Alaska Ceiling and Visibility Analysis Product Evaluation

NCAR
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Tressa L. Fowler, Jim Cowie, James Pinto, Dan Megenhardt, Gary Cunning, Rita Roberts, Julie Prestopnik, Doug Wesley, Jenny Colavito

National Center for Atmospheric Research, Alaska Aviation Weather Unit, Federal Aviation Administration

Overview

Ceiling and Visibility Analysis

The CVA-AK product is a rapidly-updated, high resolution, gridded product of ceiling and visibility conditions across Alaska, produced from a combination of data sources including model, METAR, and satellite.

The FAA sponsored CVA-AK program has been underway for 2 years. Major scientific and technical efforts include:

Model Calibration (v1.5)
- Reduce model bias.

Satellite cloud mask integration (GOES) v2.0
- Improve ceiling analysis.

Integration of web camera analyses (MIT-LL) v3.0
- Improve visibility analysis.

Ongoing product evaluation
- Direct and inform improvement efforts.

Collaboration with Alaska Aviation Weather Unit
- AAWU is extremely valuable with 'boots on the ground' assessments. Blowing snow, METAR representativeness, etc.

Transfer to EMC – RTMA

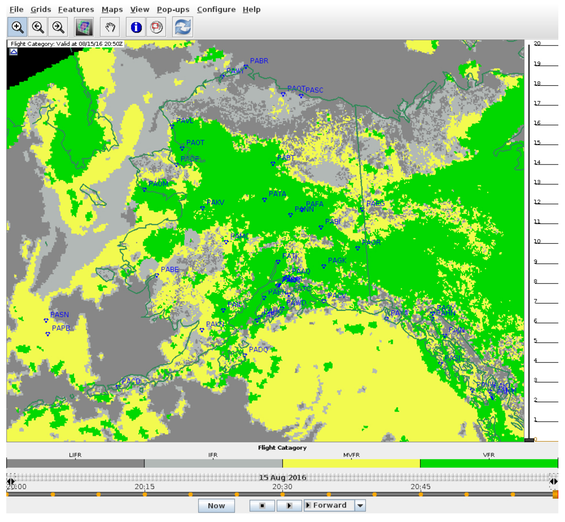

Figure 1: Map showing an example of the CVA-AK product analyzed flight category with overlaid METAR station locations.

Methods

Verification Regions

The six regions typically used for aircraft icing forecasting were also used for the ceiling and visibility evaluation.

Conditions vary widely by region.

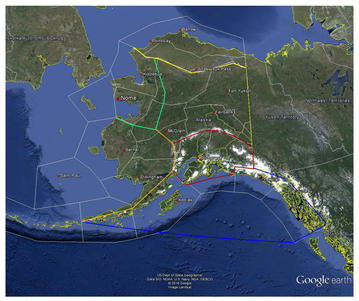

Figure 2: Map showing the six icing regions utilized for verification of the ceiling and visibility product.

Cross-Validation using METARs

METAR information is incorporated into both the ceiling and visibility analyses. Thus, in order to use METAR information for verification, a cross-validation approach is utilized. Fifty stations are held out from the product creation in two batches.

The remaining stations are used to create the product.

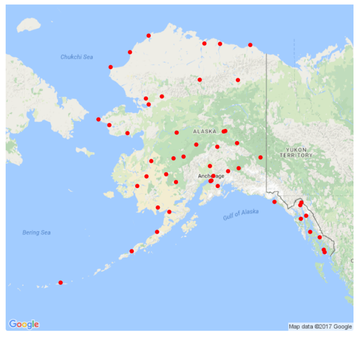

Figure 3: Map showing the fifty stations utilized for verification of the ceiling and visibility product.

Results

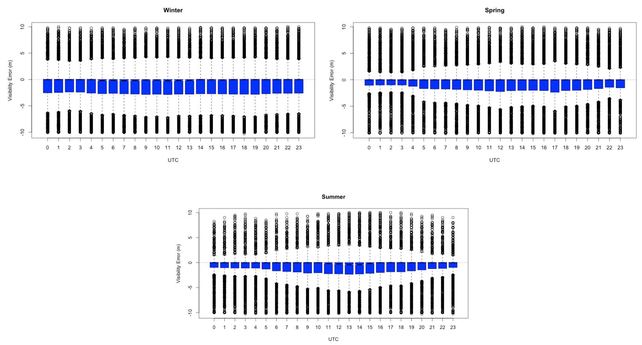

Figure 4: Boxplots of error in CVA visibility analysis product by time of day for each of 3 seasons. Diurnal cycle is evident in spring and summer, but not winter.

Visibility Error Diurnal Cycle

Visibility errors display a diurnal cycle in both spring and summer. No such cycle is evident during winter. Future calibration efforts and / or verification exercises should most likely account for the diurnal nature of the errors during seasons when they are present.

Seasonal Ceiling Comparison

Ceiling categories are correctly identified most frequently in summer and least frequently in winter. Incorporation of the GOES cloud mask improves identification of VFR conditions and degrades identification of MVFR or worse conditions.

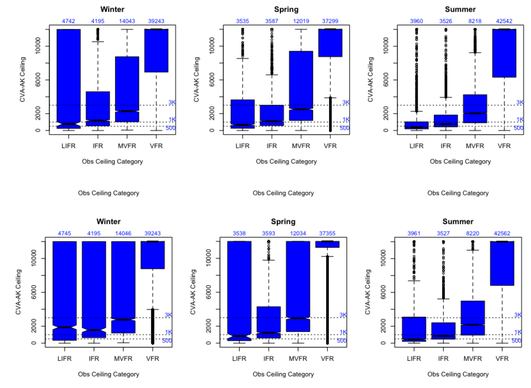

Figure 5: Boxplots showing CVA diagnosed ceiling values (v1.5 top row, v2.0 bottom row) by the observed ceiling category for each season.

Conclusions

Visibility is over-estimated by the CVA-AK product almost across the board (regions, seasons, flight categories).

AT METAR locations, the cloud mask improves VFR detection and degrades MVFR or worse detection by small amounts. Though both are small changes in the percentage correct, more cases are VFR while important cases are IFR-.

AAWU staff believe that the GOES cloud mask appropriately clears the Gulf of Alaska much of the time. This cannot be quantified in our evaluation, but suggests ongoing use of GOES cloud mask.

Users and decision makers must determine whether the cloud mask improvements in VFR justify the degradations in LIFR, IFR and MVFR.

Future Work

- Publish model calibration work.
- Investigate Web Cam visibility estimates.
- Tech transfer to NCEP - EMC / RTMA.
- Update to HRRR.
  - Resolution may help with terrain and land / water boundary issues.
- Investigate slant visibility estimates.
- Crowd source observations.

Disclaimer

**Disclaimer: This research is in response to requirements and funding by the Federal Aviation Administration (FAA). The views expressed are those of the authors and do not necessarily represent the official policy or position of the FAA.