



NATIONAL WEATHER SERVICE
Aviation Weather Center



Evaluating User-Understanding of Probabilistic Information at the 2023 AWT Experiment

Jack Lind², Stephanie Avey¹, Austin Cross¹, Alex Korner²

¹NOAA/NWS/NCEP/Aviation Weather Center, ²Cooperative Institute for Research in the Atmosphere

Ensemble User's Conference

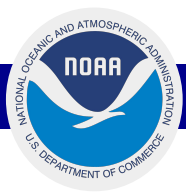
23 August 2023

 US.NOAA.AviationWeatherCenter

 @NWSAWC

<https://www.aviationweather.gov/>



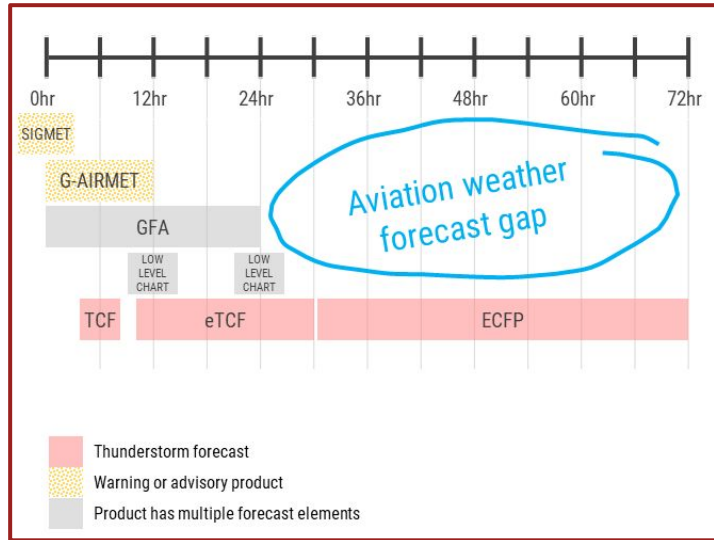


The Aviation Weather Center and Testbed

- Year round R2O with ~1 experiment/year
 - Goal: To evaluate experimental and prototype products and services to support aviation planning in the National Airspace System (NAS)
- Integral part of our Research to Operations (R2O) process
- Stakeholder engagement and collaboration
- Build relationships between multiple entities in the aviation weather enterprise

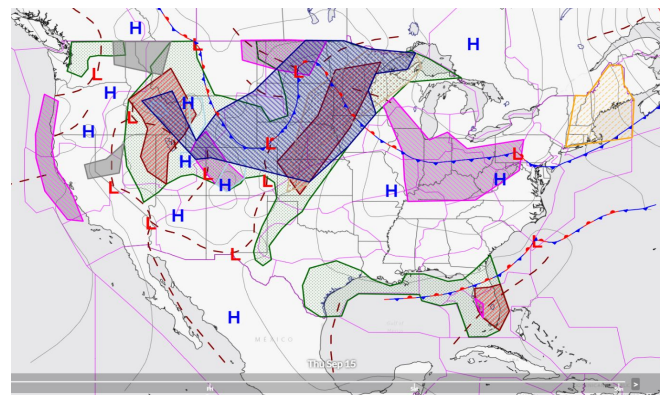
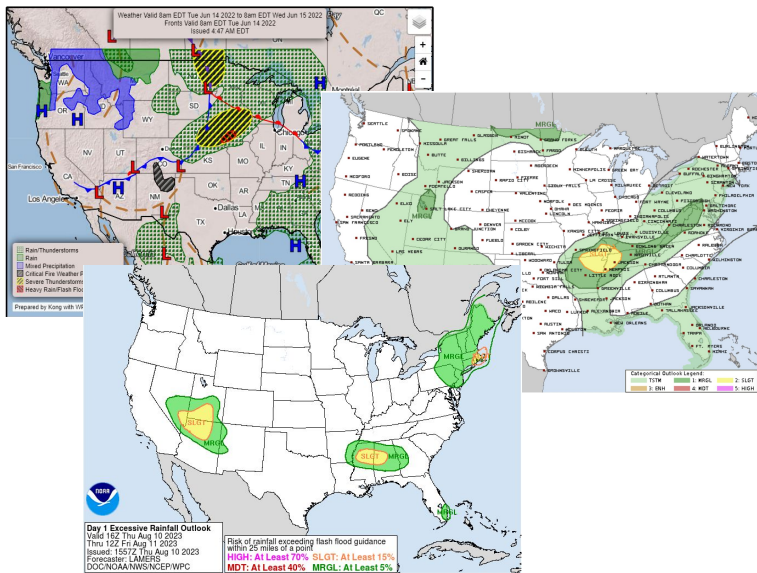


Extended Range Forecast Need



- Current (non-convective) AWC products do not go out beyond 24hrs
- Need for additional guidance to assist GA fliers with planning which was identified as a need by the National Transportation Safety Board (NTSB)
- Exploring various ways to fill this gap, both forecaster-in-the-loop and automatically generated

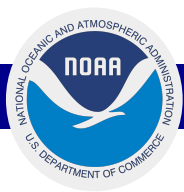
2022 Experiment Began Testing Extended Outlooks



What about probabilistic??

From the 2023 - 2033 NWS Strategic Plan...

Build expertise and tools to increase our capacity to understand, interpret, and communicate risk-based/probabilistic information to drive probabilistic IDSS.



Why should we use probabilistic information?

In a review of 300+ journal articles...


*Nearly all of the studies ... indicate that people make **better decisions**, have **higher trust** in information, and/or display a **greater understanding** of forecast information when shown a probabilistic forecast instead of a deterministic one.*

Ripberger et al. (2022), WCAS



IDSS = Impact-Based
Decision Support Services

FACETS Forecasting a Continuum of Environmental Threats



Grid-based Threat Probabilities → Observations & Guidance → The Forecaster → Threat Grid Tools → Usable Output → Effective Response → Verification

← INTEGRATED SOCIAL / BEHAVIORAL / ECONOMIC SCIENCES →

www.nssl.noaa.gov/projects/facets

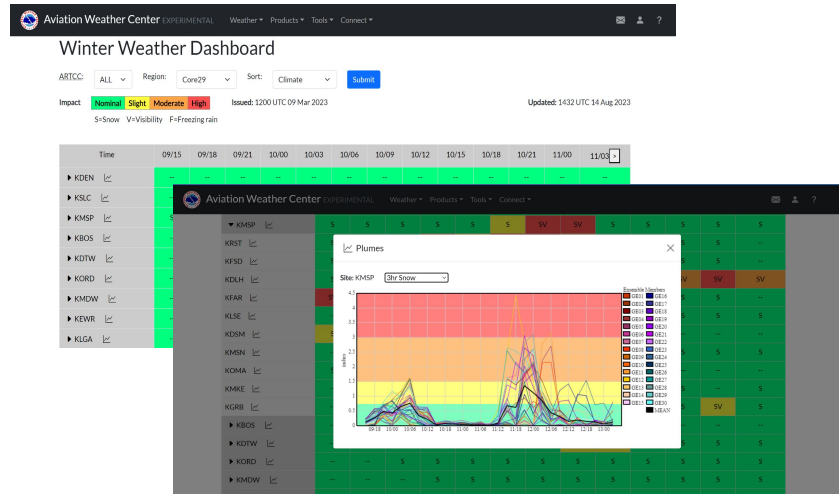


Weather Ready Nation



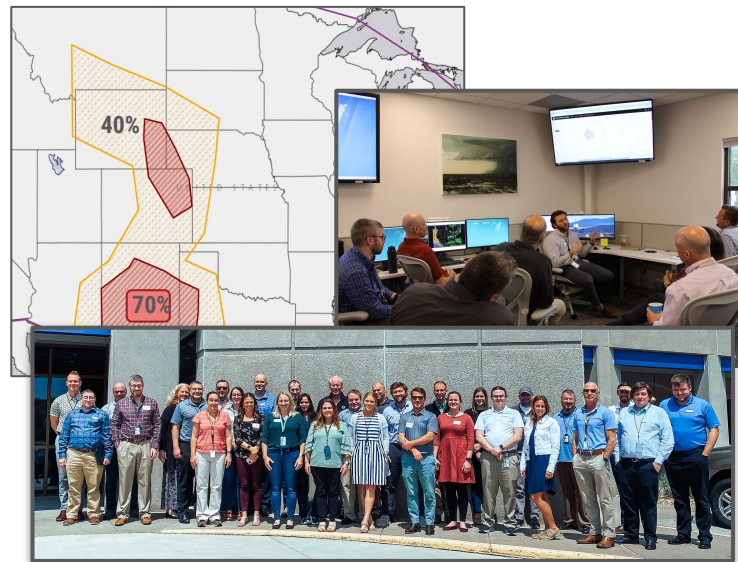
Probabilistic Products at AWC – Winter Weather Dashboard

- Decision support for FAA air traffic managers and operational meteorologists to coordinate long range strategic winter weather planning
- Convey impacts due to potential snowfall accumulation, freezing rain accumulation, or visibility restrictions
- Current operational version driven by SREF input
- New version utilizing GEFS input in development as part of AviationWeather.gov upgrade

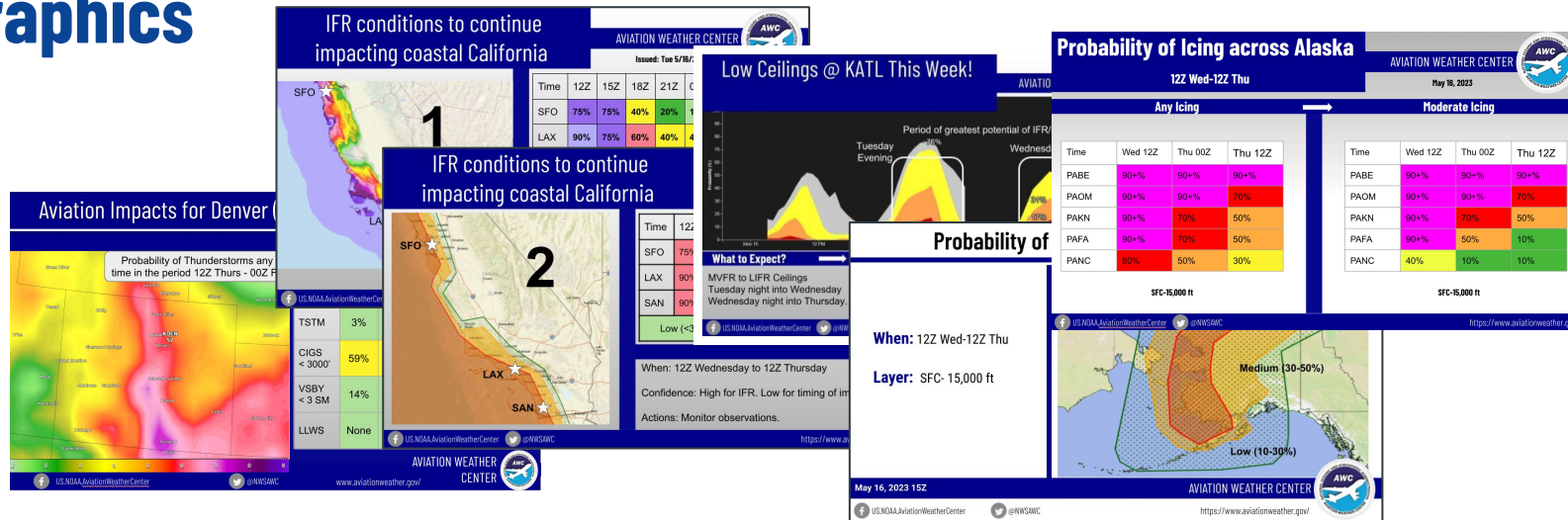


2023 Experiment Investigated Probabilistic Guidance for Aviation Hazards

- Probabilistic Guidance & Use
- How do forecasters utilize probabilistic guidance (NBM, HREF, GEFS) for aviation?
- Explore using non-deterministic methods for communicating aviation hazards
 - Assigning probabilities, incorporation of model uncertainty, forecaster confidence
- Focus on GA planning beyond the TAF forecast period
 - IFR, Turbulence, Icing



Participants Were Tasked to Create Probabilistic IDSS Graphics



1 IFR conditions to continue impacting coastal California

Time	12Z	15Z	18Z	21Z
SFO	75%	75%	40%	20%
LAX	90%	75%	60%	40%

2 IFR conditions to continue impacting coastal California

Time	12Z
SFO	75%
LAX	90%
SAN	90%

What to Expect? MVFR to LIFR Ceilings Tuesday night into Wednesday Wednesday night into Thursday. Confidence: High for IFR. Low for timing of impacts. Actions: Monitor observations.

Probability of Icing across Alaska

Time	Any Icing			Moderate Icing		
	Wed 12Z	Thu 00Z	Thu 12Z	Wed 12Z	Thu 00Z	Thu 12Z
PABE	90+%	90+%	90+%	90+%	90+%	90+%
PAOM	90+%	90+%	70%	90+%	90+%	70%
PAKN	90+%	70%	50%	90+%	70%	50%
PAFA	90+%	70%	50%	90+%	50%	10%
PANC	80%	50%	30%	40%	10%	10%

When: 12Z Wed-12Z Thu
Layer: SFC-15,000 ft

Medium (30-50%)
Low (10-30%)

Aviation Impacts for Denver

Probability of Thunderstorms any time in the period 12Z Thurs - 00Z Fri

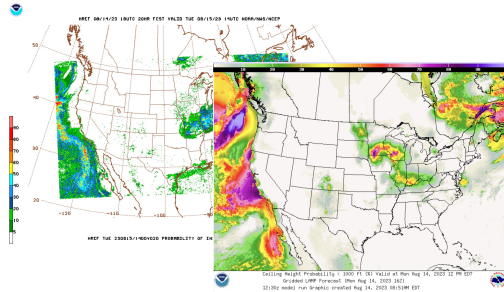
- TSTM: 3%
- CIGS < 3000': 59%
- VSBY < 3 SM: 14%
- LLWS: None

overall goal was to explore the use of probabilistic data...graphics were a catalyst to achieve that!

Key Findings: Forecasters Need More Probabilistic Data for Aviation Hazards

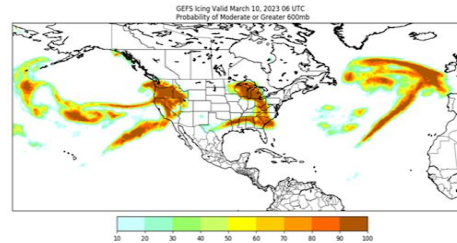
Ceiling and Visibility

- No data beyond 48 hours
- GLMP, HREF, SREF



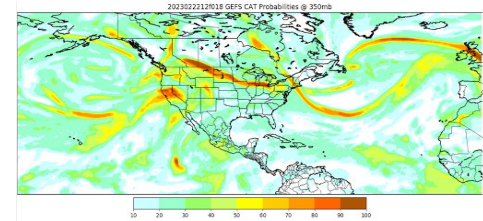
In Flight Icing

- No available operational data
- GEFS (experimental)

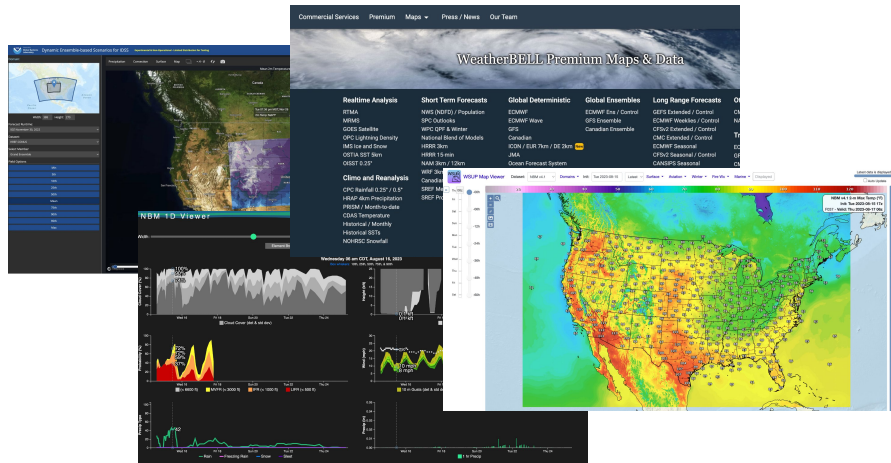


Turbulence

- No available operational data
- Graphical Turbulence Guidance using the GEFS (experimental)



Key Findings: Aviation Forecasters Need More Intuitive Visualization Tools



Common Operating Platform

Optimize Ensemble Based Forecasting for Aviation

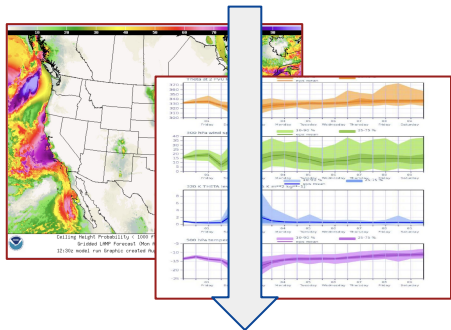
Access



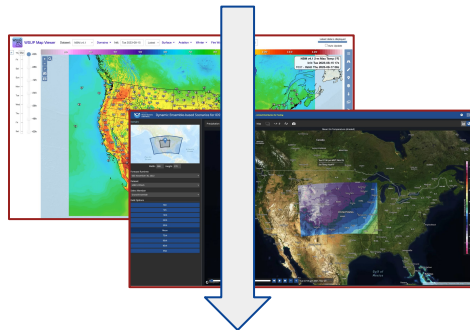
Efficiency



Effectiveness



Data



Visualization



Implementation

Some Final Takeaways and Questions

- Where do we invest our future efforts?
- What are potential model development issues/roadblocks?
- How will the RRFS implementation affect the available model data for aviation hazards?





Thank You!



Jack Lind

john.lind@noaa.gov

