Assessment of RRFS Based Cloud Forecasts at the Aviation Weather Testbed

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What is the Aviation Weather Testbed?

The Aviation Weather Testbed (AWT) is a research entity within the NCEP Aviation Weather Center (AWC) dedicated to *developing*, *evaluating* and *implementing* the latest tools and innovations to improve aviation forecasting and safety in the National Airspace System (NAS).

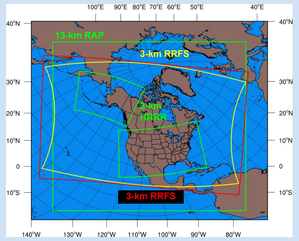
We facilitate repeatable & efficient research to operations and operations to research by leveraging strong external partnerships.

2023 AWT Spring Experiment

Running May 15-19, the 2023 AWT Spring Experiment brought together NWS WFO/CWSU meteorologists with researchers and model developers from around the aviation weather enterprise.

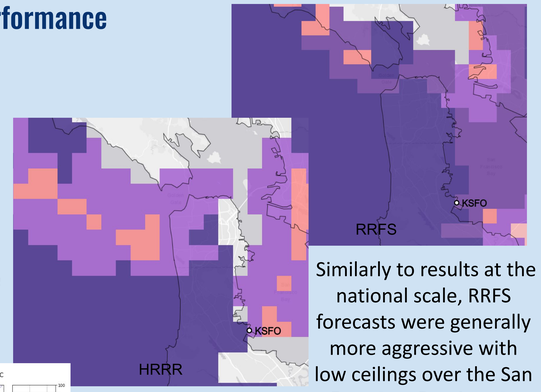
Model forecasts were viewed by participants both in AWIPS, as well as a newly developed data viewer on the AWT website, which allowed for side by side comparisons of forecasts from different models.

A main focus of the experiment was to assess forecasts of clouds, ceiling, and visibility from the experimental Rapid Refresh Forecast System (RRFS) in comparison to current operational modeling systems, such as the High Resolution Rapid Refresh (HRRR) and the High Resolution Ensemble Forecast (HREF).

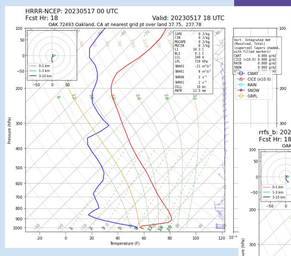


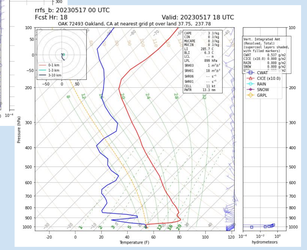
SFO Forecast Performance

Operations at San Francisco International Airport (SFO) can be heavily affected by frequent low ceilings. When assessing model forecasts, special attention was paid to ceiling forecasts for the San Francisco Bay Area.

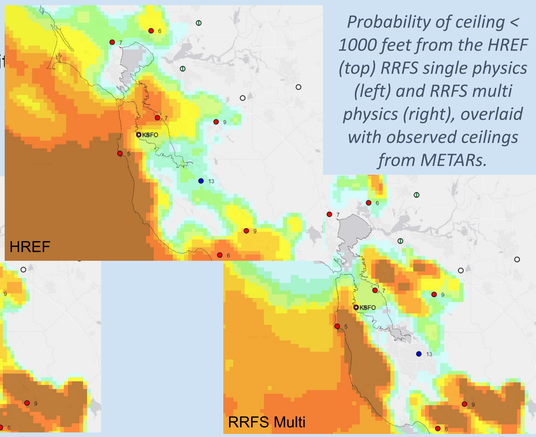


Similarly to results at the national scale, RRFS forecasts were generally more aggressive with low ceilings over the San Francisco Bay Area in comparison to the HRRR (above). Model forecast soundings (left; provided by GSL) show a cooler/more moist near surface environment in the RRFS, leading to a stronger inversion and a later clearing time of low ceilings over the Bay Area.

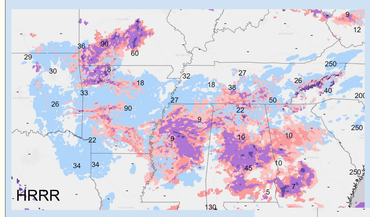




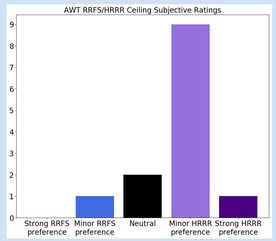
Ensemble ceiling probabilities over SFO (below) were indicative of the more aggressive nature of the RRFS single physics configuration, allowing it to achieve high POD, at the cost of a slightly higher FAR.



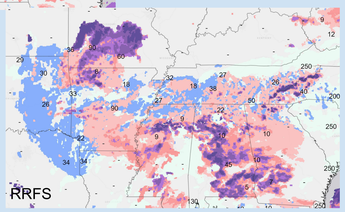
Ceiling Forecasts

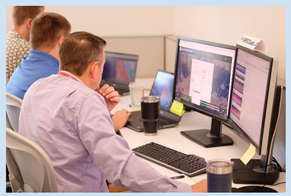


Throughout the week, participants evaluated previous day RRFS and HRRR forecasts against observations. For ceilings, there was generally a slight preference for the more conservative HRRR forecasts.

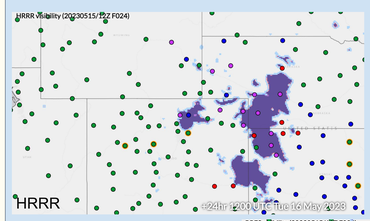


RRFS deterministic forecasts of low ceilings were generally slightly more aggressive, especially for IFR category and lower, in comparison to the HRRR.

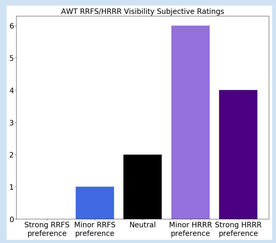




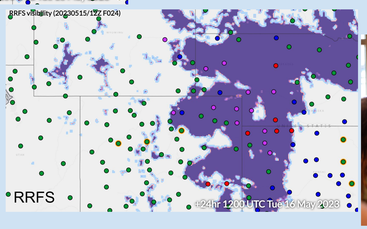
Visibility Forecasts

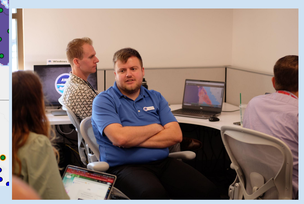


There was generally a stronger preference for HRRR visibility forecasts among participants in comparison to ceiling, though one participant preferred the more aggressive, high POD RRFS forecasts.



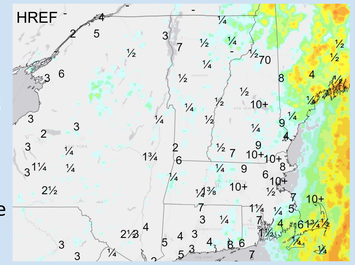
RRFS deterministic forecasts were very aggressive with visibility restrictions due to the development of fog, perhaps indicative of a cool/moist model bias.

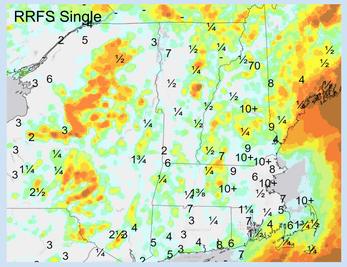


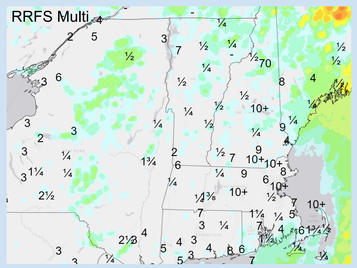


Ensembles

Two different configurations of potential ensembles for RRFS were evaluated throughout the week. One ensemble utilized a single configuration of model physics packages across all ensemble members, while the other utilized multiple physics package configurations. While additional evaluation is necessary, participants generally found both RRFS configurations to be at least comparable in skill to the HREF with regard to ceiling and visibility.



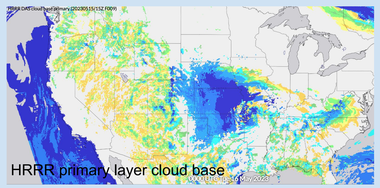


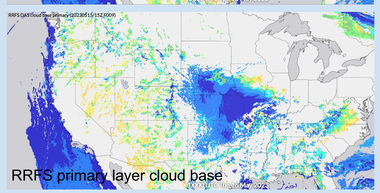


Probability of visibility < 1 mile from the HREF (top) RRFS single physics (left) and RRFS multi physics (right), overlaid with observed visibilities from METARs.

3D Clouds/Digital Aviation Services

Depiction of clouds in a 3D framework is important for detection of cloud layers to help inform TAF generation. AWC has developed an algorithm to produce cloud layer grids from raw model hybrid level cloud fields. Algorithm output using the RRFS as input appears similar to the current operational HRRR input.





The authors would like to thank all of the 2023 AWT Spring Experiment participants and collaborators! You are what make our experiments successful and fun!

Want to learn more about the Aviation Weather Testbed? Scan the QR to the right!

Are you interested in participating in a future AWT experiment?

Contact: robert.hepper@noaa.gov

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