

# Climate Change Impacts in Alaska: the Weather Perspective

Presentation to the Alaska Climate Impacts  
Assessment Commission

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NOAA's National Weather Service, Alaska Region

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# NOAA NWS Alaska Region - Overview

- 3 Weather Forecast Offices
- 12 Weather Service Offices
- River Forecast Center (covers AK and Pacific)
- Tsunami Warning Center (covers all N. America, Puerto Rico, USVI)
- 2 Aviation weather centers

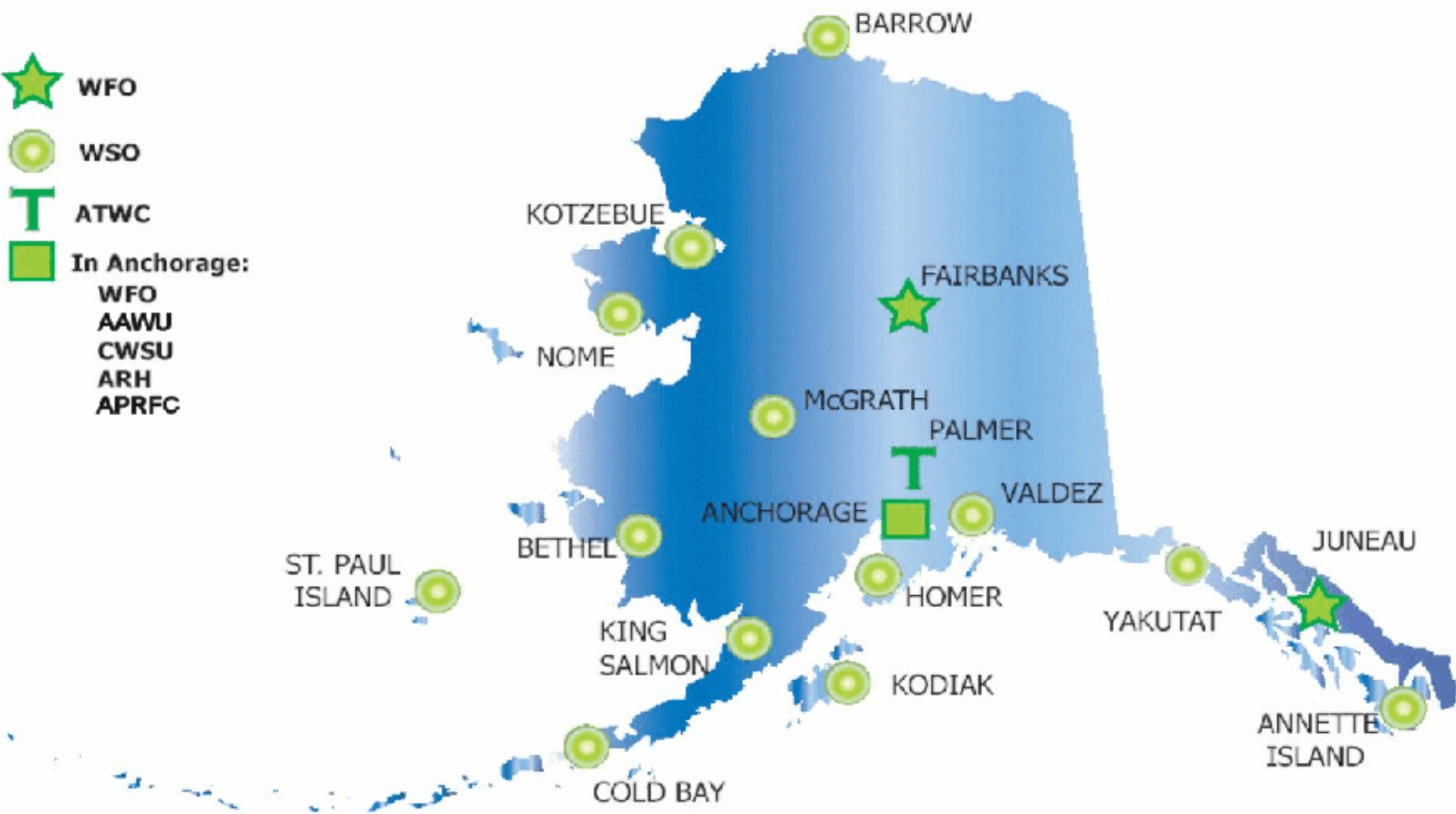
**Mission of NOAA's NWS: Protection of life & property; support safe & efficient Commerce & Transportation**

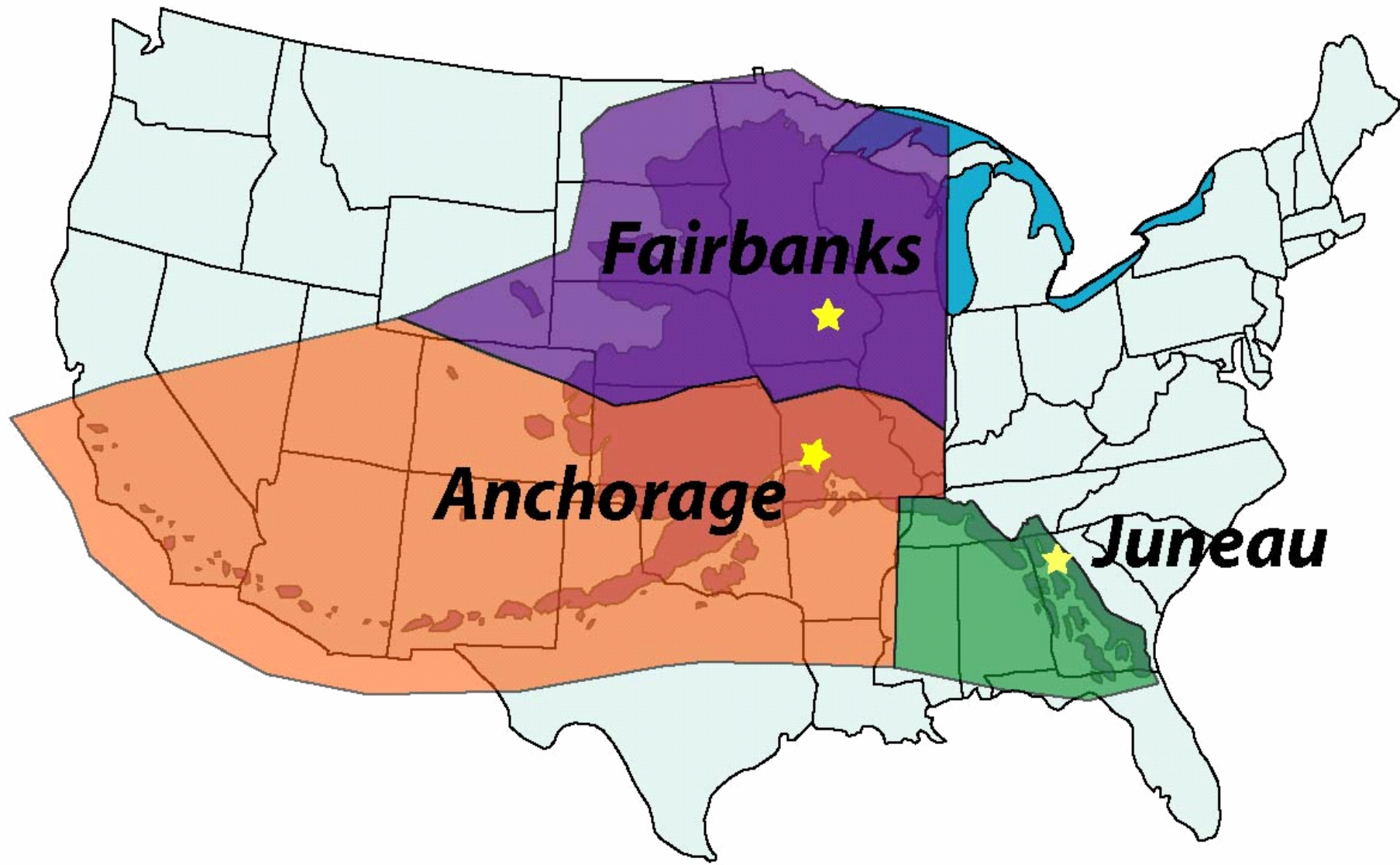
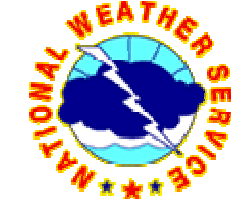


# NOAA NWS Alaska Region - Facilities



-  WFO
-  WSO
-  ATWC
-  In Anchorage:
  - WFO
  - AAWJ
  - CWSU
  - ARH
  - APRFC

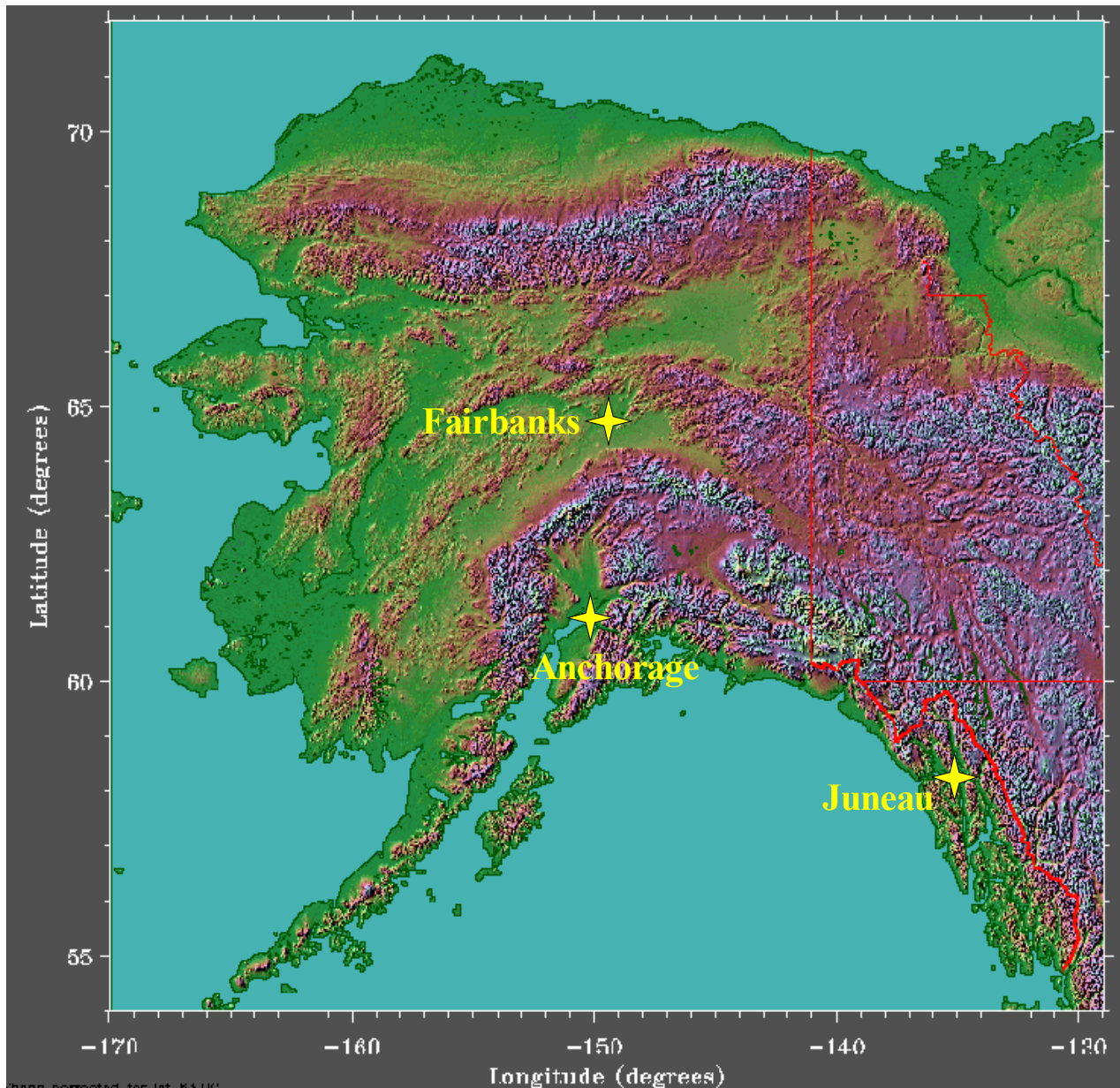




**Fairbanks**

**Anchorage**

**Juneau**



shape corrected for lat. bias (K)



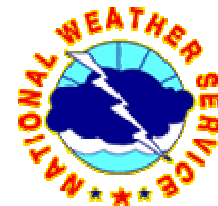
## Challenges Due to Weather/Climate Linkage

- Climate change in Alaska:
  - Decades-old warming at locations all across Alaska
  - Greatly reduced extent *and* thickness of multi-year sea ice
    - More impacts from coastal storms in Fall and Spring
    - Many resulting transportation, subsistence, hydrologic issues
  - Later freeze-up in Fall and earlier break-up in Spring
  - Glaciers retreating, Permafrost melting with attendant issues.



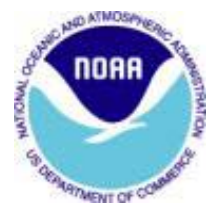
## Climate Impacts on NWS' Service Programs

- Aviation – more frequent icing conditions, low visibility; changed flying “paradigms”
- Public - more frequent extremes in weather
- Marine - more frequent high-impact events, esp. in areas of reduced sea ice (e.g. coastal erosion, water quality)
- Wildfire - more variable regime-dependent fuel-moisture conditions (e.g. 2004 and 2005 burned record # of acres in Alaska, and also produced the greatest number of lightning strikes ever recorded)
  - However, we need to relate this to socio-economic impacts – saying we burned 6.7M acres in 2004 without understanding human impacts is important to sell this to the rest of the country (e.g. it costs \$4,000 to attack a fire immediately, but it costs between \$3M and \$30M to suppress a wildfire)

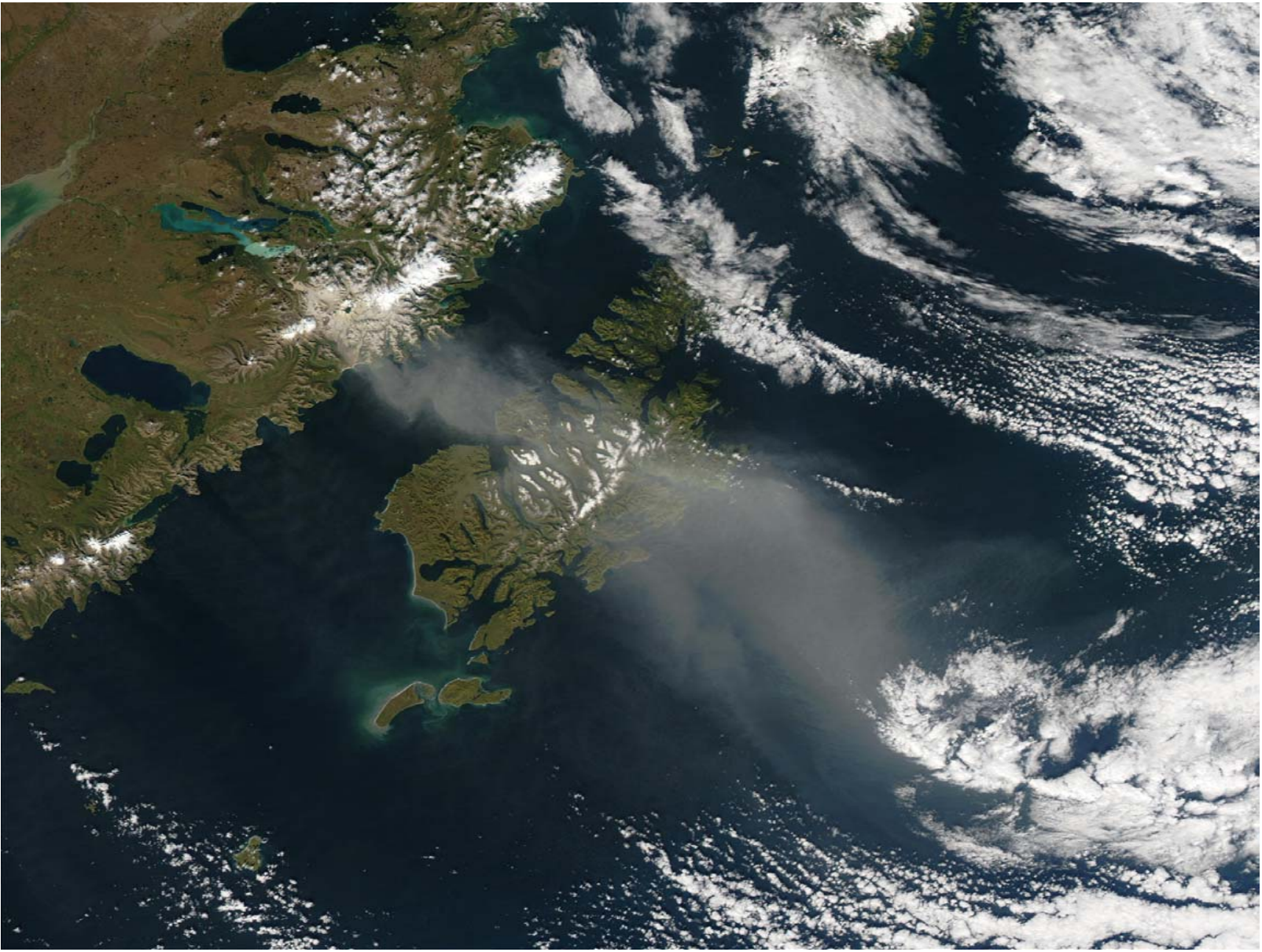


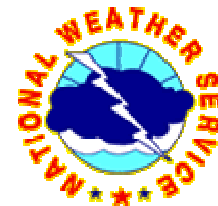
## Climate Impacts on NWS' Service Programs

- Hydrology - greater variability in river volume & related flooding and erosion, transportation, and fresh-water availability; ice-dammed glacier lake releases
- Tsunami – sea-level rise may have eventual inundation impacts
- Volcanic Ash – resuspension of relic ash and resultant impacts on aviation, marine, and public services.



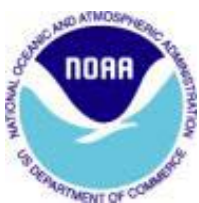
# September 2003, Katmai "Re-Suspension" Event





# Climate Science Needs

- Improving Climate Science, and therefore climate services, involves, among other things:
  - Observations
  - Numerical models
  - Decision-support tools
  - Education & Outreach



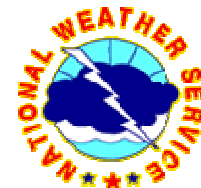
# Climate Science Needs - Observations

- Observations form the backbone of forecast and warning services:
  - Allows forecasters and rest of the world know what's "really happening"
  - Allows decision-makers (e.g. harbormaster, airline dispatcher) and numerical modelers know what to do to make decisions and make things better
- Both remotely-sensed (e.g. radar, satellite) and in-situ (e.g. weather stations, humans) are needed



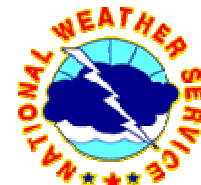
# Climate Science Needs - Models

- In Alaska, guidance from numerical models is especially critical for forecasts & warnings beyond 6-hours
- Models currently do poorest at the poles...Alaska is the 2<sup>nd</sup> worst of the 12 parts of the planet that are verified for global models (Antarctica is worst)
- Observations make the models better, as do R&D initiatives aimed at improving the models to better understand Arctic conditions and issues
- Improved models lead to improved and more confident services by forecasters and decision-makers with greater lead time



# Climate Science Needs – Decision Support and Outreach/Education

- Decision-support bridges the realms of observations, models, research, and human factors and their implications for real-world application
  - In Alaska, help is needed by many, including those involved in transportation and subsistence activities, deciding where to move villages so they will not be in harm's way in 30 years, how to deal with toxic releases when a village washes into the ocean, etc
- Outreach and education are the tools by which decision-support outputs are made effective
  - A perfect forecast or warning is entirely useless unless the customer understands its meaning and impact and can make appropriate decisions to mitigate the impacts...a terrible, yet critical lesson from the Indian Ocean catastrophe



# Conclusions

- Better, more observations lead to better numerical weather prediction models (requires funding)
- Better models lead to better, more confident forecasts, lead time, and information for decision-makers (requires funding, decision-support development)
- Climate change impacts include a tremendous number of feedback loops that we are only at the threshold of understanding (requires research)
- We must prove to the rest of the country that what is happening in Alaska is important to THEM, not just to US (requires wisdom and tact).