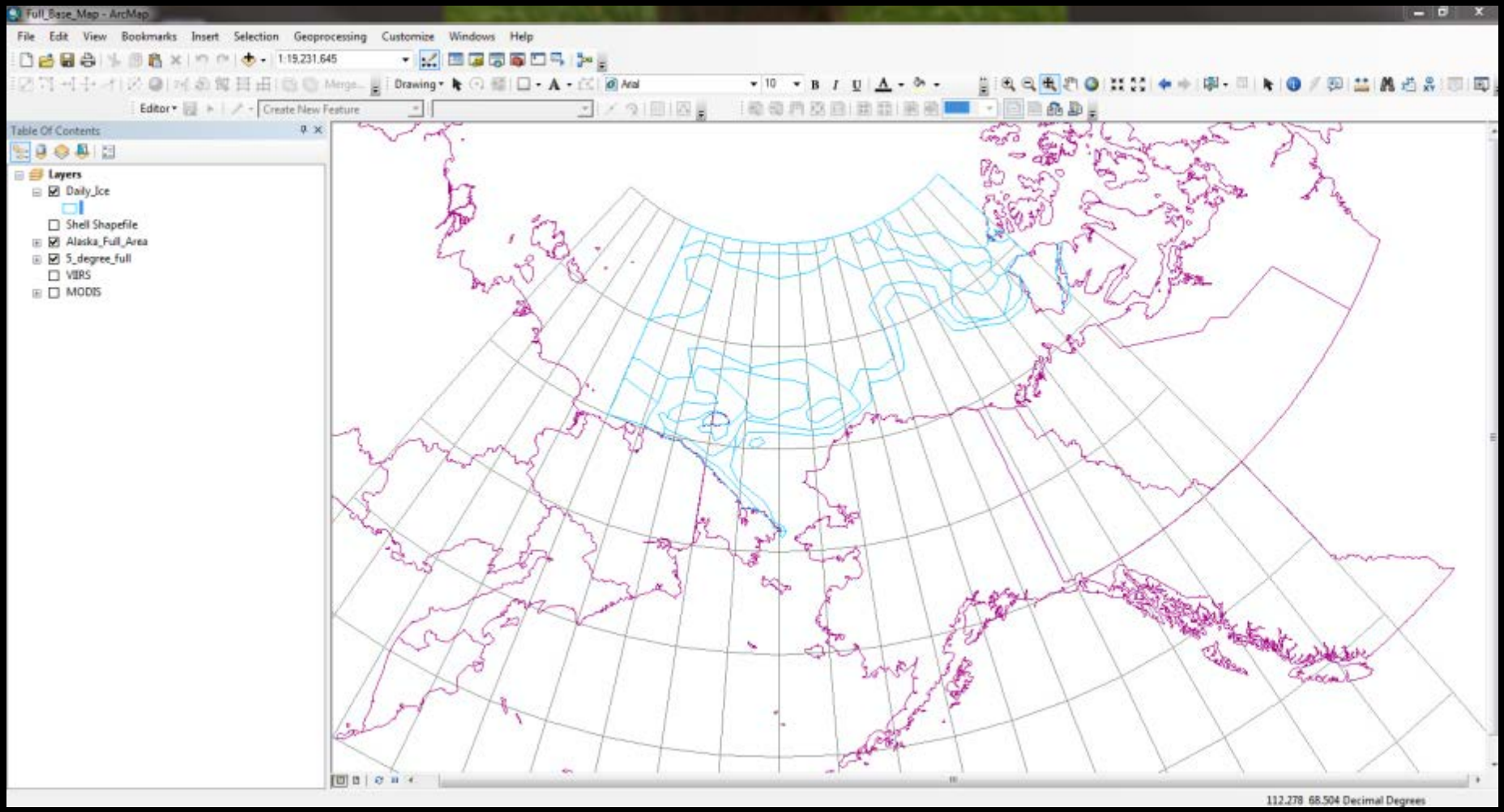

Oil
Oil
US Coast Guard
Subsistence Hunting
Village Resupply
Oil & Gas
Cod & Herring Fishing
Opilio Crab Fishing
Barges & Vessels

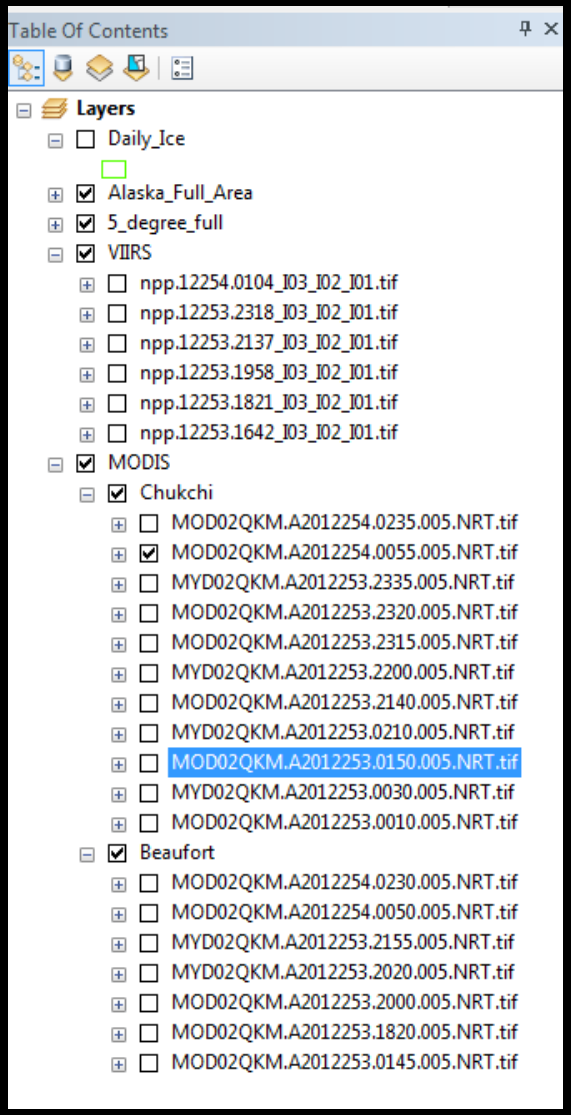
| | Oct | Nov | Dec | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Cook Inlet | | ◆ | ◆ | ◆ | ◆ | ◆ | ◆ | | | | | |
| Bering Sea | | ◆ | ◆ | ◆ | ◆ | ◆ | ◆ | ◆ | ◆ | | | |
| Crab Fishery | | ◆ | ◆ | ◆ | ◆ | ◆ | ◆ | ◆ | | | | |
| Cod Fishery | | ◆ | ◆ | | | | | | | | | |
| Herring Fishery | | | | | | | ◆ | ◆ | | | | |
| Subsistence Hunting | | | | | ◆ | ◆ | ◆ | ◆ | ◆ | ◆ | ◆ | |
| Kuskokwim Bay | ◆ | ◆ | | | | | ◆ | ◆ | | | | |
| West Coast Re-supply | ◆ | | | | | | | ◆ | ◆ | ◆ | ◆ | ◆ |
| Yukon River | ◆ | | | | | | | ◆ | ◆ | | | |
| Norton Sound Fish/Supply | | | | | | | | ◆ | ◆ | | | |
| St. Lawrence Subsistence | | | | | | ◆ | ◆ | ◆ | ◆ | | | |
| Kivalina – Red Dog Mine | ◆ | ◆ | | | | | | | ◆ | ◆ | | |
| Chukchi Sea – Subsistence | | | | | | | ◆ | ◆ | ◆ | ◆ | ◆ | |
| Chukchi Sea – Commercial | ◆ | ◆ | | | | | | | | ◆ | ◆ | ◆ |
| North Coast Supply/Crossing | ◆ | ◆ | | | | | | | ◆ | ◆ | ◆ | ◆ |
| Tourism & Recreation | ◆ | ◆ | ◆ | ◆ | ◆ | ◆ | ◆ | ◆ | ◆ | ◆ | ◆ | ◆ |

# NWS Ice Desk Products

**How do we determine ice concentration and stage?**

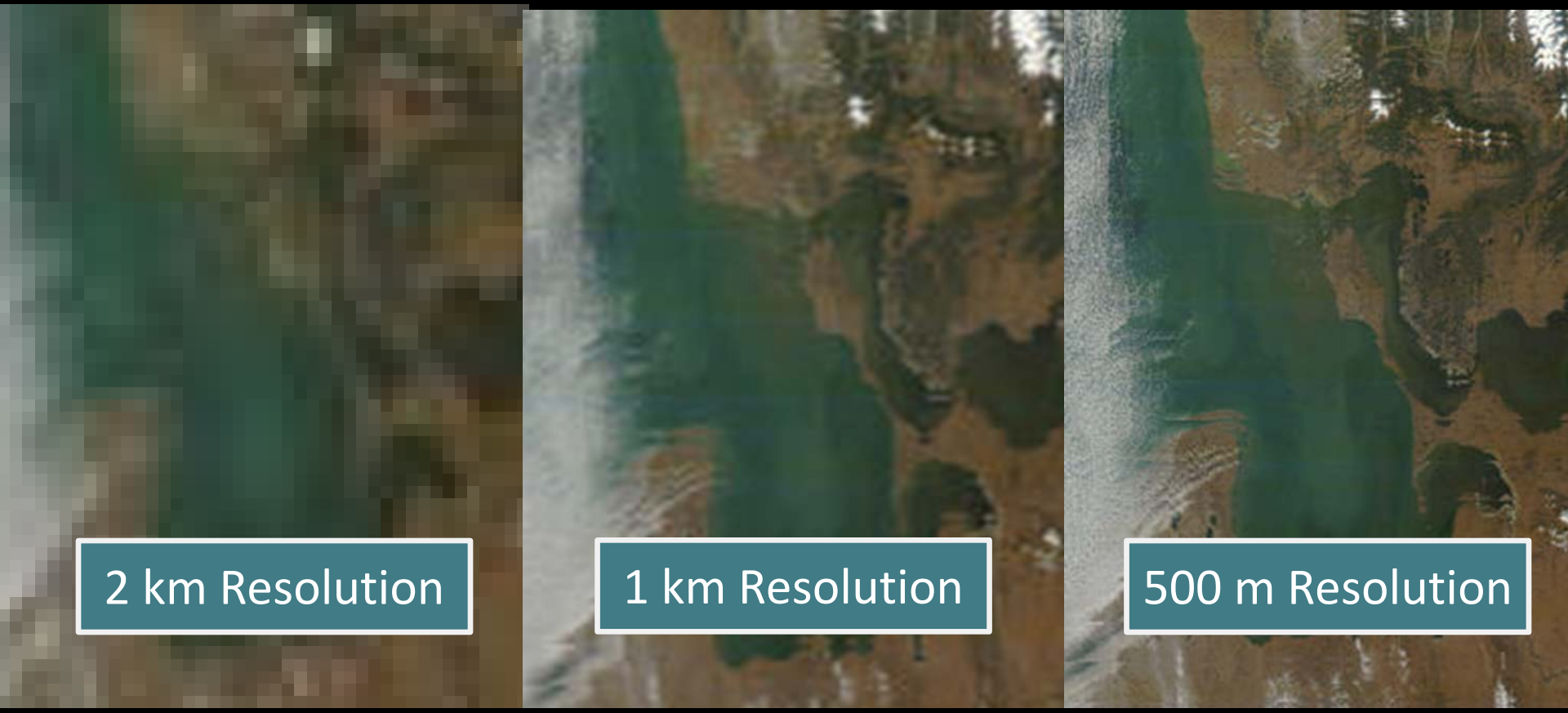
# Start with the last ice analysis



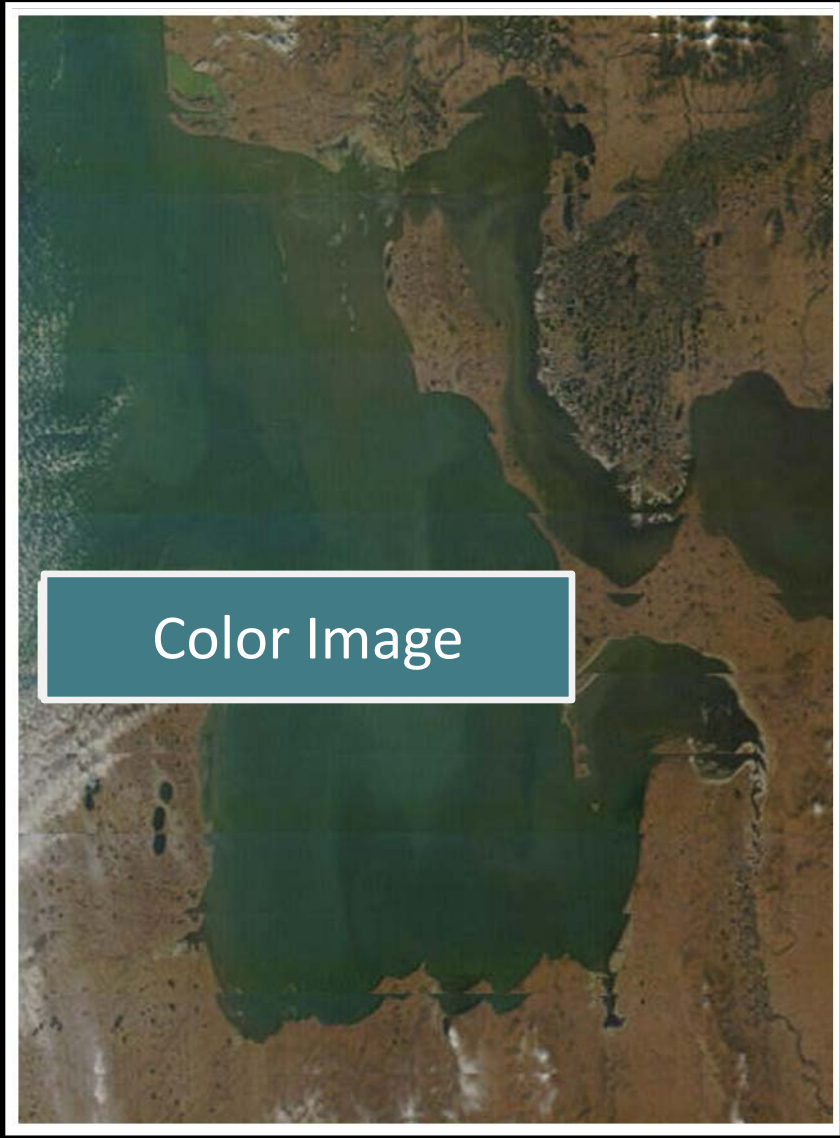


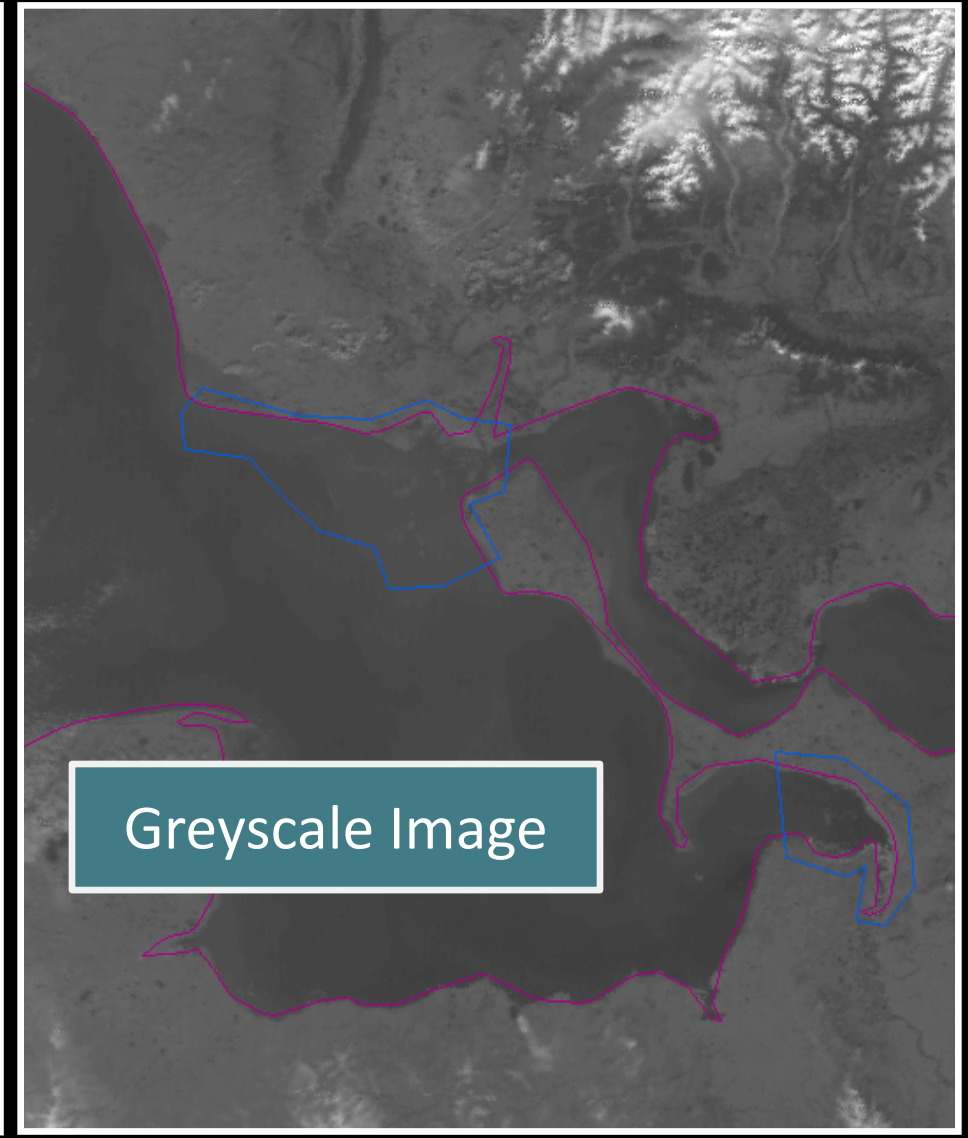

Utilizing ArcGIS 10 we add in data from all satellite sources

# MODIS resolution comparisson

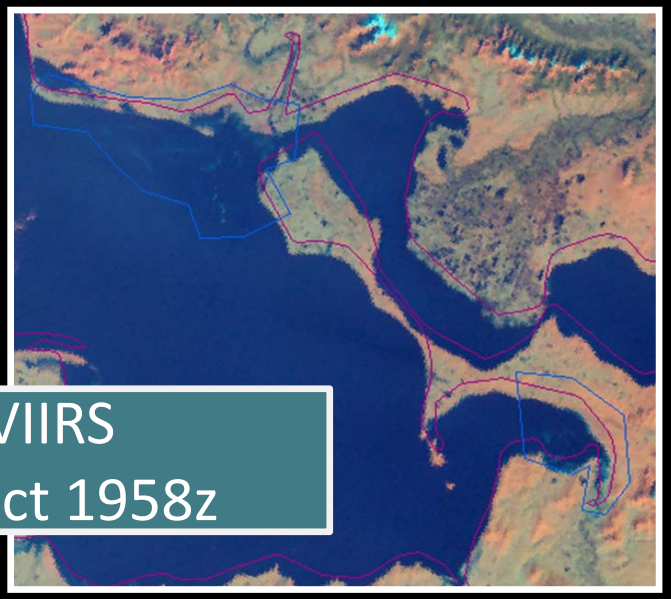


# 250 m MODIS Imagery

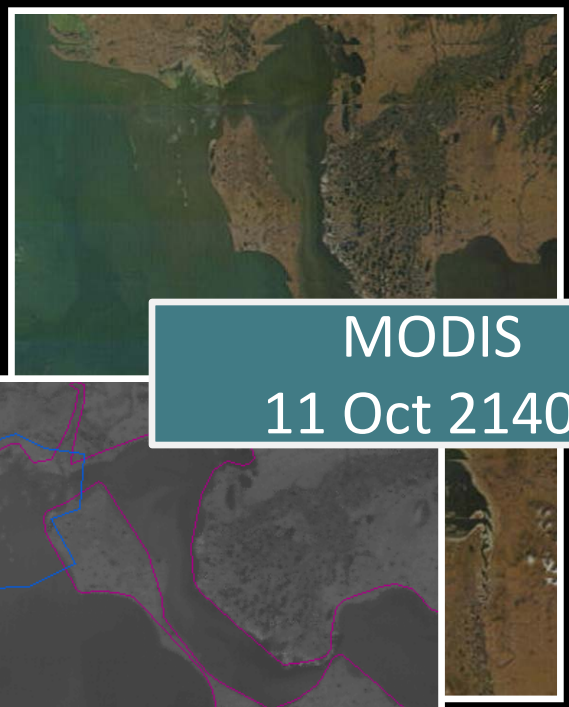


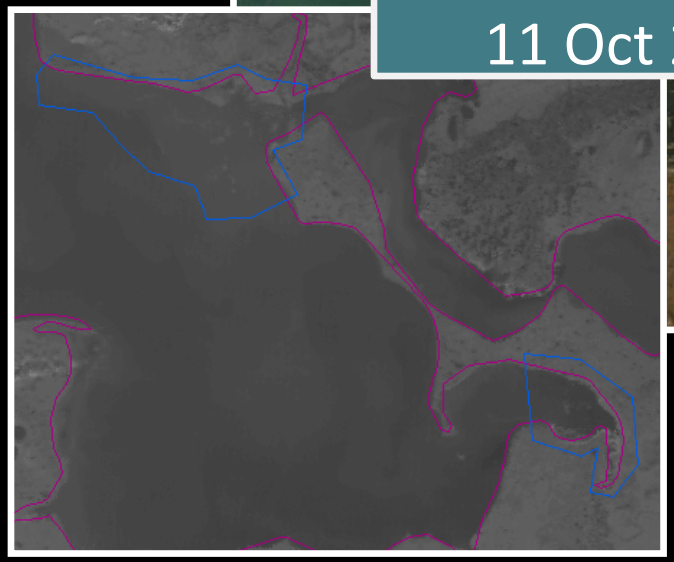
# New Ice Formation Resources



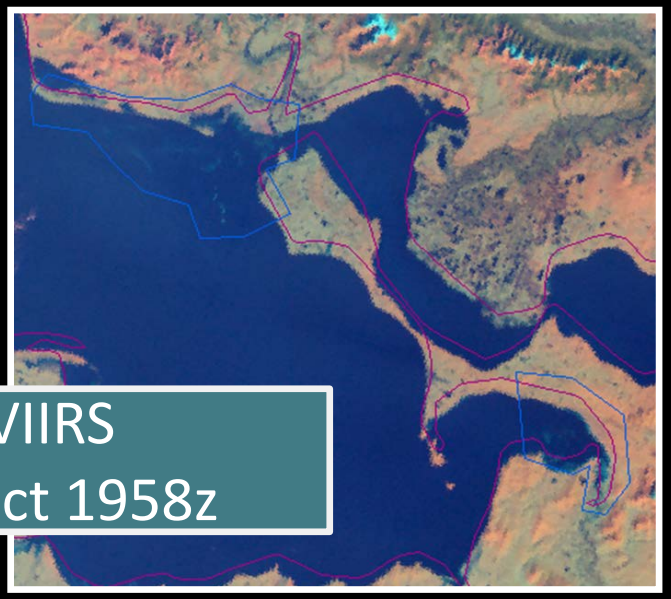
VIIRS
11 Oct 1958z



MODIS
11 Oct 2140z



# New Ice Formation Resources



VIIRS
11 Oct 1958z

Good Morning.
Well, the lagoon and Swan Lake were covered with a layer of ice this morning, finally. We have a band of ice extending out about three feet from shore out front on the Chukchi Sea side of the city. Looks like ice up has finally begun. Just thought I'd give you a heads up. SST is now at 32.3F/0.2C.

Have a Great Day,
Harry Lind, OIC
WSO Kotzebue

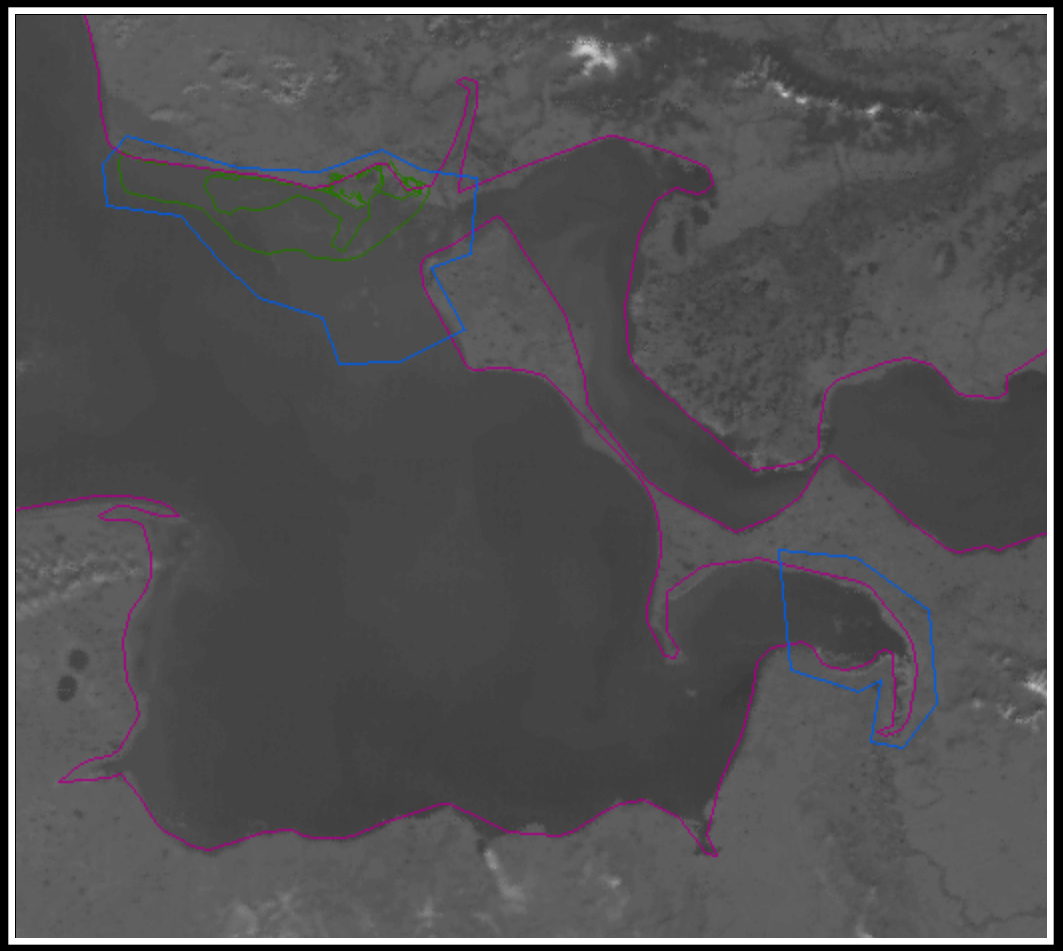
WSO Ice Report
9 Oct

The ice has almost closed Kotzeue in. We have just a small ribbon of open water running aprox 500 feet offshore and extending out maybe twice that far in width, than all ice. We are no longer able to reach open water to take SST readings so our ice observations will not contain that value. We will continue to send the ice obs until we are completely iced in, which at this pace may be this weekend.

Harry Lind, OIC
WSO Kotzebue

WSO Ice Report
16 Oct

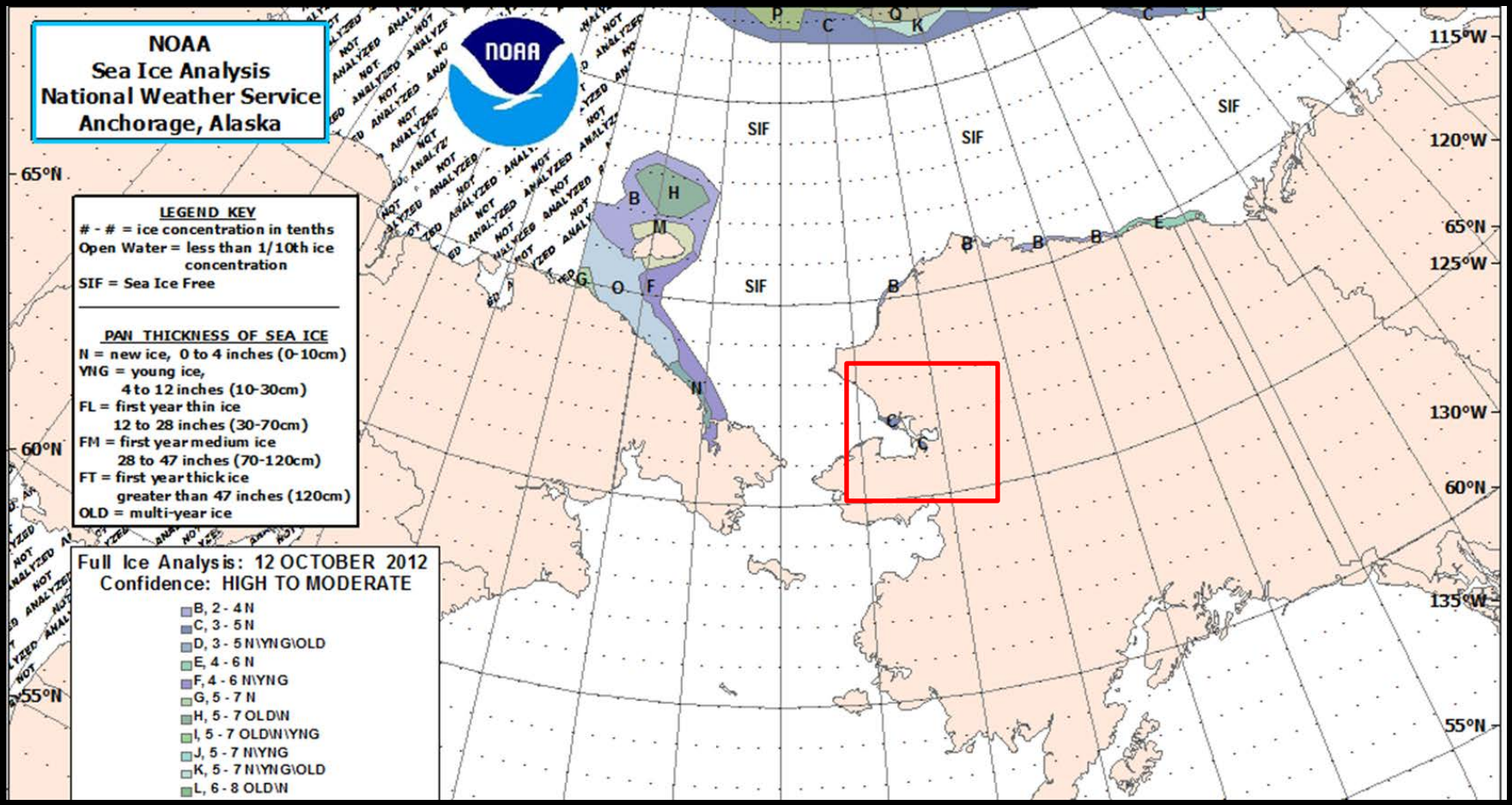
# Compare with NIC Ice Analysis



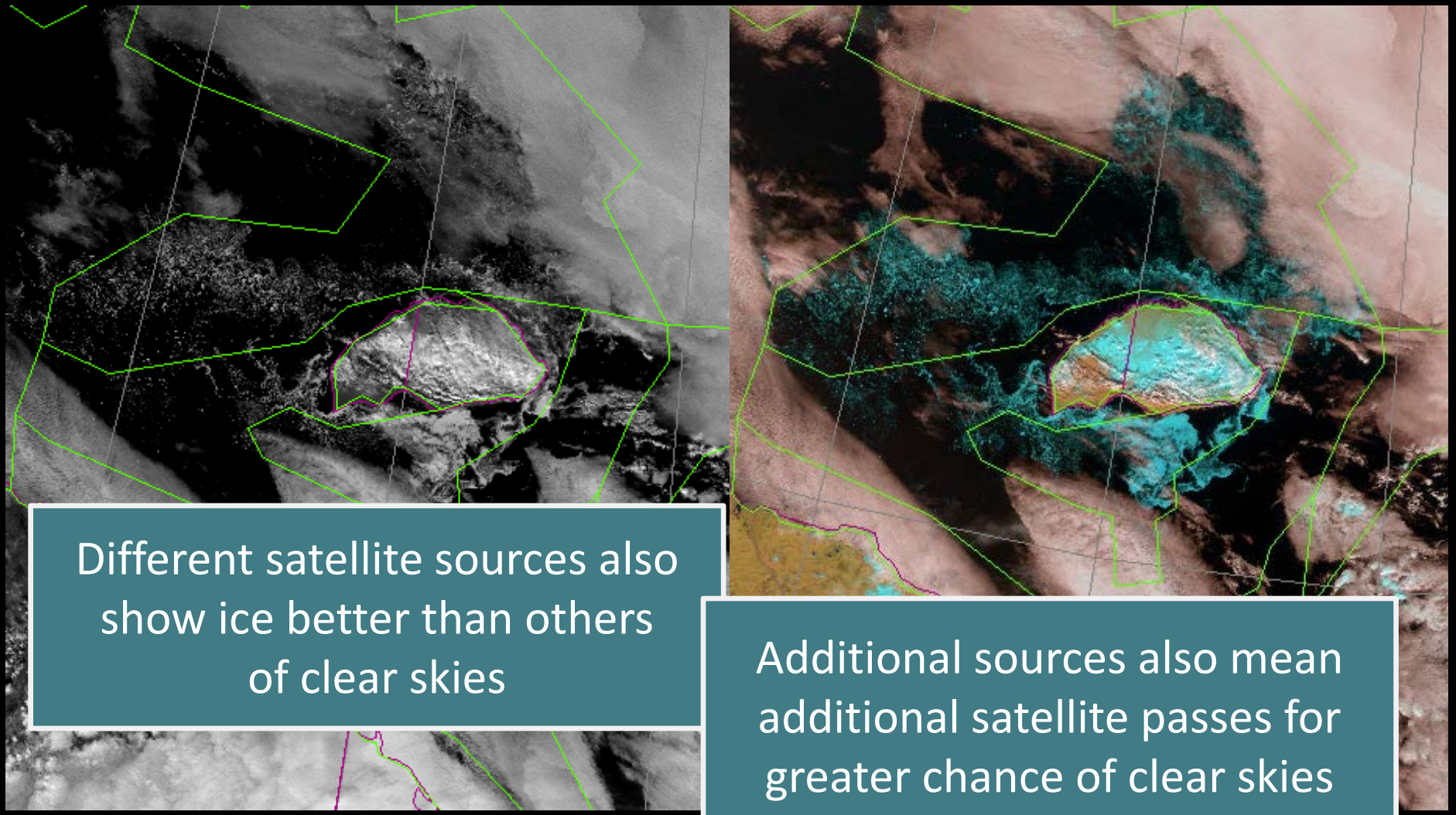
**Green:**
**NIC Ice Analysis**
**11 Oct 2012**

**Blue:**
**NWS Ice Desk**
**Anaysis**
**12 Oct 2012**

# Also need to keep in mind scale…



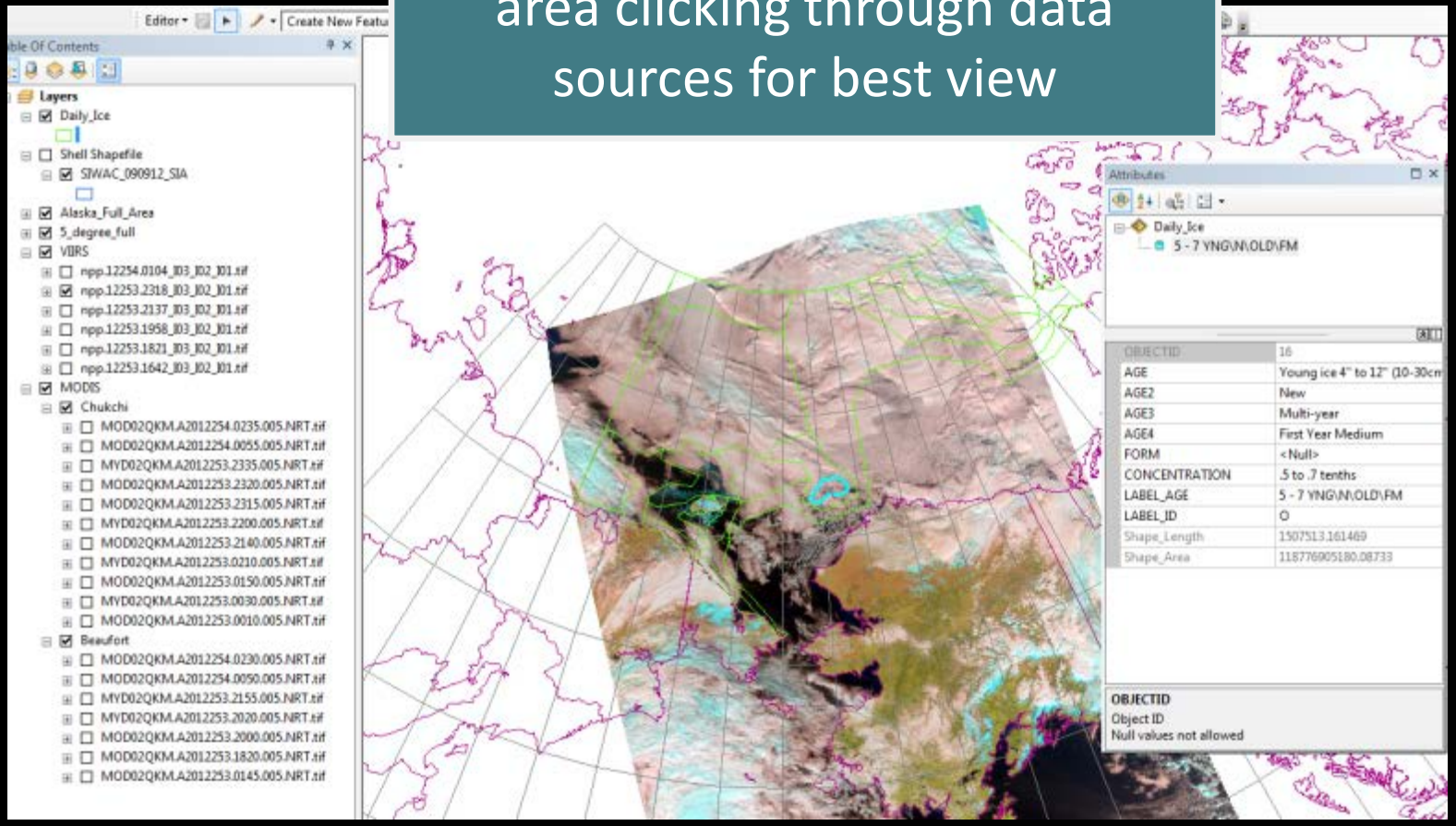
# MODIS and NPP VIIRS



Different satellite sources also show ice better than others of clear skies

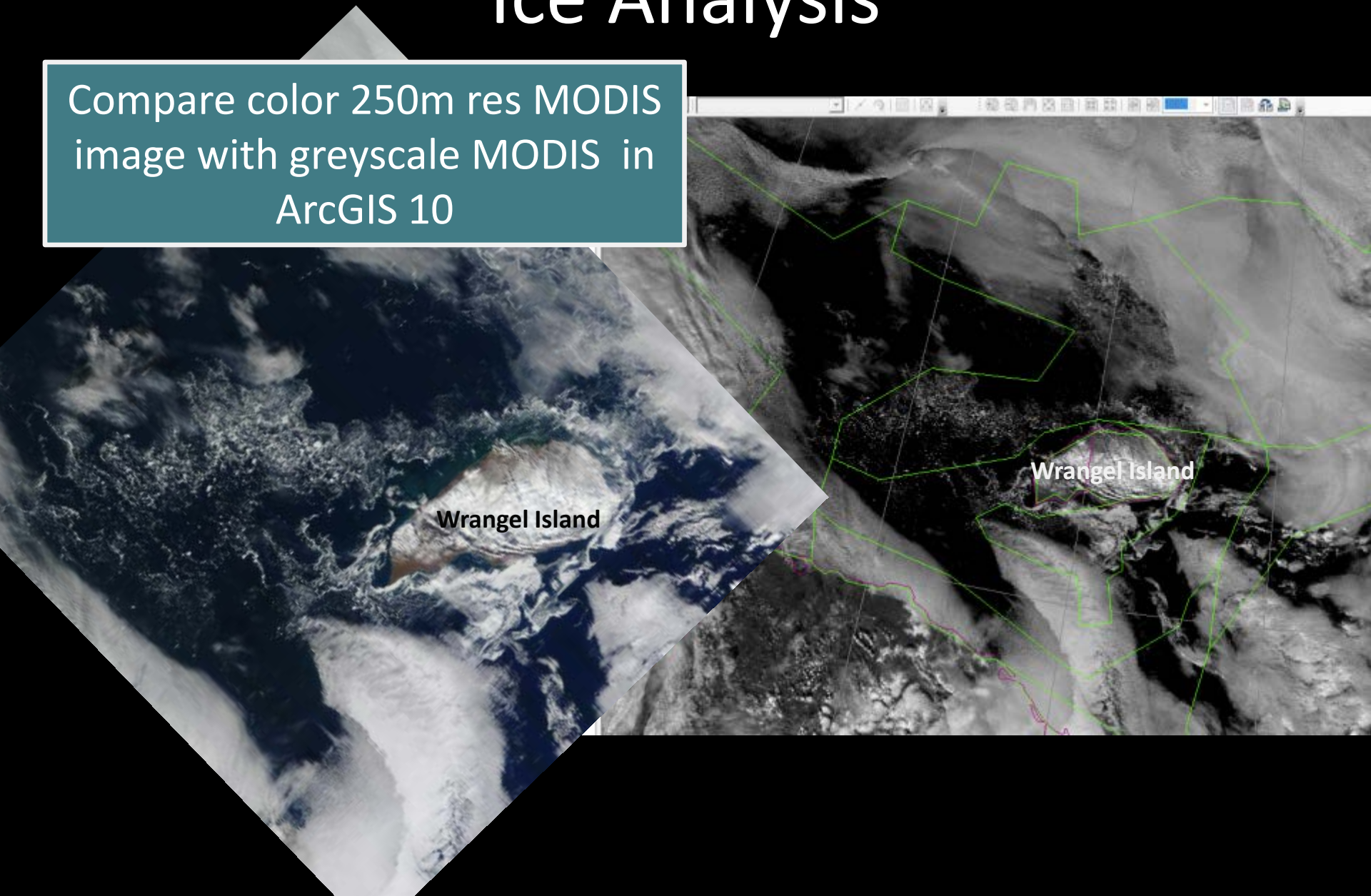
Additional sources also mean additional satellite passes for greater chance of clear skies

Ice Analysts go through each area clicking through data sources for best view

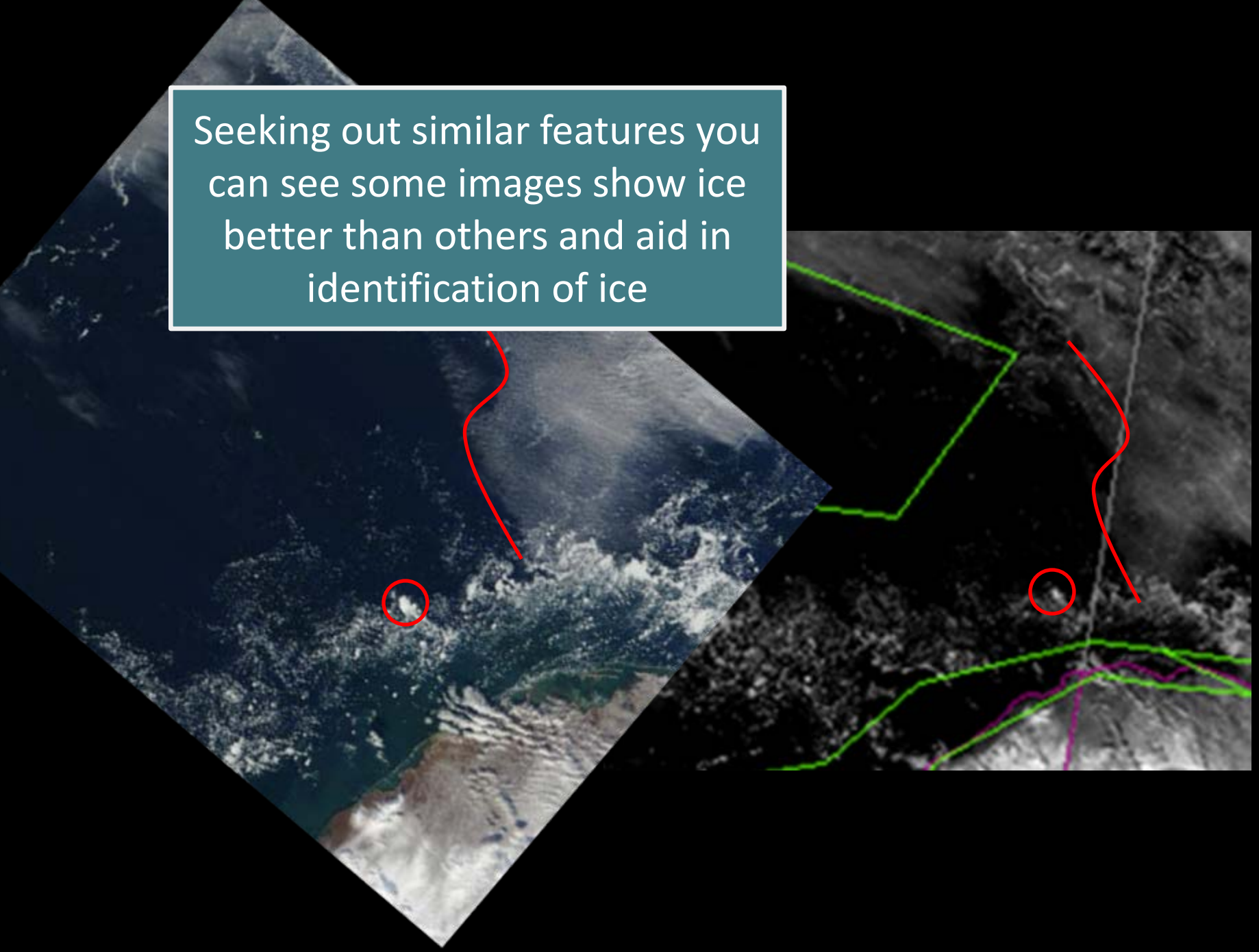


# Ice Analysis

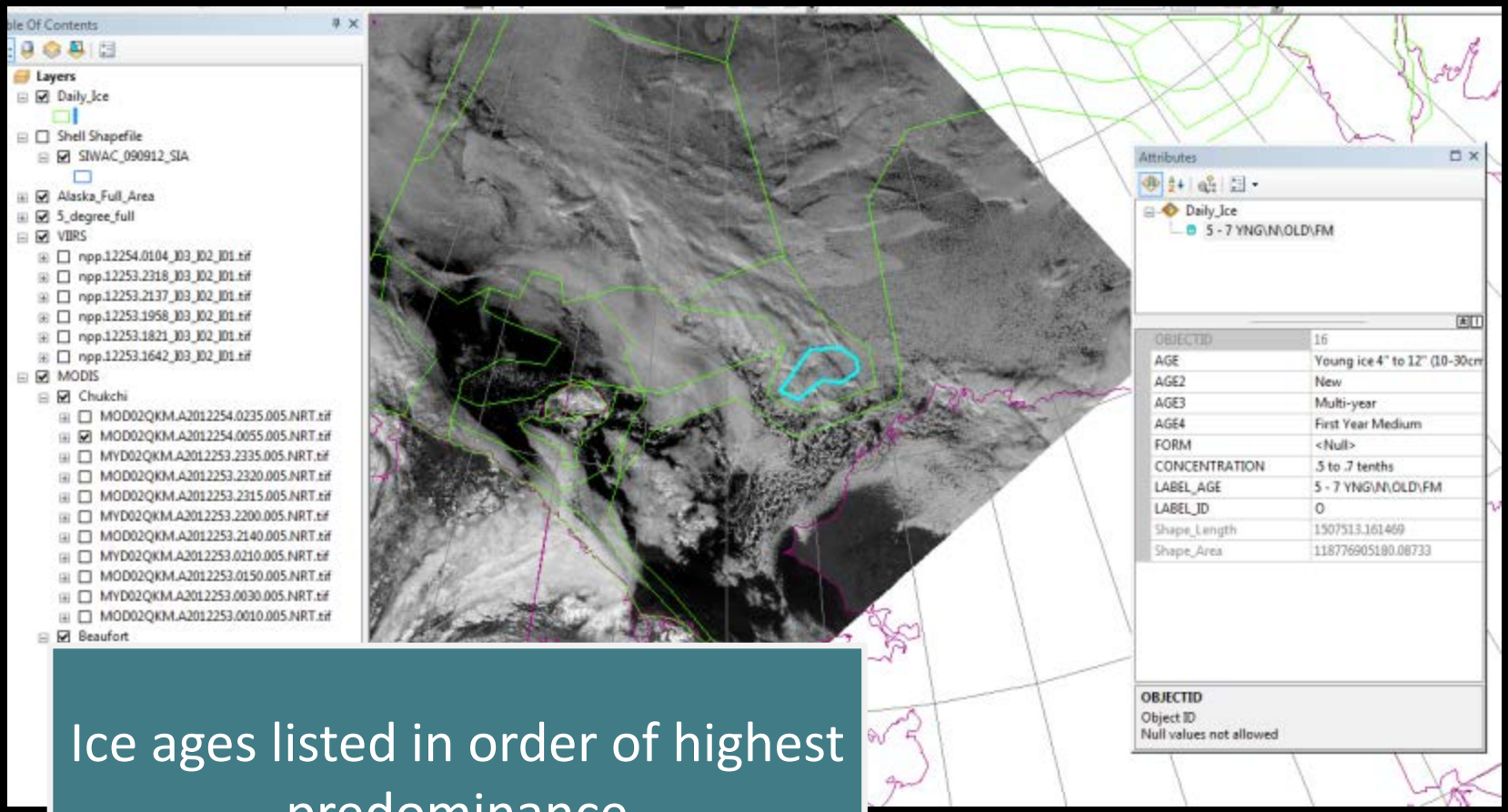
Compare color 250m res MODIS image with greyscale MODIS in ArcGIS 10



Seeking out similar features you can see some images show ice better than others and aid in identification of ice

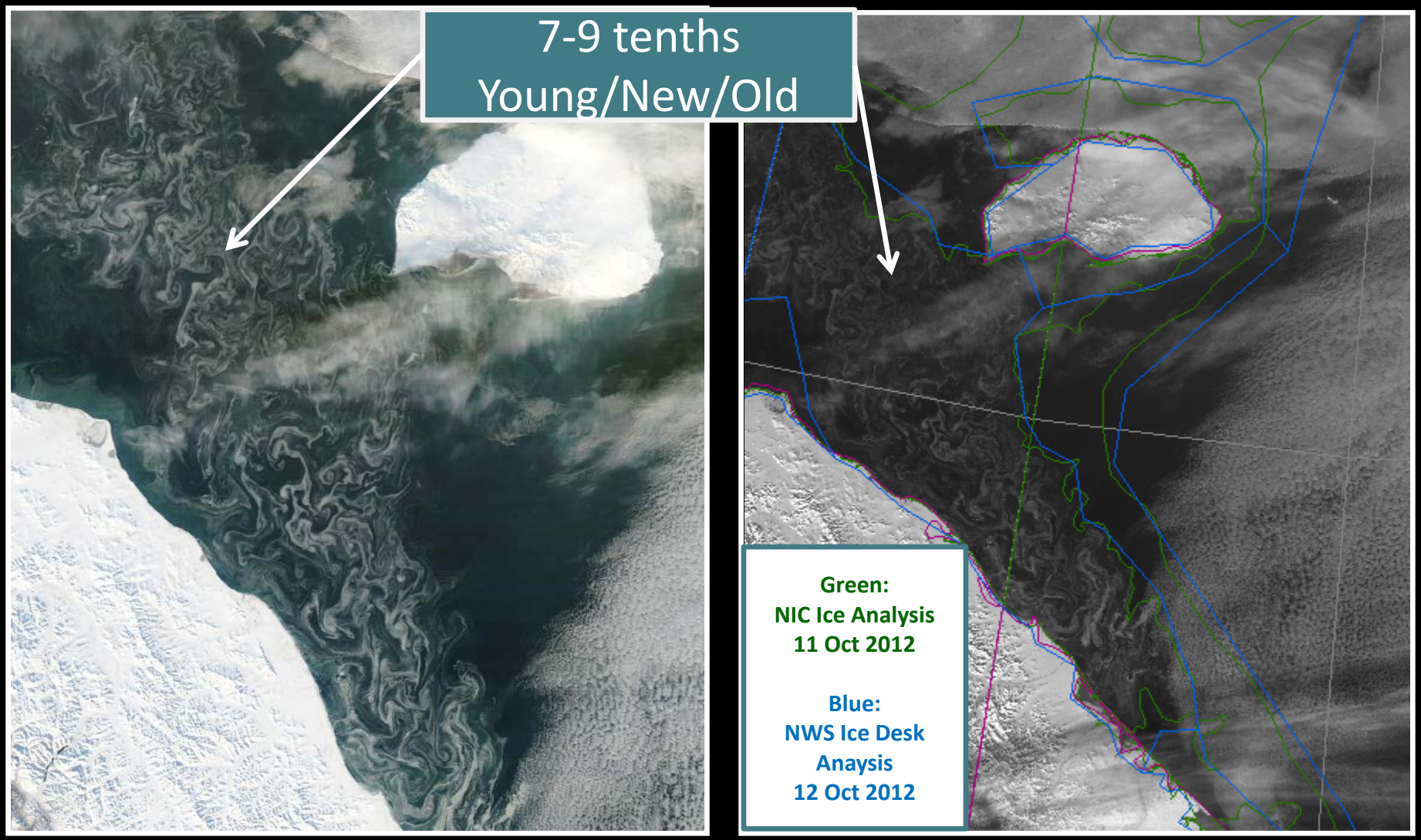


# Drawing Ice Area and Adding Attributes




Ice ages listed in order of highest predominance

# New Ice Forming Near Wrangel Island



# New Ice is Hard to See

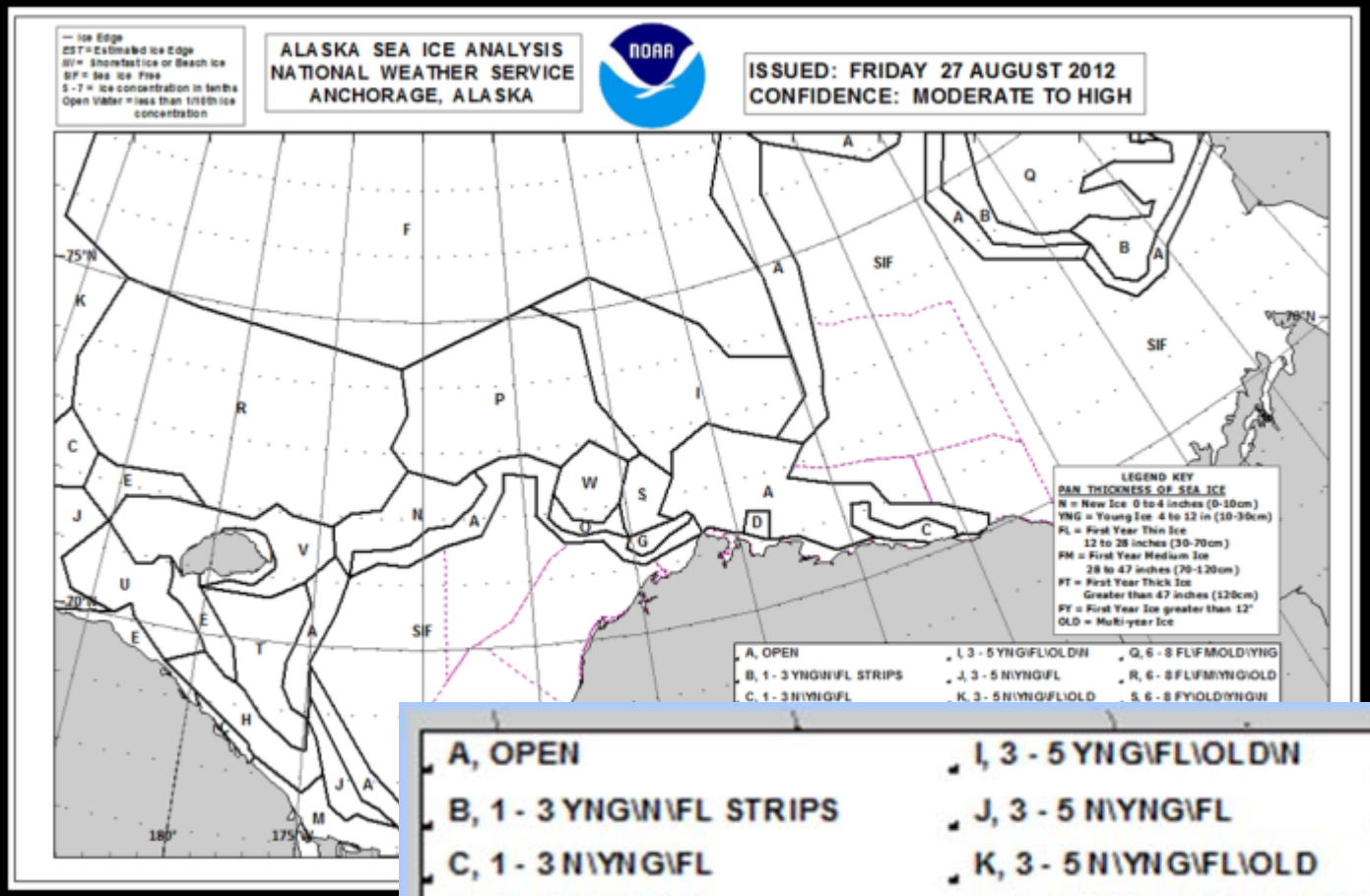
# NWS Ice Desk Products

**What do those letters mean?**

# Decoding Ice Concentration & Type

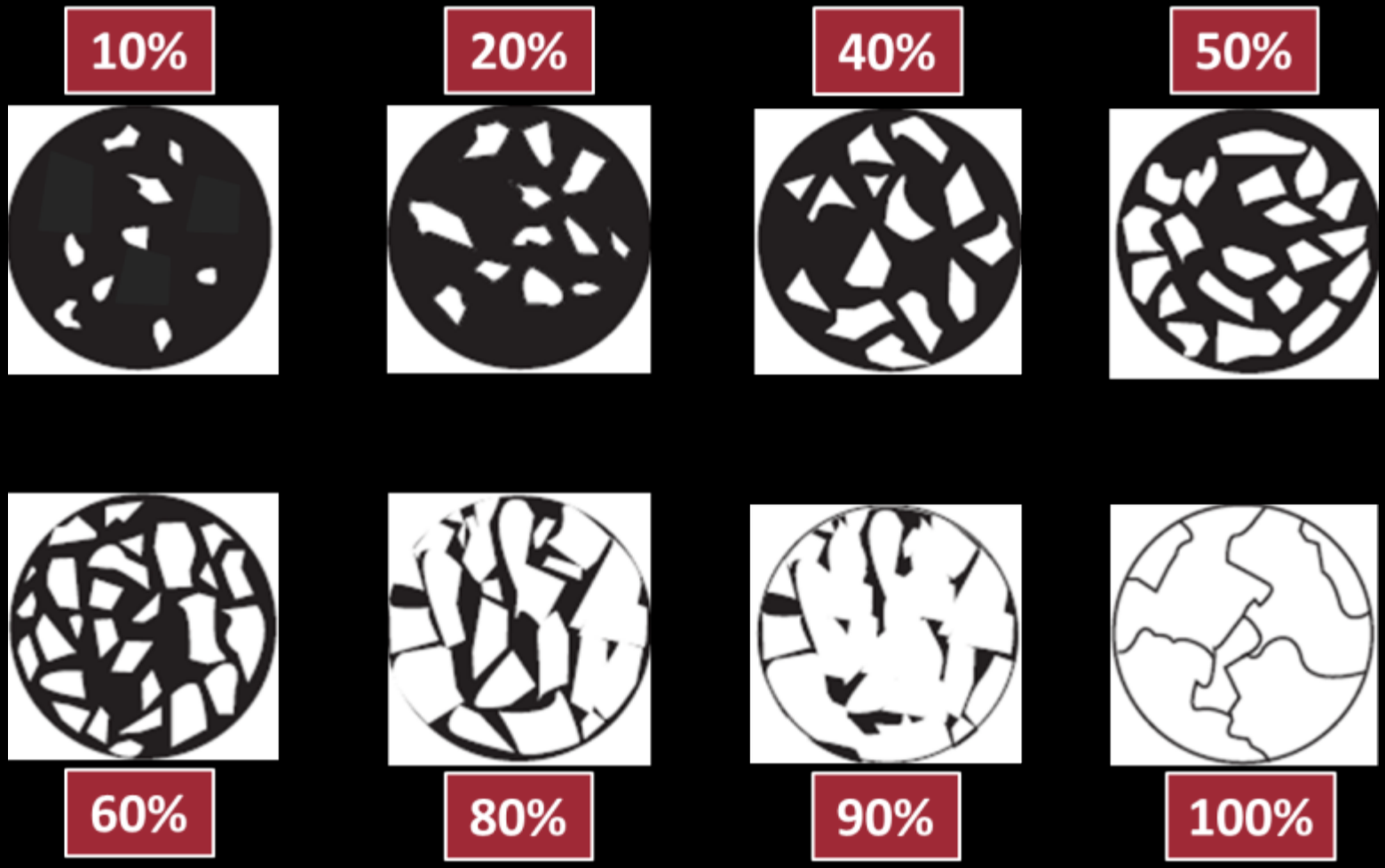
- Ice areas are characterized by:
  - Concentration (in tenths)
  - Age (Thickness)
  - Form (Strips, Brash, Nilas, etc.)

| | | |
|---|---|---|
| A, OPEN | I, 3 - 5 YNG\FL\OLD\N | Q, 6 - 8 FL\FM\OLD\YNG |
| B, 1 - 3 YNG\N\FL STRIPS | J, 3 - 5 N\YNG\FL | R, 6 - 8 FL\FM\YNG\OLD |
| C, 1 - 3 N\YNG\FL | K, 3 - 5 N\YNG\FL\OLD | S, 6 - 8 FY\OLD\YNG\N |
| D, 2 - 4 YNG\FL\N | L, 4 - 6 YNG\FL\N STRIPS | T, 6 - 8 FL\YNG\N |
| E, 2 - 4 N\YNG\FL | M, 5 - 7 YNG\FL\N | U, 6 - 8 FL\YNG\N\FM |
| F, 2 - 4 FL\YNG\FM\OLD STRIPS | N, 5 - 7 YNG\N\FL | V, 7 - 9 FM\FL\YNG\OLD |
| G, 2 - 4 FY\YNG\N | O, 5 - 7 FY\YNG\N | W, 7 - 9 FY\OLD\YNG\N |
| H, 3 - 5 YNG\FL\N | P, 6 - 8 YNG\FL\OLD\N | |



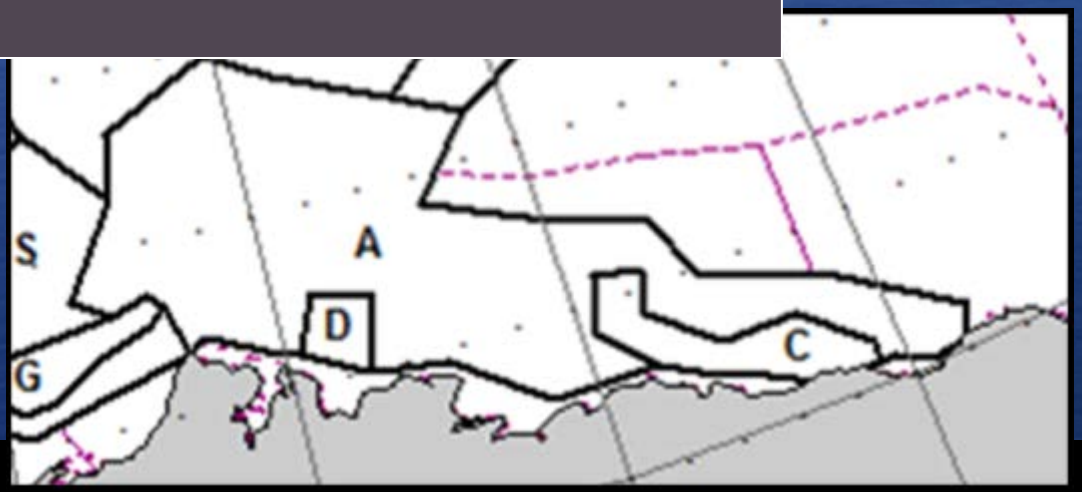

| | | |
|---|---|---|
| A, OPEN | I, 3 - 5 YNG\FL\OLD\N | Q, 6 - 8 FL\FM\OLD\YNG |
| B, 1 - 3 YNG\N\FL STRIPS | J, 3 - 5 N\YNG\FL | R, 6 - 8 FL\FM\YNG\OLD |
| C, 1 - 3 N\YNG\FL | K, 3 - 5 N\YNG\FL\OLD | S, 6 - 8 FY\OLD\YNG\N |
| D, 2 - 4 YNG\FL\N | L, 4 - 6 YNG\FL\N STRIPS | T, 6 - 8 FL\YNG\N |
| E, 2 - 4 N\YNG\FL | M, 5 - 7 YNG\FL\N | U, 6 - 8 FL\YNG\N\FM |
| F, 2 - 4 FL\YNG\FM\OLD STRIPS | N, 5 - 7 YNG\N\FL | V, 7 - 9 FM\FL\YNG\OLD |
| G, 2 - 4 FY\YNG\N | O, 5 - 7 FY\YNG\N | W, 7 - 9 FY\OLD\YNG\N |
| H, 3 - 5 YNG\FL\N | P, 6 - 8 YNG\FL\OLD\N | |

# Ice Concentrations

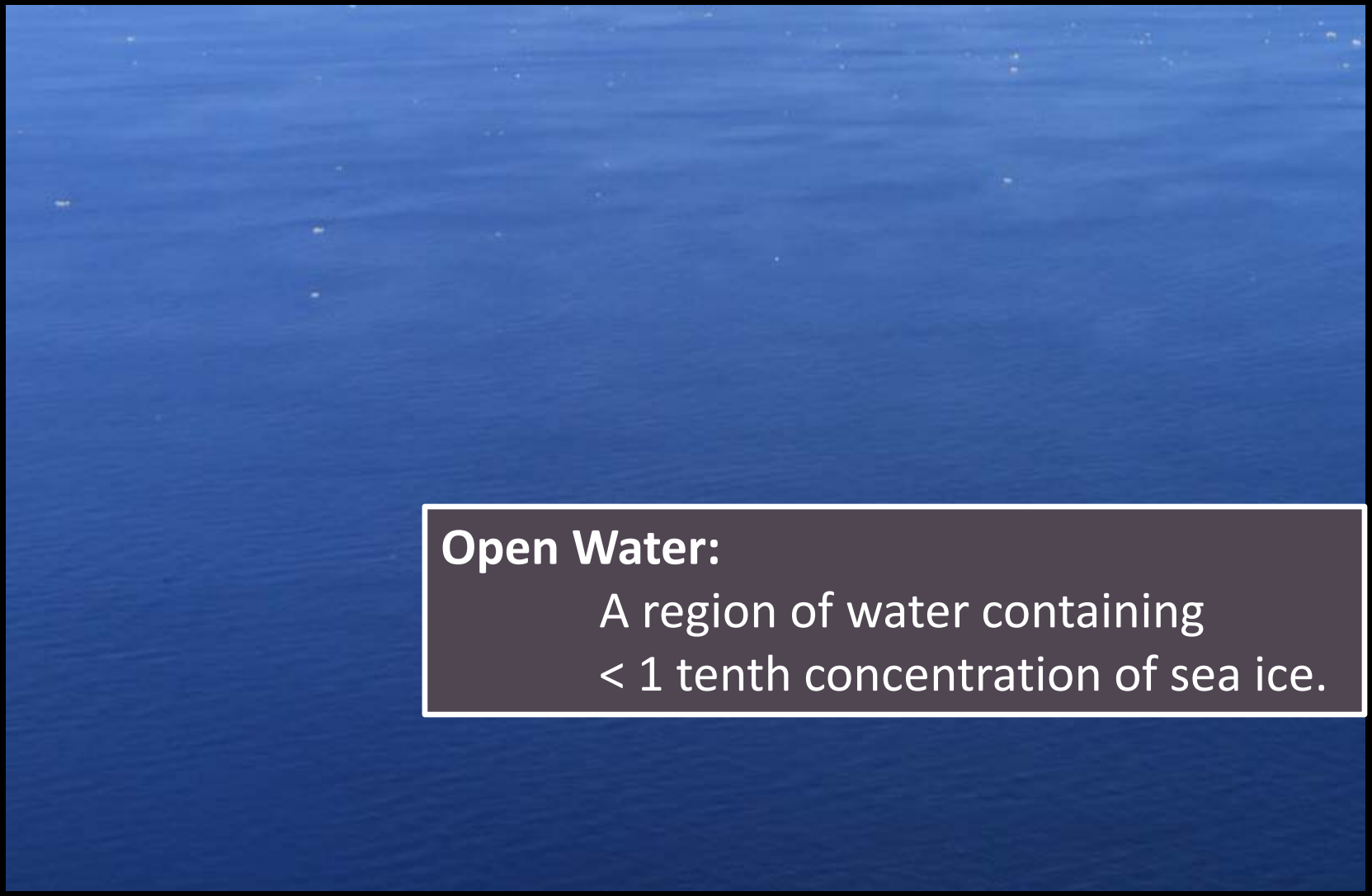


# Ice Edge

1.9.1 Ice edge
The demarcation between the open sea and sea ice of any kind, whether fast (fast ice edge) or drifting. The drift ice edge may be termed compacted or diffuse (4.4.8 Ed.). – WMO



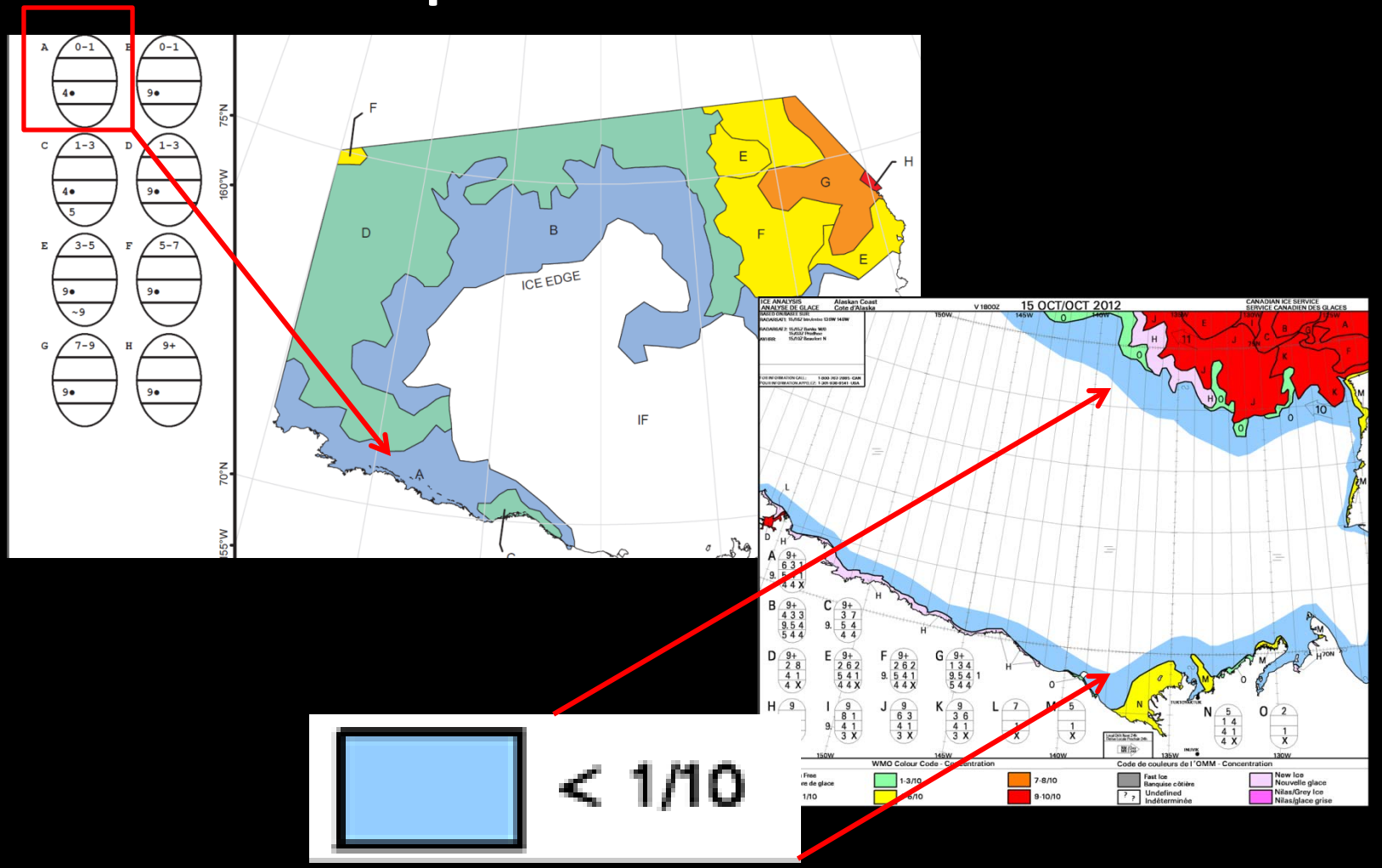
# Open Water (A zones)



**Open Water:**

A region of water containing
< 1 tenth concentration of sea ice.

# Compared to NIC and CIS



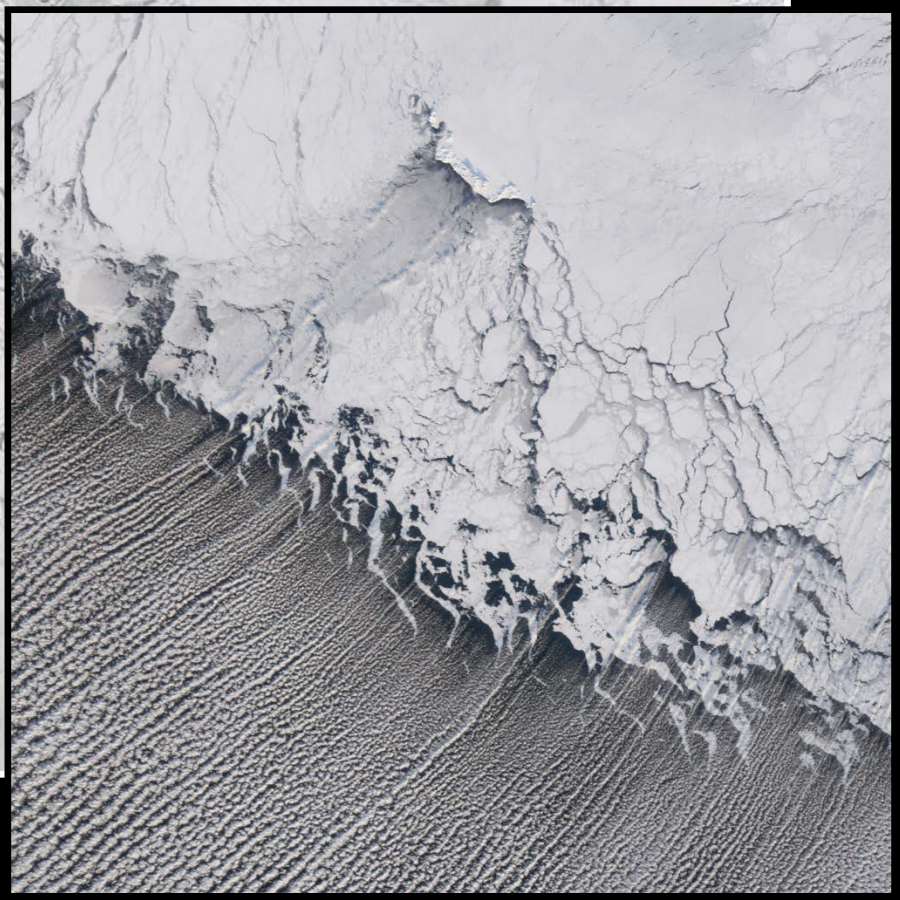
# Shorefast Ice


Photo Credit: http://www.arcus.org/files/siwo/2010-04-23/images/wls100420capemtn.jpg

# Ice Strips & Belts

# Ice Strips & Belts

Ice Strips viewed from satellite

# 2. Sea Ice Stages

| Ice Stage | Ice Thickness | Description |
|---|---|---|
| New (N) | 0-10 cm thick | Grease or Wax Appearance |
| Young (YNG) | 10-30 cm thick | Light Blue or Grey Rafts easily |
| First Year Thin (FL) | 30-70 cm thick | White Surface Easily Breaks at Edges |
| First Year Medium (FM) | 70-120 cm thick | White Surface Rubbled Sharp Edges Blue-Green Melt Ponds |
| First Year Thick (FT) | 120-200 cm thick | White Surface Sharp Edges Blue-Green Melt Ponds |
| Multi-Year (OLD) | >200 cm thick | White Surface Smoothed Ridges Blue Melt Ponds |

# Different Stages of Sea Ice

New Ice

Brash Ice

Young Ice

First Year Ice

Photo Credit: http://www.oceanlight.com/log/category/southern-ocean/south-georgia-island
http://earthobservatory.nasa.gov/Features/SeaIce
http://www.photolib.noaa.gov/bigs/corp2559.jpg
http://en.wikipedia.org/wiki/File:Nilas_Sea_Ice1.jpg

# New (N)

Slush freezes together to form sheets (Up to 4 inches thick)

Photo Credit: Wikipedia
http://en.wikipedia.org/wiki/File:Nilas_Sea_Ice1.jpg
http://3mmagicscotchtapegardguardweldproduct.blogspot.com/

# New Ice (N)

# New Ice (N) with Young (Y)

New Ice Sheets move in the wind

Bump together

Form Pancakes

Photo Credit: Wikipedia
http://upload.wikimedia.org/wikipedia/commons/3/37/Pancakeice_ross_sea.jpg
http://www.bbb.org/blog/2012/02/national-pancake-day-means-free-pancakes/

# Young Ice (YNG)

Somewhat translucent

Grey or Light Blue

Pieces collide & pile on top of each other

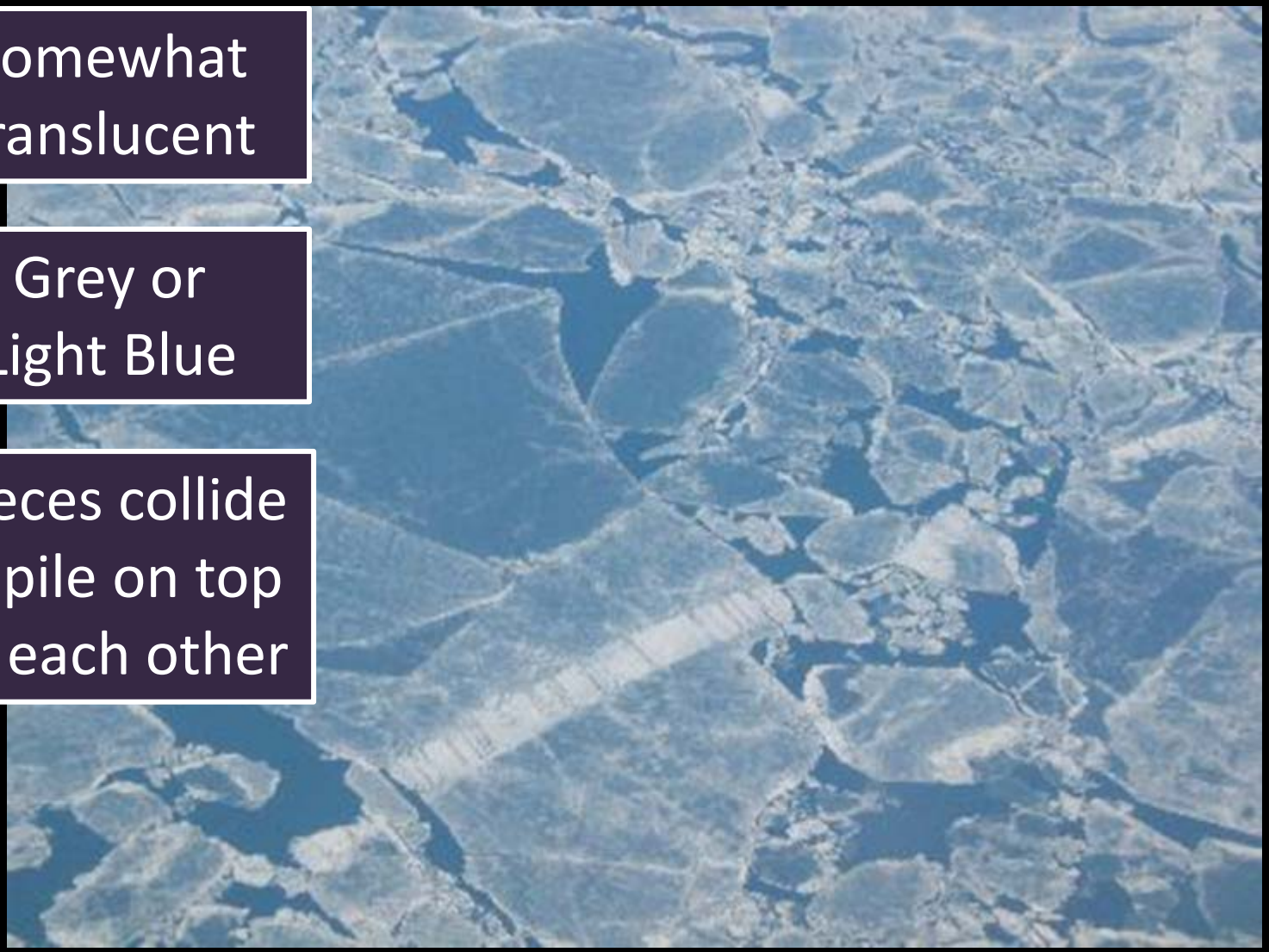


Photo Credit: http://wp.canatec.ca/wp-content/uploads/2011/03/NECaspianSeaRaftedYoungIce.jpg

# Young Ice (YNG)

Color will vary depending on sunlight

Grey or Light Blue (Bright White on VIS Sat)

10-30 cm Thick

# Young Ice (YNG)

When Pancakes become thicker → No longer transparent → Form Young Ice

**3 - 20 meters across**

Photo Credit:
http://nsidc.org/cryosphere/seaice/images/normal_TS_03_7Pancake02.jpg
http://nightskypictures.com/antarctica/pancake_2.htm

# Ice Thickness and Age Determination
## (Thicker than Young)

- In-Situ Observations
- Algorithm
  - Computed by National Ice Center

# First Year Thin (FL)

White Surface

More Clear Edges

30-70 cm Thick

Photo Credit:
http://www.arcus.org/files/siwo/2010-04-02/images/beringicemarch192010c.jpg

# First Year Medium (FM)

White Surface

Rubbled Ridges where Floes Collide

Greenish Blue Melt Ponds

Photo Credit:
http://neven1.typepad.com/.a/6a0133f03a1e37970b015435478273970c-pi

# First Year Medium (FM)

White Surface

Rubbled Ridges where Floes Collide

Greenish Blue Melt Ponds

# First Year Thick (FT)

White Surface

Sharp Rubbled Ridges where Floes Collide

Greenish Blue Meltponds

Photo Credit: http://roslynlawrence.typepad.com/.a/6a01538ee2ba41970b01676692c12a970b-pi

# First Year Thick (FT)

# Happy Birthday to Last Year's Ice… that survived summer!

Sea Ice that formed last winter…

And survived the summer melt…

Is now considered Multi-Year Sea Ice!

# Multi-Year (OLD)

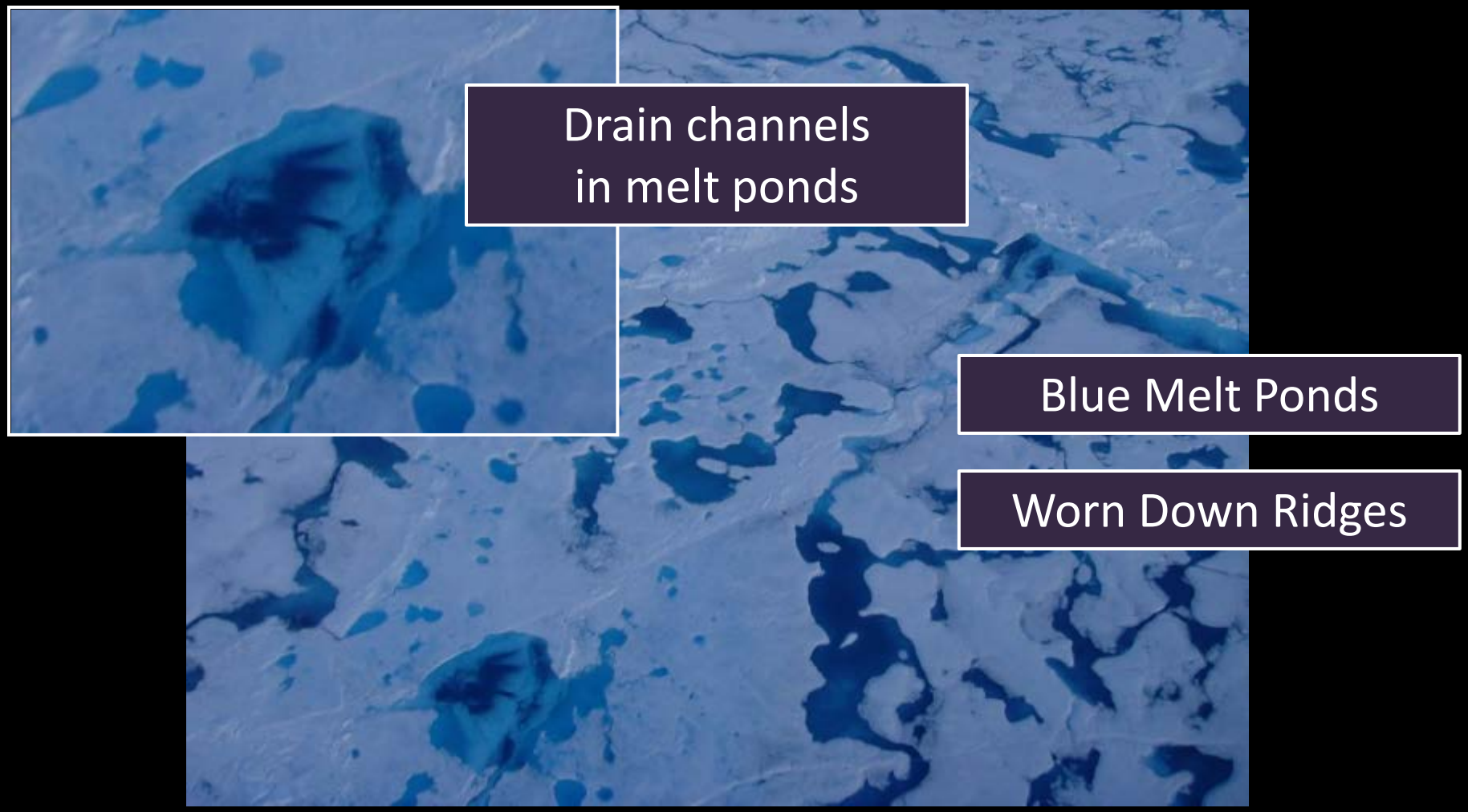



Photo Credit:
http://arctic.cbl.umces.edu/Laurier2010/index/Looking%20to%20Robeson%20Channel%2017.jpg

# Multi-Year (OLD)

Blue Melt Ponds

Drain channels
in melt ponds


Photo Credit:
http://neven1.typepad.com/.a/6a0133f03a1e37970b014e8b68eec7970d-pi

# View from the Air…

- Flight over Bering Strait to Little Diomede
- http://www.youtube.com/watch?v=p2F-FD37pVc

# NWS Sea Ice Desk


NWS Sea Ice Desk Anchorage Weather Forecast Office

(907) 266-5133 or (907) 266-5138

nws.ar.ice@noaa.gov

http://pafc.arh.noaa.gov/ice.php