International Civil Aviation Organization

WORKING PAPER

ICAO Asia and Pacific (APAC)
Twenty-Sixth Meeting of the Meteorology Sub-Group (MET SG/26)

Online, 1 to 5 August 2022

Agenda Item 6: Research, development and other initiatives

WAFS UPDATE

(Presented by WAFC London and WAFC Washington)

SUMMARY

This paper provides an update on recent and upcoming changes to the World Area Forecast System (WAFS) service provision by WAFC[1] London and Washington.

1. INTRODUCTION

1.1 This paper reports on WAFS operational matters as well as recent and upcoming changes in the provision of WAFS data sets and a change to the way in which the data will be delivered to users. These changes have been agreed though the ICAO Met Panel Meteorological Operations Group (MOG) at its annual meetings.

2. Operational WAFS matters

2.1 WAFS Verification Data.

2.1.1 Verification data for WAFC London is available here http://www.metoffice.gov.uk/aviation/responsibilities/icao. Information availability of WAFS data on SADIS is also available here.

2.1.2 Verification data for WAFC Washington is available here: http://www.emc.ncep.noaa.gov/gmb/icao/.

2.1.3 Both WAFCs verify their own wind and temperature forecasts. WAFC London provides verification data for the harmonized/blended cumulonimbus cloud forecasts, and turbulence forecasts. Unfortunately, verification data is not currently available for turbulence but it is hoped that this will be

[1] World Area Forecast Centre

published within the next couple of months. WAFC Washington provide verification data for the harmonized/blended icing data sets.

2.1.4 The verification data should be used in conjunction with the guidance material available on the WG-MOG public webpage (in the MOG-WAFS Reference Documents section).

3. Upcoming WAFS Upgrades

3.1 Both WAFCs have been working to define the next generation WAFS provision, which will bring an upgrade in the horizontal, vertical and temporal resolutions to all WAFS data sets. A full summary of the new data is included in Appendix A. The new data includes:

- the provision of wind, temperature, relative humidity and geopotential height at 0.25 degree horizontal resolution
- data at 1000ft flight level intervals
- data at 1-hourly intervals from 6-hours to 24-hours, 3-hourly intervals from 27-hours to 48-hours, and wind and temperature data at 6-hourly intervals out to 120-hours.

3.2 The upgrade to the WAFS Significant Weather (SIGWX) forecasts will follow in 2024 (date to be confirmed) when SIGWX forecasts will be produced for 3-hourly intervals for the 6-hour to 48-hour period.

3.3 Some changes will be made to the WAFS SIGWX forecast content:

- It will cover FL100 to FL600 in a single forecast (i.e. no separate SWM, medium level SIGWX)
- Tropopause spot heights will be replaced by tropopause contours
- Icing objects will be available for the whole globe
- Only occasional (OCNL) and frequent (FRQ) Cumulonimbus cloud will be shown (it is not possible to include embedded [EMBD] cloud)
- Turbulence objects will include clear air and orographic turbulence. There will be no separate in-cloud turbulence field.

3.4 The new SIGWX forecasts will be produced in IWXXM format. Test data sets are available here: https://www.metoffice.gov.uk/services/transport/aviation/regulated/wafs-sigwx-test-data and everyone is encouraged to try to visualize them.

3.5 BUFR format SIGWX will be retired 2 years after the new SIGWX is introduced, and WAFC produced "paper copy" SIGWX charts for T+24 will cease in 2028. It should be noted that ICAO Annex 3 has stated for many years that the digital version of SIGWX forecasts should be used and integrated into flight planning and meteorological visualization software. Customized "paper copy" chart relevant for a specific flight can be created if needed from the digital visualizations.

4. Delivery of WAFS data via SADIS[2] and WIFS[3]

4.1 Increasing the resolution of the data is going to have a huge impact on its total volume, and therefore the SADIS and WIFS systems will be upgraded. Both WAFC's have been working together to develop a consistent approach for both systems will make it easier for users to switch to the other system for backup in the event of any failure.

4.2 The upgraded SADIS and WIFS will both be SWIM[4] compliant and will be based on the Open Geospatial Consortium Environmental Data Retrieval[5] API. This will enable users to customize the data sets that are downloaded. For example, it will be possible for users to choose which region to download data for (a set of 8 fixed regions will be provide, as well as global data) as well to specify which vertical levels of data are required. This should make managing the volume of data easier for downstream users, and users will be strongly encouraged to only the take the data they need operationally.

4.3 OPMET data will also be made available via API and users will be able to choose which specific data they would like.

4.4 The new SADIS and WIFS API's for WAFS gridded and OPMET data are expected to become operational in November 2023. Users will be invited to try out the beta/test versions of the new systems once these are available (likely towards the end of 2022), and will be encouraged to provide the SADIS provider with feedback.

5. Conclusion

5.1 Significant changes to the WAFS data sets are coming over the next two years and users will need to make updates to their systems in order to be able to benefit from it.

5.2 https://www.metoffice.gov.uk/services/transport/aviation/regulated/wafs-2023 contains further information on the upcoming changes.

5.3 The group is also invited to consider formulating the following action:

Draft Action Met-SG26/xx – SADIS and WIFS upgrades

SADIS and WIFS users are invited to;

a) familiarize themselves with the proposed WAFS data and technical changes planned for November 2023 and 2024;

b) discuss the upcoming changes with their technical departments and make plans for how their organization could adapt to these technological changes;

c) get involved in trying out the new test/beta API's once they become available in late 2022 or 2023.

[2] Secure Aviation Data Information Service – operated by WAFC London
[3] WAFS Internet File Service – operated by WAFC Washington
[4] https://www.eurocontrol.int/concept/system-wide-information-management
[5] https://ogcapi.ogc.org/edr/

6. ACTION BY THE MEETING

6.1 The meeting is invited to:

a) note the information contained in this paper; and

b) discuss any relevant matters as appropriate.

Appendix A

Fixed valid times of available WAFS upper-air gridded forecasts with a horizontal resolution of 0.25°of latitude and longitude:

Upper-air gridded forecasts	*1-hourly intervals*	*3-hourly intervals*	*6-hourly intervals*
Wind, temperature, geopotential altitude	6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23 and 24 hours*	27, 30, 33, 36, 39, 42, 45 and 48 hours*	54, 60, 66, 72, 78, 84, 90, 96, 102, 108, 114 and 120 hours*
Flight level and temperature of tropopause			
Direction, speed and flight level of maximum wind			
Humidity			
Horizontal extent, and flight levels of base and top, of cumulonimbus clouds	6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23 and 24 hours*	27, 30, 33, 36, 39, 42, 45 and 48 hours*	Not provided
Icing			
Turbulence			

* after the time (0000, 0600, 1200 and 1800 UTC) of the synoptic data on which the forecasts were based

Availability (marked by X) of WAFS upper-air gridded forecasts with a horizontal resolution of 0.25° of latitude and longitude as a function of flight level

Flight Level	*ICAO Standard Atmosphere pressure level (hPa)*	*Geopotential Altitude*	*Wind*	*Temperature*	*Turbulence*	*Icing*	*Humidity*
FL 050	843.1	X	X	X	—	X	X
FL 060	812.0	X	X	X	—	X	X
FL 070	781.9	X	X	X	—	X	X
FL 080	752.6	X	X	X	—	X	X
FL 090	724.3	X	X	X	—	X	X
FL 100	696.8	X	X	X	X	X	X
FL 110	670.2	X	X	X	X	X	X
FL 120	644.4	X	X	X	X	X	X
FL 130	619.4	X	X	X	X	X	X
FL 140	595.2	X	X	X	X	X	X
FL 150	571.8	X	X	X	X	X	X
FL 160	549.2	X	X	X	X	X	X
FL 170	527.2	X	X	X	X	X	X
FL 180	506.0	X	X	X	X	X	X
FL 190	485.5	X	X	X	X	X	—
FL 200	465.6	X	X	X	X	X	—
FL 210	446.5	X	X	X	X	X	—
FL 220	427.9	X	X	X	X	X	—
FL 230	410.0	X	X	X	X	X	—
FL 240	392.7	X	X	X	X	X	—

Flight Level	*ICAO Standard Atmosphere pressure level (hPa)*	*Geopotential Altitude*	*Wind*	*Temperature*	*Turbulence*	*Icing*	*Humidity*
FL 250	376.0	X	X	X	X	X	—
FL 260	359.9	X	X	X	X	X	—
FL 270	344.3	X	X	X	X	X	—
FL 280	329.3	X	X	X	X	X	—
FL 290	314.9	X	X	X	X	X	—
FL 300	300.9	X	X	X	X	X	—
FL 310	287.4	X	X	X	X	—	—
FL 320	274.5	X	X	X	X	—	—
FL 330	262.0	X	X	X	X	—	—
FL 340	250.0	X	X	X	X	—	—
FL 350	238.4	X	X	X	X	—	—
FL 360	227.3	X	X	X	X	—	—
FL 370	216.6	X	X	X	X	—	—
FL 380	206.5	X	X	X	X	—	—
FL 390	196.8	X	X	X	X	—	—
FL 400	187.5	X	X	X	X	—	—
FL 410	178.7	X	X	X	X	—	—
FL 420	170.4	X	X	X	X	—	—
FL 430	162.4	X	X	X	X	—	—
FL 440	154.7	X	X	X	X	—	—
FL 450	147.5	X	X	X	X	—	—
FL 460	140.6	X	X	X	—	—	—
FL 470	134.0	X	X	X	—	—	—
FL 480	127.7	X	X	X	—	—	—
FL 490	121.7	X	X	X	—	—	—
FL 500	116.0	X	X	X	—	—	—
FL 510	110.5	X	X	X	—	—	—
FL 520	105.3	X	X	X	—	—	—
FL 530	100.4	X	X	X	—	—	—
FL 540	95.7	X	X	X	—	—	—
FL 550	91.2	X	X	X	—	—	—
FL 560	87.0	X	X	X	—	—	—
FL 570	82.8	X	X	X	—	—	—
FL 580	79.0	X	X	X	—	—	—
FL 590	75.2	X	X	X	—	—	—
FL 600	71.7	X	X	X	—	—	—

Availability (marked by X) of WAFS upper-air gridded forecasts with a horizontal resolution of 1.25° of latitude and longitude as a function of flight level

WAFS forecasts with a horizontal resolution of 1.25° will be provided for users unable to process WAFS forecasts with a horizontal resolution of 0.25°.

Flight Level	*ICAO Standard Atmosphere pressure level (hPa)*	*Geopotential Altitude*	*Wind*	*Temperature*	*Humidity*
FL 050	843.1	X	X	X	X
FL 080	752.6	X	X	X	X
FL 100	696.8	X	X	X	X
FL 140	595.2	X	X	X	X
FL 180	506.0	X	X	X	X
FL 210	446.5	X	X	X	—
FL 240	392.7	X	X	X	—
FL 270	344.3	X	X	X	—
FL 300	300.9	X	X	X	—
FL 320	274.5	X	X	X	—
FL 340	250.0	X	X	X	—
FL 360	227.3	X	X	X	—
FL 390	196.8	X	X	X	—
FL 410	178.7	X	X	X	—
FL 450	147.5	X	X	X	—
FL 480	127.7	X	X	X	—
FL 530	100.4	X	X	X	—

** after the time (0000, 0600, 1200 and 1800 UTC) of the synoptic data on which the forecasts were based.*

Fixed valid times of available WAFS upper-air gridded forecasts with a horizontal resolution of 1.25° of latitude and longitude

Upper-air gridded forecasts	*3-hourly intervals*
Wind, temperature, geopotential altitude	6, 9, 12, 15, 18, 24, 27, 30, 33 and 36 hours*
Flight level and temperature of tropopause	
Direction, speed and flight level of maximum wind	
Humidity	

* after the time (0000, 0600, 1200 and 1800 UTC) of the synoptic data on which the forecasts were based