Enhancing Ceiling and Visibility Capabilities in the Helicopter Emergency Medical Services (HEMS) Tool

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HEMS Overview

➢ **H**elicopter & **E**mergency **M**edical **S**ervices (HEMS) Tool

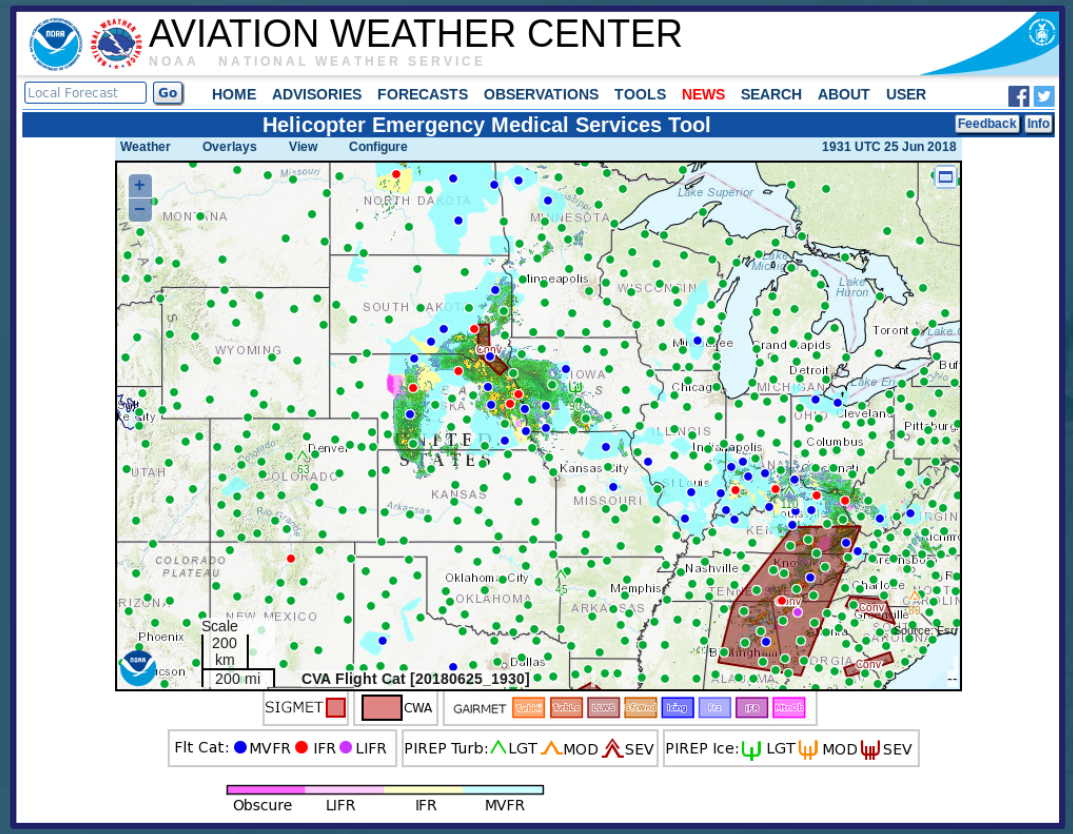
- Designed to show weather conditions for short-distance and low-altitude flights that are common for the Helicopter Air Ambulance (HAA) community

Completed an evaluation of various ceiling and visibility (C&V) analyses products (Nov 2018)

- **NCVA** → current analysis in operational HEMS Tool
- **RTMA-RU** → 15 min analysis in experimental HEMS Tool
- **GLMP** → 15 min analysis

Also looked at forecast capability of C&V

- **GLMP** → 15 min updated forecasts in experimental HEMS Tool



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Multiple collaborative partners that contribute to HEMS

Earth **S**ystems **R**esearch **L**aboratory/**G**lobal **S**ystems **D**ivision
Model development, quality assessment of analysis

Aviation **W**eather **C**enter
Web Platform, data collection and display, user interaction

Meteorological **D**evelopment **L**aboratory (MDL) and the **E**nvironmental **M**odeling **C**enter (EMC)
Model development and integration

Aviation **W**eather **R**esearch **P**rogram (AWRP) / **A**viation **W**eather **D**emonstration & **E**valuation (AWDE)
End-user evaluations

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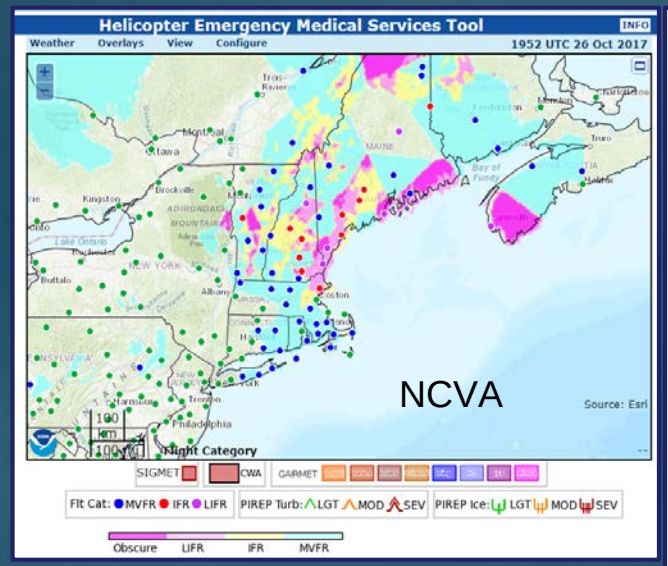
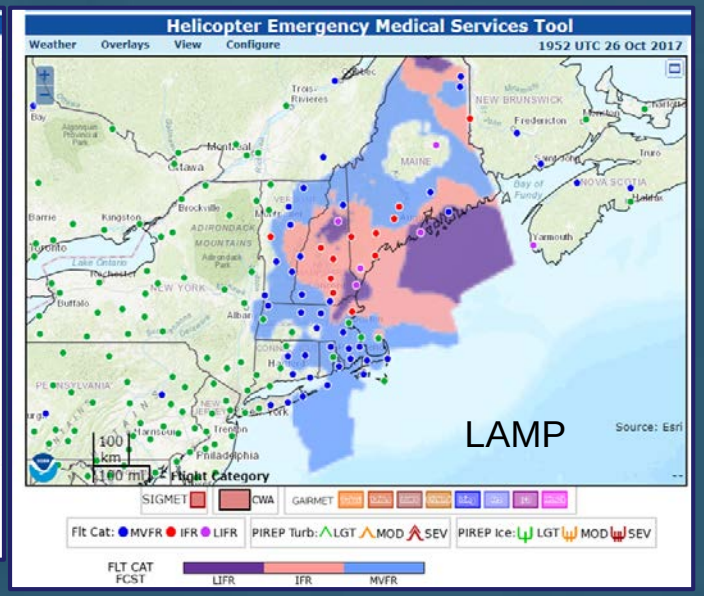
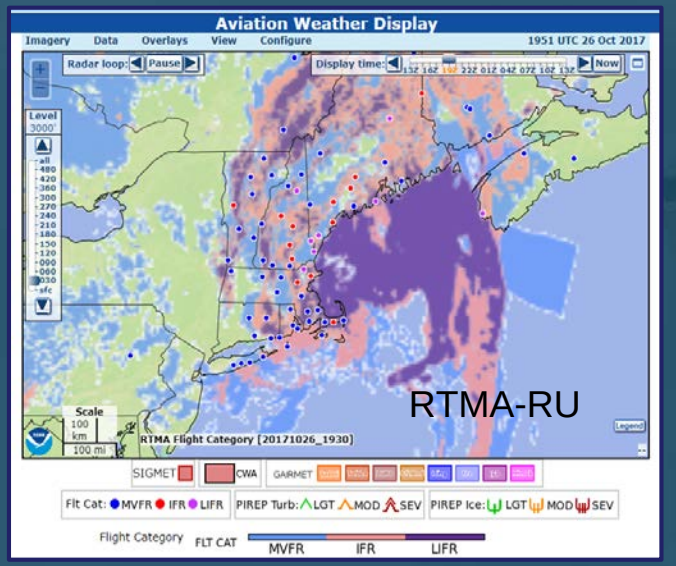
HEMS C&V Evaluation

➢ Evaluation of ceiling and visibility guidance completed Nov 2018:

- Quality Assessment of C&V Components (GSD)
- Focus Group Evaluation (FAA AWDE)
- Latency and Uptime Statistics (AWC)
- Public Evaluation (AWC)







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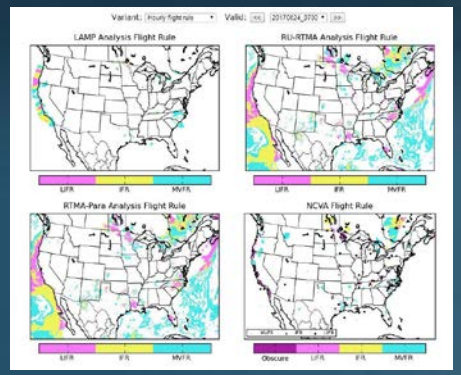
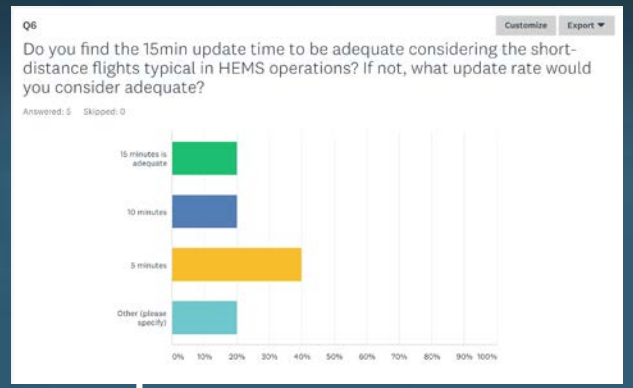
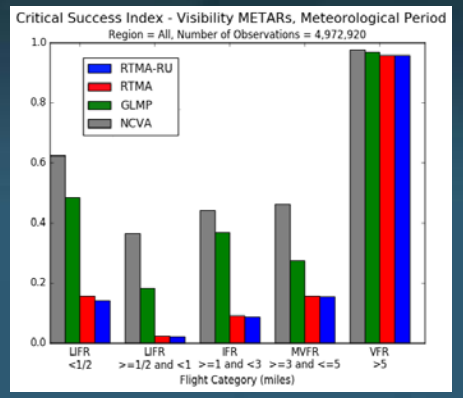
Analysis Evaluation Timeline



August 2017



Jan-Mar 2018



May-Aug 2018

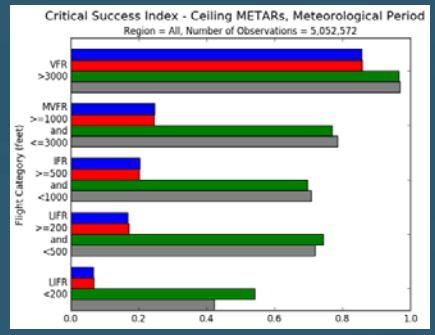
December 2017

March 2018

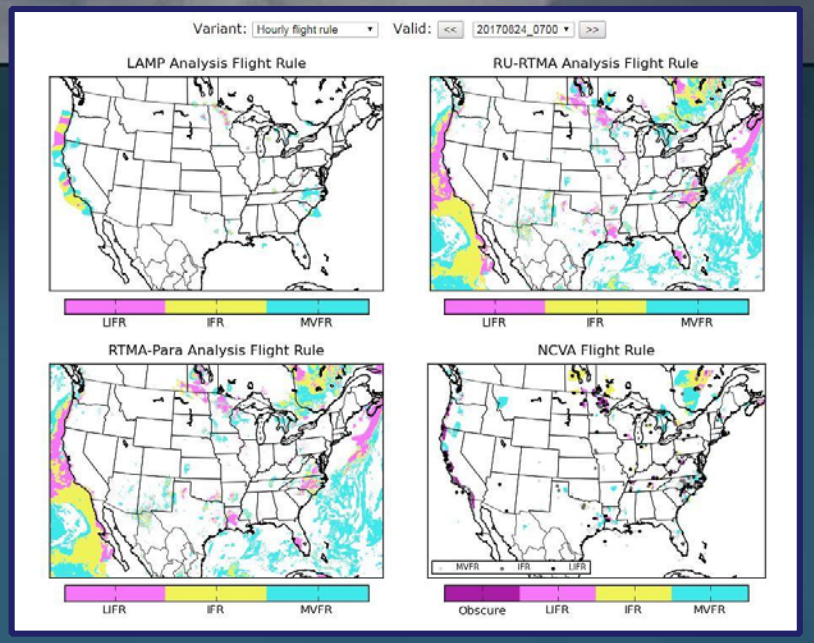
Average latency and product counts

product	datalatency	count
LAMP15	-0.27	4224
NCVA	0.47	12663
RTMA	49.99	1056
RTMA-RU	17.43	4223

Jan-Apr 2018



User Evaluations



- User Survey
  - Users were happy with the display; felt the analysis coverage and thresholds were adequate
  - Users noticed instances when the analysis (RTMA-RU) and METARS did not match up
  - Concerned about the latency and thus accuracy of the product.

- Focus Group Evaluation with FAA Aviation Weather Demonstration and Evaluation (AWDE) Services
  - Users preferred RTMA-RU and RTMA over the LAMP and NCVA graphics
  - 15 minute updating time is adequate, but would prefer 5 minutes
  - Users rank the importance of Visibility and Ceiling analysis above the combined product of Flight Category
  - Users may also want to see more cloud information (few, sct)

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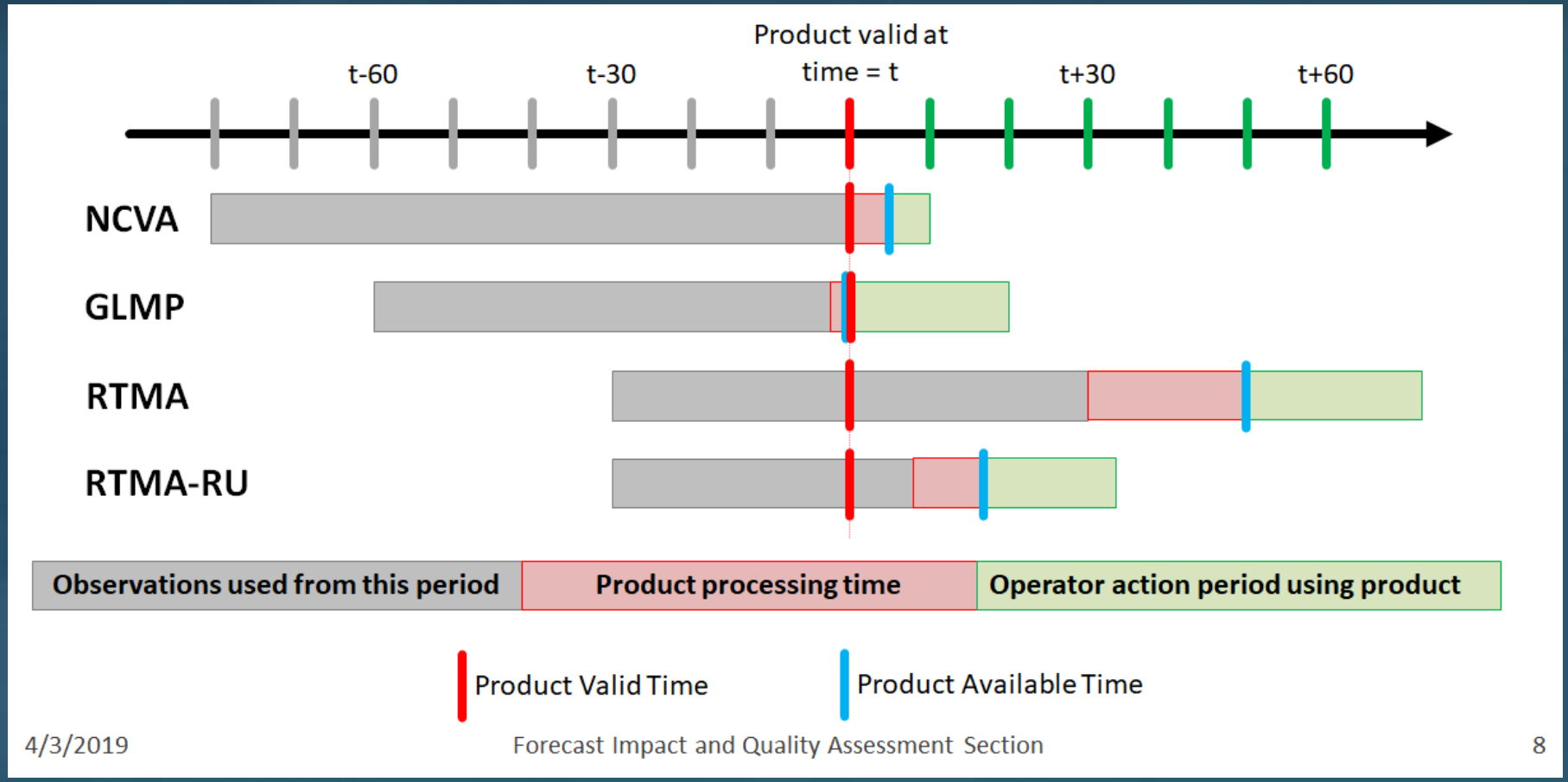
Latency Tracking

- Latency is the difference between the product valid time and the product available time. It varies based on which observations are used and how long it takes to process them.



Latency Tracking

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- After product receipt, additional latency is added for posting the product on the web

RTMA-RU

cycle	grib2	web	datalatency	weblatency
2018-06-26 16:00:00	2018-06-26 16:17:42	2018-06-26 16:19:07	17	19
2018-06-26 15:45:00	2018-06-26 16:02:07	2018-06-26 16:04:11	17	19
2018-06-26 15:30:00	2018-06-26 15:46:47	2018-06-26 15:48:06	16	18
2018-06-26 15:15:00	2018-06-26 15:32:55	2018-06-26 15:34:07	17	19
2018-06-26 15:00:00	2018-06-26 15:17:27	2018-06-26 15:19:06	17	19
2018-06-26 14:45:00	2018-06-26 15:02:06	2018-06-26 15:04:12	17	19

Analysis Product	Average Web Latency	Issuance Frequency
LAMP	2 min	Every 15 min
RTMA-RU	19 min	Every 15 min
NCVA	2 min	Every 5 min

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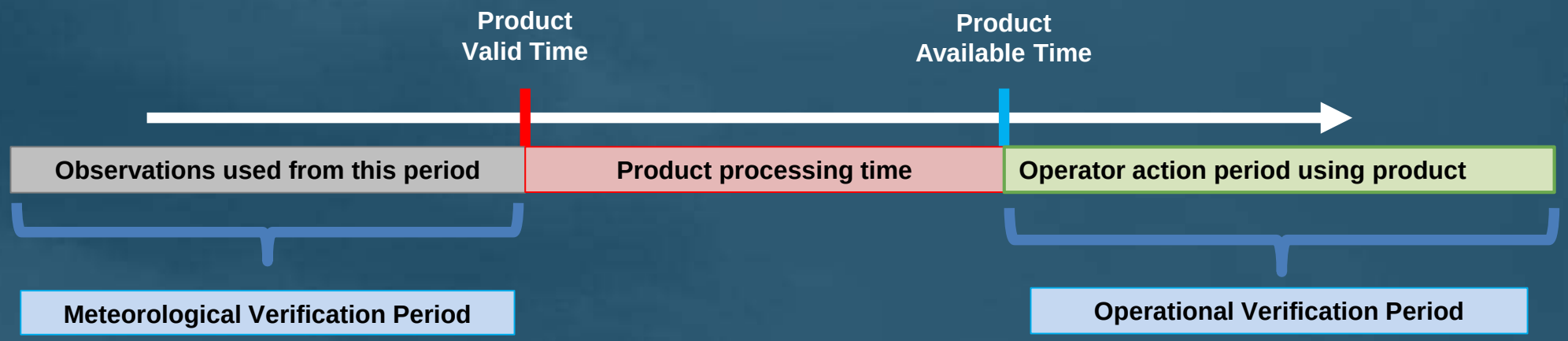
Quality Assessment

- GSD Quality Assessment - Product Development Team (QA-PDT) completed a quality assessment of the different analyses
  - NCVA (5 min), GLMP (15 min), RTMA (1 hr), & RTMA-RU (15 min)
  - Cool & Warm season verification
  - Two methods (Meteorological & Operational periods of verification)



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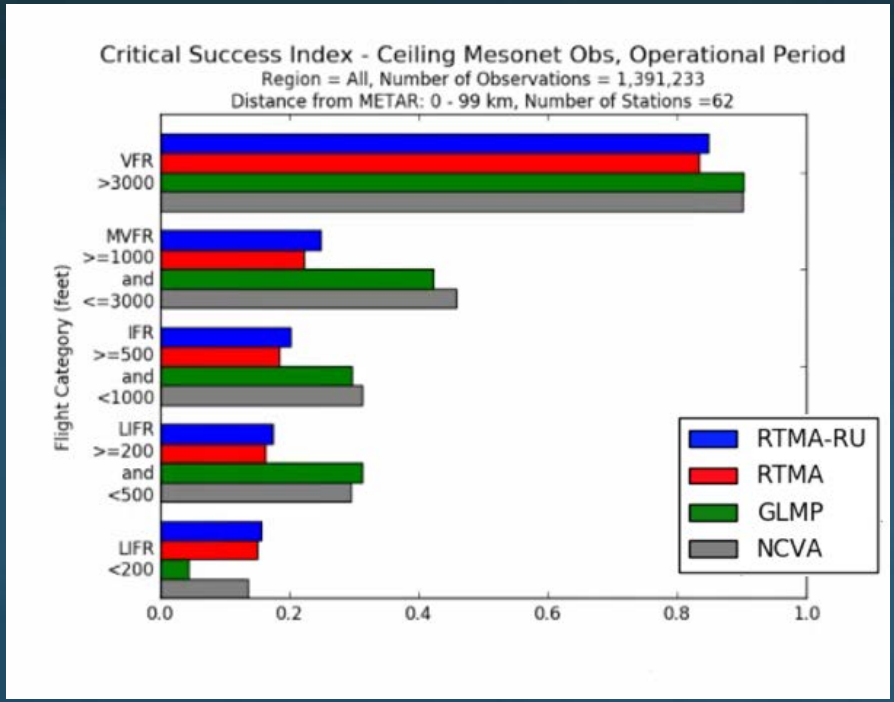
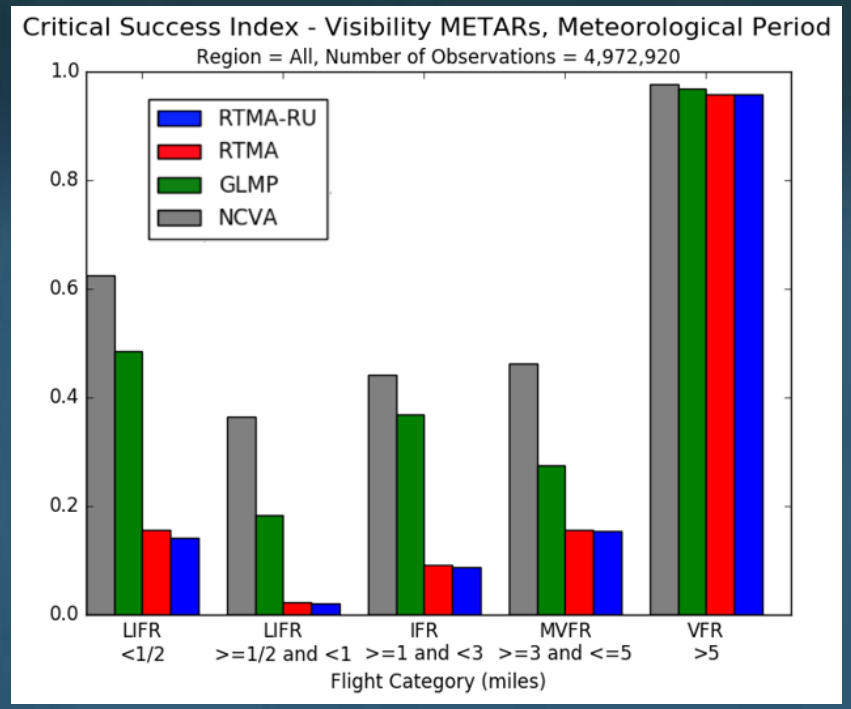
Quality Assessment Results



Ceiling: NCVA and GLMP were top performers; results similar between warm and cool season



Visibility: NCVA was closest match to the METARs; GLMP was second best.

- The overall results between NCVA and GLMP were generally very close
- GLMP tends to limit coverage areas while maintaining higher accuracy rates

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Other Considerations

- GLMP is an operational system
  - NOAA and FAA support continued improvements
  - Part of NCEP operational suite
  - Contributing member to National Blend of Models (NBM)
- GLMP has a forecast component that can be integrated into the HEMS tool in the future
- NCVA is a homegrown analysis run and maintained by AWC
  - No support for maintenance or upgrades
  - Legacy data ingest format (from GOES) is becoming obsolete
  - External data access not available

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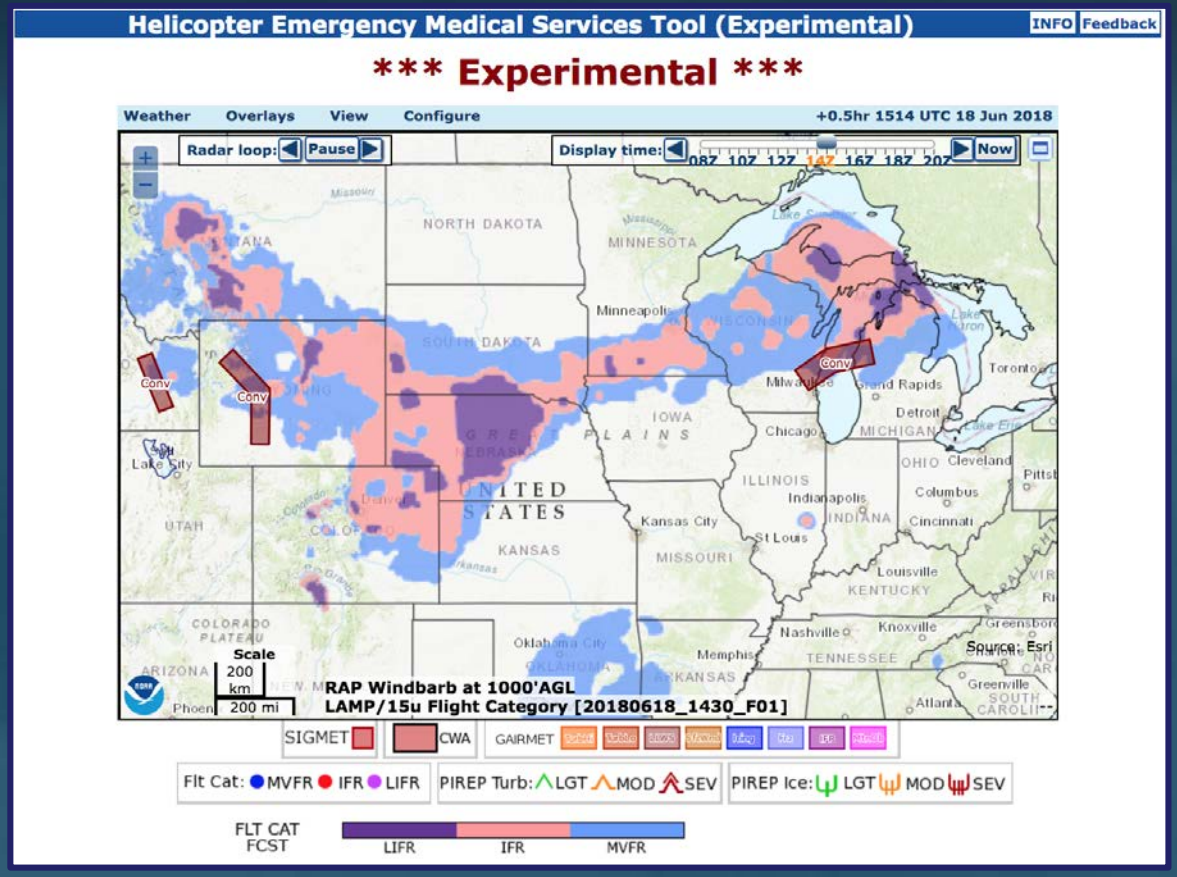
Summary & Conclusions

- **NCVA**
  - Highest temporal resolution (every 5 min) and low latency
  - Low spatial resolution and “blocky” look.
  - Best accuracy performance
  - Not supported as NCEP operational model
- **RTMA-RU**
  - Adequate temporal resolution (every 15 min), but high latency (19 min)
  - High spatial resolution and best appearance
  - Low accuracy performance
- **GLMP Analysis**
  - Adequate temporal resolution (every 15 min) and low latency
  - High spatial resolution and good appearance
  - High accuracy performance
  - Supported as NCEP operational model and will continue to improve
  - Has forecast component that can be integrated into the HEMS tool in the future

- ***GLMP** Analysis as the most suitable option for enhancing ceiling and visibility analysis in the HEMS tool*
- *Transition to operations is planned for FY2020*

Other Findings and Recommendations
FAA User Evaluations



- A three-hour C&V forecast received an average rating of 4.4 out of 5 for effectiveness in supporting decision making.
- GLMP provides 1 hour forecasts that refresh every 15 minutes (always valid at the top of the hour)
- Recommendations:
  - *Increase temporal resolution of the forecast to 15 min*
  - *Add looping capability*

Other Findings and Recommendations
FAA User Evaluations

- Tool Usability Recommendations:
  - Improve time slider, valid time markings, and looping controls
  - Improve colors and legends
  - “HELP” not “INFO”
  - Improvements to information overlays
- Provide a portable version of the tool that can be accessed while in-flight.
- Include the capability to see the freezing level.
- Include turbulence forecasts.
- Increase the weather products to provide information up to 9000 AGL.

Other Findings and Recommendations
FAA User Evaluations

- Change the name of the tool
  - Not only used by HEMS Pilots but also general aviation, crop duster, and forest service pilots, to name a few.
  - May get more use if the name is more generic.
- Favorite Name Suggestions:
  - **N**ear **E**arth **A**viation **T**ool (NEAT)
  - **N**ear **E**arth **W**eather **T**ool (NEWT)
  - **L**ow **A**ltitude **O**perator **T**ool (LAOT)
  - **W**eather **I**nformation **F**or **F**light in **L**ow-levels (WIFFL)
- *NOTE: FAA will issue a formal requirement letter for name change and usability recommendations*

Next Steps for C&V info in HEMS

- GLMP Analysis operational implementation:
  - Software changes, e.g. add possible terrain obscuration to GLMP
  - Safety Risk Management Process
  - Update documentation and facilitate user interaction

- Continue GLMP development:
  - Add more observation sources
  - Increase analysis update rate to every 5 minutes
  - Continue to improve forecast accuracy for ceiling, visibility, and sky cover.
  - Additional analysis of GLMP forecast (0-3 hrs) utility in HEMS tool
  - Increase the temporal resolution of the forecast to 15 minutes (0-3 hrs)

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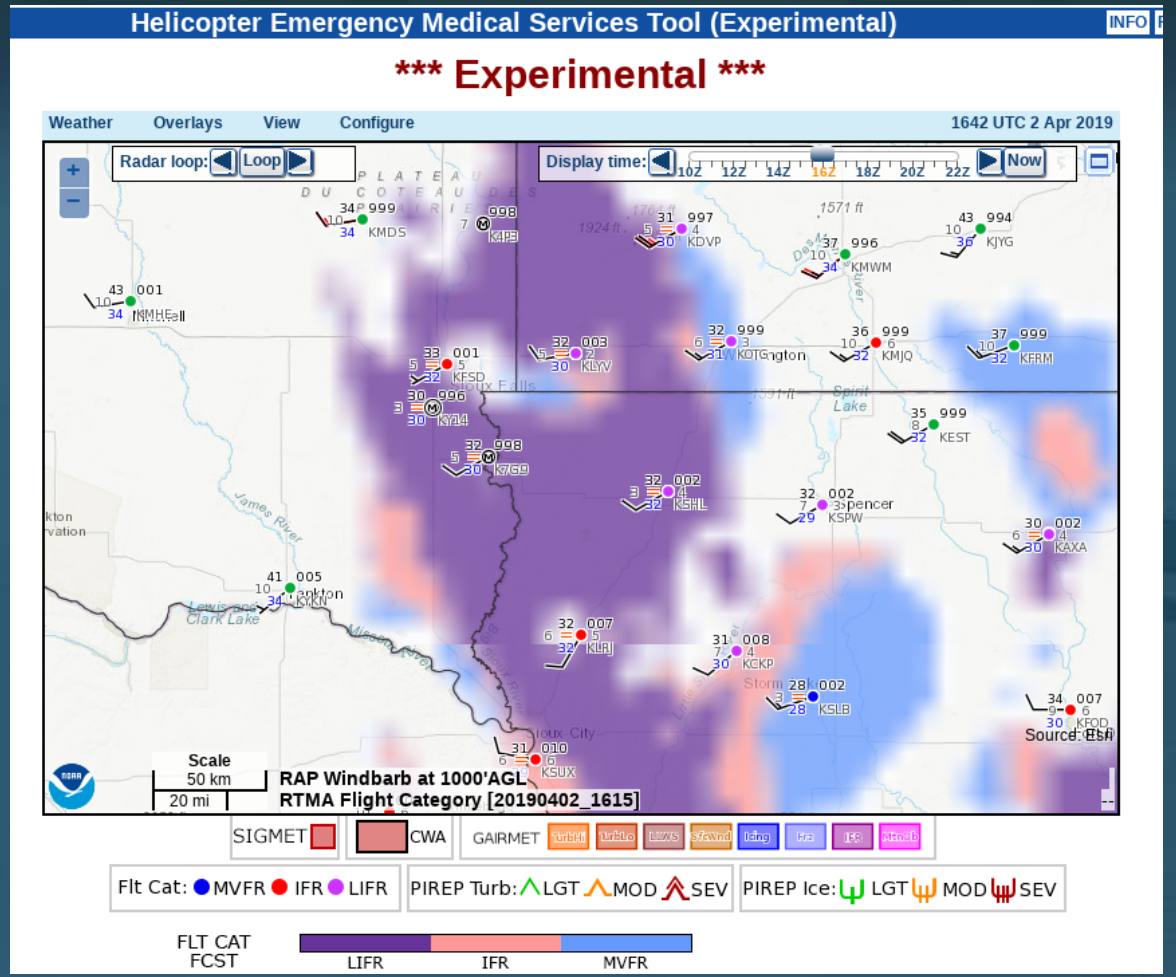
AWC Planned Work for 2019

- Evaluate current MADIS station data set, including mesonet stations with ceiling and visibility, temperature, dewpoint, and winds to determine utility to website
- Investigate QC flag filtering by MADIS to determine best usability for AWC web tools
- Implement internal QC filtering on the MADIS data using the metadata provided by the stations for internal testing and evaluation



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Thank you!

Questions?

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