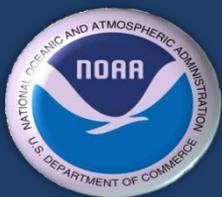


Gridded Aviation Performance and Model Blends at WFO Marquette, Michigan

Steven Fleegel and Todd Kluber

National Weather Service Marquette
Michigan



Gridded Aviation Timeline at NWS Marquette



2012

February: Started as a part of experimental Fire Weather grid creation

Testing phase with background grids that a few people looked at

2013

Initial verification showed skill in synoptic and lake effect events

All Year: Fine tuned model grid creation

Summer: Implemented TAF Formatter for forecaster use

2014

Growing use of grids in TAF process by all forecasters

- Helped buy-in and increased feedback on performance

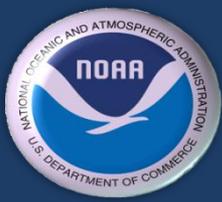
September: Six forecasters started producing aviation grids for TAF creation

2015

March: Installed Milwaukee (MKX) Gridded Verification scripts

March: Transitioned local model blend to full suite

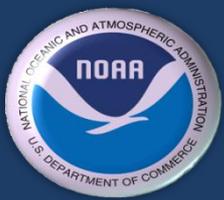
August: Full office participation in Gridded Aviation



Marquette Aviation Grid Blends



- Full suite of Aviation Grid blends started in March 2015
 - Based off CONSShort code (Jerry Wiedenfeld, MKX)
- All models are created hourly between :55 and :10
 - Hourly data through 30 hours and then 3 hourly through 72 hours
- **AvnMQT**
 - RAP13 (x2), GLAMP25, ADJMET, NAM12, GFS40, HiResWRF (Local), RegWRF (Local)
 - Performance has been as good or better than the previous MQT model blend
 - Although as you will see in the coming slides, likely need to tune the blend again
- **AvnMQTAll**
 - All of the available models
- **AvnMQTRaw**
 - Just the RAW models
- **AvnMQTMOS**
 - Just the MOS (e.g. MET, LAV) models
- **AvnMQTHiRes**
 - The higher resolution models: HiResWRF (Local), RegWRF (Local), HIRESWarw, HIRESWnmm, RAP13, HRRR, NARRE



Statistics Calculated for AWOS/ASOS Sites

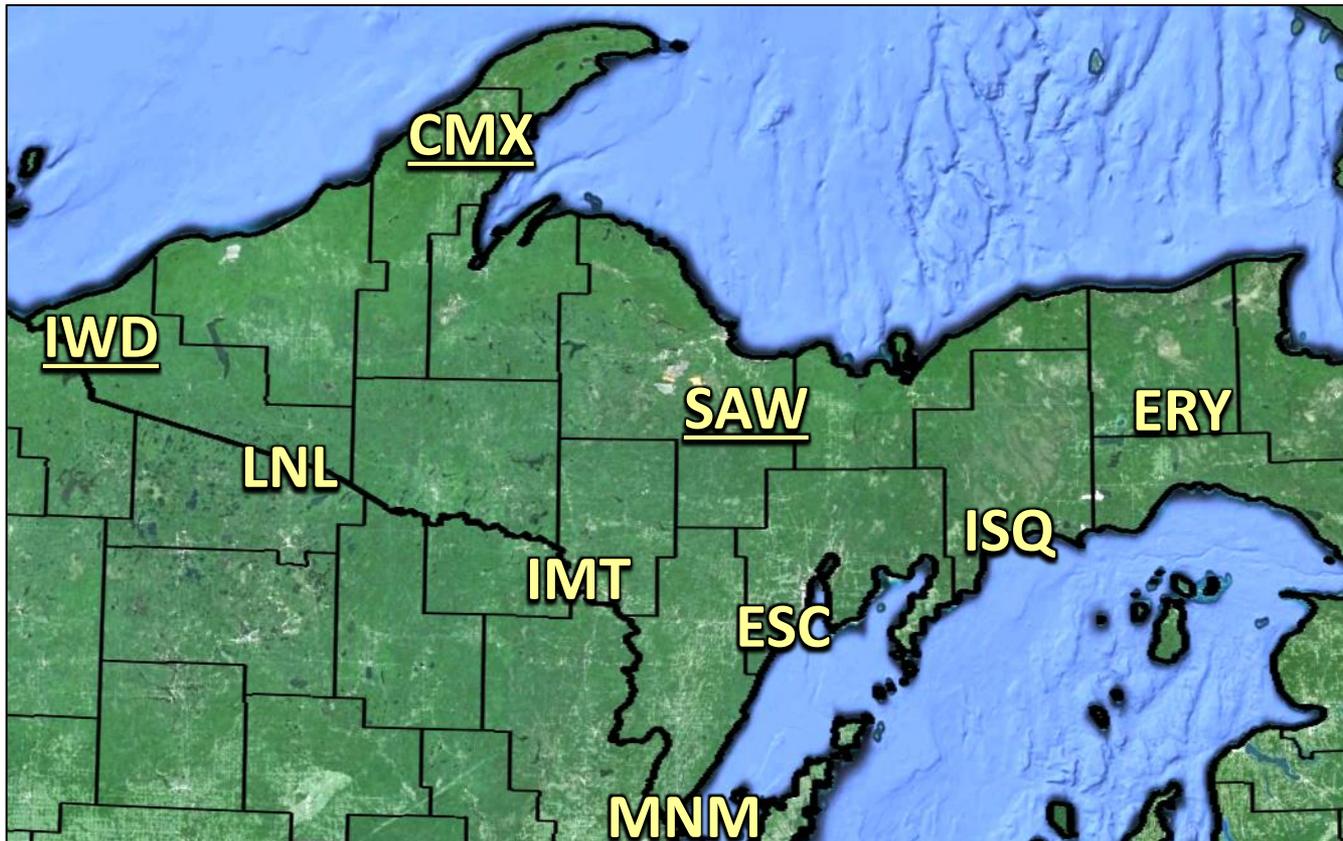


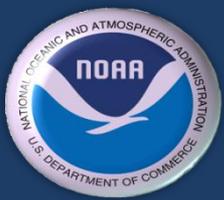
NWS Marquette TAF Sites

- CMX (Houghton/Hancock)
- IWD (Ironwood)
- SAW (Gwinn/K.I. Sawyer)

Additional AWOS/ASOS

- ESC (Escanaba)
- ERY (Newberry)
- IMT (Iron Mountain)
- ISQ (Manistique)
- LNL (Land O' Lakes, WI)
- MNM (Menominee)



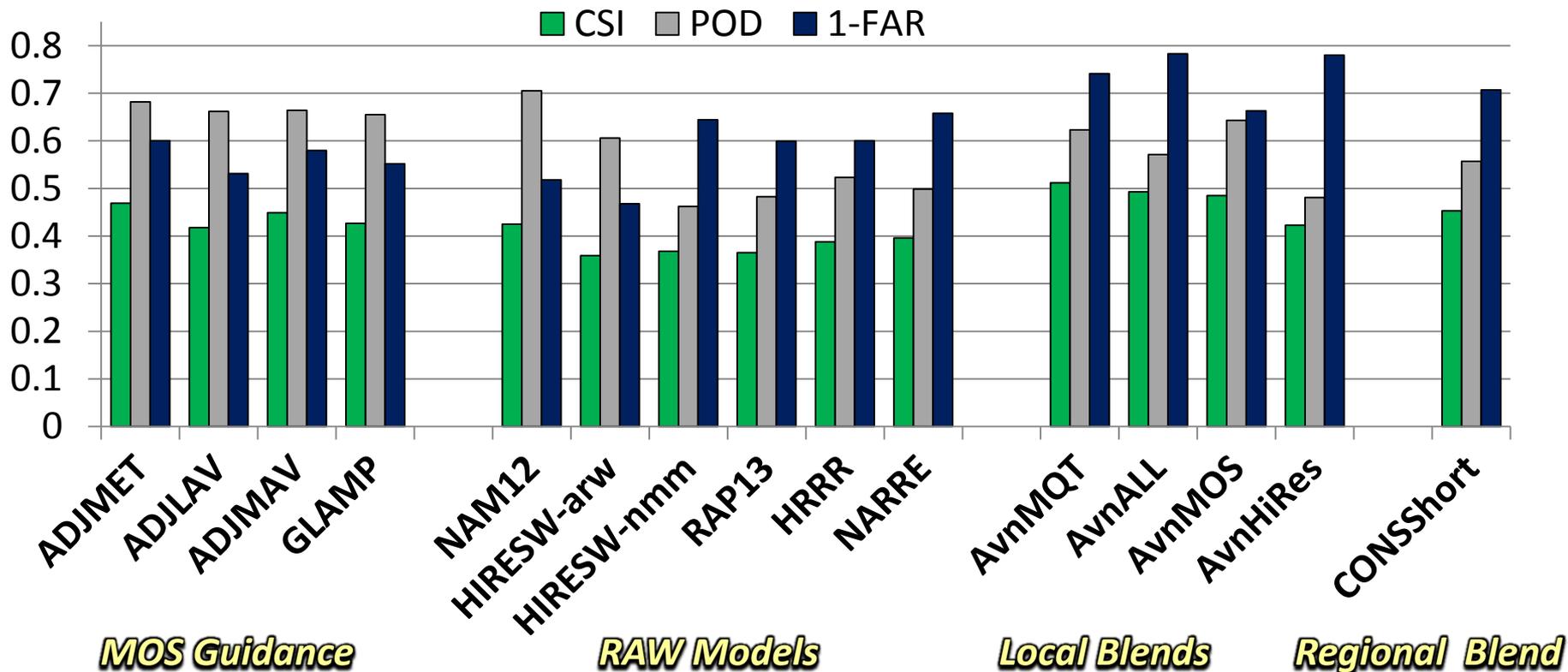


Model Scores – Ceiling



<1000' (\leq IFR) at AWOS/ASOS sites for 1-12 hour forecast: March – July 2015

- Model blends provide best CSI and lowest FAR
- POD generally better with individual models, but FAR also much higher
 - **Best all-around performance from AVNMQT**

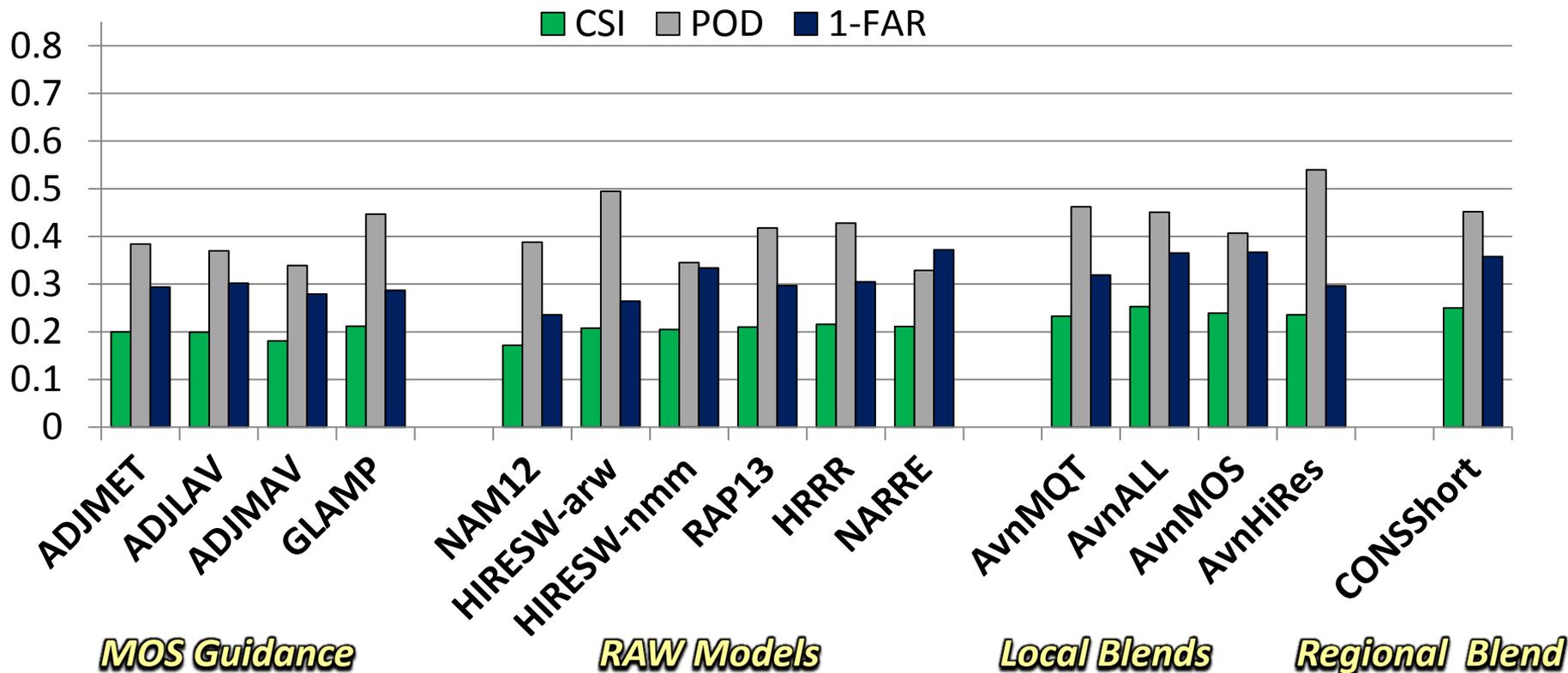


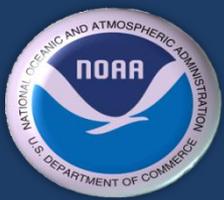


Model Scores – Visibility

3SM (\leq IFR) at AWOS/ASOS sites for 1-12 hour forecast: March – July 2015

- Individual models vary in ability, thus reducing the effectiveness of blends
- Blends still perform slightly better than individual models for all categories
 - Models less reliable than for ceiling





Model Scores vs. Official TAF



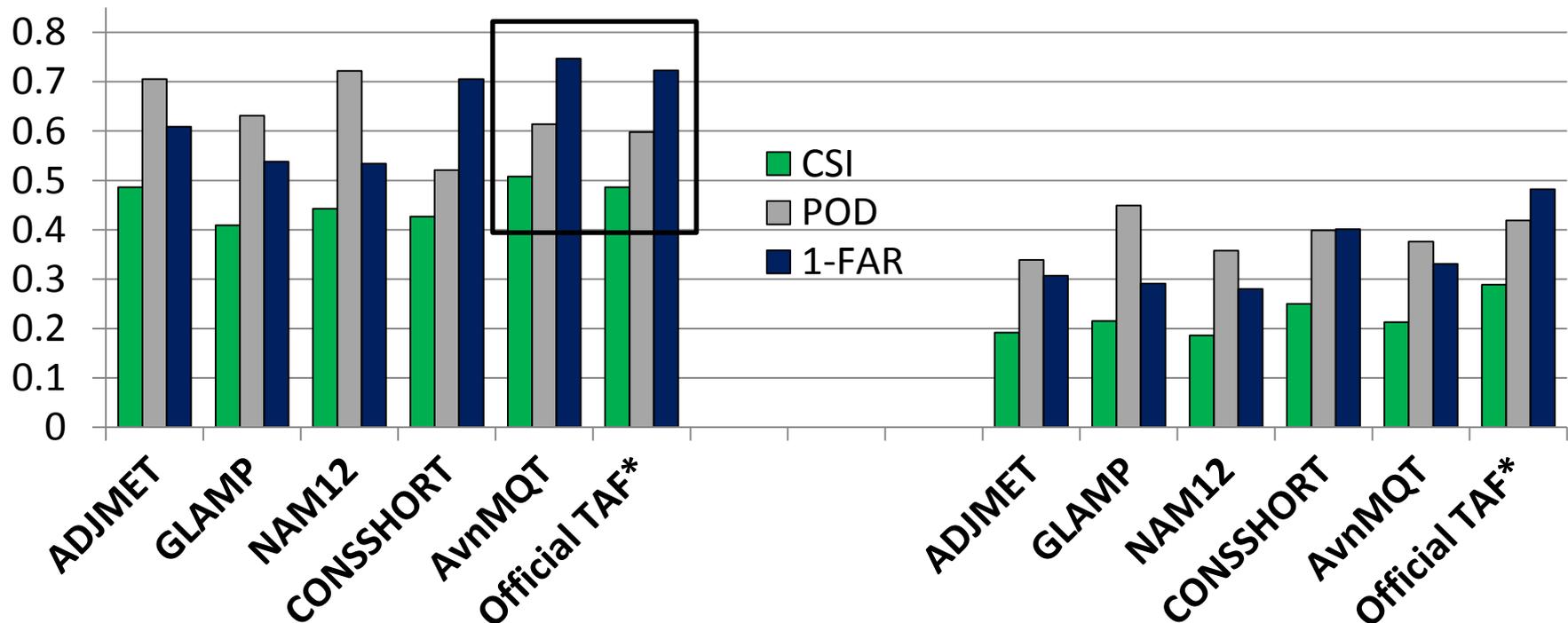
≤IFR at MQT TAF sites for 1-12 hour forecast: March – July 2015

Ceiling

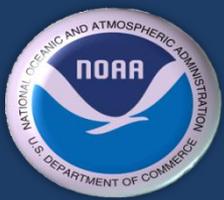
- AvnMQT score is nearly identical to the official TAF
- POD for individual models higher, but so is FAR

Visibility

- Official TAF outperforms models/blends
- CONSShort scores best compared to the official TAF



*Data unavailable in Stats on Demand after 7/22



Analysis of Model vs. TAF Stats



≤IFR at MQT TAF sites

Ceiling

- AvnMQT scores better than the official TAF in the 7-12 hour period

Visibility

- Persistent high model FAR likely due to over-forecasting of fog
- POD improved during the warm season, indicating an issue with snow

March – July 2015: Forecast hours 1-6

Model	POD	FAR	CSI
Official TAF*	0.62	0.25	0.51
AvnMQT	0.60	0.25	0.50

March – July 2015: Forecast hours 1-12

Model	POD	FAR	CSI
Official TAF*	0.42	0.52	0.29
AvnMQT	0.39	0.67	0.21

March – July 2015: Forecast hours 7-12

Model	POD	FAR	CSI
Official TAF*	0.58	0.30	0.46
AvnMQT	0.63	0.25	0.52

May – July 2015: Forecast hours 1-12

Model	POD	FAR	CSI
Official TAF*	0.40	0.57	0.26
AvnMQT	0.43	0.68	0.23

* Data unavailable after 7/22. AvnMQT stats through 7/22 and through 7/31 are within 0.001 of each other.



Case: 4/9/15 through 4/10/15



- Extended period of \leq IFR ceiling with frequent \leq IFR visibility
- Mixed precipitation across Upper Michigan with strong low pressure system
- **Model blends perform well for synoptic IFR events**

Ceiling (<1kft) Hr 1-12

Model	POD	FAR	CSI
Official TAF	0.89	0.08	0.82
AvnMQT	0.98	0.08	0.91

Visibility (<3mi) Hr 1-12

Model	POD	FAR	CSI
Official TAF	0.45	0.57	0.28
AvnMQT	0.52	0.62	0.28

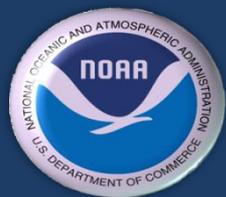
KSAW 4/09/15 – 4/10/15			
Time (UTC)	Wx	Vis (SM)	CIG (ft)
12	SN	0.5	500
11	SN	0.75	200
10	+SN	0.5	200
09	SN	1	500
08	-SN	1.25	500
07	-SN	2	300
06	UP	7	300
05	-SN	4	300
04	-SN	3	500
03	-SN	3	300
02	SN	0.5	100
01	FG	0.5	100
00 (4/10)	FG	0.25	300
23	BR	3	300
22	BR	3	300
21	-RA	3	500
20 (4/9)	BR	1.75	300



Summary



- Weighted blend has provided skill over individual models and is on par or slightly better than our Official
 - Supports using a blend of models as a starting point
 - Advantages to the forecasters
 - Only need to intervene when needed
 - Focus on other portions of the forecast or DSS
 - Gridded Aviation maintains consistency with the entire forecast package



Future Plans



- Continue to tune the AvnMQT blend
 - Develop seasonal blends
 - For example, past verification has shown poor performance of MOS guidance in lake effect situations
 - Set to time of the year or preferably by temperatures aloft
 - Possibly develop a blend based off recent performance (similar to CR WModel)
 - Separate blends for Ceiling and Visibility
- Expand verification to 24 hours