

# AERONAUTICAL INFORMATION CIRCULAR P 131/2024

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Safety



## CHANGES TO ICAO UPPER-AIR SIGNIFICANT WEATHER (SIGWX) FORECASTS

### 1 Introduction

- 1.1 This AIC provides notification of changes and enhancements to ICAO World Area Forecast System (WAFS) Upper-Air (En-route) SIGWX Forecast information, and notification of changes to the appearance of the WAFS SIGWX Forecast Charts produced by the ICAO World Area Forecast Centres (WAFS London and WAFS Washington).

**The changes are significant to flight operations and require operator and briefing system supplier action by 26 November 2024.**

- 1.2 Key changes are summarised in the table below. For detailed information see Appendices A to C to this AIC.

Changes effective from 26 November 2024	
Change	Comment
Clear-air turbulence (CAT) forecasts will become "Turbulence" areas (which will encompass CAT, in-cloud, and orographic (i.e., generated by mountains) turbulence type forecasts).	Turbulence forecasts to be based on 'Eddy Dissipation Rate.'  Note – Convective and non-convective cloud areas associated with in-cloud moderate or severe turbulence are included in SIGWX forecasts.
Areas of forecast of isolated and/or embedded cumulonimbus clouds will no longer be included in WAFS BUFR data and PNG Charts; areas of forecast cumulonimbus clouds which are expected to have more than 50% coverage will continue to be shown in both WAFS BUFR data and PNG charts.	For forecasts of isolated and/or embedded cumulonimbus clouds Users should instead make use of WAFS gridded cumulonimbus extent data sets.
On medium level SIGWX charts (for specific areas FL 100 - FL 450), the combined in-cloud icing and turbulence areas will change to show areas of moderate and severe icing only.	Associated in-cloud turbulence areas will no longer be depicted.
WAFS SIGWX forecasts provided in a new digital data (IWXXM) format (IWXXM is the ICAO specified format for reporting and transmitting weather information in XML/GML).	Will be issued alongside existing BUFR data format and provide enhancements to the services offered including an increased number of timesteps and extended forecast period.
Changes effective from November 2026	
Change	Comment
WAFS SIGWX forecast data will no longer be produced in BUFR format.	IWXXM becomes the only digital data format.
Changes effective from November 2028	
Change	Comment
Specific chart areas for briefing purposes in PNG format will no longer be produced centrally by WAFS.	Users should therefore ensure that they have systems capable of extracting, decoding, and visualising the new WAFS SIGWX Forecast data in IWXXM format.

1.2.1 The changes to SIGWX forecasts summarised above have been planned for several years by the WAFC providers and offer a number of enhancements to the forecasts. It was anticipated that the changes would be introduced in Amendment 81 to ICAO Annex 3 (Meteorological Service for International Air Navigation), but they were unexpectedly excluded from this amendment along with a number of other changes.

However, the changes to SIGWX forecasts will still be implemented with effect **from 26 November 2024** and hence there will be certain differences between the specifications for the new WAFS SIGWX Forecasts and the provisions in ICAO Annex 3 Amendment 81 (but it is expected that the specifications will become aligned in Annex 3 Amendment 82 which it is anticipated will be **introduced in November 2025**).

1.2.2 In the interim, users will need to ensure that in order to continue to be able to extract and visualise WAFS SIGWX charts, applicable systems are able to correctly process the changes and decode the BUFR data into charts.

1.2.3 The new WAFS SIGWX IWXXM data available **from 26 November 2024** will provide important enhancements including an increased number of timesteps and extended forecast period. Flight planning systems will need to be upgraded to extract, decode, and visualise the new IWXXM format SIGWX data as weather charts in accordance with ICAO Standards before it can be used.

1.3 Operators and other users of WAFC SIGWX forecasts should ensure: -

1. That all relevant personnel, and particularly flight crew and operations control staff are briefed on the changes listed in section 2 below and provided with training appropriate to their role; and
2. Applicable software and systems used for flight planning and in-flight applications are updated as required.

**It is strongly recommended that users implement systems that can process and visualise the new WAFS SIGWX IWXXM data, to benefit from improved situational awareness, more timely forecast information, and enhanced functionality as detailed in Appendix B.**

Systems **must have this capability by November 2026** as after this date the WAFCs will no longer produce data in BUFR format. IWXXM beta data test files are available via the SADIS application programming interface (SADIS API).

1. To ensure standardization of flight documentation, software and systems used to extract and visualise WAFS BUFR or IWXXM data must decode the data into forecast charts in accordance with applicable ICAO Standards and UK Regulations.

## 2 References

1. WAFC London and WAFC Washington Summary of Changes to WAFS SIGWX Forecasts (<https://www.metoffice.gov.uk/binaries/content/assets/metofficegovuk/pdf/services/transport/aviation/sigwx-flyer.pdf>)
2. WAFC London overview of upcoming changes (<https://www.metoffice.gov.uk/services/transport/aviation/regulated/wafs-2023>)
3. WAFC London SADIS Overview (<https://www.metoffice.gov.uk/services/transport/aviation/regulated/sadis>)
4. WAFC London SADIS API Service Summary (<https://www.metoffice.gov.uk/services/transport/aviation/regulated/sadis/info/sadis-api-service-summary>)
5. UK Reg (EU) No. 965/2012 (Air Operations) (<https://www.caa.co.uk/uk-regulations/aviation-safety/basic-regulation-the-implementing-rules-and-uk-cao-amc-gm-cs-air-operations/>)
6. ICAO SADIS Reference Documents (<https://www.icao.int/airnavigation/METP/MOGWIFSSADIS%20Reference%20Documents/Forms/AllItems.aspx>)
7. ICAO Annex 3 Meteorological Service for International Air Navigation
8. ICAO Document 8896 Manual of Aeronautical Meteorological Practice

## 3 Contacts

3.1 For further details regarding the information in this AIC contact: [SADISManager@metoffice.gov.uk](mailto:SADISManager@metoffice.gov.uk).

## 4 APPENDIX A - Description of changes to T+24 WAFS SIGWX Forecast Data (BUFR) and Charts (PNG)

### 4.1 Changes to Issue Times and Forecast Periods

4.1.1 WAFS SIGWX Forecasts are made available by file transfer protocol (FTP) from the WAFS London SADIS (Secure Aviation Data Information Service) system.

1. SADIS is the ICAO internet-based system for the dissemination of meteorological data produced in accordance with ICAO Annex 3. WAFS SIGWX Forecasts are supplied by the WAFCs in Chart (PNG format), and BUFR data format for extraction and processing by end users' systems which must visualise the BUFR data as weather charts in accordance with ICAO Standards before it can be used.

4.1.2 The 24-hour (T+24) SIGWX Forecasts are published on SADIS 17 hours ahead of their validity times of 06:00, 12:00, 18:00 and 00:00 UTC. **These forecasts will continue to be published every six hours but will be available approximately one hour earlier (18 hours ahead of their validity time).**

### 4.2 Changes to Horizontal and Vertical Resolution (Flight Levels)

4.2.1 T+24 WAFS SIGWX Forecasts in BUFR and PNG formats provide Medium- Level Forecasts applicable to FL 100 - FL 450, and High-Level Forecasts applicable to FL 250 - FL 630. **FL 630 will change to FL 600.**

4.2.2 2.T+24 Medium Level BUFR data "coverage area" may change to encompass a larger area. However, this will not impact users when creating charts from the new BUFR data. BUFR data test files will be available via SADIS FTP by mid-August at the latest.

### 4.3 Changes to WAFS SIGWX Forecast Weather Phenomena

4.3.1 The weather phenomena currently included in WAFS SIGWX Forecasts, and the changes to them are described below:

#### 4.3.1.1 Clear-air turbulence (CAT)

1. CAT areas will become "Turbulence" areas (which will encompass CAT, in-cloud, and orographic (i.e., generated by mountains) turbulence types).
2. MOD and SEV Turbulence areas will be indicated when Eddy Dissipation Rate (EDR) forecast threshold values are exceeded (EDR forecast information is contained in the WAFS Gridded turbulence data which is available on the SADIS API). MOD areas of turbulence will be marked when the WAFS EDR forecast value is equal to or above 0.20 and below 0.35. SEV areas of turbulence will be marked when the EDR value equals or exceeds 0.35 (Note: The WAFCs are fine tuning these thresholds and the final values used **from 26 November 2024** may reflect minor amendments).

4.3.1.2 Cumulonimbus clouds (CB): Occasional CB (OCNL CB); Frequent CB (FRQ CB); Isolated Embedded CB (ISOL EMBD CB); Occasional Embedded CB (OCNL EMBD CB); and Frequent Embedded CB (FRQ EMBD CB).

1. Currently ISOL CB are only included within the SIGWX forecast when they are embedded (ISOL EMBD CB). The WAFCs do not have meteorological model output that indicates whether CB are embedded, and this is added manually by meteorologists. But, without model output, forecasting EMBD CB is a very subjective exercise and difficult to verify. Hence the current SIGWX provision means that large areas of ISOL EMBD CB are forecast and there is limited ability for users to identify where there are specific concentrations of CB.
2. Because of the subjectivity and lack of specific location information when forecasting areas of ISOL EMBD CB, OCNL EMBD CB and FRQ EMBD CB these phenomena will not be included in WAFS SIGWX Forecasts (BUFR data or PNG Charts). To identify areas of ISOL CB users should make use of WAFS gridded cumulonimbus extent data sets, which should also be used to support the identification of thunderstorms. This data is available on the SADIS API. Hence, it is strongly recommended that users implement systems that can process and visualise the new WAFS gridded cumulonimbus data sets.
3. Areas where forecasted cumulonimbus clouds are more concentrated with more than 50% coverage (being OCNL or FRQ in nature) will continue to be included in both WAFS BUFR data and PNG Charts. There will be more OCNL CB areas included on the WAFS SIGWX forecasts, because OCNL CB forecasts may include areas which were formerly depicted as ISOL EMBD CB, and which may have a horizontal extent that is in alignment with the OCNL thresholds.
4. For in-flight weather, certified aircraft systems e.g., weather radar, can identify the location of larger precipitation sized water droplets that can indicate the potential location of heavy rain or thunderstorms in a larger mass of cloud.

#### 4.3.1.3 In-cloud icing and turbulence

1. On medium level SIGWX charts, the combined in-cloud icing and turbulence areas will change to only show areas of MOD and SEV icing based on the categorical icing assessment values contained in the WAFS Gridded icing forecast data. The WAFS gridded icing forecast is calibrated and verified against aircraft reports of icing and vertical profiles obtained from satellite imagery.

#### 4.3.1.4 Other phenomena

1. Flight level of tropopause, jet-streams, and tropical cyclones, volcanic eruptions, and the release of radioactive material into the atmosphere.

- a) These will continue to be included within the SIGWX forecast.

#### 4.4 Changes to the appearance of WAFS SIGWX Charts (PNG Format)

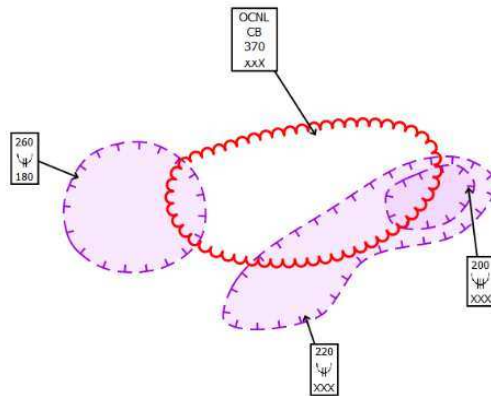
4.4.1 Along with other presentational amendments, the changes described in paragraphs 4.1 to 4.3 will result in changes to the appearance and content of the WAFS SIGWX Charts (PNG) produced by the WAFCs as summarised below:

1. Tropopause level will be shown as contours (as a thin dashed line with a label indicating its flight level e.g., FL 300, instead of spot heights).
2. Clear Air Turbulence (CAT) areas will become “Turbulence” areas, which will encompass CAT, in-cloud, and orographic (i.e., generated by mountains) turbulence types. MOD and SEV Turbulence areas will be shown as applicable.
3. For the reasons stated in Paragraph 4.3.1.2 ISOL EMBD CB, OCNL EMBD CB and FRQ EMBD CB will not be shown on charts. Only Occasional (OCNL) and Frequent (FRQ) CB amounts will be shown on WAFS SIGWX charts.

**Note:** Users are reminded that information to support the identification of thunderstorms must be derived from WAFS gridded cumulonimbus extent data sets.

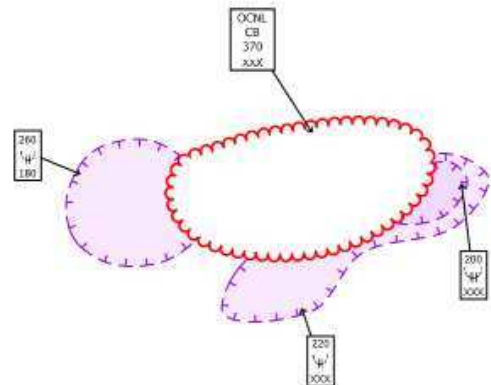
4. On medium level SIGWX charts combined in-cloud turbulence and icing areas will become icing areas.
5. The T+24 charts produced by the WAFc’s will be produced in colour to enable clearer identification of features, and icing areas will be depicted with a different line style to distinguish them from cumulonimbus cloud areas as shown in the illustration below:

**Depiction of CB and icing areas on T+24 charts produced by WAFCs code from 26 November 2024:**



**Note:** Unlike the charts produced by the WAFCs, from 26 November 2024, when BUFR data is visualised by third-party systems, the BUFR file will not contain overlapping areas of icing and CB. This will enable clear labelling and depiction of respective areas of CB and icing when systems do not use colour or different line styles. This means that suppliers will be able to continue to use their existing BUFR visualisation code. The illustration below shows how BUFR data will be coded to appear on charts produced by third-party systems:

**Depiction of CB and icing areas on T+24 charts produced by BUFR code from 26 November 2024:**



4.4.2 An example of a WAFS High-Level SIGWX chart produced **before 26 November 2024** is provided in Appendix C to this AIC along

with an example of the same chart showing how the forecast will be visualised **after 26 November 2024**.

- 4.4.3 WAFS SIGWX PNG charts published by the WAFCs are used for briefing purposes by those unable to generate charts themselves, or to validate third-party weather charts produced from WAFS SIGWX BUFR data.
  - 4.4.4 **From November 2028** the WAFCs will no longer produce charts for briefing purposes. **By November 2028** users should therefore ensure that they have systems capable of extracting, decoding, and visualising the new WAFS SIGWX Forecast data in IWXXM format.
- 4.5 Changes to SIGWX Forecast Data – BUFR Format**
- 4.5.1 Test BUFR data test files (as they will be **from 26 November 2024**) will be published by the SADIS provider by mid-August at the latest for testing.
  - 4.5.2 **From November 2026** the WAFCs will no longer produce data in BUFR format. **By November 2026** users will need to ensure that systems are able to extract, decode and visualise the WAFS SIGWX Forecast data in IWXXM format.

## 5 APPENDIX B - Description of enhancements introduced in WAFS SIGWX Forecast IWXXM Data

### 5.1 Overview

5.1.1 The new digital data IWXXM format will enable the development of interactive systems with features such as the ability to control map projection, adjust zoom level, map layer toggle functionality and the visualisation of how weather features will move during the forecast period.

1. Users will need to collaborate with suppliers to establish requirements and upgrade systems to deliver new functionality and visualisation of forecast information in accordance with applicable ICAO Standards and UK regulations.
2. Implementation of new functionality and visualisation, and the associated benefits, should include plans to ensure that all relevant personnel have received appropriate briefing and training regarding applicable changes for flight-planning and for in-flight weather applications if/as necessary.
3. Briefing quality charts will not be produced for the new WAFS SIGWX Forecasts, but charts will be produced that enable users to validate third-party weather charts produced from IWXXM data.

5.1.2 IWXXM beta data test files are currently available via the SADIS API. **From 26 November 2024** IWXXM data files made available via the SADIS API will be for operational use.

5.1.3 The enhanced WAFS SIGWX Forecast information provided in IWXXM data format is summarised below.

### 5.2 Enhancements to Forecast Periods

5.2.1 Instead of a single 24 hour forecast the new SIGWX Forecast data provided in IWXXM format will cover a period from 6 hours to 48 hours from the issue time (T+48) and include forecasts at 3-hourly intervals: T+6, T+9, T+12, T+15, T+18, T+21, T+24, T+27, T+30, T+33, T+36, T+39, T+42 and T+48.

It is expected that the extended forecast period and introduction of multiple-timesteps will assist users to better interpolate forecast data to identify weather phenomena that may be encountered at applicable points and times throughout the en-route phase of flights, helping to improve situational awareness and the safety and efficiency of flight-planning.

### 5.3 Enhancements to Horizontal and Vertical Coverage of Forecasts

5.3.1 The WAFS SIGWX T+24 forecasts are provided in a high and medium level form. The high-level chart (encompassing FL 250 – FL 600) covers the whole globe, whilst the medium level chart (encompassing FL 100 - FL 400) only covers a limited geographical area. This means that some phenomena, particularly icing areas, are not currently provided for the full globe. Additionally, forecast information is, on occasion, duplicated on both medium and high-level charts.

5.3.2 To increase the coverage area of forecasts, reduce complexity and remove duplication, the WAFS SIGWX Forecasts provided in IWXXM format will encompass the full globe for FL 100 - FL 600 in a single dataset. This means there will no longer be separate medium and high-level versions of the forecast hence removing duplication, and the discrepancy in forecast coverage area will be eliminated.

5.3.3 Each feature within the SIGWX forecast will contain information about the flight level range that it is occurring at, in addition to its geographical location, enabling the accurate identification of the vertical boundaries of specific areas of forecast phenomena.

Briefing system suppliers will be able to filter WAFS SIGWX Forecast data and only show features of interest that lie within a particular vertical range that are important to users' operations. For example, data could be filtered to only show cumulonimbus areas that extend above FL 300 or not to show turbulence areas above FL 400.

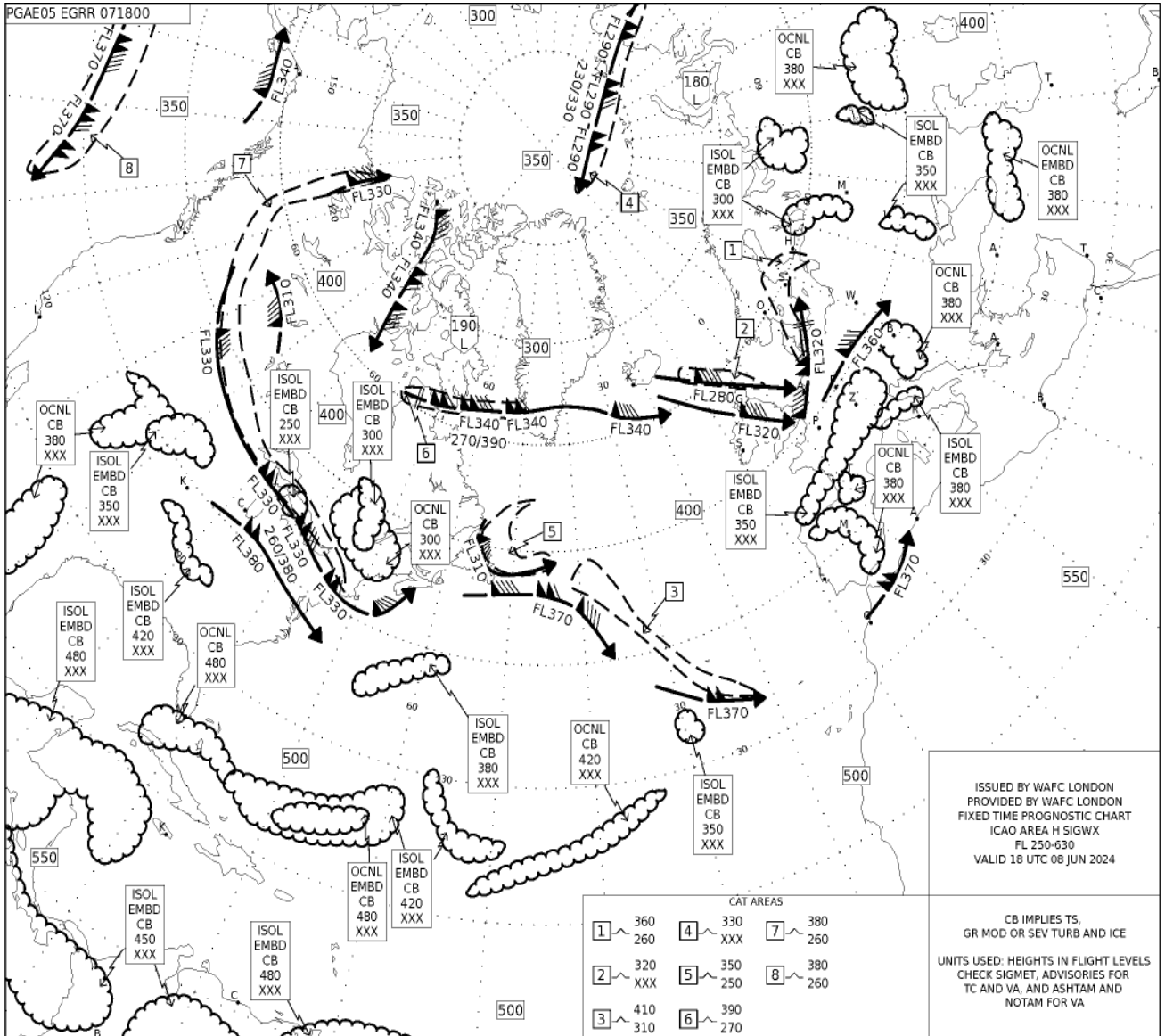
*Note: This facility will provide maximum flexibility when creating charts and visualising data to end users.*

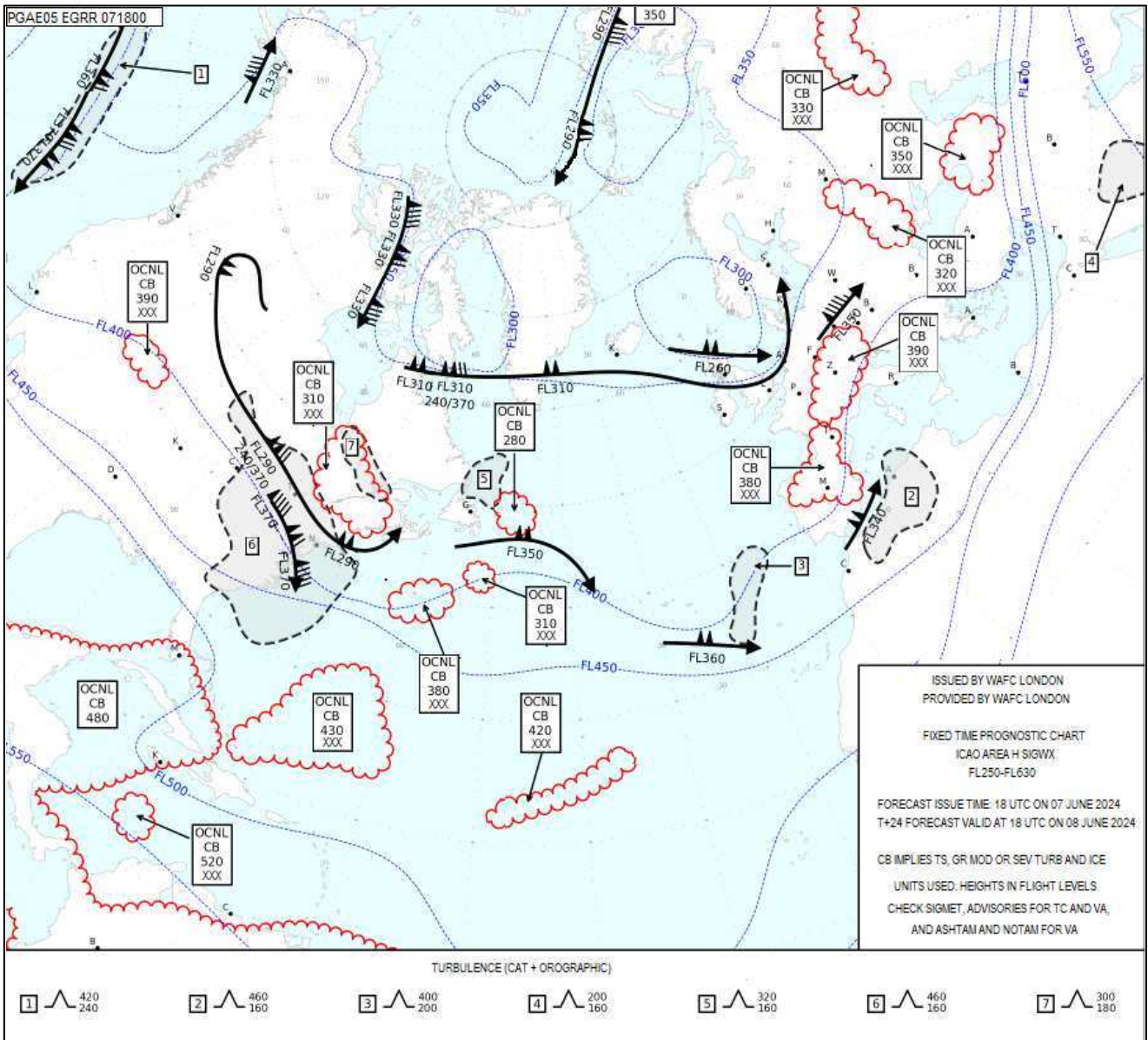
### 5.4 Changes to Forecast Weather Phenomena

5.4.1 The phenomena included in SIGWX Forecasts in IWXXM data format will continue to include the parameters described in Paragraph 4.3 with one exception. Cumulonimbus (CB) base information will not be included because historically it's nearly always shown as "XXX" (i.e. below FL 100 - the lower boundary of the forecast)", and experience shows that when it is above this level (e.g. FL 110 or FL 120 and above) these details in the forecast have provided no additional value to users.

6 APPENDIX C – Example of changes to the appearance of WAFS SIGWX Charts (PNG Format)

6.1 HIGH-LEVEL CHART PRODUCED BEFORE 26 NOVEMBER 2024





**Note:** The example above demonstrates the colour schemes that will be used on charts produced by the WAFCs. Colour schemes used by third parties when creating charts directly from BUFR data may use different colours or presentation styles (in accordance with applicable specifications contained in ICAO Standards and UK Regulations).