

# THE IMPORTANCE OF CLIMATE SCALE OUTLOOKS IN ALASKA

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Rick Thoman

National Weather Service Alaska Region

Environmental and Scientific Services Division



# Climate Outlooks and Alaska

- Why? Building a Weather and Climate Ready Nation

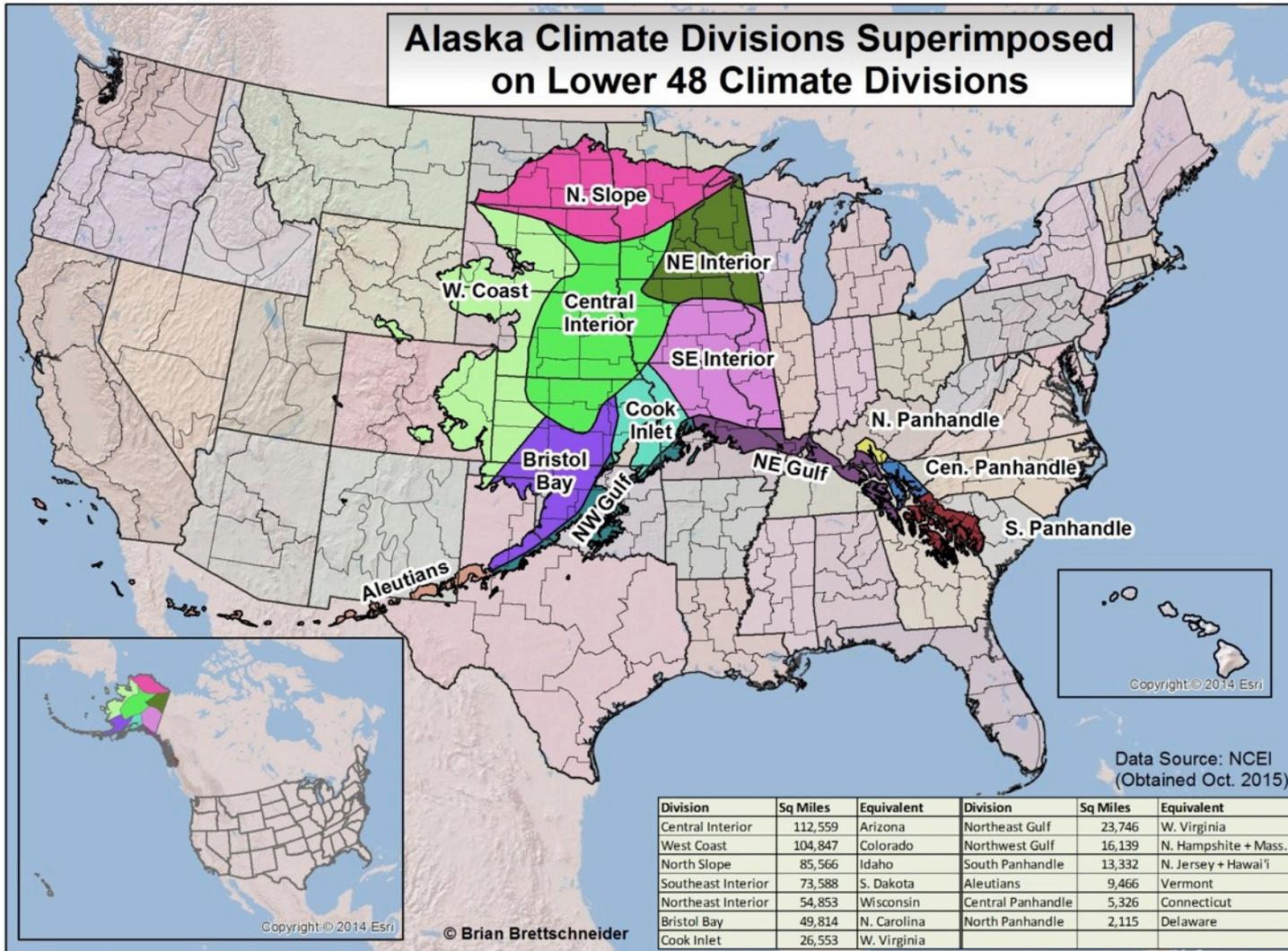


- Alaska Challenges
- What
  - Storminess/Extremes
  - Cumulative/Persistence
- When
  - Week 2 to Annual
- Who
  - Federal, State, Local/Tribal
- The Future

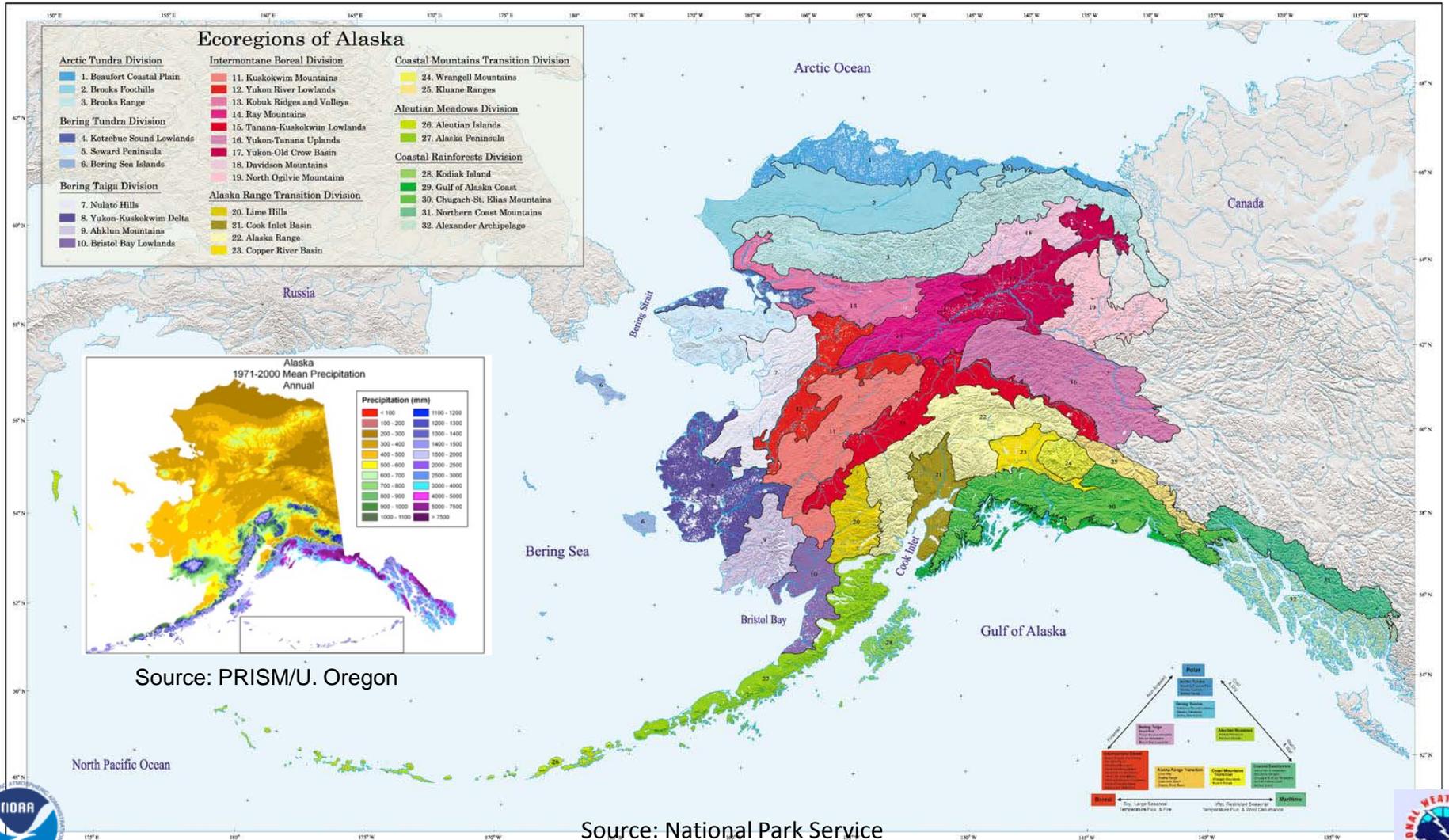


Denali from Eielson VC, September 2, 2015  
Source: FAA

# Alaska is Big



# Alaska: Vastly different ecosystems

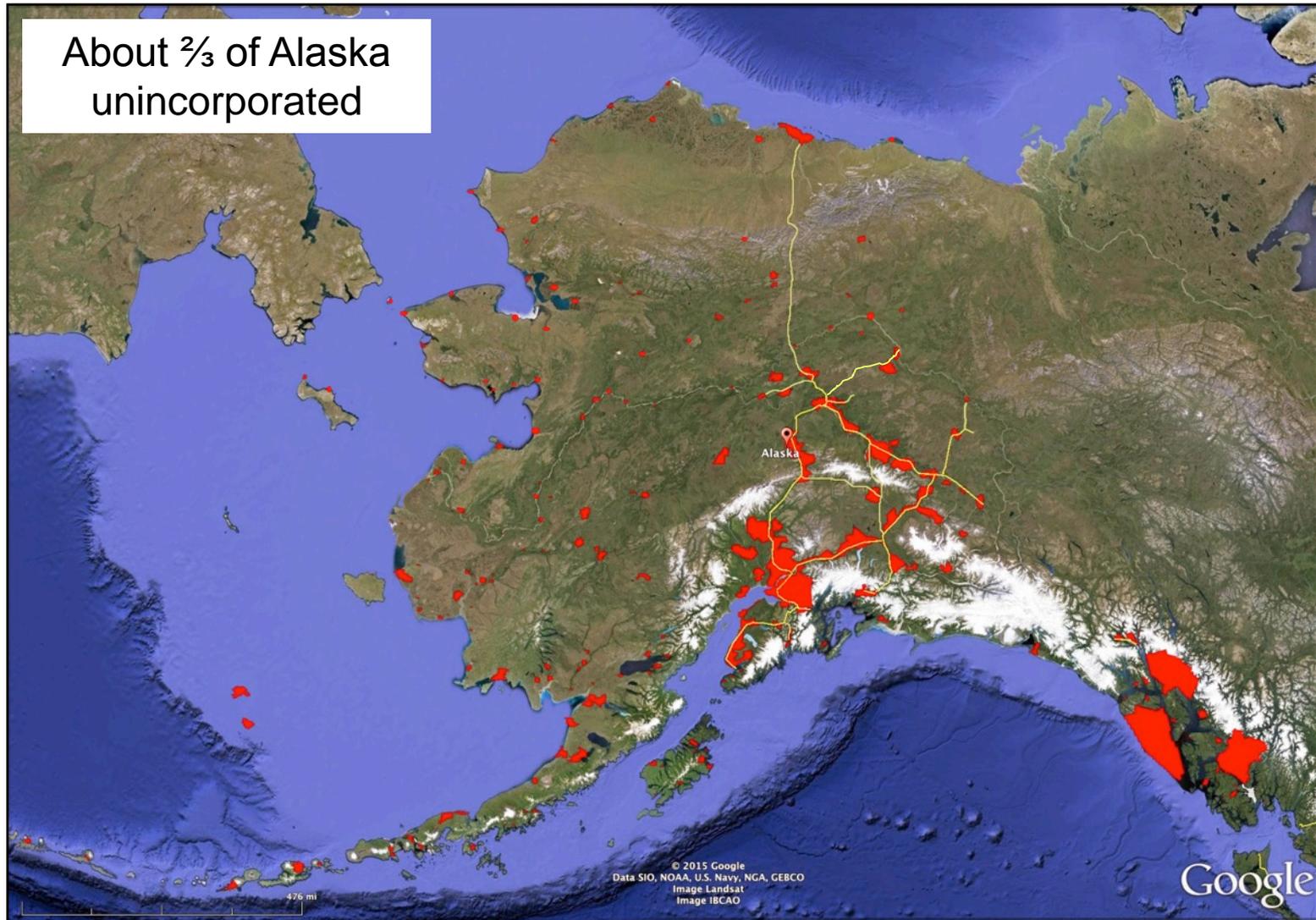


Source: PRISM/U. Oregon

Source: National Park Service

# Most of Alaska's 400+ communities are isolated

About  $\frac{2}{3}$  of Alaska  
unincorporated



# Remote and Vulnerable

- 95% of Alaska supplies come through the Port of Anchorage
  - Most of those originate in the Port of Tacoma
- Isolated energy, electrical and telecon systems (all off-road communities)
- Greater than one week lead time required for full preparation (evacuations, moving assets)
  - Governmental Agencies
  - Communities
  - Industry

# Extremes

- Short duration extremes USUALLY have limited impact
- Exceptions
  - Superstorms
  - Fire Weather: few days of hot dry weather *following* widespread convection
  - Winter rain (where rare)
    - Transportation
    - Ecological



# Persistence/Cumulative Impacts

- Excess Rain
  - Flooding
  - Agriculture
- Snow Loading
- Precip Drought
  - Water supply
- Snow Drought
  - Water supply
  - Excessive ground freezing
  - Transportation
- Extended Deep Cold
  - Rural Alaska supply
  - Transportation
- Extended Heat
  - Glacial melt and riverine impacts
  - Thawing Permafrost
- Climate Change: Sea Ice Loss

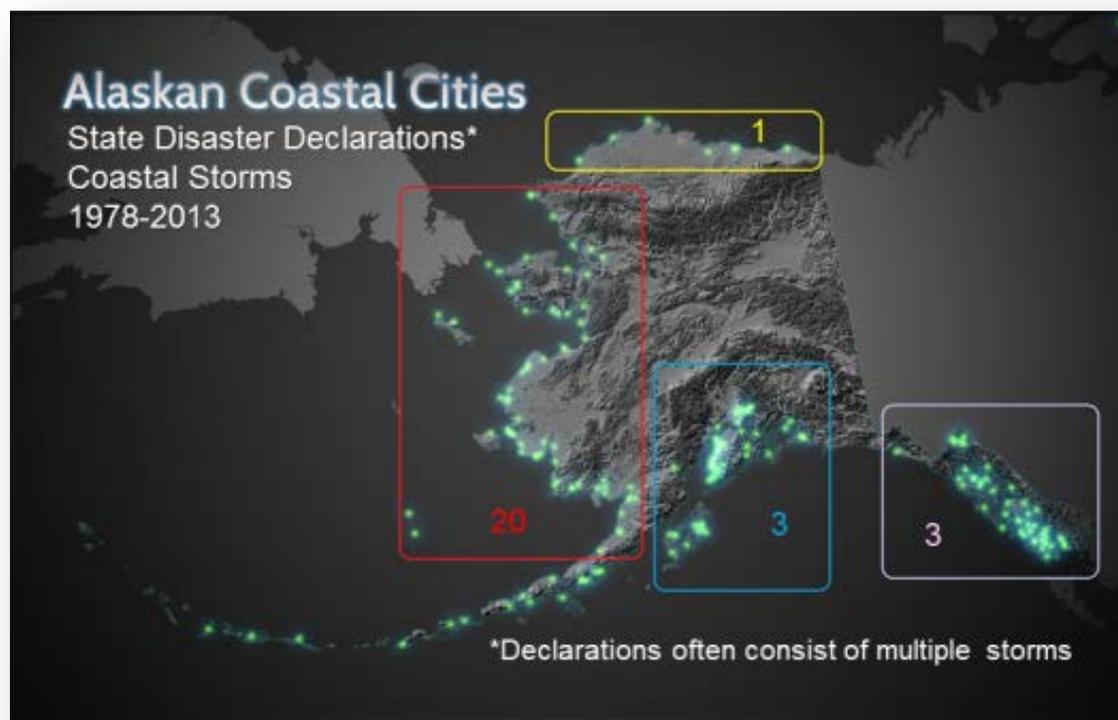


Cordova January 2012

**Identifying changes in patterns critical**

# Storminess: Coastal Flooding

- High impact, most costly weather event in Alaska
- Isolated communities: recovery logistically difficult
- Almost all in autumn/early winter
- Strongly sea ice dependent



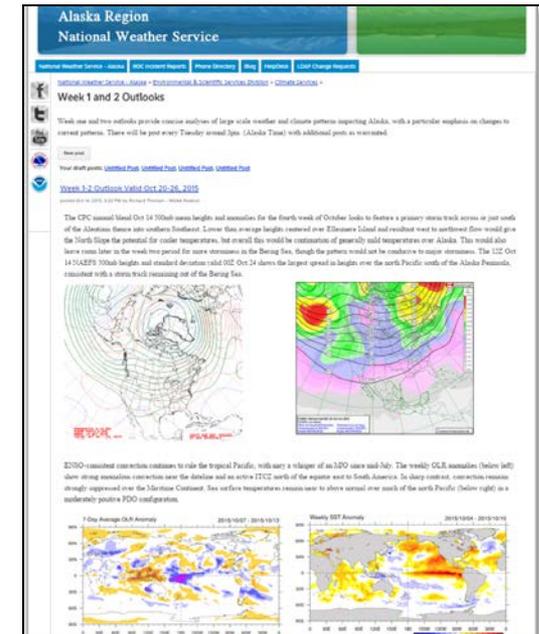
# Western Alaska Coastal Flooding

- Dependent on:
  - Storm track and intensity
  - Ocean level and wave action
  - Sea Ice: coverage and quality...or lack thereof
- Multiple high impact storms recent years: no trend in storm counts, big trend in sea ice



# Weather with a climate connection: Week 2

- Week 2 Partners
  - State of Alaska Emergency Operations
  - Communities
  - Alaska-Pacific River Forecast Center
  - Alaska Fire Service
- Weekly NOAA AR internal guidance
- Weekly SEOC Briefing
- November 2013 Bering Sea Flooding
  - Well forecast by CPC and EMC
  - SEOC → Communities
  - NWS Alaska Region ROC and WFOs
    - Special services



# Subseasonal: Week 3 to Month 1-2

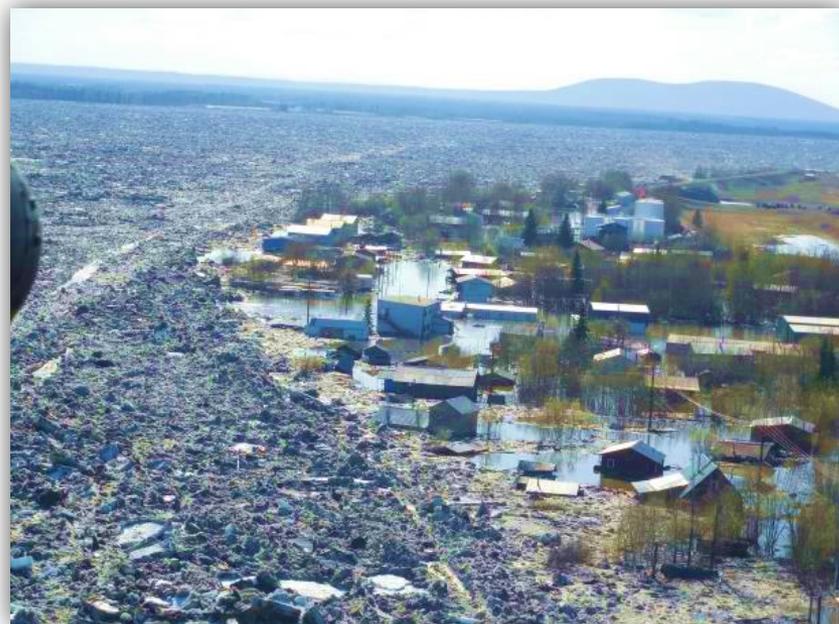
- State of Alaska Emergency Operations
  - Autumn storminess, spring river ice break-up, extended deep cold
- RFC
  - Spring river ice break-up,, extended steamflows: pcpn & summer temps for glacier melt related problems
- Alaska Fire Service
  - Preseason: overall seasonal severity strongly dependent on May & June temperatures
  - In season: resource staging and deployment
    - CONUS and Canadian resources required during big seasons

CFS and NMME primary tools  
New CPC experimental Week 3-4 Outlook



# Spring River Ice Break-up

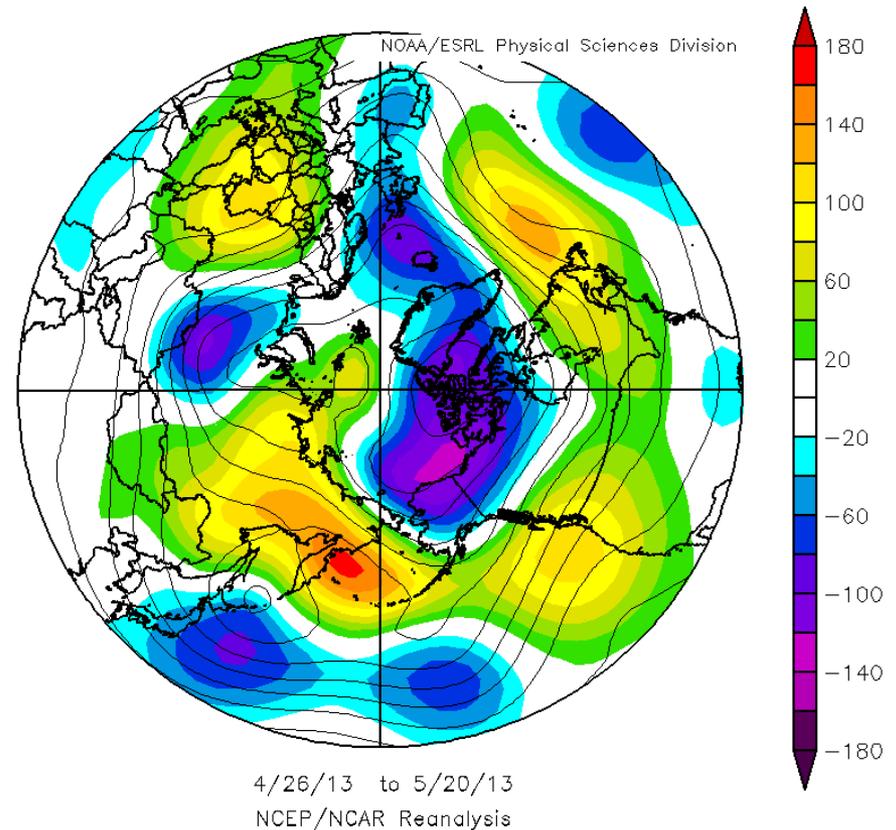
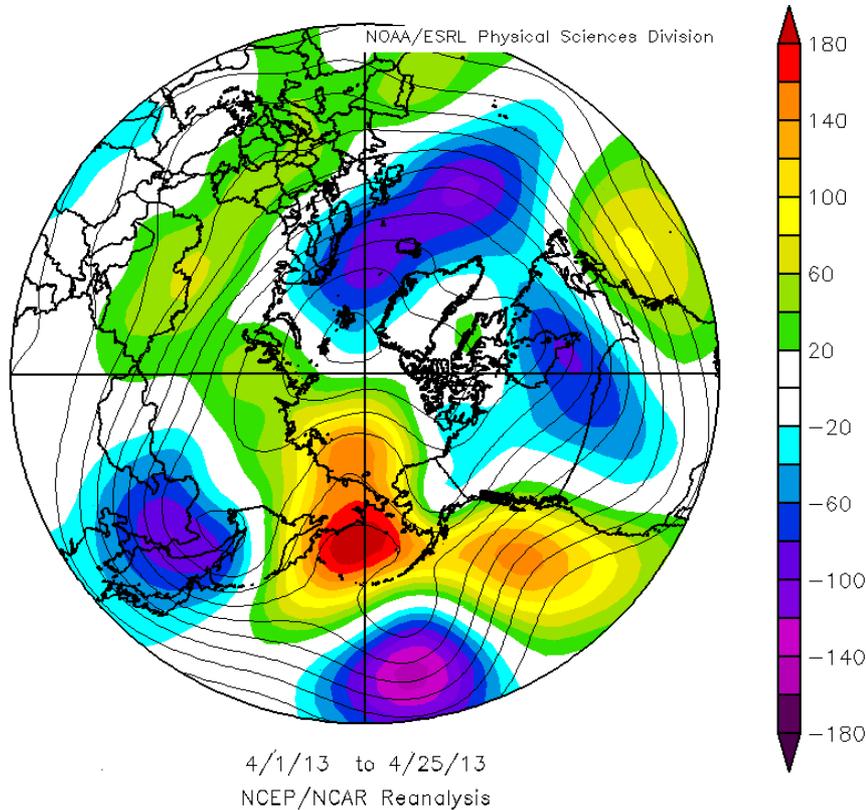
- Ice jam flooding locally serious and costly
- Largely dependent on temperatures early April to mid May
- Subseasonal outlooks critical



Galena, Alaska: May 28, 2013  
Damage & recovery: \$70 million

# Cold Spring=Potential Ice Jam Problems

## Mean 500mb Heights and Anomalies



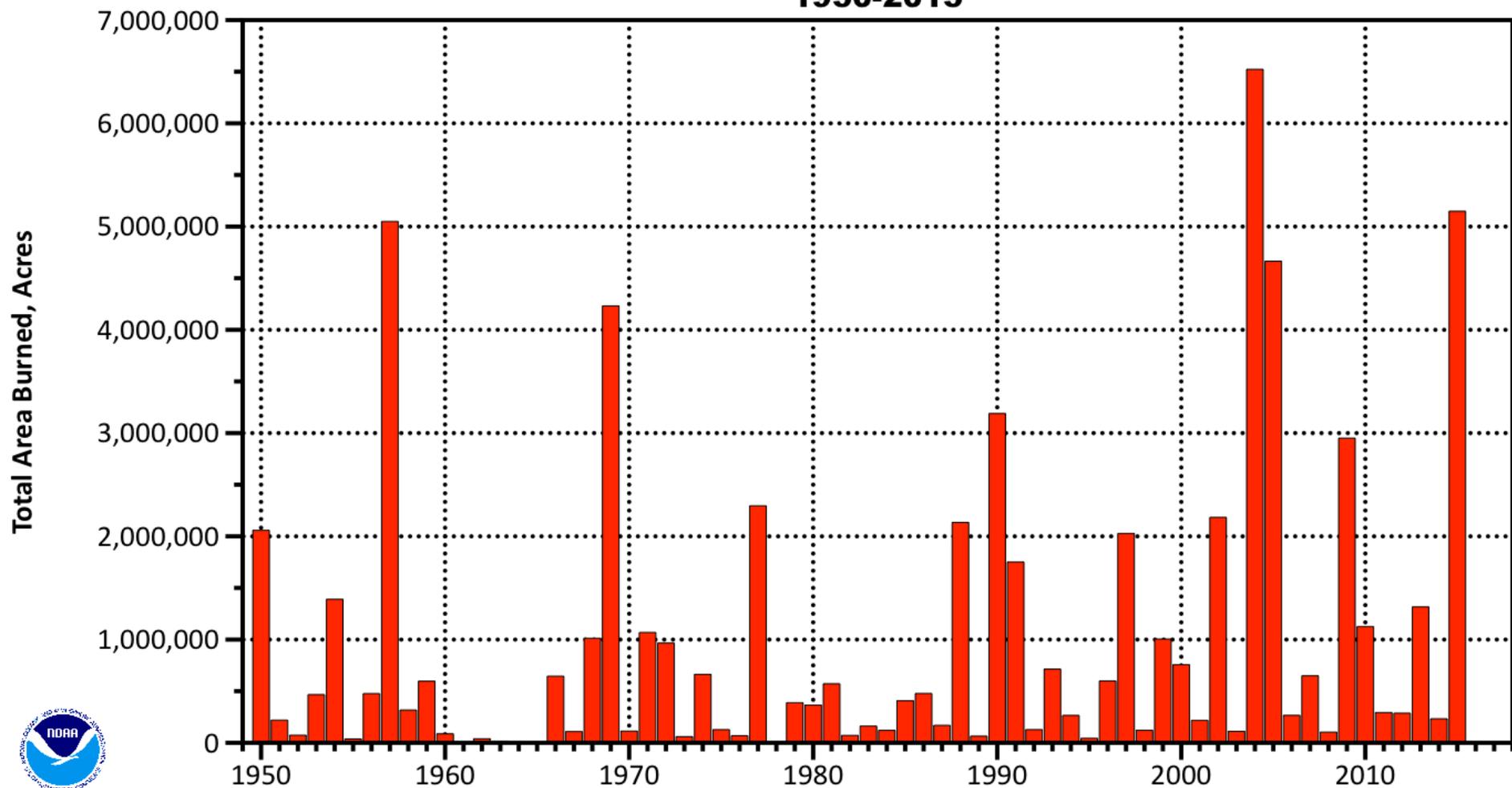
Apr 01-24, 2013

Apr 24 to May 20, 2013



# Wildfire Acreage: Growing

**Alaska Wildfire Acreage  
Seasonal Total  
1950-2015**



# Seasonal and Beyond

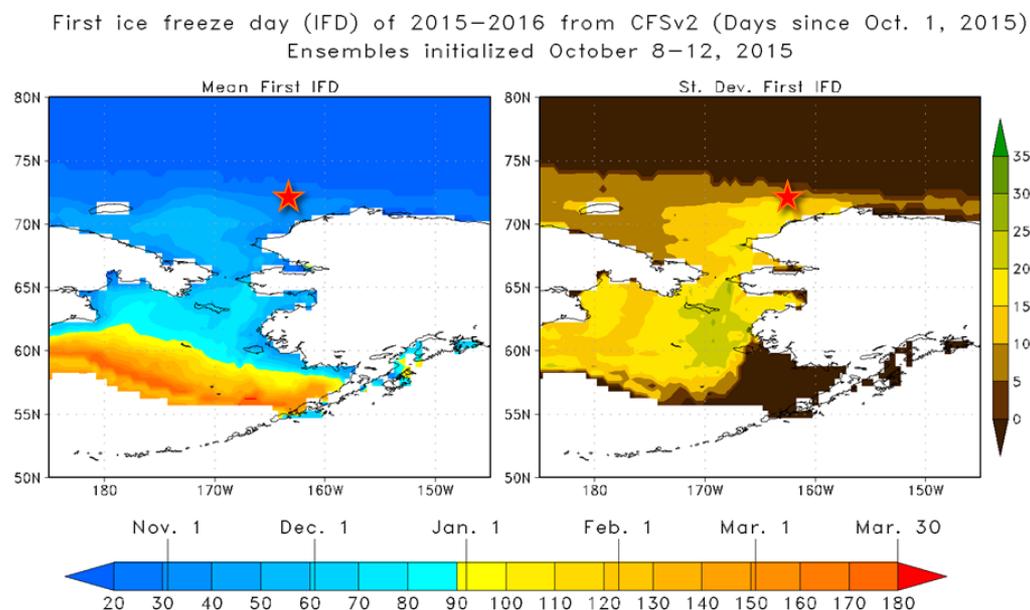
- Sea Ice: Break-up and Freeze-up
  - Resource Extraction
  - Transportation
  - Ecological & Subsistence Activities
- Precip vs. Snow
  - Water Supply
  - Ecological Impacts
  - Tourism



Courtesy Anchorage Daily News

# Experimental CFS Sea Ice Forecast

- Improved sea ice modeling
- Focused processing of model output to directly help with the question “when is it going to freeze-up in a particular area?”
- Presented to Federal partners 2014-2015 as part of Shell Oil exploration in Chukchi Sea

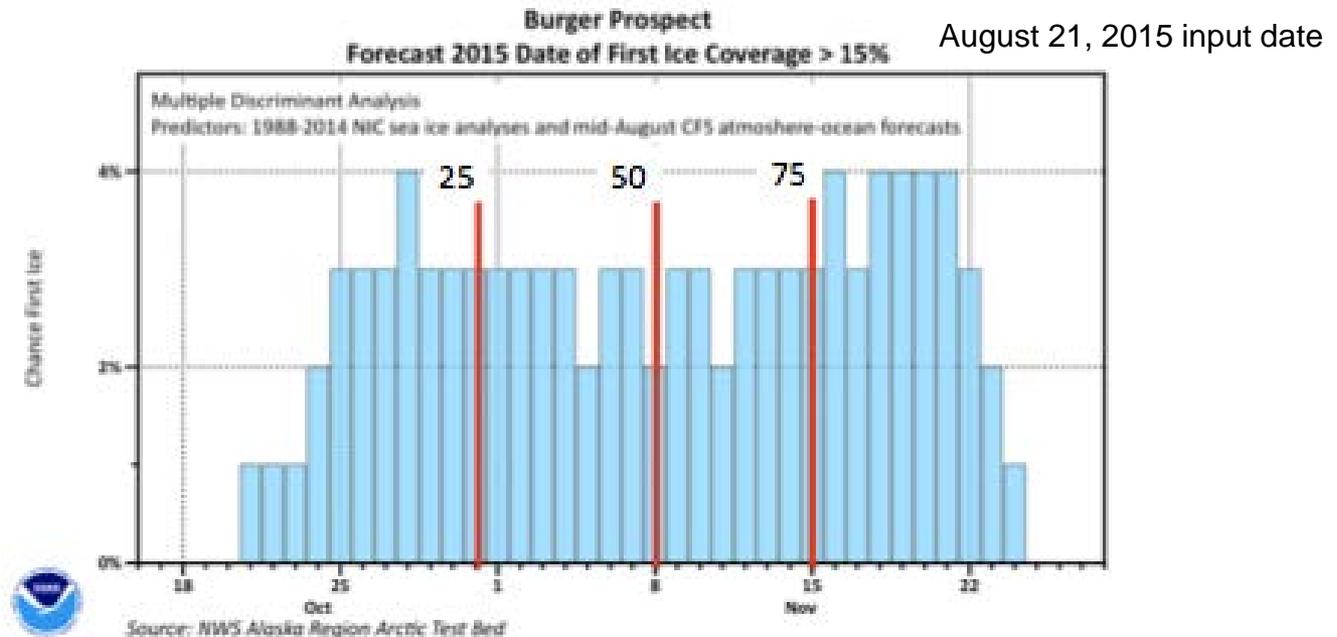


Source: W. Wang & T. Collow, /CPC

**A shining example  
CPC – NWS Alaska Region working together**

# Sea Ice Freeze-up Guidance: Site Specific

- Multiple Discriminant Analysis
  - Run weekly
  - National Ice Center Analyzes 1988-2014
  - Operational CFSv2 Atmosphere-Ocean



Source: Arctic Test Bed/NWS

# Who in Alaska

- NOAA Internal
  - NWS Forecast Offices and APRFC
  - NWS Alaska Region ROC
- Federal Partners
  - Land Management/Wildfire Agencies (DoI: NPS, BLM, FWS)
  - Regulatory Agencies (DoI: BOEM, BSSE)
  - National Security (DoD and Coast Guard)
- State of Alaska
  - Department of Homeland Security & State Emergency Operations
  - Department of Transportation
  - Department of Natural Resources (wildfires)
- Local/Tribal
  - Boroughs & Villages
  - Alaska Native Regional Corporations
  - Alaska Native Tribal Health Consortium



# The Future

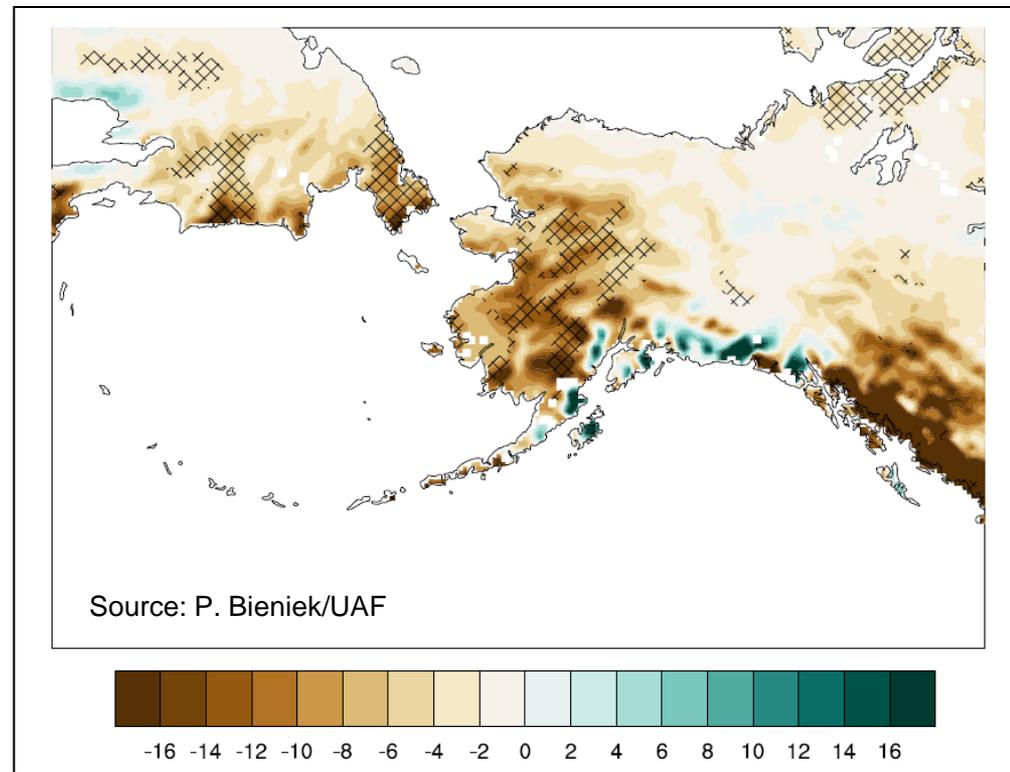
- Higher Spatial and Temporal Resolution
- Expanding the Product Suite through improved modeling AND innovative processing of existing climate model output
  - Storminess: not the same as precipitation anomalies
  - Extremes
    - Threshold exceedance (e.g. days above freezing upcoming winter)
    - Start/End of season dates (e.g. sea ice, snow on/off, first/last freeze)
  - Sea Ice
    - Regionally Specific
  - One to ten year temperatures
    - Industry
    - Engineering
    - Permafrost



# Higher Spatial Resolution Climate Outlooks

- Complex terrain: an underutilized source of predictability
- Where/how does regional downscaling occur?

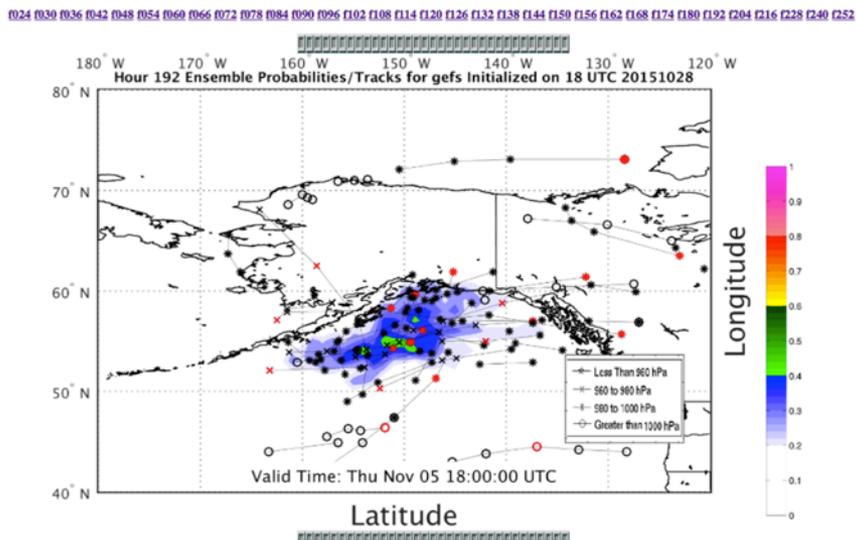
JFM temp anomalies during moderate to strong El Niño seasons, 1979-2013 from dynamically downscaled ERA-Interim (1981-2010 means)



# Storminess

- Common question: “with El Niño/PDO/sun spots/Blob will there be more storms than usual this fall?”
- Western Alaska: increased storminess → Increased chances coastal flooding (not so much flooding rains Gulf coast)

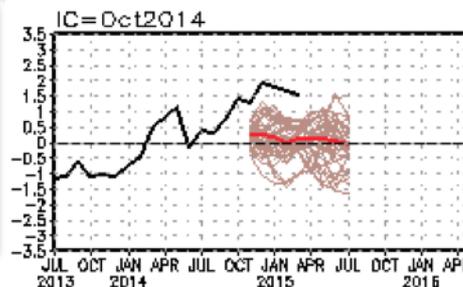
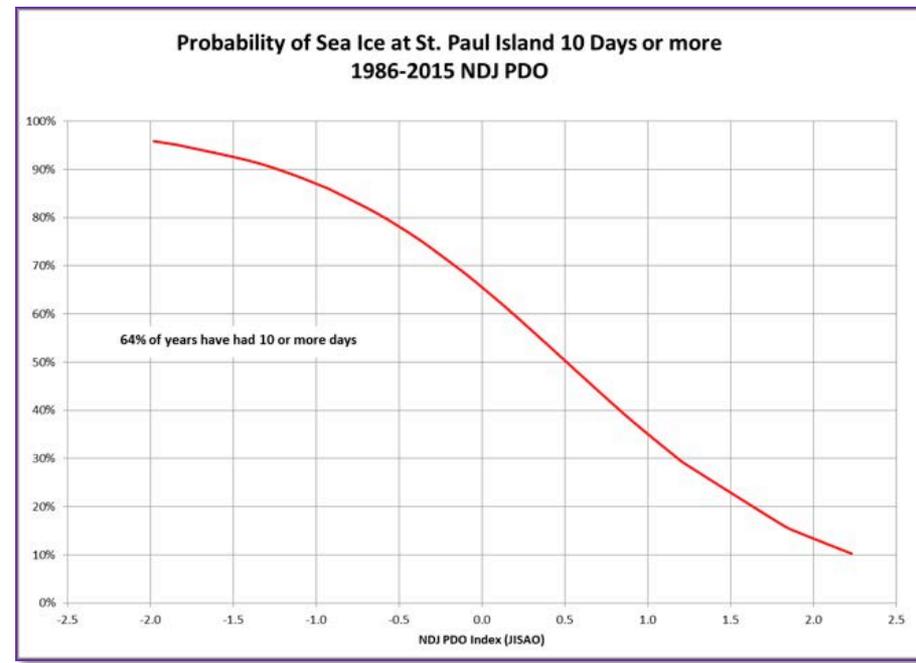
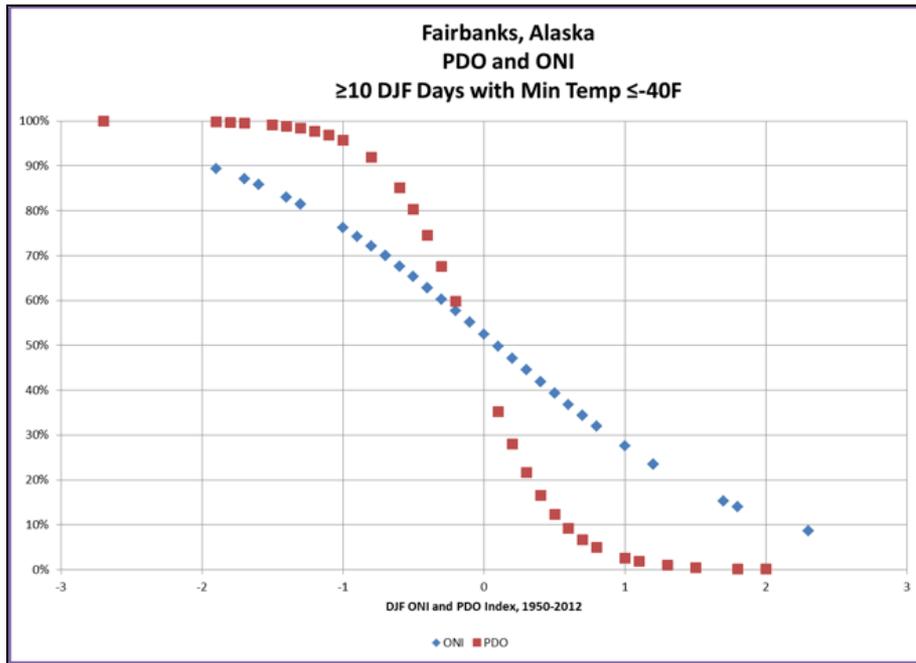
## Alaska Non-Tropical Track Probabilities Model Evolution - 24-Hour Window Ensemble Probabilities



Day 8 GEFS Cyclone Density  
Courtesy M. Erickson/Stonybrook

# Improved Global Scale SST Forecasts

## Improved Regionally Produced Products



# Summary for Alaska

- Climate scale forecasts from week 2 to annual+ matters
- Integral to building a weather & climate ready nation
  - Alaskans
  - National and multi-national industries
  - National Security

