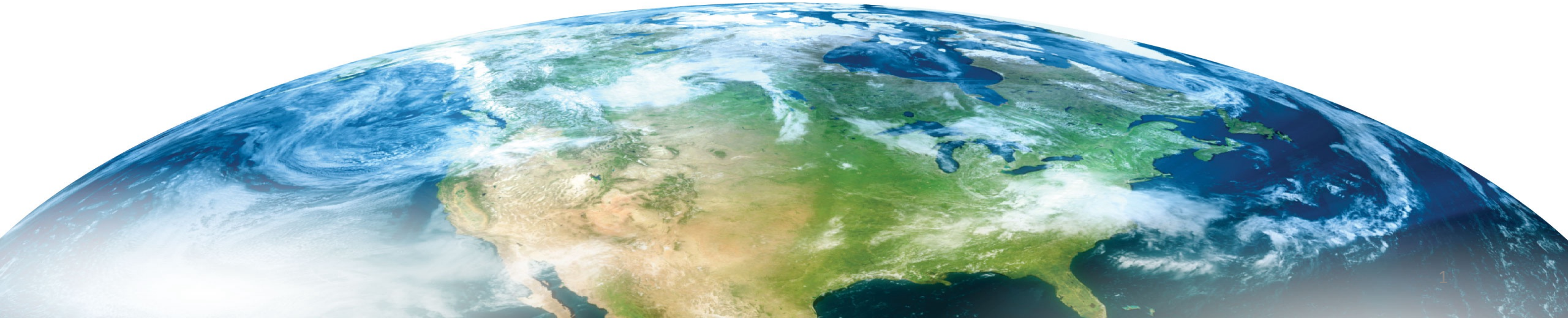
Inflight Icing Overview and Plans – CIP, FIP, Alaska

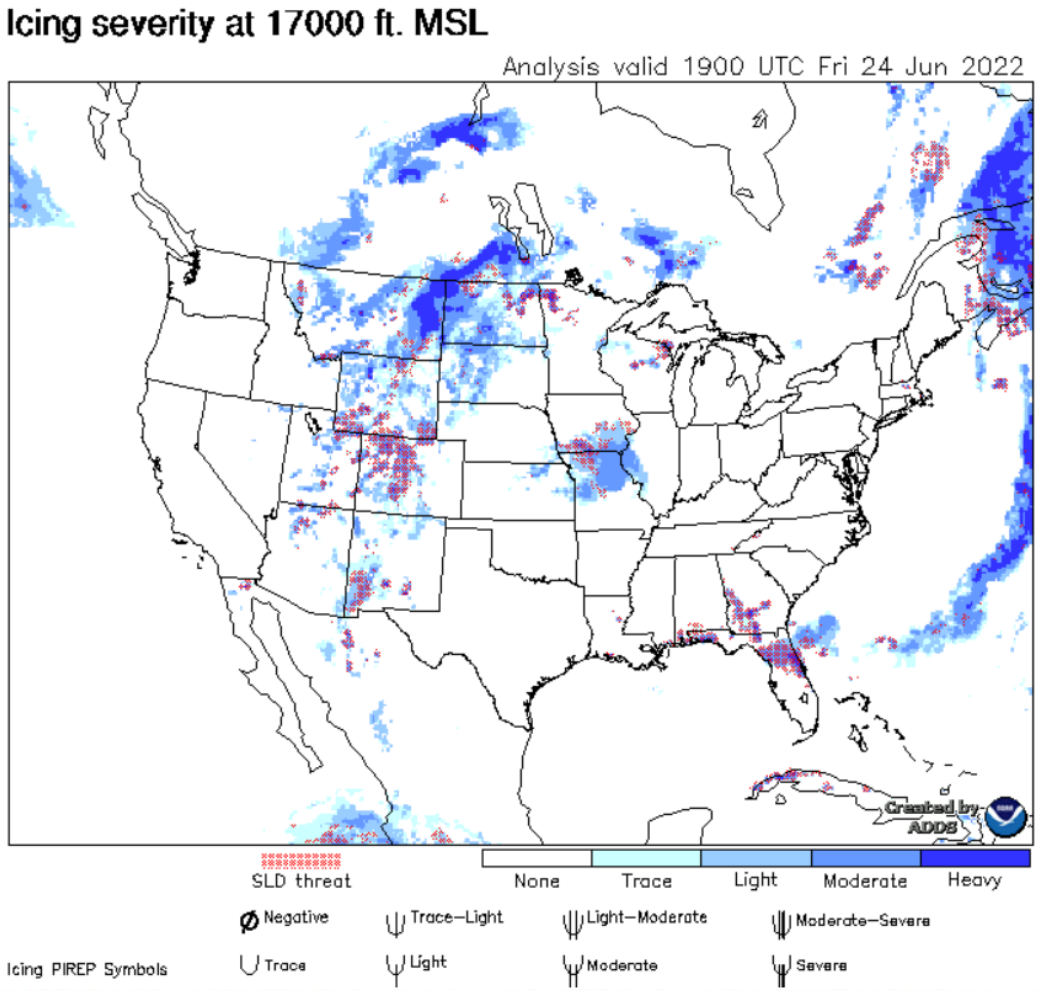
Danny Sims
FAA Aviation Weather Division
FPAW – October 2022



What's the Problem to be Solved?

- National Transportation Safety Board (NTSB) findings
  - From 2008-2018, 5 fatalities per year with structural, inflight icing as a cause
- General Aviation safety issue (AOPA Nall Report)
  - Inflight Icing one of the top 5 weather-related causes of accidents
- Changes to aircraft certification envelopes
  - Appendix C: small drop
  - Appendix O: large drop (FZDZ & FZRA)
- Our goal is to increase safety and address certification changes by enhancing automated diagnostic and forecast capabilities

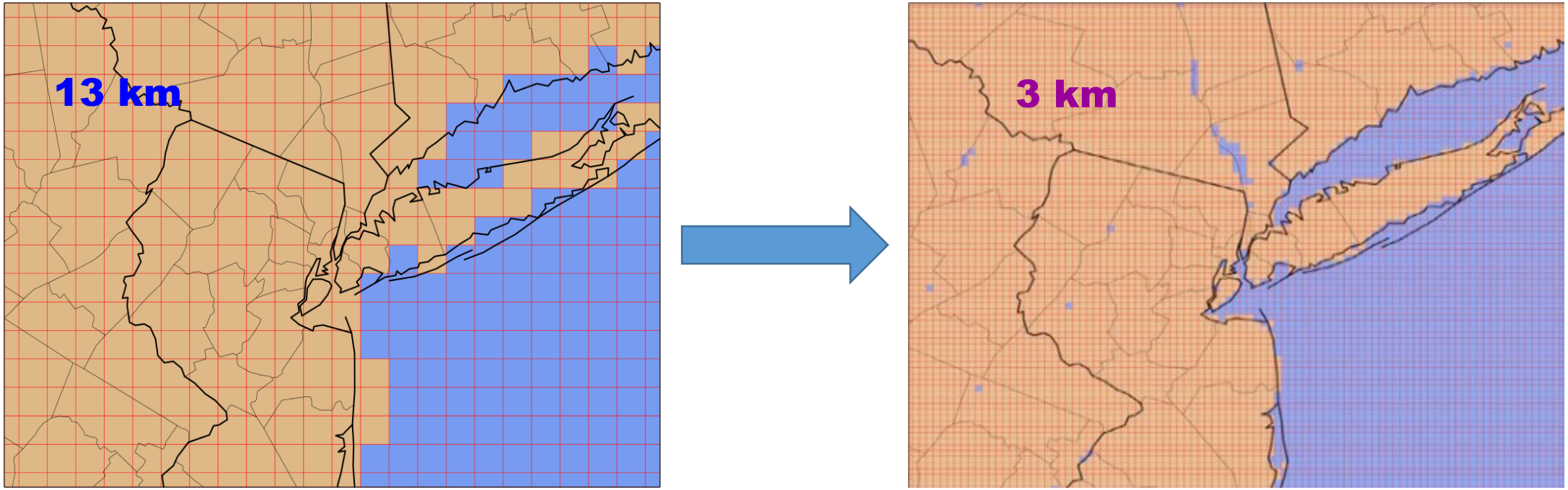
Operational Automated Capabilities



- Current Icing Product (CIP) produced hourly by combining multiple sources
- Forecast Icing Product (FIP) generated hourly out to 18 hours
  - CIP-like but only uses model forecast data
- Both provide probability, severity, and SLD likelihood
- Operated and maintained by National Weather Service (NWS)
  - aviationweather.gov/icing

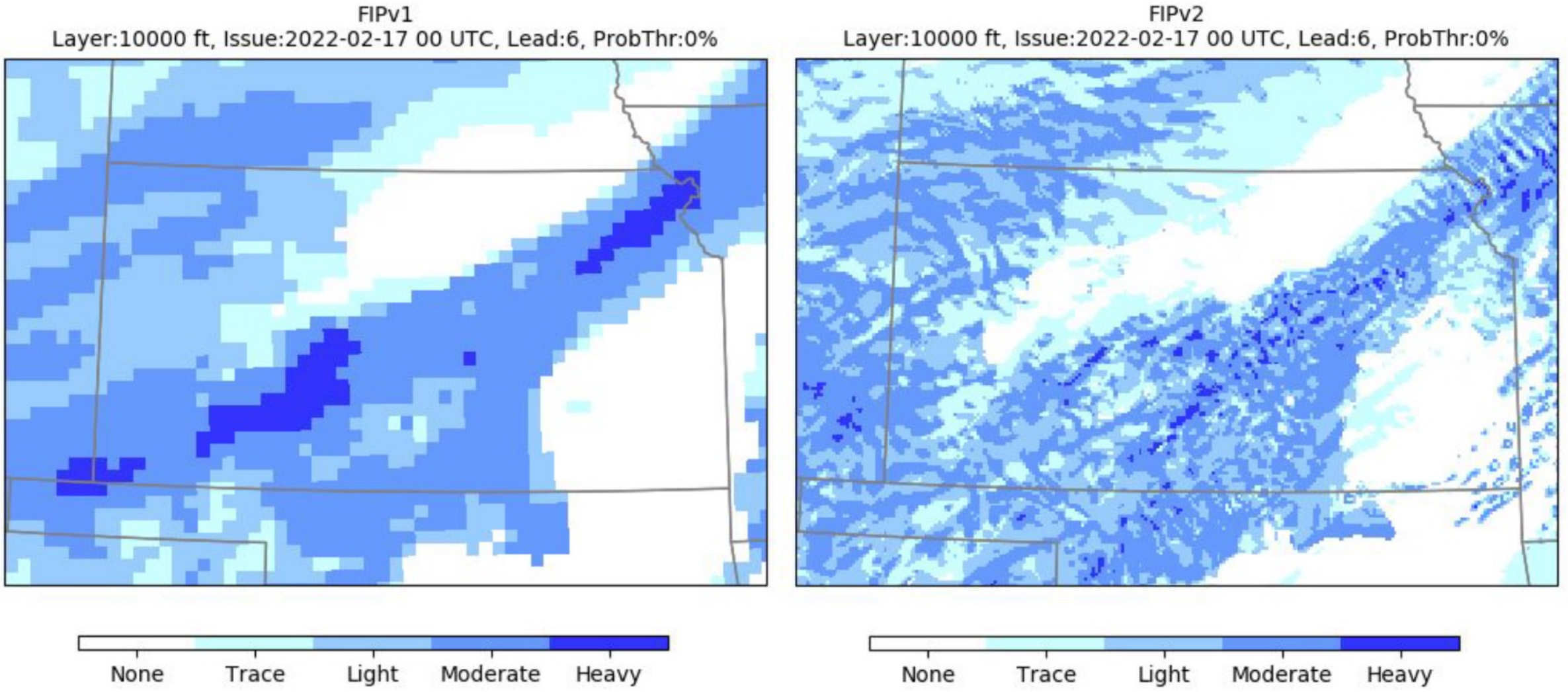
New Technology to Address Shortfalls

- Higher resolution weather prediction models
  - Rapid Refresh Forecast System (RRFS) over CONUS and Alaska with 3-km horizontal grid spacing
  - Usable explicit predictions of icing related fields (e.g., Dmax, LWC)

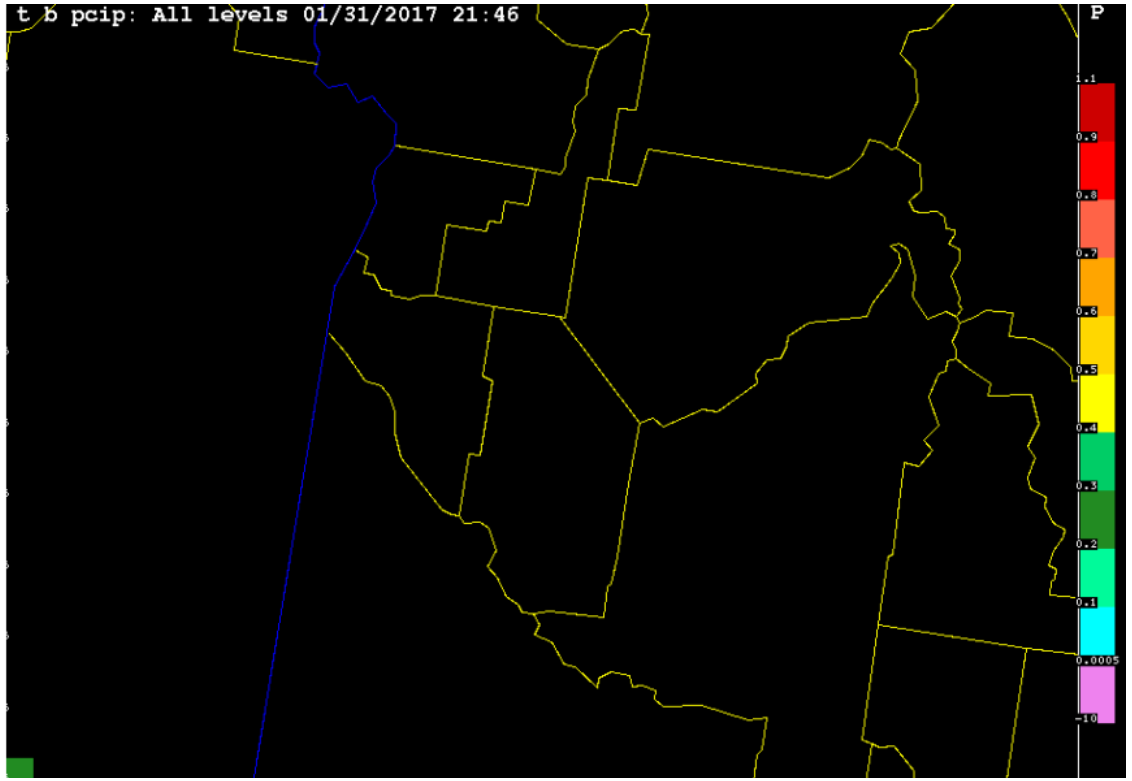


Courtesy of NOAA GSL

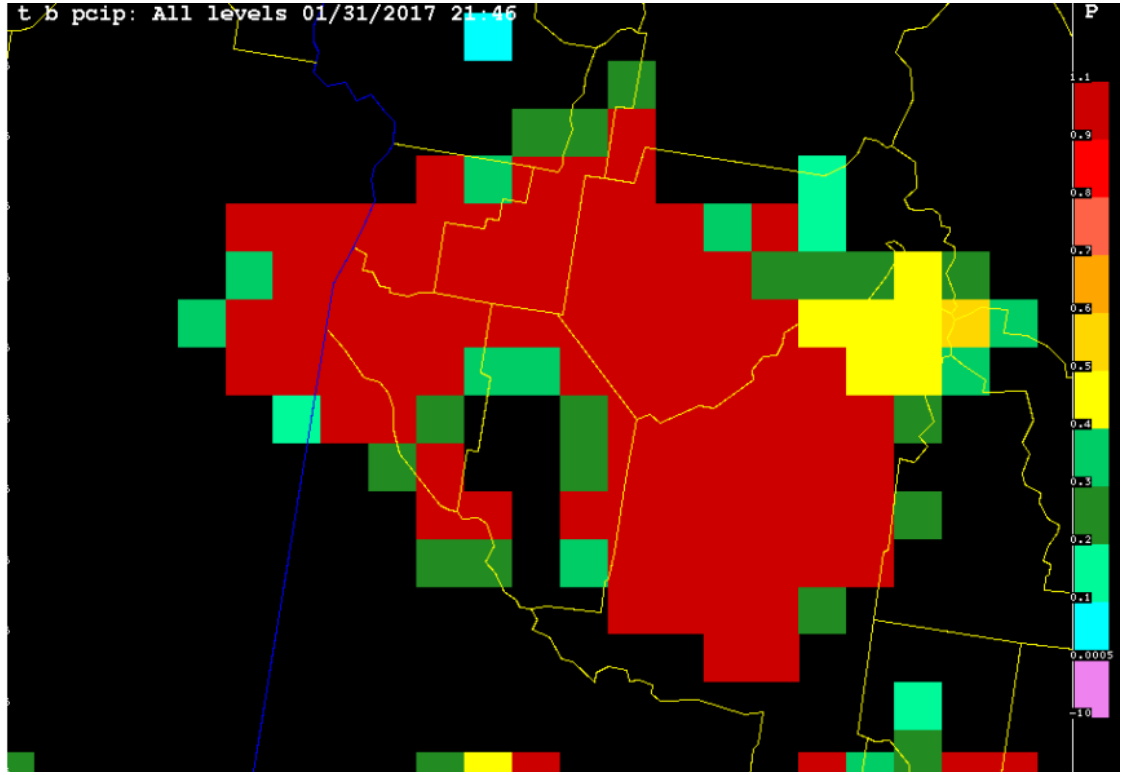
Presentation of Increased Resolution



New Technology – Radar



CIP not showing any SLD

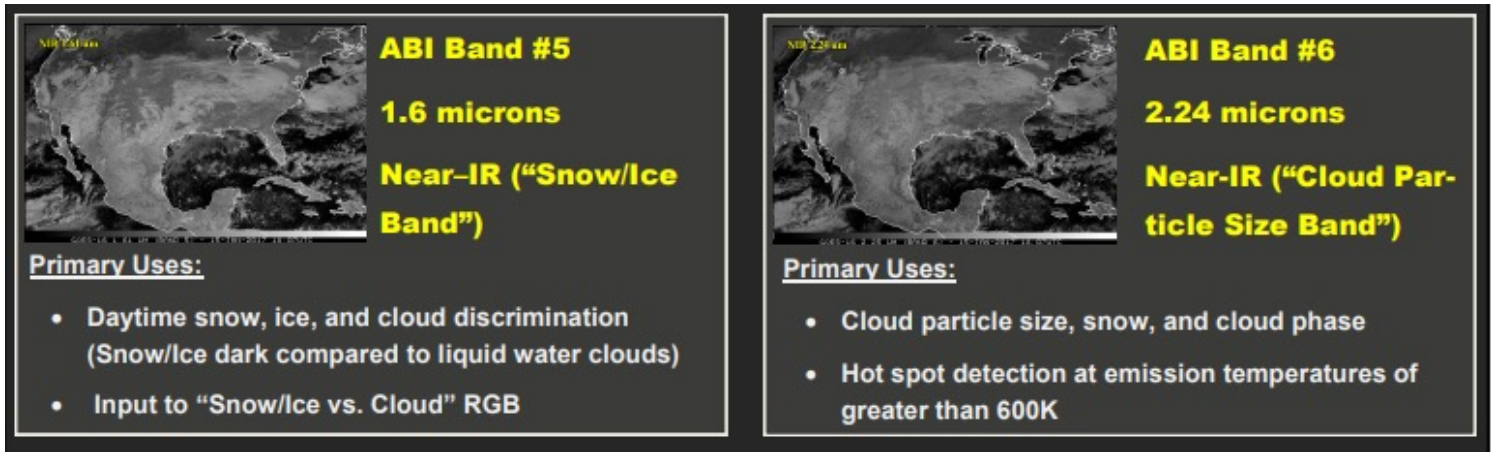


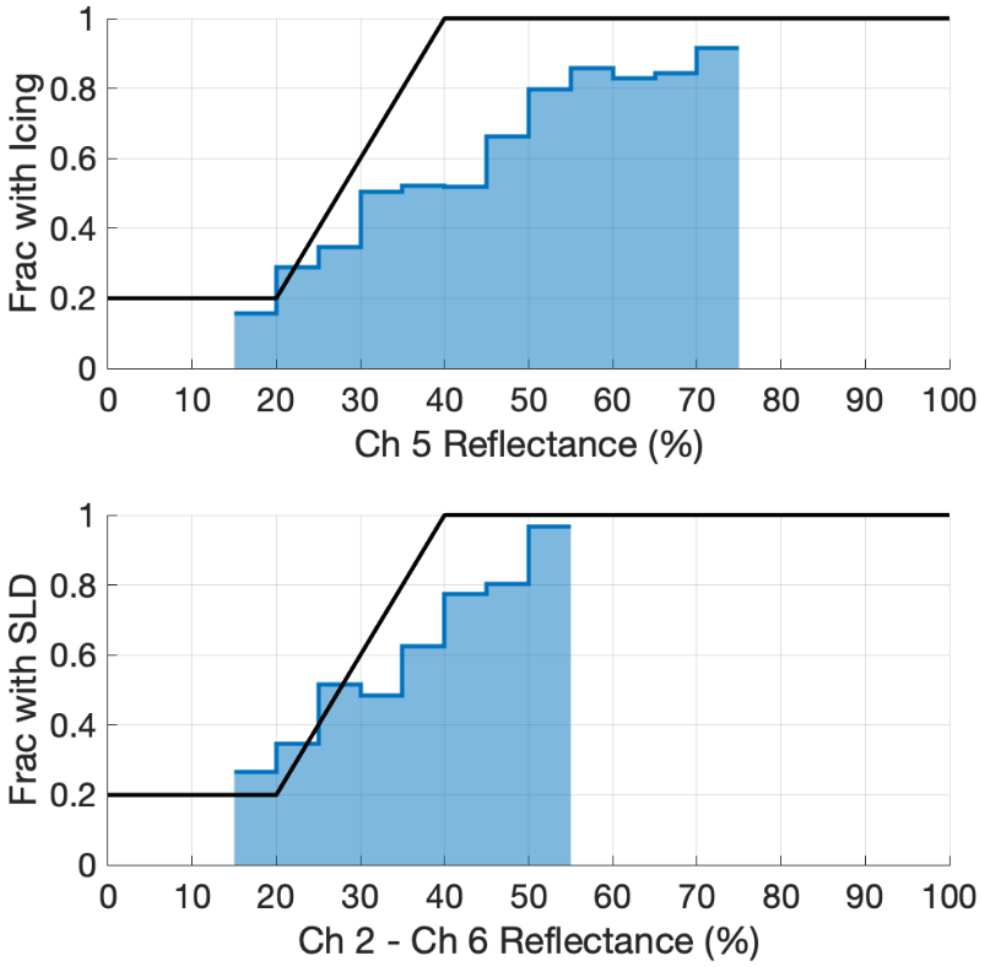
CIP & Radar Icing Algorithm (RadIA) shows the threat!

Courtesy of NCAR

New Technology - Satellite

- GOES enhancements
  - Improved spatial and temporal resolution
  - Additional channels being incorporated
    - Cloud top phase
    - Cloud top drop size



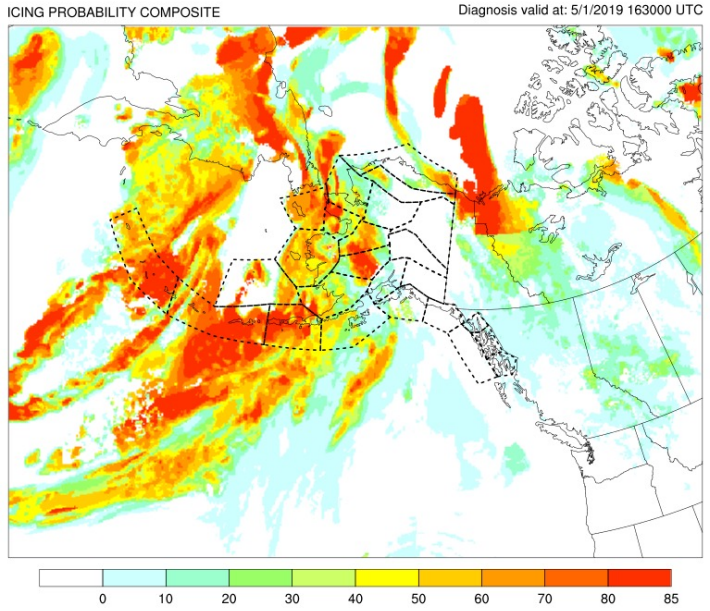


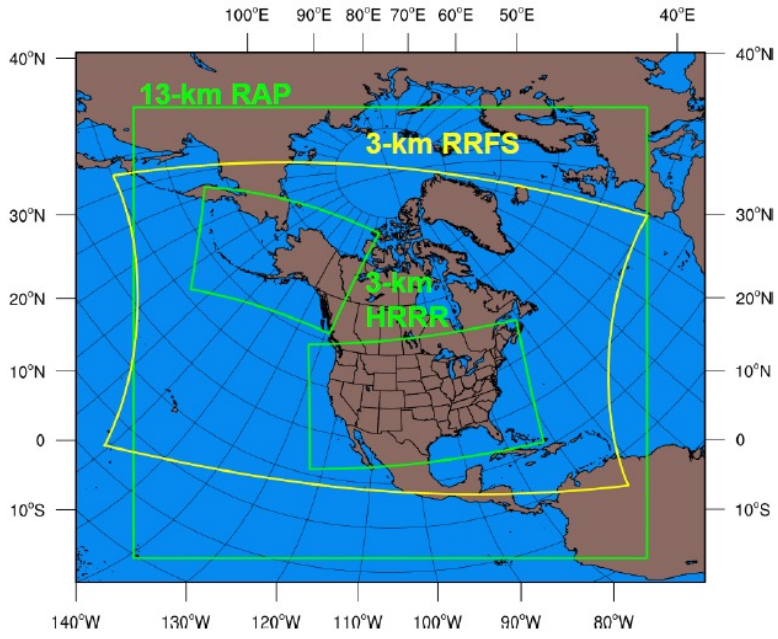
New Requirements

- FAA regulatory and policy changes
  - Drop size information to determine certification
    - No icing
    - Cloud drop (Dmax < 100 microns)
    - Freezing drizzle (Dmax of 100 – 500 microns)
    - Freezing rain (Dmax > 500 microns)
- A shift from historical output of icing potential and severity
  - Current products have limited capability especially with drop size
  - Current verification datasets have limitations; need data!

Alaska Status

- Icing Product Alaska (IPA)
  - Developed using CONUS CIP and FIP concepts
  - Uses RAP 13-km grid spacing
  - Code transitioned to NWS
    - Not implemented due to resource limitations
  - Maintained experimental version at NCAR
  - Will be obsolete with RRFS
- FIP will run on entire RRFS domain
  - Can provide gridded product
  - Need to assess performance over Alaska





Plans and Schedule

- CIP and FIP Version 2.x
  - Transition to RRFS-based
  - Incorporate dual-polarization weather radar information
  - Incorporate GOES advanced information
  - FIP initial operational implementation in 2024
    - Dependent upon NWS model upgrade schedule
    - CIP to follow
- Later enhancements
  - Drop size output
  - Tailor to Unmanned Aircraft System (UAS) and other air vehicles?
    - More rapid updates?
    - More vertical resolution?
  - CIP as a tactical tool?

Contact Information

- Danny Sims, Inflight Icing Project Lead
  - danny.sims@faa.gov
  - 202-267-2785
- Tammy Flowe, AWRP Manager
  - tammy.flowe@faa.gov
  - 202-267-2796
- Randy Bass, Aviation Weather Division Manager
  - randy.bass@faa.gov
  - 202-267-2800