WORLD AREA FORECAST SYSTEM MANAGEMENT REPORT

March 2017 – February 2018

World Area Forecast Centre (WAFC) London
World Area Forecast Centre (WAFC) Washington

1. EXECUTIVE SUMMARY

Overview:

1) Both WAFCs continue to provide a valuable and reliable service to the aviation community, as evidenced by the detailed availability, timeliness and verification statistics provided in this Management Report.

2) Nonetheless, the WAFCs are receptive to feedback and to the continued development of the WAFC portfolio to meet the stated requirements under the Aviation System Block Upgrade (ASBU) methodology, and this is demonstrated through separate papers presented to the WG-MOG/7 (WAFS) meeting.

Events of note:

1) On 24th August 2017, for the 06:00UTC model run, WAFC London implemented a significant upgrade to their Global Model which is used for the production of EGRR WAFC data sets. The Global Model resolution was increased from ~17km to ~10km, and a suite of scientific changes were also implemented.

2) At approximately 02:00UTC on 23rd January 2018 WAFC London was affected by a small electrical fire in one of its IT halls. This impacted a variety of WAFC London systems including WAFC production. WAFC London handed over SIGWX production to WAFC Washington at 02:30UTC, and WAFC Washington were able to successfully issue the 00:00UTC and 06:00UTC SIGWX BUFR and PNG charts. WAFC London issued the 12:00UTC data as normal.

   The GRIB data valid for 00:00UTC was produced successfully, however it was not able to be disseminated downstream until approx. 09:00UTC. 06:00 UTC data was disseminated as normal. WAFC London returned to normal operational service at 13:00UTC.

3) Seven scheduled WAFC Significant Weather (SIGWX) forecast backup tests were successfully conducted during the period of the Management Report. The backup test planned for the 25th October 2017 was cancelled due to operational problems encountered by WAFC London earlier in the day.
In accordance with WG-MOG/3 (WAFS) Decision 3/1, WAFC Washington purposefully delayed issuance of the SIGWX forecasts issued on 26th July 2017 by 1 hour, and WAFC London purposefully delayed issuance of the SIGWX forecasts issued on 24th January 2018.

4) WAFC Washington's WIFS system experienced a prolonged outage on 20th February 2018. Due to a problem with the web hosting service, the system was either unreachable or else contained out of date data for around 24 hours.

Summary of availability and timeliness statistics:

A detailed, month by month analysis is provided in **Appendix A** to the WAFS Management Report, and a high level summary of that analysis is presented below:

WAFC London

SIGWX Forecasts:

The availability and timeliness of WAFC London SIGWX BUFR and PNG data is very high. Through the period there was only 1 instance of WAFC London SIGWX BUFR/PNG data being later than the ICAO requirement (0.07% from a total of 1460 occasions). This was due to WAFC London mistakenly believing that the backup test applied to the 06UTC run on the 25 October 2017 when WAFC Washington were not expecting to issue backup files until the 12UTC run.

Note, the purposefully delayed issuance of WAFC London SIGWX by 1 hour on 24 January 2018 and 26 July 2017 (WG-MOG/3 Decision 3/1) has been excluded from the statistics in this regard.

There were only 6 occasions where WAFC London SIGWX corrections were issued. All instances were related to human error.

Upper air gridded forecast data

The availability and timeliness of WAFC London upper air grid point data is very high. Through the period there was one instance of WAFC London WAFC London upper air grid point data being later than the ICAO requirement, which was a result from the small fire in the IT Hall at WAFC London (0.81% from a total of 1460 occasions).

There were 8 occasions where WAFC London issued non-harmonised cumulonimbus cloud (hereafter referred to as CB), icing and turbulence data. On 7 occasions this was due to the late delivery of the raw data from WAFC Washington (5 of these occurrences were in July 2017). 1 instance was due to corrupt CAT bulletins.

	SIGWX BUFR	SIGWX PNG	Upper air gridded forecast data	Upper air gridded forecast data CB, icing, turbulence
Total complete datasets expected	1460	1460	1460	1460
Total complete datasets provided	1457	1457	1459	1458
Complete datasets issued later than ICAO target:	3 (0.21%)	3 (0.21%)	1 (0.07%)	12 (0.82%)
Number of incomplete datasets	1 (0.07%)	1 (0.07%)	1 (0.07%)	2 (0.14%)
SIGWX Correction events	6 (0.41%)	6 (0.41%)	N/A	N/A
Non-harmonised GRIB2 data events	N/A	N/A	N/A	8 (0.54%)

WAFC Washington

SIGWX Forecasts:

The availability and timeliness of WAFC Washington SIGWX BUFR and PNG data is very high. Through the period there were five instances of PNG charts being later than the ICAO requirement, and 8 instances of the BUFR files being later than the ICAO requirement. The largest problem with both PNG and BUFR was 5 cases of communications failures between the WAFC and its web host. The other 3 late BUFR files were instances where the WAFC retransmitted a BUFR file at the request of the user. These retransmissions are counted as late by the accounting software.

Note, the purposefully delayed issuance of WAFC Washington SIGWX by 1 hour on 26 July 2017 (WG-MOG/3 Decision 3/1) has been excluded from the statistics in this regard.

Upper air gridded forecast data

There was 1 occasion where WAFC Washington issued non-harmonised CB, icing and turbulence data, related to late delivery of raw data from WAFC London. There were 7 occasions where WAFC Washington delivered incomplete gridded data sets, due to communications problems between the WAFC and its web host.

	SIGWX BUFR	SIGWX PNG	Upper air gridded forecast data	Upper air gridded forecast data CB, icing, turbulence
Total complete datasets expected	1460	1460	1460	1460
Total complete datasets provided	1452	1455	1453	1454
Complete datasets issued later than ICAO target:	8	5	7	6
Number of incomplete datasets:	8	5	7	6
SIGWX Correction events	4	4	N/A	N/A
Non-harmonised GRIB2 data events	N/A	N/A	N/A	1

Commentary on the verification of wind, temperature, icing potential, Clear Air Turbulence (CAT) potential, and CB horizontal extent (North Atlantic and North Pacific):

Verification graphs are provided in Appendix D. Note both WAFCs provide verification for wind and temperature, but per agreement between the WAFCs, London provides combined WAFC verification for CAT and CB horizontal extent while Washington provides the combined icing results, since these forecasts are harmonized by computer processing.

WAFC London

Wind verification:

The Root Mean Square Error (RMSE) for the 24 hour forecast of the FL340 (250hPa) wind over the North Atlantic against model analyses has improved from approximately 5.5 m/s in 1995, to 3.1 m/s by end of 2017. For the North Pacific area the RMSE has improved from 4.4 m/s in 2005 to 3.5 m/s by end 2017.

Temperature verification:

The RMSE for the 24 hour forecast of FL340 temperature over the North Atlantic against model analyses has improved from approximately 1.4 C in 1995, to 0.7 C by end of 2017. For the North Pacific area the RMSE has improved from 1.0 C in 2005 to ~0.7 C by end 2017.

For both the wind and temperature data, the verification data shows a degree of oscillation (often related to seasons), and there has been a levelling off in recent years. With recent investments in more powerful supercomputers, it is anticipated further improvements to accuracy will be realised.

Clear Air Turbulence potential:

With regard to mean and maximum CAT verified against automated aircraft data, over the North Atlantic the ROC curves demonstrate clear skill. Appendix D shows a comparison of the mean CAT (≥4.5) in the North Atlantic Area for the period Jan-Dec2017 compared to a year earlier. A clear improvement in skill is shown which is attributable to a major upgrade in the WAFC London global model. A similar improvement is evident with max CAT.

CB horizontal extent:

For both the North Atlantic and North Pacific, skill is demonstrated. For the North Atlantic the skill is comparable to the previous year. The North Pacific skill shows slightly lower skill than the previous year though it should be noted that the coverage over the N Pacific is more limited using lighting data to verify the forecasts. In future satellite data will enable fuller coverage to extend the area verified.

WAFC Washington

Wind Verification:

The RMSE for the 24 hour forecast of the FL340 wind over the North Atlantic and North Pacific against model analyses has been holding steady at around 3.0 m/s

Icing potential:

For both the North Atlantic and North Pacific, skill is demonstrated and is comparable to the skill of the previous year. It should be noted that due to the miniscule number of direct observations, the existence of icing is inferred using a combination of satellite imagery (existence of cloud), surface observations (rules out snow), lightning data, and model temperature analysis.

2. OPERATIONS OF THE WAFS

2.1 WAFS Operational Product Changes

2.1.1 **Forecast data –** No changes were made to the data provide by WAFS.

2.2 Harmonization of WAFS data

2.2.1 **Harmonised CB, icing and turbulence data –** No changes to existing procedures have been introduced during the period. The reliability of the harmonisation process is very high, and the contingency processes by which non-harmonised data are issued at a specified cut-off time have been demonstrated to be effective.

2.2.2 **WAFC Coordination:**– The WAFCs continue to coordinate their activities:

- A WAFC coordination meeting was held at the Aviation Weather Services Office, Kansas City, USA 5 – 7 February 2018.
- WAFC Washington hosted a WAFC London scientist July 17 through August 25, 2017. The project involved testing turbulence algorithms on the ensemble models of both centers. Software that creates SIGWX objects from WAFS grids was also tested.
- A WAFC Science Meeting was held at the National Center for Atmospheric Research the week of 1st May 2017 in Boulder, Colorado, USA to discuss implementing new hazards algorithms.
- Several 'Webinar' virtual meetings have been undertaken as necessary between the WAFCs during the period.

2.2.3 **WAFC 'Web Chat' Coordination** - The WAFCs continue to convene a 'Web Chat' prior to the finalization of the each SIGWX forecast cycle. The WAFCs wish to thank the participants who have provided WAFC forecasters with valued input to the SIGWX forecasts. Details for joining the 'Web chats' can be obtained from Matt Strahan (matt.strahan@noaa.gov).

2.2.4 WAFC Quality Management System

2.2.4.1 WAFC London – as a function of the Met Office – is ISO 9001:2008 and ISO 14001:2004 compliant. Twice per year, SGS (certification partners) visit the Met Office to monitor its compliance with ISO 9001 and ISO 14001. These visits usually take place during May and November. Both the ISO 9001:2008 and the ISO 14001:2004 certificates are valid until 14 September 2018. WAFC London is planning to re-certify against those standards, whilst preparing to transition to 2015 standards in the following 6 months.

2.2.4.2 WAFC Washington, as a function of the Aviation Weather Center in Kansas City, continues to maintain ISO9001:2008 QMS certification, and is working towards upgrading to the new ISO9001:2015 standard. The ISO 9001:2008 certificate is valid until 15 September, 2018.

2.3 WAFS Workshops/Seminars

2.3.1 No WAFS Workshops/Seminars were held during the period.

2.4 Development of improved forecasts for Icing, Turbulence, and CB in the grid-point format

2.4.1 The existing processes for provision of icing, turbulence and CB in grid-point format remain unchanged during the period. Both WAFCs are working towards enhancing these forecasts to provide information relating to severity and probability in accordance with the timelines set out under the ASBUs. Separate Study Notes will be presented to the WG-MOG/7 (WAFS) meeting with regard to proposed enhancements.

2.5 WIFS Enhancements

2.5.1 No changes or enhancements to WIFS occurred during the period of this report.

2.6 SADIS Enhancements

2.6.1 No changes or enhancements to SADIS FTP occurred during the period of this report. A study note on the future of SADIS (and WIFS) will be presented to the WG-MOG/7 (WAFS) meeting .

2.7 WAFS Performance Indicators

2.7.1 WAFC London performance indicators are online at http://www.metoffice.gov.uk/public/weather/aviation-wafc/#?tab=wafcPerformance

2.7.2 WAFC Washington performance indicators are online at http://www.emc.ncep.noaa.gov/gmb/icao/

2.8 WAFC SIGWX Backup Tests

2.8.1 The WAFCs conducted quarterly scheduled SIGWX backup tests during the management report period – see **Appendix B** to this **Attachment** for details. It should be noted that, in accordance with WG-MOG/3 (WAFS) Decision 3/1, two of the scheduled backup operations (26th July 2017 and 24th January 2018) were purposefully delayed by 1 hour.

2.8.2 The backup test scheduled for the 25th October 2017 was cancelled due to operational problems encountered by WAFC London on the prior forecast issue to the test.

2.8.3 There were two occasions of unscheduled SIGWX backup events during the management report period, for the 00:00UTC and 06:00 UTC forecast issues on 23rd January 2018. WAFC Washington successfully provided the backup when WAFC London was experiencing severe technical problems.

2.8.4 The backup test schedule and test results are also available from the WG-MOG web site at URL http://www.icao.int/airnavigation/METP/MOG/Pages/WAFS.aspx . Select ' Forthcoming and Historical Record of WAFC Backup Tests'.

3. SERVICE CONTINUITY

3.1 Service Interruptions

3.1.1 WAFC London –

There has been one interruption to WAFC London's capability to provide SIGWX forecasts during the period, from 02:00UTC until 13:00UTC on 23rd January 2018. This was caused by a small electrical fire in one of the IT Halls which affected a variety of system.

There has been one interruption to WAFC London's capability to provide upper air gridded forecasts during the period. The 00:00UTC data on 23rd January 2018 was produced correctly, but problems caused by the IT Hall fire prevented this data from being disseminated on time. It was delivered to downstream systems at 09:00UTC.

3.1.2 WAFC Washington –

There was one interruption to WAFC Washington's capability to provide both SIGWX and upper air gridded forecasts during the period. Communications problems occurred with its web host on 20th and 21st February 2018. Up to five issuances of products were either prevented from being sent to the web host, or prevented from being served by the web host.

Appendix A to WAFC Management Report
WAFS Performance Indicator Tables
01 May 2016 to 28 February 2017

The following tables provide information on:

- WAFC London SIGWX BUFR availability on SADIS FTP
- WAFC Washington SIGWX BUFR availability on WIFS

- WAFC London SIGWX PNG availability on SADIS FTP
- WAFC Washington SIGWX PNG availability on WIFS

- WAFC London GRIB2 availability (not including CB cloud, icing or turbulence parameters) on SADIS FTP
- WAFC Washington GRIB2 availability (not including CB cloud, icing or turbulence parameters) on WIFS

- WAFC London GRIB2 CB cloud, Icing and Turbulence availability on SADIS FTP
- WAFC Washington GRIB2 CB cloud, Icing, Turbulence availability on WIFS

- The number of WAFC London SIGWX Correction messages, by month
- The number of WAFC Washington SIGWX Correction messages, by month

- The number of harmonization failures of WAFS GRIB2 CB cloud, icing, and turbulence by WAFC London, by month
- The number of harmonization failures of WAFS GRIB2 CB cloud, icing, and turbulence by WAFC Washington, by month

Note: The time reference, T+hh:mm is the time in hours and minutes measured from the nominal observation time of the data on which forecasts are based. For example, a complete WAFC GRIB2 forecast dataset based on 1200 UTC 'observations' is expected to be made available by T+4:20 (4 hours and 20 minutes after 1200 UTC). Forecasts necessarily require time for processing before they can be made available. WAFC forecasts are made available 4 times per day, based on 0000, 0600, 1200 and 1800 UTC 'observation' times; hence in a 30 day month 120 such forecasts would be expected to be issued.

WAFC London SIGWX BUFR Availability on SADIS FTP

Month	Total sets	Complete sets by T+7:00	Complete sets by T+7:30	Complete sets by T+9:00	Earliest time for complete set	Latest time for complete set	Average time for complete set	Incomplete sets at T+9:00
Mar 2017	124	124 (100%)	124 (100%)	124 (100%)	T+06:50	T+06:55	T+06:51	0 (0%)
Apr 2017	120	120 (100%)	120 (100%)	120 (100%)	T+06:50	T+06:55	T+06:51	0 (0%)
May 2017	124	124 (100%)	124 (100%)	124 (100%)	T+06:50	T+06:55	T+06:51	0 (0%)
Jun 2017	120	124 (100%)	124 (100%)	124 (100%)	T+06:50	T+06:55	T+06:51	0 (0%)
Jul 2017	124	124[1] (100%)	124 (100%)	124 (100%)	T+06:50	T+06:55	T+06:51	0 (0%)
Aug 2017	124	123 (99.19%)	123 (99.19%)	124 (100%)	T+06:50	T+07:50[2]	T+06:50	0 (0%)
Sep 2017	120	120 (100%)	120 (100%)	120 (100%)	T+06:50	T+06:50	T+06:50	0 (0%)
Oct 2017	124	123 (99.19%)	123 (99.19%)	123 (99.19%)	T+06:50	T+11:15[3]	T+06:52	1 (0.81%)
Nov 2017	120	120 (100%)	120 (100%)	120 (100%)	T+06:50	T+06:55	T+06:50	0 (0%)
Dec 2017	124	124 (100%)	124 (100%)	124 (100%)	T+06:50	T+06:55	T+06:50	0 (0%)
Jan 2018	124	123 (99.19%)[4]	124 (100%)	124 (100%)	T+06:50	T+07:05[5]	T+06:51	0 (0%)
Feb 2018	112	112 (100%)	112 (100%)	112 (100%)	T+06:50	T+06:50	T+06:50	0 (0%)
TOTAL	**1460**	**99.79%**	**99.86%**	**99.93%**	T+06:50	T+11:15	T+06:51	**0.07%**

[1] DT261200 UTC: Purposefully delayed by 1 hour (WG-MOG/3, Decision 3/1). Delay excluded from statistics.

[2] DT161200 UTC: Technical problems led to a 1 hour delay in SIGWX WAFC London BUFR and PNG data being made available on SADIS FTP.

[3] DT250600 UTC: Confusion over what time the WAFC backup was taking place, led to the 06UTC WAFC London SIGWX BUFR being issued late.

[4] DT241200 UTC: Purposefully delayed by 1 hour (WG-MOG/3, Decision 3/1). Delay excluded from statistics.

[5] DT23000 UTC: WAFC Washington backing up WAFC London due to small fire in IT hall, issued slightly late.

WAFC Washington SIGWX BUFR Availability on WIFS

Month	Total sets	Complete sets by T+7:00	Complete sets by T+7:30	Complete sets by T+9:00	Earliest time for complete set	Latest time for complete set	Average time for complete set	Incomplete sets at T+9:00
Mar 2017	124	109 (87.9%)	123 (99.2%)	123 (99.2%)	T+06:45	T+11:25	T+06:56	1 (0.8%)
Apr 2017	120	120 (100%)	120 (100%)	120 (100%)	T+06:45	T+07:00	T+06:51	0 (0%)
May 2017	124	123 (99.2%)	124 (100%)	124 (100%)	T+06:45	T+07:02	T+06:50	0 (0%)
Jun 2017	120	117 (97.5%)	120 (100%)	120 (100%)	T+06:45	T+07:08	T+06:52	0 (0%)
Jul 2017	124	117 (94.4%)	123 (99.2%)	124 (100%)	T+06:45	T+07:49	T+06:55	0 (0%)
Aug 2017	124	120 (96.8%)	123 (99.2%)	124 (100%)	T+06:45	T+08:17	T+06:53	0 (0%)
Sep 2017	120	117 (97.5%)	119 (99.2%)	120 (100%)	T+06:45	T+07:47	T+06:54	0 (0%)
Oct 2017	124	110 (88.7%)	124 (100%)	124 (100%)	T+06:45	T+07:26	T+06:56	0 (0%)
Nov 2017	120	117 (97.5%)	118 (98.3%)	118 (98.3%)	T+06:00	T+11:40	T+06:56	2 (1.7%)
Dec 2017	124	118 (95.2%)	123 (99.2%)	123 (99.2%)	T+06:00	T+09:35	T+06:55	1 (0.8%)
Jan 2018	124	119 (96%)	123 (99.2%)	124 (100%)	T+06:00	T+07:45	T+06:53	0 (0%)
Feb 2018	112	105 (93.8%)	108 (96.4%)	108 (96.4%)	T+06:45	Missing ***	T+12:03	4 (3.6%)
TOTAL	**1460**	**1392 (95.34%)**	**1448 (99.18%)**	**1452 (99.45%)**	**T+06:00**	**T+11:40**	**T+06:56**	**8 (0.55%)**

*** Day long web host outage on 2/20/2018

WAFC London SIGWX PNG Availability on SADIS FTP

Month	Total sets	Complete sets by T+7:00	Complete sets by T+7:30	Complete sets by T+9:00	Earliest time for complete set	Latest time for complete set	Average time for complete set	Incomplete sets at T+9.00
Mar 2017	124	124 (100%)	124 (100%)	124 (100%)	T+06:50	T+06:55	T+06:51	0 (0%)
Apr 2017	120	120 (100%)	120 (100%)	120 (100%)	T+06:50	T+06:55	T+06:51	0 (0%)
May 2017	124	124 (100%)	124 (100%)	124 (100%)	T+06:50	T+06:55	T+06:51	0 (0%)
Jun 2017	120	120 (100%)	120 (100%)	120 (100%)	T+06:50	T+06:55	T+06:51	0 (0%)
Jul 2017	124[6]	124 (100%)	124 (100%)	124 (100%)	T+06:50	T+06:55	T+06:51	0 (0%)
Aug 2017	124	123 (99.19%)	123 (99.19%)	120 (100%)	T+06:50	T+07:50[7]	T+06:50	0 (0%)
Sep 2017	120	120 (100%)	120 (100%)	120 (100%)	T+06:50	T+06:55	T+06:50	0 (0%)
Oct 2017	124	123 (99.19%)	123 (99.19%)	123 (99.19%)	T+06:50	T+11:20[8]	T+06:52	1 (0.81%)
Nov 2017	120	120 (100%)	120 (100%)	120 (100%)	T+06:50	T+06:55	T+06:50	0 (0%)
Dec 2017	124	124 (100%)	124 (100%)	124 (100%)	T+06:50	T+06:55	T+06:50	0 (0%)
Jan 2018	124[9]	123 (99.19%)	124 (100%)	124 (100%)	T+06:50	T+07:05[10]	T+06:51	0 (0%)
Feb 2018	112	112 (100%)	112 (100%)	112 (100%)	T+06:50	T+06:50	T+06:50	0 (0%)
TOTAL	**1460**	**99.79%**	**99.86%**	**99.93%**	T+06:50	T+11:20	T+06:51	**0.07%**

[6] DT261200 UTC: Purposefully delayed by 1 hour (WG-MOG/3, Decision 3/1). Delay excluded from statistics.

[7] DT161200 UTC: Technical problems led to a 1 hour delay in SIGWX PNG data being made available on SADIS FTP.

[8] DT250600 UTC: Confusion over what time the WAFC backup was taking place, led to the 06UTC WAFC London SIGWX PNG being issued late.

[9] DT241200 UTC: Purposefully delayed by 1 hour (WG-MOG/3, Decision 3/1). Delay excluded from statistics.

[10] DT23000 UTC: WAFC Washington backing up WAFC London due to small fire in IT hall, issued slightly late.

WAFC Washington SIGWX PNG Availability on WIFS

Month	Total sets	Complete sets by T+7:00	Complete sets by T+7:30	Complete sets by T+9:00	Earliest time for complete set	Latest time for complete set	Average time for complete set	Incomplete sets at T+9:00
Mar 2017	124	116 (93.5%)	124 (100%)	124 (100%)	T+06:45	T+07:29	T+06:53	0 (0%)
Apr 2017	120	119 (99.2%)	120 (100%)	120 (100%)	T+06:45	T+07:24	T+06:52	0 (0%)
May 2017	124	123 (99.2%)	124 (100%)	124 (100%)	T+06:45	T+07:02	T+06:50	0 (0%)
Jun 2017	120	117 (97.5%)	120 (100%)	120 (100%)	T+06:45	T+07:07	T+06:51	0 (0%)
Jul 2017	124	121 (97.6%)	123 (99.2%)	124 (100%)	T+06:45	T+07:49	T+06:53	0 (0%)
Aug 2017	124	119 (96%)	123 (99.2%)	124 (100%)	T+06:45	T+08:27	T+06:53	0 (0%)
Sep 2017	120	117 (97.5%)	119 (99.2%)	120 (100%)	T+06:45	T+07:47	T+06:53	0 (0%)
Oct 2017	124	121 (97.6%)	124 (100%)	124 (100%)	T+06:45	T+07:05	T+06:53	0 (0%)
Nov 2017	120	118 (98.3%)	119 (99.2%)	119 (99.2%)	T+06:00	T+07:02	T+06:52	1 (0.8%)
Dec 2017	124	119 (96%)	124 (100%)	124 (100%)	T+06:00	T+07:04	T+06:53	0 (0%)
Jan 2018	124	118 (95.2%)	123 (99.2%)	124 (100%)	T+06:00	T+07:46	T+06:54	0 (0%)
Feb 2018	112	106 (94.6%)	108(96.4%)	108 (96.4%)	T+06:45	Missing ***	T+12:02	4 (3.6%)
TOTAL	**1460**	**1414 (96.85%)**	**1451 (99.38%)**	**1455 (99.66%)**	**T+06:00**	**T+08:27**	**T+07:19**	**5 (0.34%)**

*** Day long web host outage on 2/20/2017

WAFC London GRIB2 Availability (not including CB, icing or turbulence parameters) on SADIS FTP

Month	Total sets	Complete sets by T+4:20	Complete sets by T+6:00	Earliest time for complete set	Latest time for complete set	Average time for complete set	Incomplete sets at T+6:00
Mar 2017	124	124 (100%)	124 (100%)	T+03:25	T+03:50	T+03:31	0 (0%)
Apr 2017	120	120 (100%)	120 (100%)	T+03:25	T+03:45	T+03:31	0 (0%)
May 2017	124	124 (100%)	124 (100%)	T+03:25	T+03:40	T+03:31	0 (0%)
Jun 2017	120	120 (100%)	120 (100%)	T+03:25	T+03:55	T+03:33	0 (0%)
Jul 2017	124	124 (100%)	124 (100%)	T+03:25	T+03:45	T+03:33	0 (0%)
Aug 2017	124	124 (100%)	124 (100%)	T+03:25	T+03:40	T+03:32	0 (0%)
Sep 2017	120	120 (100%)	120 (100%)	T+03:30	T+04:20	T+03:35	0 (0%)
Oct 2017	124	124 (100%)	124 (100%)	T+03:30	T+04:15	T+03:34	0 (0%)
Nov 2017	120	120 (100%)	120 (100%)	T+03:25	T+04:10	T+03:34	0 (0%)
Dec 2017	124	124 (100%)	124 (100%)	T+03:30	T+04:10	T+03:34	0 (0%)
Jan 2018	124	123 (99.19%)	123 (99.19%)	T+03:30	T+08:55[11]	T+03:37	1 (0.81%)
Feb 2018	112	112 (100%)	112 (100%)	T+03:30	T+04:05	T+03.36	0 (0%)
TOTAL	**1460**	**99.93%**	**99.93%**	**T+03:25**	**T+08:55**	**T+03:33**	**0.07%**

[11] DT230000 UTC: Small electrical fire in IT hall meant that data sets were produced but could not be sent to SADIS on time, resulting in a 5.5 hour delay.

WAFC Washington GRIB2 Availability (not including CB, icing or turbulence parameters) on WIFS

Month	Total sets	Complete sets by T+4:20	Complete sets by T+6:00	Earliest time for complete set	Latest time for complete set	Average time for complete set	Incomplete sets at T+6:00
Mar 2017	124	123 (99.2%)	124 (100%)	T+03:35	T+05:10	T+03:41	0 (0%)
Apr 2017	120	118 (98.3%)	118 (98.3%)	T+03:30	T+07:20	T+03:45	2 (1.7%)
May 2017	124	124 (100%)	124 (100%)	T+03:40	T+03:40	T+03:40	0 (0%)
Jun 2017	120	120 (100%)	120 (100%)	T+03:35	T+03:40	T+03:40	0 (0%)
Jul 2017	124	124 (100%)	124 (100%)	T+03:35	T+04:00	T+03:42	0 (0%)
Aug 2017	124	124 (100%)	124 (100%)	T+03:40	T+03:43	T0+3:43	0 (0%)
Sep 2017	120	120 (100%)	120 (100%)	T+03:40	T+04:00	T+03:45	0 (0%)
Oct 2017	124	124 (100%)	124 (100%)	T+03:40	T+03:43	T+03:43	0 (0%)
Nov 2017	120	119 (99.2%)	119 (99.2%)	T+03:40	T+06:44	T+03:44	1 (0.8%)
Dec 2017	124	123 (99.2%)	123 (99.2%)	T+03:40	T+07:17	T+03:44	1 (0.8%)
Jan 2018	124	123 (99.2%)	123 (99.2%)	T+03:40	T+06:45	T+03:45	1 (0.8%)
Feb 2018	112	110 (98.2%)	110 (98.2%)	T+03:40	T+04:00	T+03:47	2 (1.8%)
TOTAL	**1460**	**1452 (99.45%)**	**1453 (99.52%)**	**T+03:30**	**T+07:20**	**T+03:43**	**7 (0.48%)**

WAFC London GRIB2 CB, Icing and Turbulence Availability on SADIS FTP

Month	Total sets	Complete sets by T+4:35	Complete sets by T+4:50	Complete sets by T+6:00	Earliest time for complete set	Latest time for complete set	Average time for complete set	Incomplete sets at T+6:00
Mar 2017	124	123 (99.2%)[12]	123 (99.2%)	124 (100%)	T+04:10	T+04:55	T+04:18	0 (0%)
Apr 2017	120	119 (99.2%)[13]	120 (100%)	120 (100%)	T+04:10	T+04:50	T+04:15	0 (0%)
May 2017	124	123 (99.2%)[14]	124 (100%)	124 (100%)	T+04:10	T+04:50	T+04:12	0 (0%)
Jun 2017	120	119 (99.2%)[15]	119 (99.2%)	119 (99.2%)	T+04:10	T+04:20[16]	T+04:11	1 (0.8%)
Jul 2017	124	119 (96.0%)[17]	121 (97.6%)	124 (100%)	T+04:10	T+04:55	T+04:12	0 (0%)
Aug 2017	124	124 (100%)	124 (100%)	124 (100%)	T+04:10	T+04:10	T+04:10	0 (0%)
Sep 2017	120	120 (100%)	120 (100%)	120 (100%)	T+04:10	T+04:50	T+04:10	0 (0%)
Oct 2017	124	123 (99.19%)[18]	124 (100%)	124 (100%)	T+04:10	T+04:45	T+04:10	0 (0%)
Nov 2017	120	123 (99.17%)[19]	124 (100%)	124 (100%)	T+04:10	T+04:45	T+04:10	0 (0%)
Dec 2017	124	124 (100%)	124 (100%)	124 (100%)	T+04:10	T+04:35	T+04:10	0 (0%)
Jan 2018	124	123 (99.19%)	123 (99.19%)	123 (99.19%)	T+04:10	T+08.55[20]	T+04:12	1 (0.8)
Feb 2018	112	112 (100%)	112 (100%)	112 (100%)	T+04:10	T+04:20	T+04:10	0 (0%)
TOTAL	**1460**	**99.18%**	**99.59%**	**99.86%**	**T+04:10**	**T+08.55**	**T+04:12**	**0.14%**

[12] DT070600 UTC: Late receipt of data from WAFC Washington, however 'cut-off' triggered slightly late, resulting in 5 minute delay.

[13] DT201200 UTC: Clock synchronisation causing late trigger of process. Data released by cut-off deadline.

[14] DT070600 UTC: Late receipt of data from WAFC Washington, however 'cut-off' triggered slightly late, resulting in 5 minute delay.

[15] DT010600 UTC: Data issued on time, but 77 CAT bulletins were corrupt, therefore classed as unavailable. Processes in place to prevent repeat.

[16] Excluding DT010600 UTC which is regarded as incomplete as noted above.

[17] DT191200, 191800, 200000, 200600, 261800 UTC: Late receipt of data from WAFC Washington, however 'cut-off' triggered slightly late, resulting in 5 minute delay.

[18] DT280000. Cause unknown. Data released by cut-off deadline..

[19] DT091200: Late receipt of data from WAFC Washington.

[20] DT230000 UTC: Small fire in IT hall meant that data sets were produced but could not be sent to SADIS on time, resulting in a 4.5 hour delay.

WAFC Washington GRIB2 CB, Icing and Turbulence Availability on WIFS

Month	Total sets	Complete sets by T+4:35	Complete sets by +4:50	Complete sets by +6:00	Earliest time for complete set	Latest time for complete set	Average time for complete set	Incomplete sets at T+6:00
Mar 2017	124	123 (99.2%)	123 (99.2%)	124 (100%)	T+04:35	T+05:10	T+04:35	0 (0%)
Apr 2017	120	116 (96.7%)	117 (97.5%)	117 (97.5%)	T+04:35	T+07:30	T+04:39	3 (2.5%)
May 2017	124	124 (100%)	124 (100%)	124 (100%)	T+04:35	T+04:35	T+04:35	0 (0%)
Jun 2017	120	118 (98.3%)	120 (100%)	120 (100%)	T+04:35	T+04:45	T+04:35	0 (0%)
Jul 2017	124	110 (88.7%)	123 (99.2%)	124 (100%)	T+04:35	T+05:30	T+04:37	0 (0%)
Aug 2017	124	93 (75%)	124 (100%)	124 (100%)	T+04:35	T+04:45	T+04:37	0 (0%)
Sep 2017	120	87 (72.5%)	120 (100%)	120 (100%)	T+04:35	T+04:45	T+04:38	0 (0%)
Oct 2017	124	88 (71%)	124 (100%)	124 (100%)	T+04:35	T+04:45	T+04:38	0 (0%)
Nov 2017	120	89 (74.2%)	120 (100%)	120 (100%)	T+04:35	T+04:45	T+04:38	0 (0%)
Dec 2017	124	93 (75%)	124 (100%)	124 (100%)	T+04:35	T+04:45	T+04:37	0 (0%)
Jan 2018	124	93 (75%)	123 (99.2%)	123 (99.2%)	T+04:35	T+06:30	T+04:38	1 (0.8%)
Feb 2018	112	79 (70.5%)	110 (98.2%)	110 (98.2%)	T+04:35	T+04:45	T+04:38	2 (1.8%)
TOTAL	**1460**	**1213 (83.1%)**	**1452 (99.45%)**	**1454 (99.59%)**	**T+04:35**	**T+07:30**	**T+04:37**	**6 (0.41%)**

Log of SIGWX Correction Messages:

Month	WAFC London		WAFC Washington	
	Number of occasions	Notes	Number of occasions	Notes
Mar 2017	2	VT090600: Missing jetstream. Correction issued, with required administrative messages. Human error. DT291800: Incorrect jet direction. Correction issued, with required administrative messages. Human error.	0	
Apr 2017	0	N/A	1	VT121200 Error in label for a turbulence area.
May 2017	0	N/A	0	N/A
Jun 2017	0	N/A	0	N/A
Jul 2017	1	VT051200: Incorrect severity of icing. Severe should have been moderate. Corrections and admin messages issued.	1	VT120000 Volcano mistakenly left off chart (Copahue).
Aug 2017	1	VT080000: Incorrect Jetstream height shown in NE USA. Correction issued with required administrative messages. Human Error.	0	N/A
Sep 2017	0	N/A	0	N/A
Oct 2017	2	VT181200: Jetstream missing a height labels in SW Atlantic Ocean and Southern Ocean. Correction issued with required administrative messages. Human Error. VT270600: Tropical Cyclone KYANT incorrectly named. Correction issued with required administrative messages. Human Error.	2	VT050600 forgot to remove a volcano VT290000 missing tropical cyclone label
Nov 2017	0	N/A	0	N/A
Dec 2017	0	N/A	0	N/A
Jan 2017	0	N/A	0	N/A
Feb 2017	0	N/A	0	N/A
TOTAL	**6**	----------	**4**	----------

Log of occasions where non-harmonized WAFS CB, Icing and Turbulence Harmonization issued:

Month	WAFC London		WAFC Washington	
	Number of occasions	Notes	Number of occasions	Notes
Mar 2017	1	DT070600: Late receipt of data from WAFC Washington. Harmonised data issued slightly later than cut-off time, resulting in availability by T+4:55	0	N/A
Apr 2017	0	N/A	0	N/A
May 2017	0	N/A	0	N/A
Jun 2017	1	Although issued on time, 77 CAT bulletins were corrupt. Reason identified and processes put in place to prevent recurrence.	2	VT2900 and VT2906 Internet problems with WAFC Washington prevented receipt of WAFC London Grids.
Jul 2017	5	DT191200, 191800, 200000, 200600, 261800 UTC: Late receipt of data from WAFC Washington, however 'cut-off' triggered slightly late, resulting in availability by T+4:55	0	N/A
Aug 2017	0	N/A	0	N/A
Sep 2017	0	N/A	0	N/A
Oct 2017	0	N/A	0	N/A
Nov 2017	1	DT091200. Late receipt of data from WAFC Washington. Resulting in availability by T+4:45	0	N/A
Dec 2017	0	N/A	0	N/A
	0	N/A	0	N/A
Dec 2017	0	N/A	0	N/A
Jan 2018	8	----------	2	----------

Appendix B to WAFC Management Report
History of Scheduled and un-scheduled WAFC SIGWX Backups

Scheduled WAFC SIGWX backup events

DATE	NOTES
12 April 2017 - WAFC London provided backup SIGWX products on behalf of WAFC Washington.	Implemented successfully.
26 April 2017 - WAFC Washington provided backup SIGWX products on behalf of WAFC London.	Implemented successfully.
12 July 2017 - WAFC London provided backup SIGWX products on behalf of WAFC Washington.	Implemented successfully.
26 July 2016 - WAFC Washington provided backup SIGWX products on behalf of WAFC London.	No problems reported but note that on this occasion the data was purposefully issued 1 hour later than normal, as per WG-MOG Decision 3/1.
11 October 2017 - WAFC London provided backup SIGWX products on behalf of WAFC Washington.	Implemented successfully.
25 October 2017	Backup test cancelled
10 January 2018 - WAFC Washington provided backup SIGWX products on behalf of WAFC London.	Implemented successfully.
24 January 2018 - WAFC London provided backup SIGWX products on behalf of WAFC Washington.	No problems reported but note that on this occasion the data was purposefully issued 1 hour later than normal, as per WG-MOG Decision 3/1.

Non-scheduled WAFC SIGWX backup events

DATE	ISSUES
23 January 2018 – Data VT 00:00UTC and 06:00UTC issued by WAFC Washington on behalf of WAFC London	Backup implemented successfully.

Appendix C to WAFC Management Report
WAFC Meetings and Seminar Participation

Meeting	Location	Date	WAFC London	WAFC Washington
Twenty-first Meeting of the Meteorology Sub-group of the Asia/Pacific Air Navigation Planning and Implementation Regional Group (MET/SG/21)	Bangkok	29 May to 01 June 2017		Yes
Twenty-first meeting of DMG (DMG/21)	Saint Petersburg, Russian Federation	27 to 29 June 2017	Yes	
Third meeting of the Meteorological Information Exchange Working Group to the Meteorological Panel (WG-MIE/3)	Montréal, Canada	10 to 13 July 2017	Yes	Yes
Third meeting of the Meteorological Information and Service Development Working Group to the Meteorological Panel (WG-MISD/3)	Montréal, Canada	17 to 18 July 2017	Yes	Yes
Caribbean/South American Regional Planning and Implementation Group (GREPECAS)	Lima, Peru	18 to 22 September 2017		Yes
Twenty seventh meeting of the European/North Atlantic Meteorological Group (METG/27)	Paris, France	19 to 22 September 2017	Yes	Yes
Seventh meeting of the MIDANPIRG Meteorology Sub-Group (MET SG/7)	Cairo, Egypt	14 to 15 November 2017	Yes	

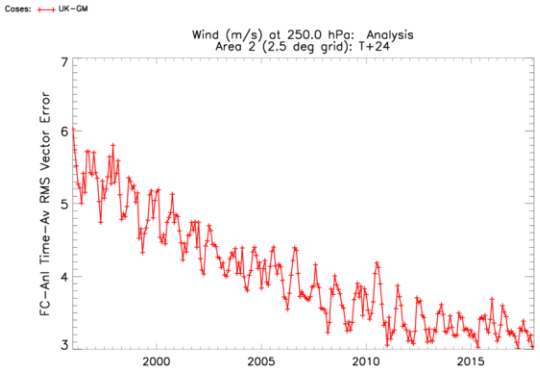
Second Global Air Navigation Industry Symposium (GANIS/2)	Montréal, Canada	11 to 13 December 2017	Yes	
WAFC Coordination meeting	Kansas City, USA	5 to 7 February 2018	Yes	Yes
IATA FOSTF meeting	London, UK	13 to 14 February 2018	Yes	Yes

Appendix D to WAFC Management Report
Verification Statistics

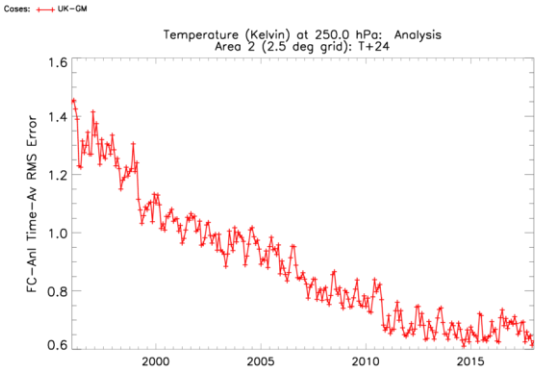
North Atlantic:
WAFC London 250hPa T+24 Wind
WAFC London 250hPa T+24 Temperature
WAFC Washington 250hPa T+24 Wind
WAFC Washington 250hPa T+24 Temperature
Harmonized T+24 Mean CAT
Harmonized T+24 Max CAT
Harmonized T+24 Mean Icing
Harmonized T+24 Max Icing
Harmonized T+24 CB Horizontal Extent

WAFC London

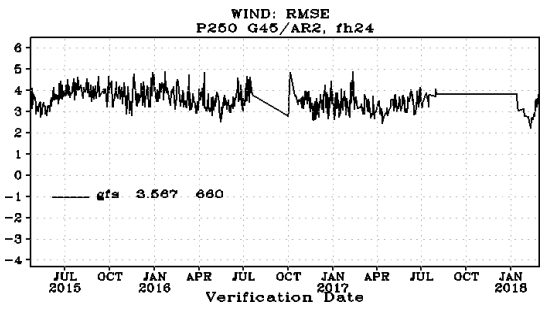
Wind (m/s)

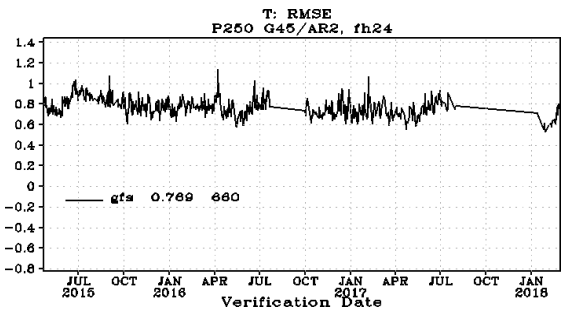


Temp (C)

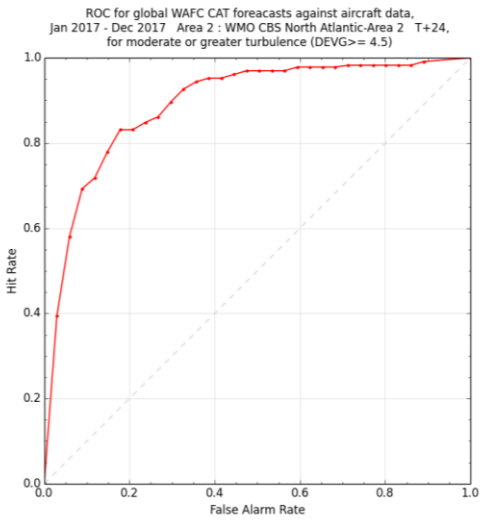


WAFC Washington

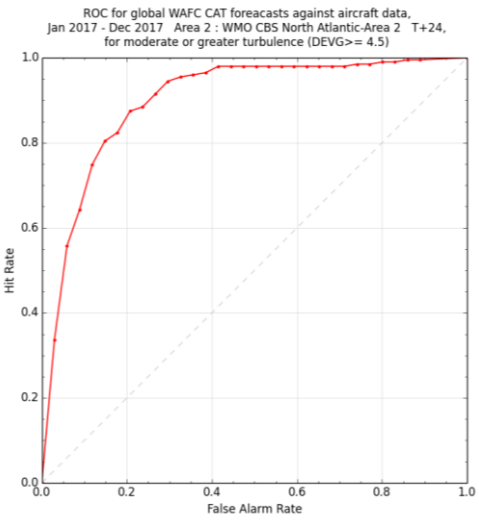




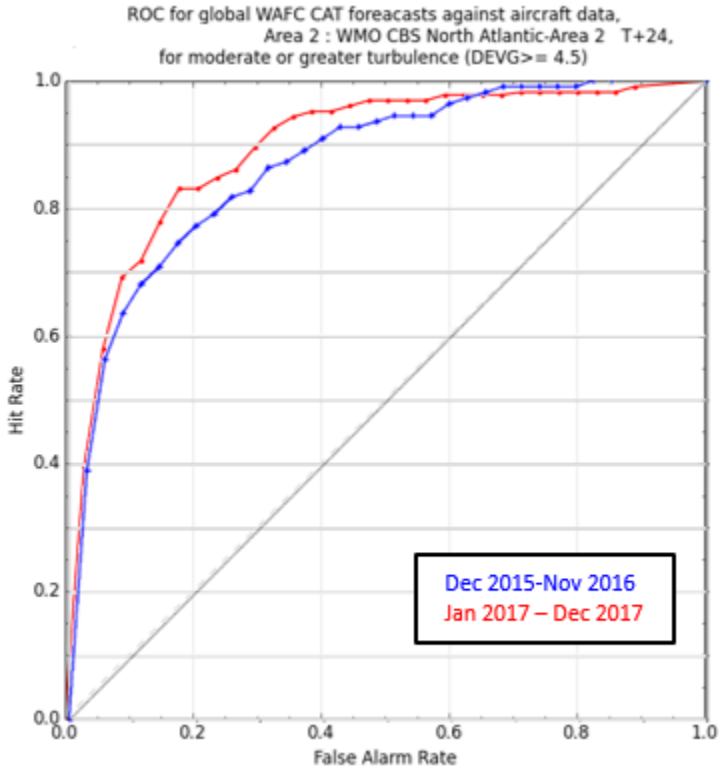
Mean CAT (T+24)



Max CAT (T+24)



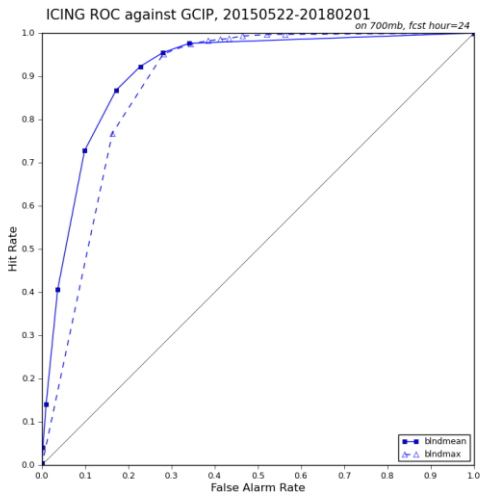
Comparison



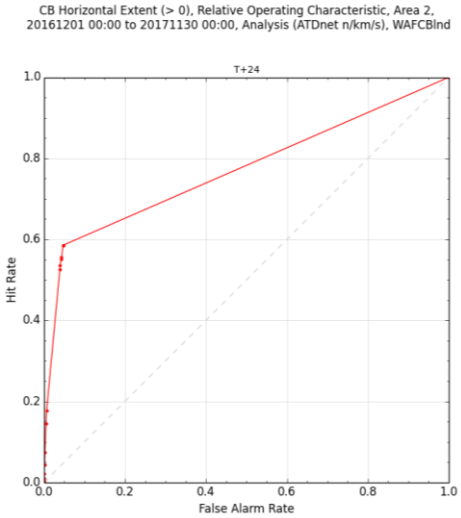
This plot shows a comparison of the Mean CAT (≥4.5) for the North Atlantic Area (Area 2) for
Jan 2017-Dec 2017 (red line) and,
Dec 2015-Nov 2016 (blue line)

The area under the curve in the Jan 2017 plot is greater, demonstrating an improvement in skill.

Max/Mean Icing Potential



CB horizontal Extent

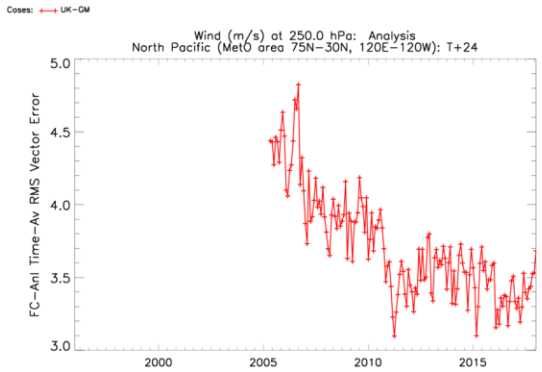


North Pacific:

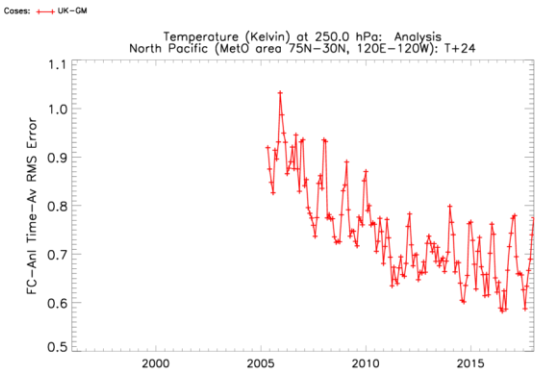
WAFC London 250hPa T+24 Wind
WAFC London 250hPa T+24 Temperature
WAFC Washington 250hPa T+24 Wind
WAFC Washington 250hPa T+24 Temperature
Harmonized T+24 Mean CAT
Harmonized T+24 Max CAT
Harmonized T+24 Mean Icing
Harmonized T+24 Max Icing
Harmonized T+24 CB Horizontal Extent

WAFC London

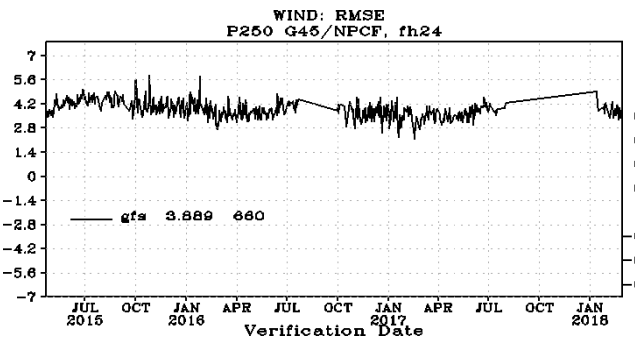
Wind (m/s)

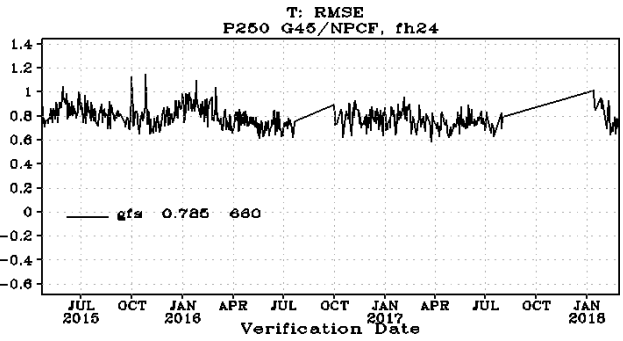


Temp (C)

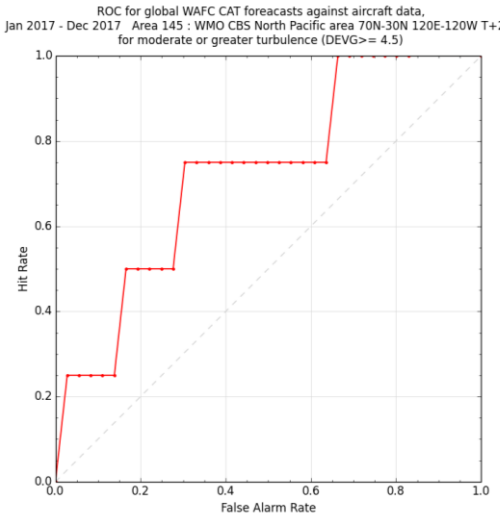


WAFC Washington

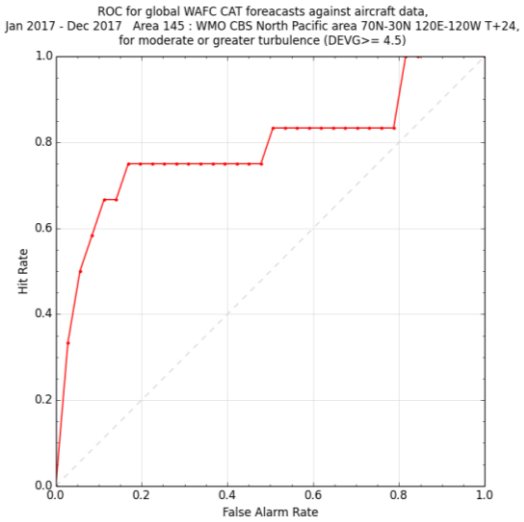




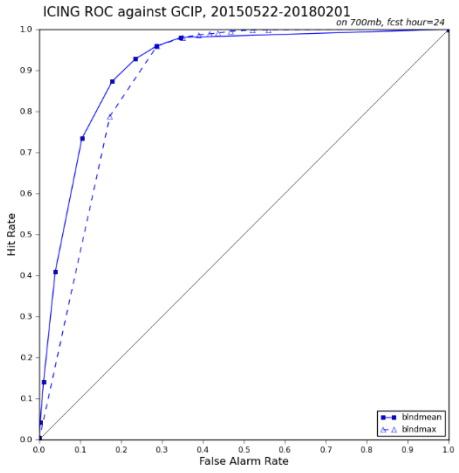
Mean CAT (T+24)



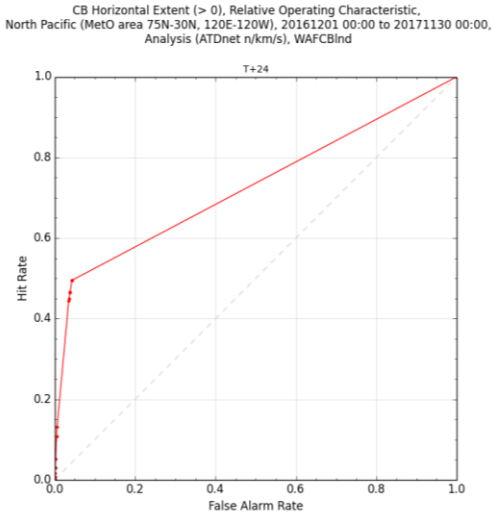
Max CAT (T+24)



Max/Mean Icing Potential



CB horizontal Extent



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