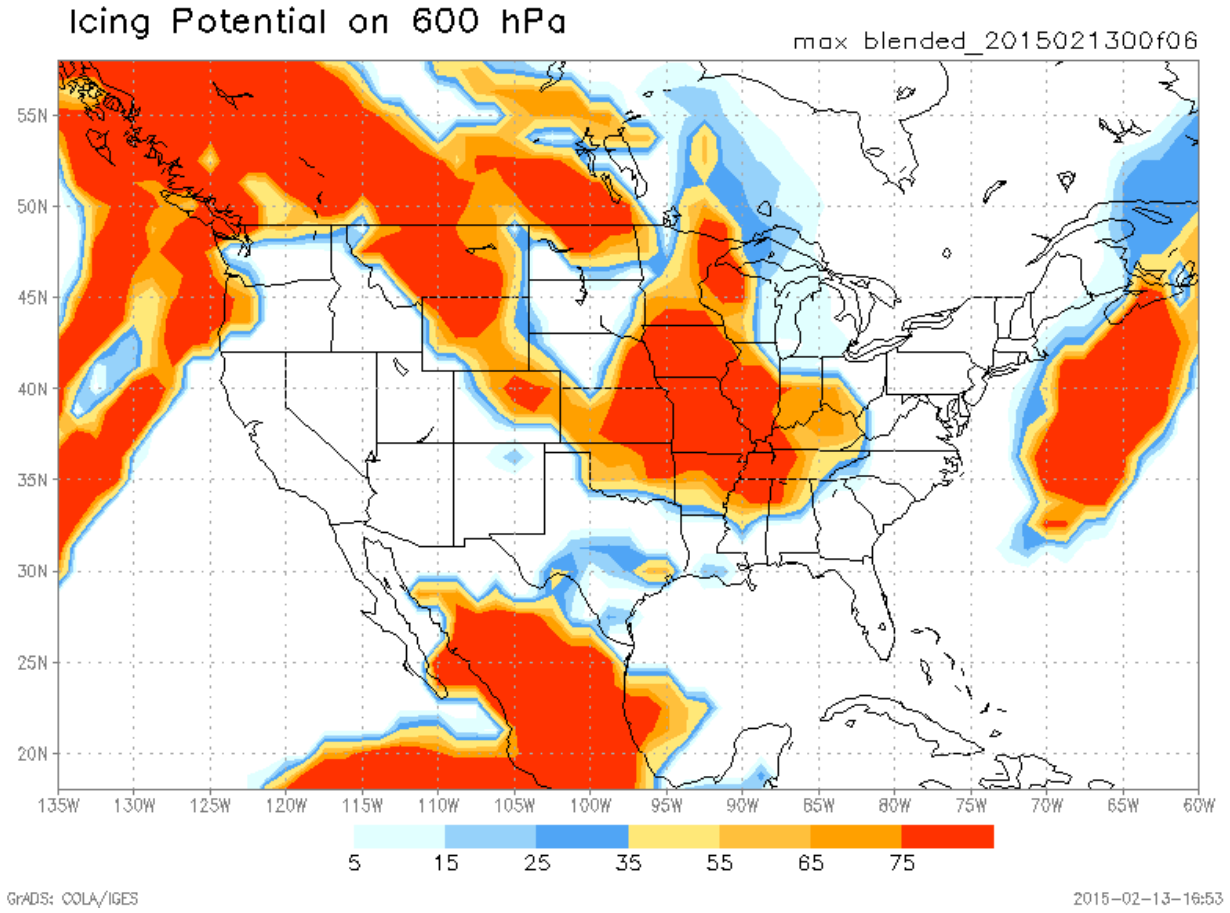
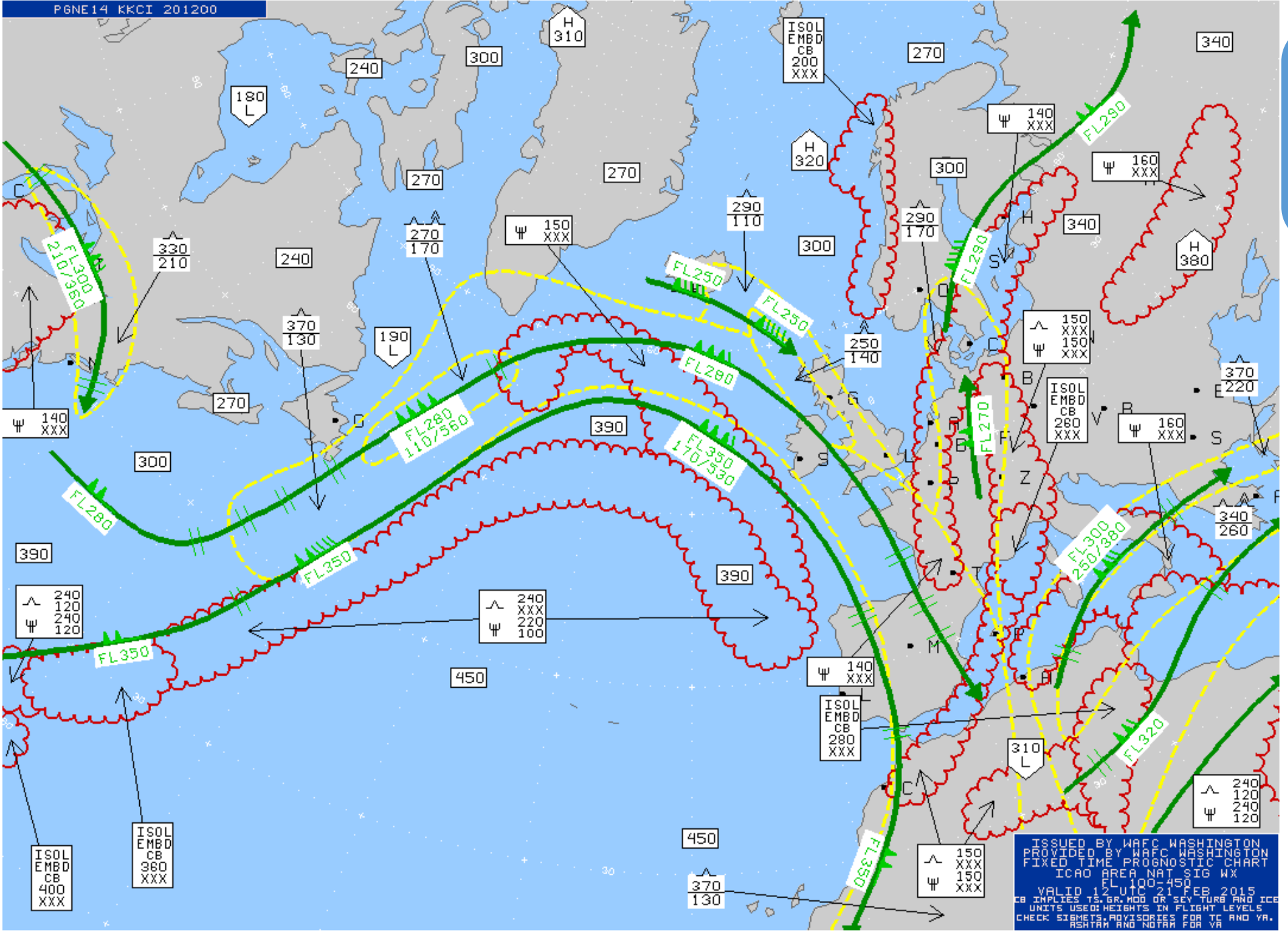
World Area Forecast System Icing Grids



- History
- Current Configuration
- Performance
- Uses
- Future Improvements



Significant WX Chart

- Limited Area
- Only 24hr
- Is Geo-referenced
- Human Drawn

WAFS Gridded Icing Forecasts

- Began in 2008.
- Harmonized with WAFC London data in 2011.
- Approved by FAA in 2012
- Approved by ICAO in 2013

Background Information

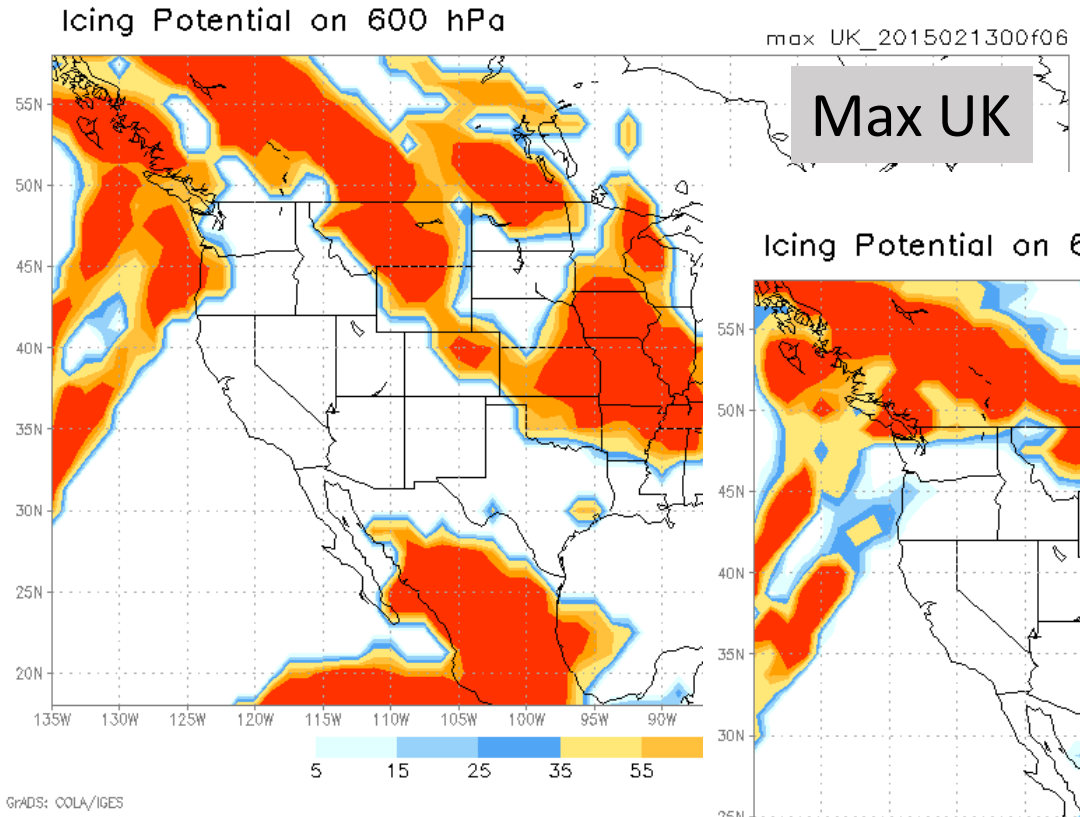
Produced on 1.25 degree grid from native high res grid.

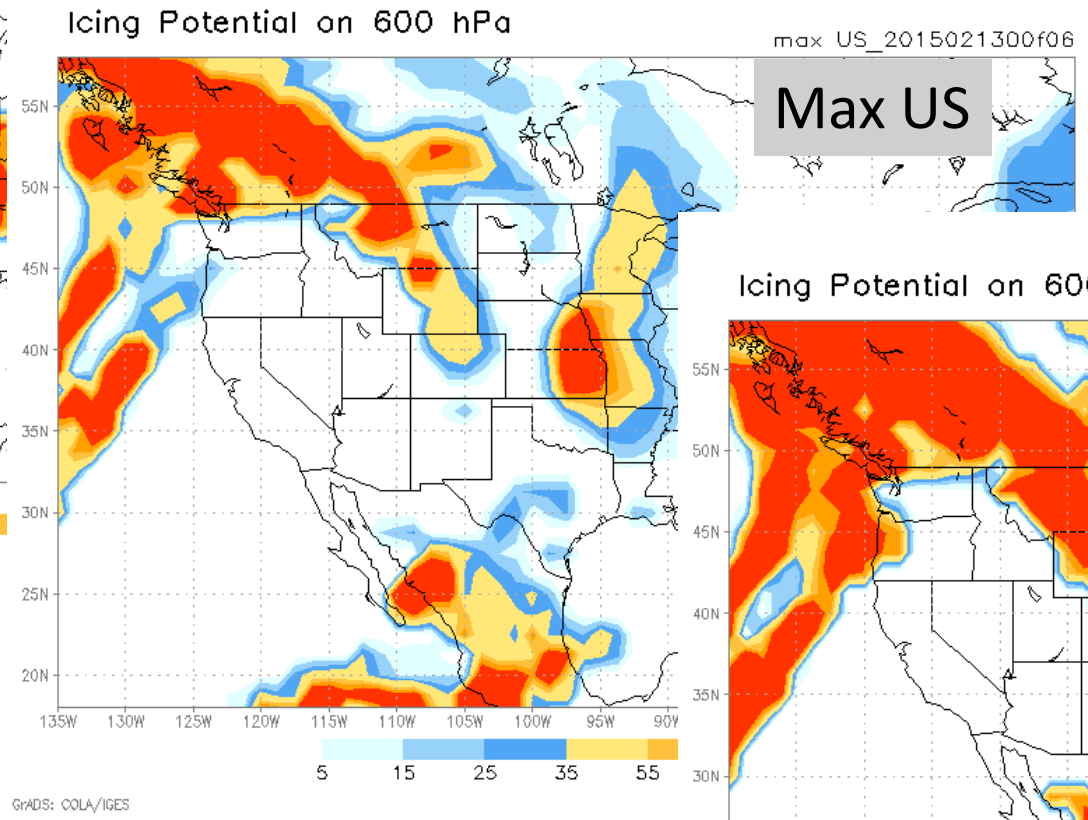
Result is a max and a mean grid from both the US and UK

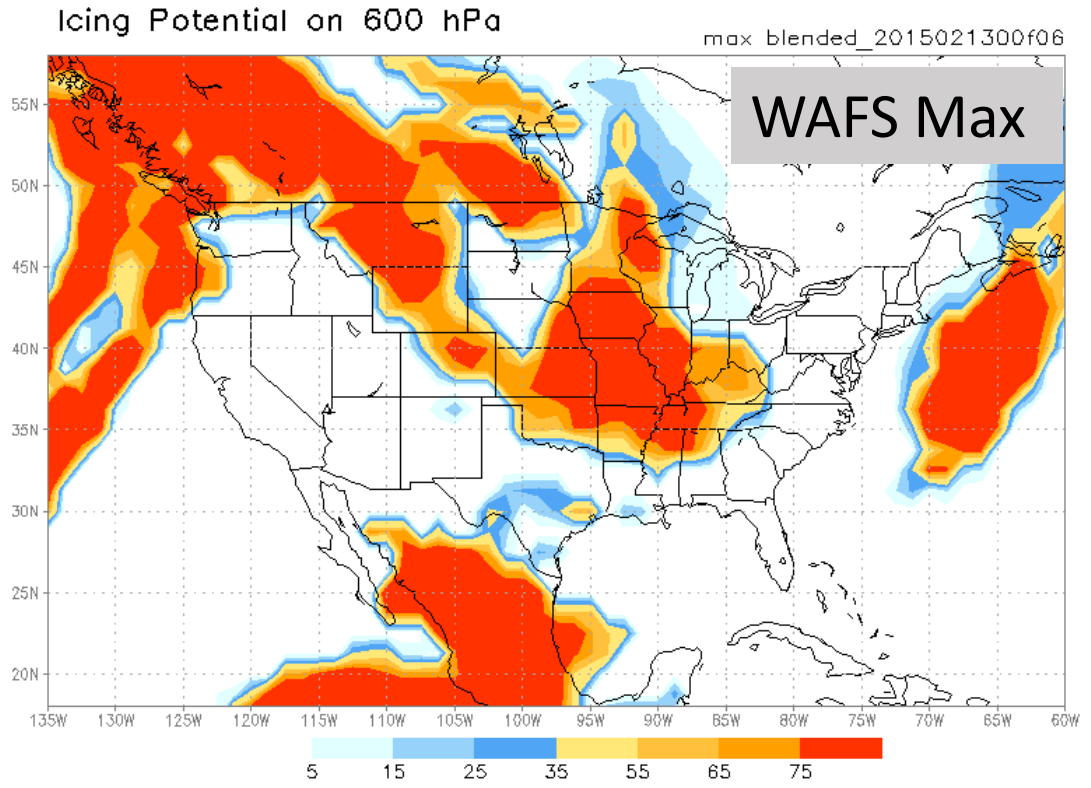
- Max is max of high resolution grids inside each 1.25 grid
  - Will over-forecast
- Mean is mean of high resolution grids inside each 1.25 grid
  - Will under-forecast

Harmonization insures one global source. Result is WAFS Max and Mean Grids.

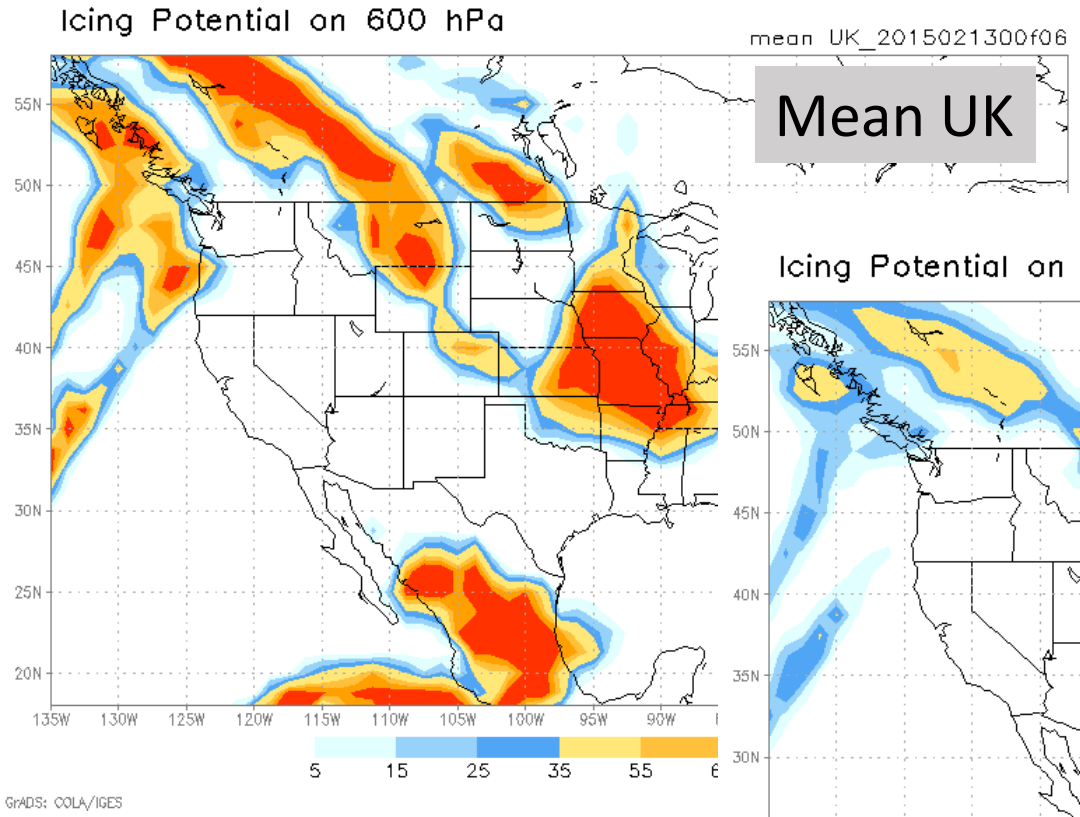
- The WAFS Max grid is the max of the US and UK max grids.
- The WAFS mean grid is the mean of US and UK mean grids.

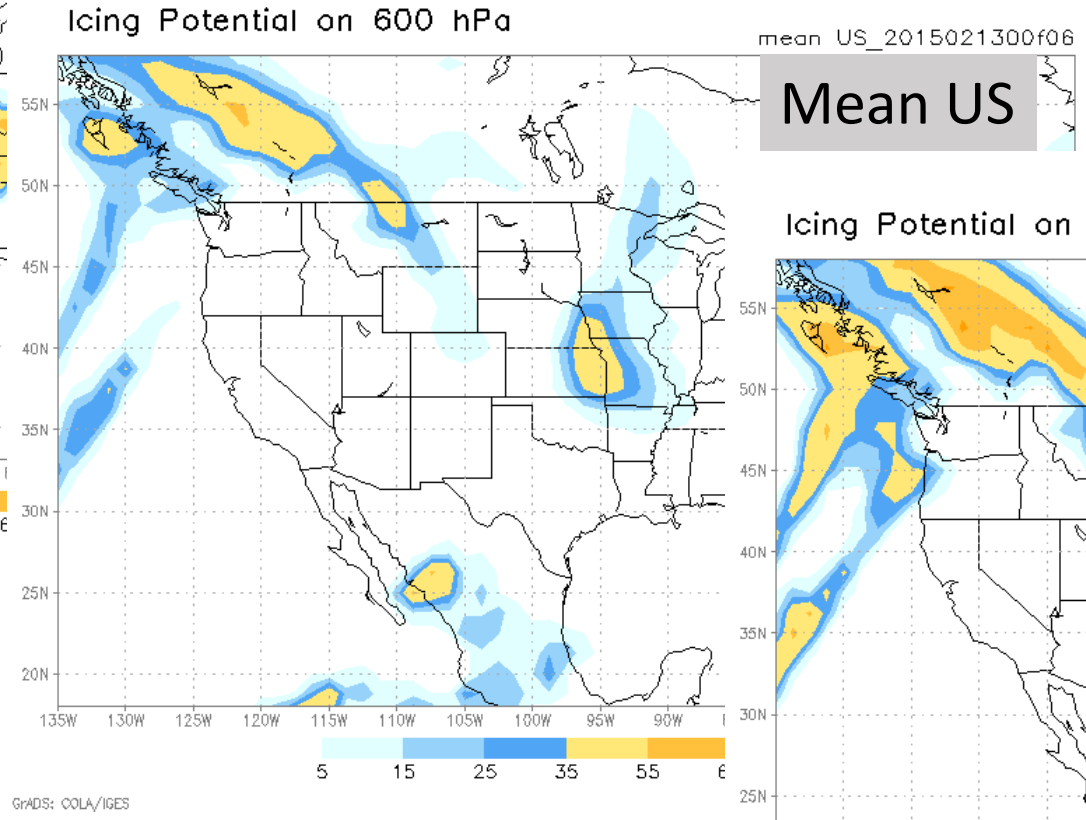


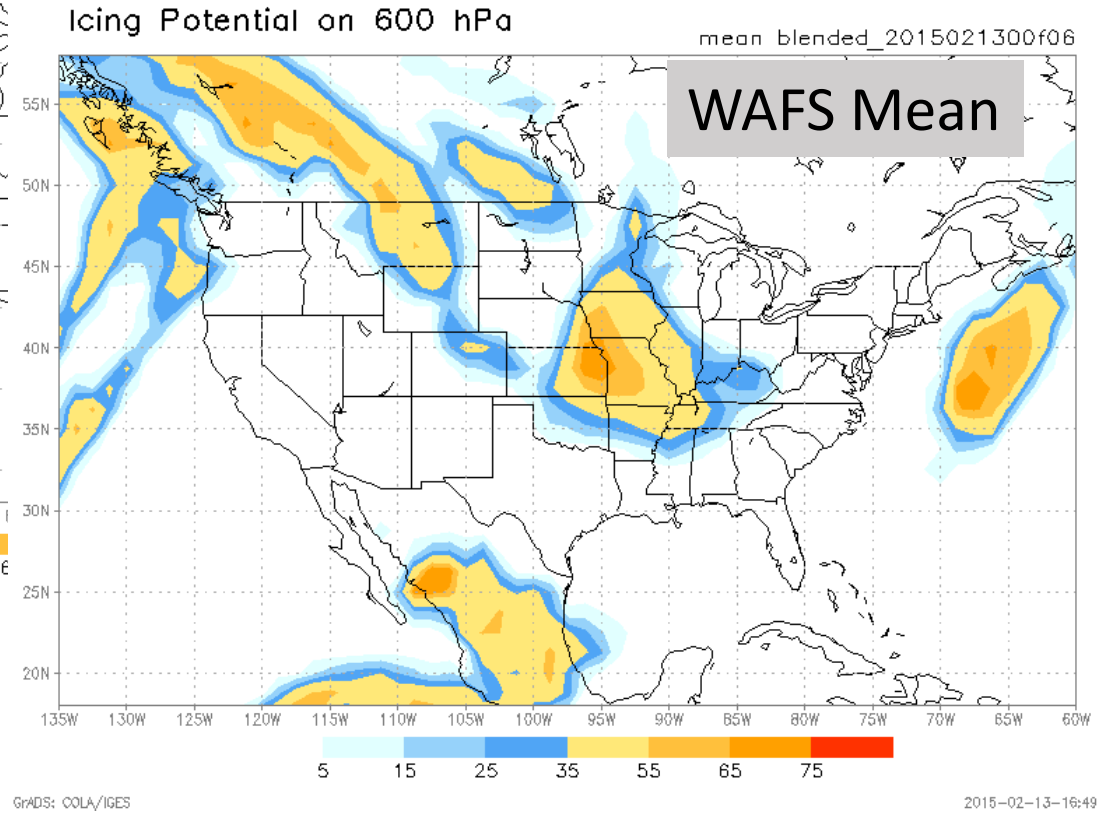




Images Courtesy of Yali Mao, NCEP/EMC







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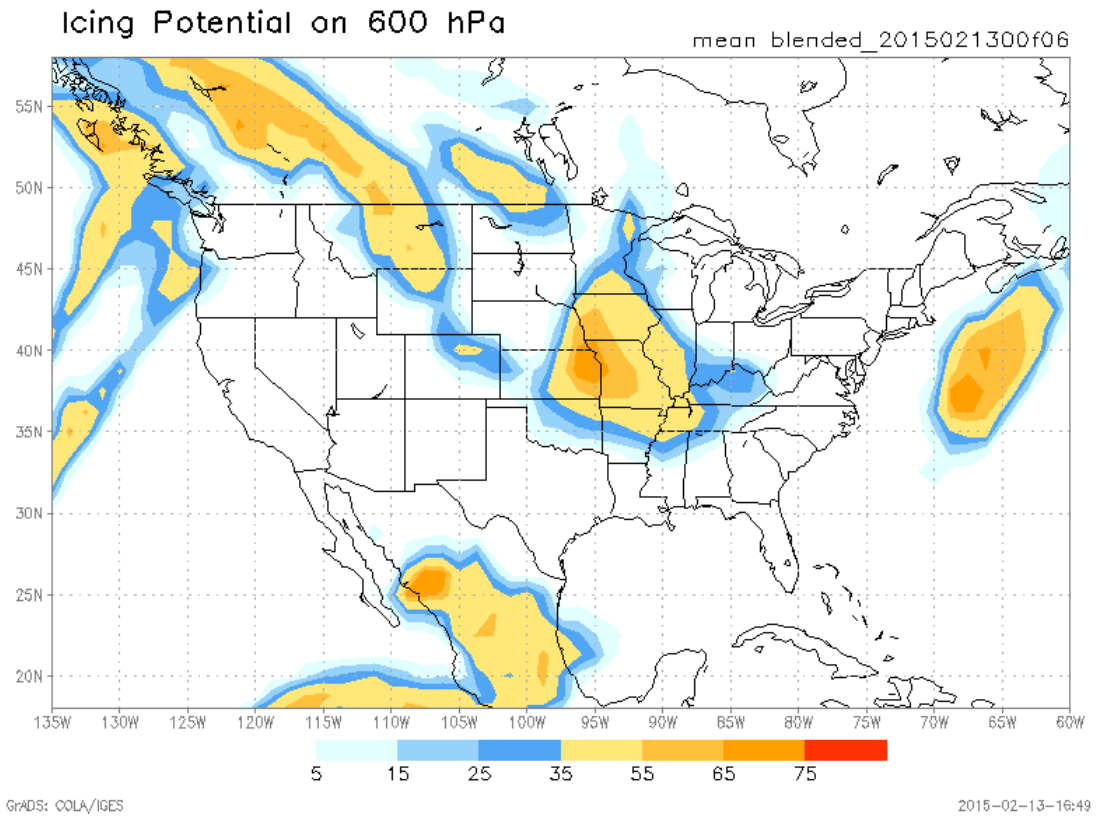
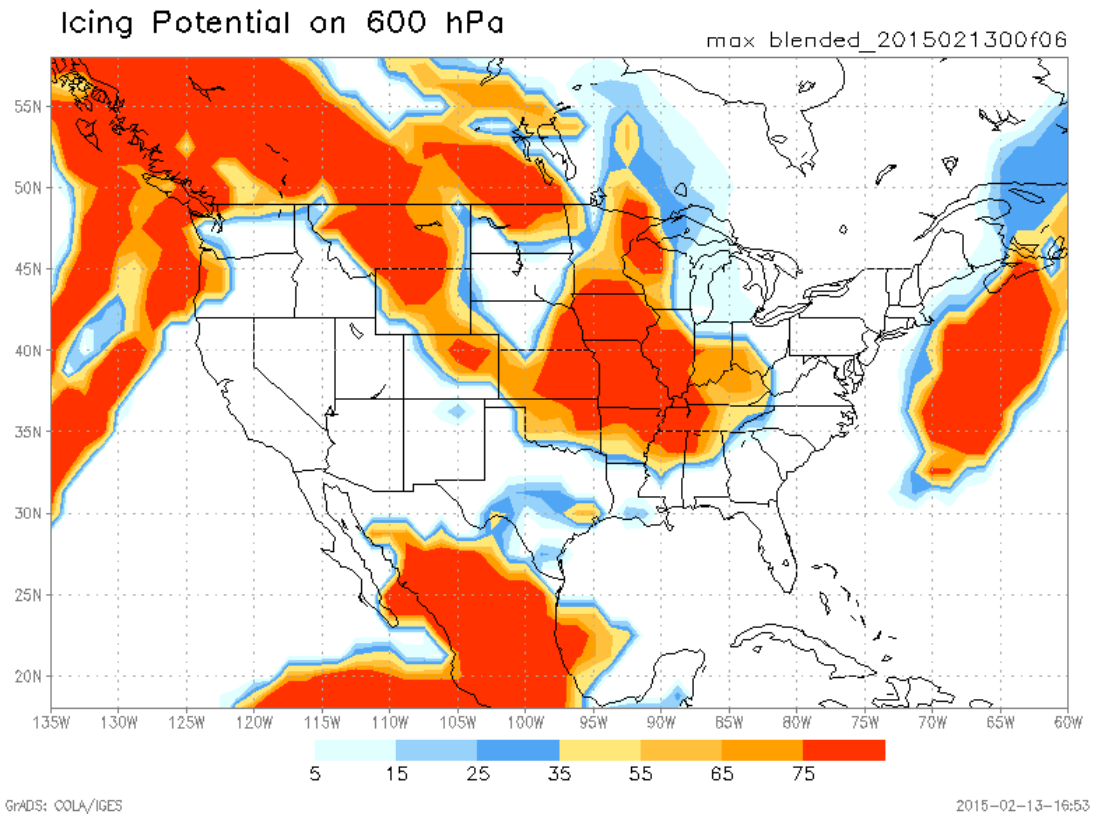
WAFS Mean



WAFS Max



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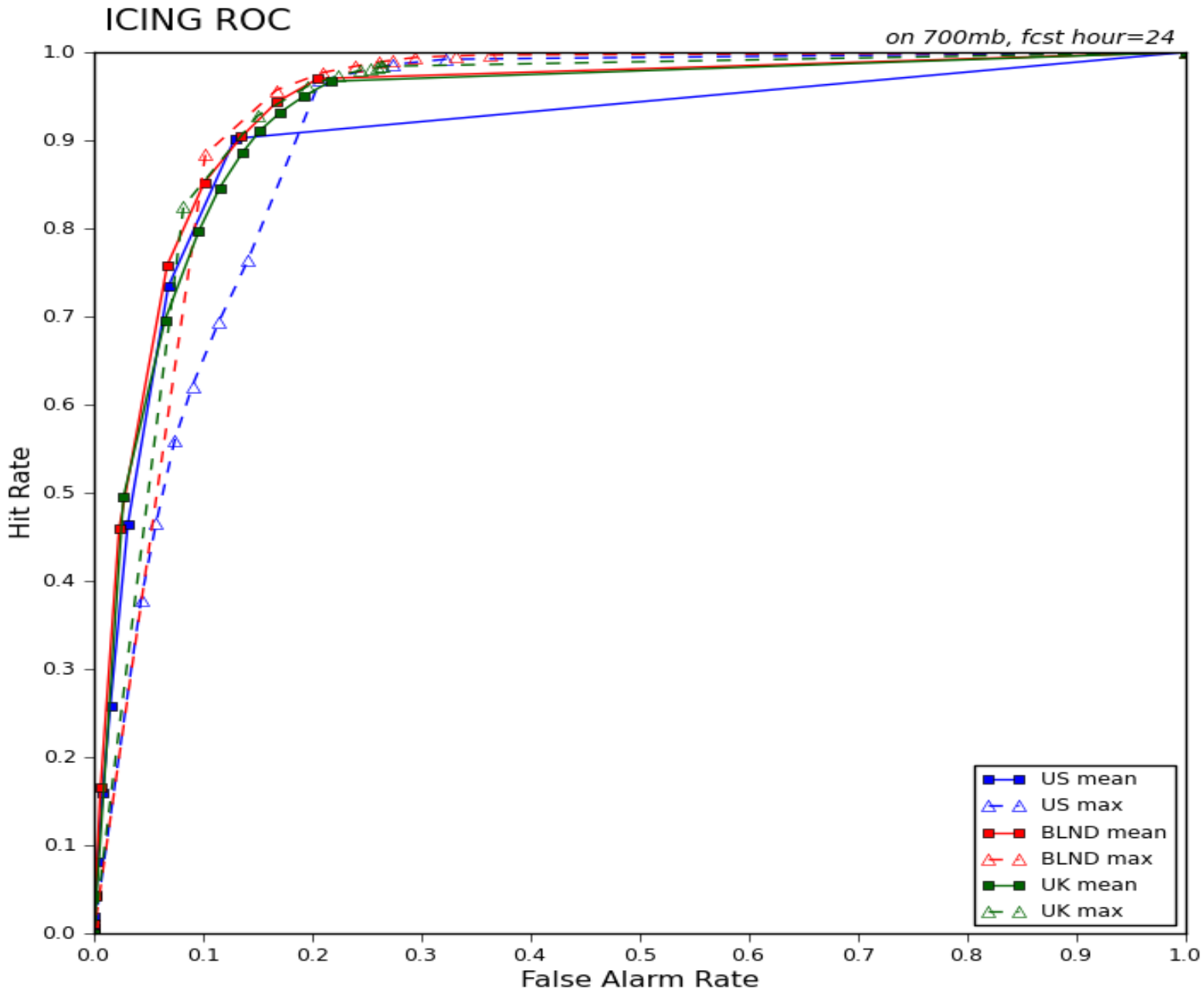
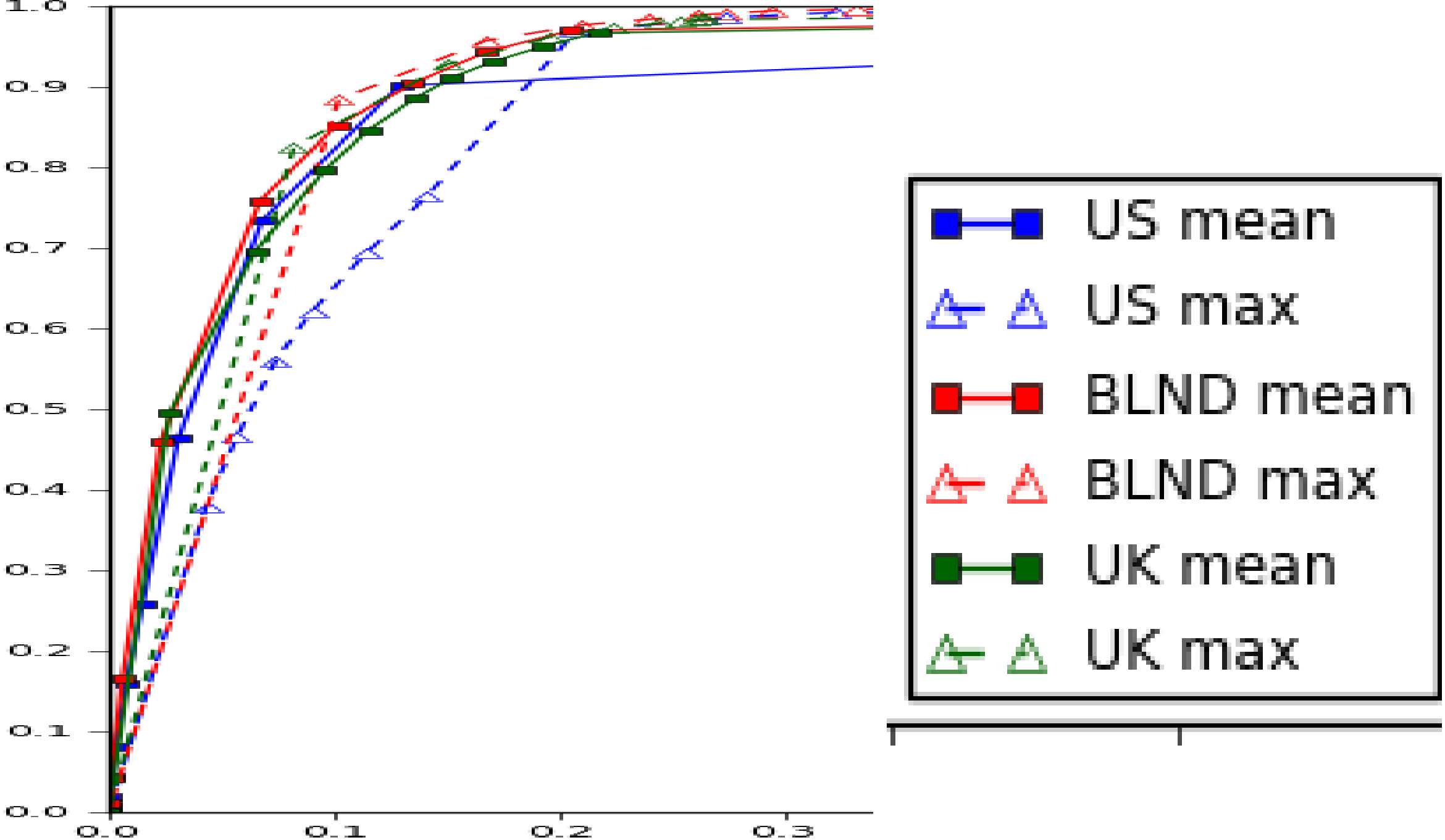

ICING ROC
on 700mb, fcst hour=24
Hit Rate
False Alarm Rate
0.0
0.1
0.2
0.3
0.4
0.5
0.6
0.7
0.8
0.9
1.0
US mean
US max
BLND mean
BLND max
UK mean
UK max


1.0
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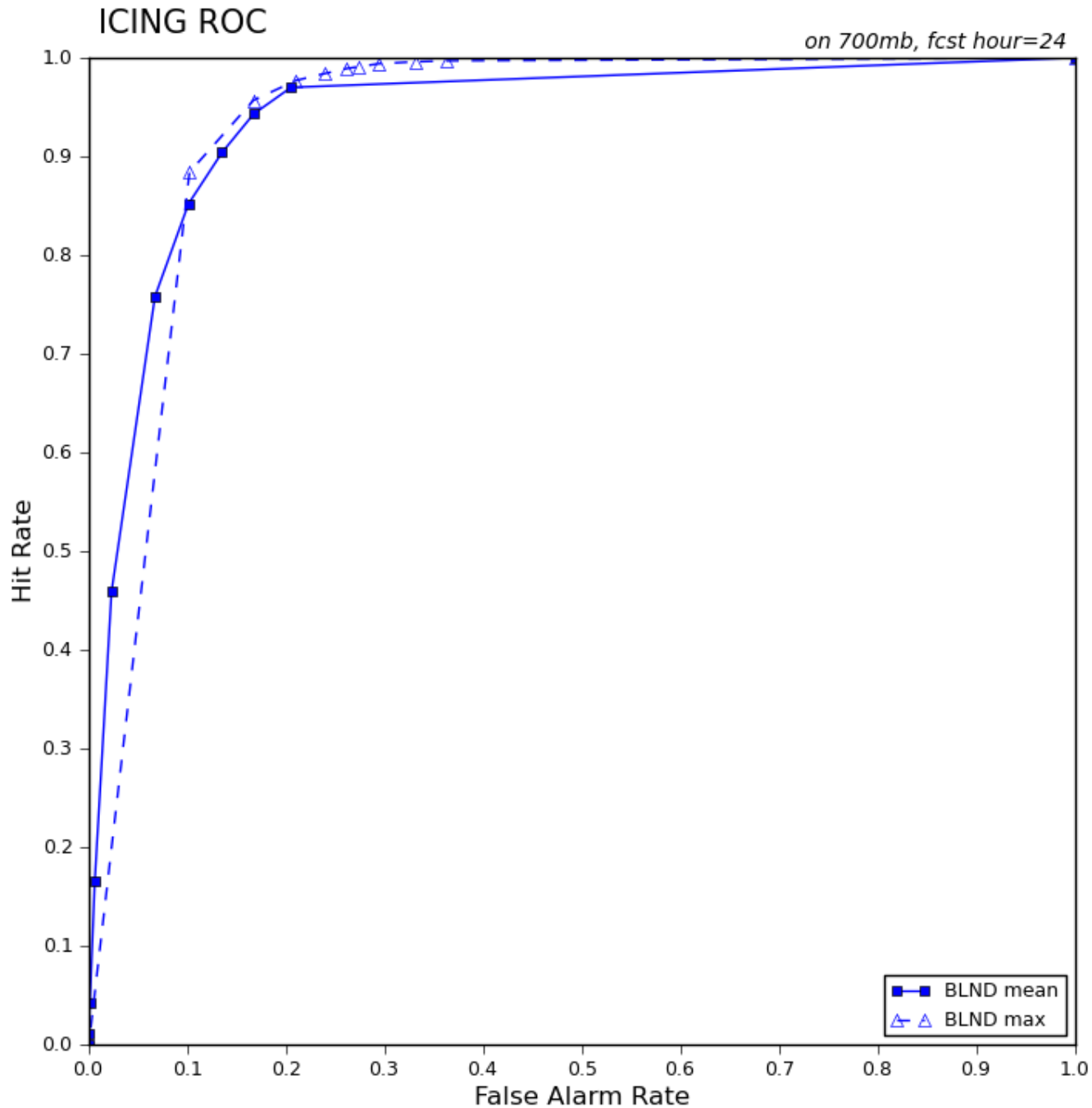
0.2
0.3
US mean
US max
BLND mean
BLND max
UK mean
UK max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0.6
0.7
0.8
0.9
1.0
BLND mean
BLND max

Uses of WAFS Icing

Strategic Planning – ICAO approved for ETOPS planning

- Similar POD, with lower FAR and less Bias than old zero to -20C and 55% RH method.

Tactical Avoidance – unsanctioned use

- Appears to be extremely good at predicting areas of no ice.
- If ice is encountered, could grids point the way out of it?

Future Work

Icing Severity Forecasts – operational in 2018

- Should use CONUS Forecast Icing Severity definitions of severity.
  - As opposed to just outputting super cooled liquid water content, which could be added later.

Calibrated Probabilistic Icing Forecasts – 2018-2023

- Based on MOGREPS and GEFS ensemble.
- Provide probabilities of exceeding severity thresholds.

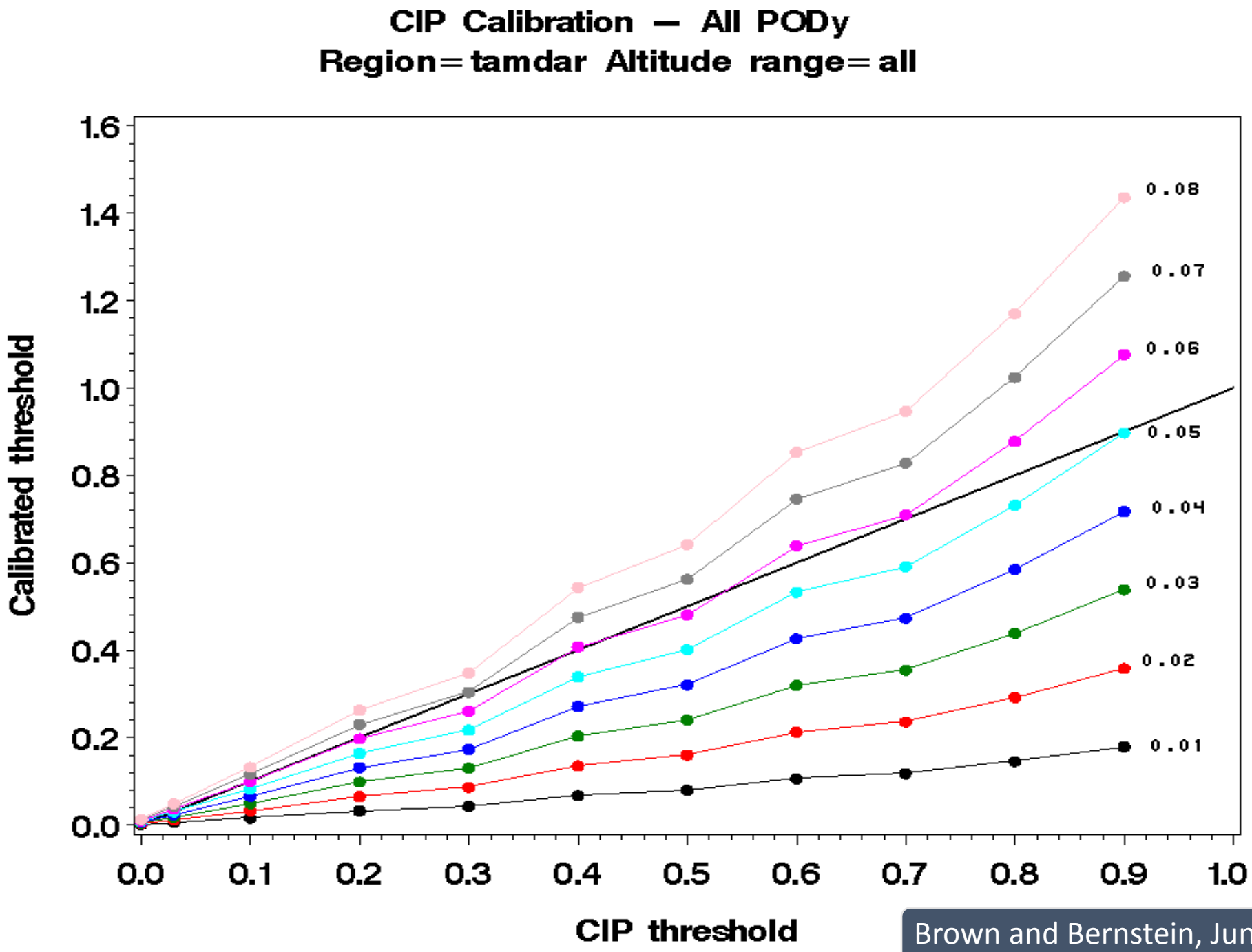
Calibration???

Requires verification

Needs to be updated when models change

Multiple calibration methods exist – huge science question

Calibration must be done the same by both WAFCs to maintain the one global source of data.



How CIP/FIP calibration is affected by estimated climatology of icing:

Under-estimate of climatological frequencies results in underforcasts

Over-estimate of climatological frequencies results in overforecasts

Regional/Seasonal calibration is required.

Brown and Bernstein, June 2006

Challenges

- Verification
- Calibration
- Maintenance
- Politics