Guidelines for interpreting World Area Forecast Centre T+24 Significant Weather forecasts.

Version 2.01 - UPDATED 7 OCTOBER 2024 TO REFLECT SIGWX STYLE AND CONTENT THAT BECOMES OPERATIONAL ON 23 JAN 2025

0. Contents

1. Introduction

1.1. The World Area Forecast Centres (WAFCs) are responsible for producing WAFC Significant Weather (SIGWX) forecasts as specified by the International Civil Aviation Organization (ICAO).

1.2. There are two WAFCs. WAFC London (based at the United Kingdom's Met Office headquarters in Exeter) and WAFC Washington (based at the National Oceanic and Atmospheric Administration (NOAA) Aviation Weather Service offices in Kansas City, Missouri, USA).

1.3. In January 2025 the WAFC's are changing the way in which the WAFS SIGWX products are produced, and will be introducing multi-timestep SIGWX forecast data in a new format. The legacy 24-hour (T+24) SIGWX charts and BUFR[1] data sets will be maintained for a transition period.

1.4. The legacy T+24 SIGWX forecasts consist of the following:

- 'High Level SIGWX' forecasts (SWH) are valid between flight level (FL) 250 and FL600, Both WAFCs produce SIGWX forecasts covering the entire globe for this height range.
- 'Medium Level SIGWX' forecasts (SWM) are valid between FL100 and FL450 for four specified regions of the globe. WAFC London is responsible for producing charts for three of these regions, and WAFC Washington is responsible for one.

1.5. Both WAFCs produce their T+24 SIGWX forecasts in a digital format known as 'BUFR' and sets of charts for fixed coverage areas in the Portable Networks Graphic (PNG) format. Taken together, the PNG images issued by the WAFCs give complete coverage of the globe.

1.6. In the unlikely event that one of the WAFCs is unable to produce their SIGWX forecasts, the other WAFC will automatically publish a set of backup up files that they have produced. This ensures that a full set of WAFC SIGWX forecasts will always be issued and is accomplished in such a way to be as transparent as possible to the users.

[1] Binary Universal Form for the Representation of meteorological data, developed and maintained by the World Meteorological Organization (WMO)

2. SIGWX Overview

2.1. Validity time and production schedule

2.1.1. WAFC SIGWX forecasts are 24 hour forecasts. That means that they represent the expected weather 24 hours after the time of observation/analysis.

2.1.2. WAFC SIGWX are produced automatically, based on the WAFS gridded data sets and information taken from tropical cyclone advisories, volcanic ash advisories and radioactive release messages. The WAFC SIGWX forecasts will typically be issued around 5 hours 45 minutes after the 'analysis' time, and therefore are available 18 hours 15 minutes before their specified validity.

2.1.3. WAFC SIGWX forecasts are provided for 'fixed validity times'. This is as specified in ICAO Annex 3 – *Meteorological Service for International Air Navigation* and ICAO Doc 8896 – *Manual of Aeronautical Meteorological Practice*. However, ICAO have noted, in ICAO Doc 8896, that the WAFC SIGWX forecasts are 'usable' for a period of time extending from 3 hours before to 3 hours after the stated 'fixed' validity time.

2.1.4. The WAFC SIGWX forecasts are produced and made available to a routine schedule by both WAFCs:

Analysis time	Fixed Validity time	Normally made available
(DD) 0000 UTC	(DD+1) 0000 UTC	(DD) 0545 UTC
(DD) 0600 UTC	(DD+1) 0600 UTC	(DD) 1145 UTC
(DD) 1200 UTC	(DD+1) 1200 UTC	(DD) 1745 UTC
(DD) 1800 UTC	(DD+1) 1800 UTC	(DD) 2345 UTC

Table 1: Availability schedule for WAFC SIGWX. DD represents day of month, i.e. '18' means 18th day of the month.

Example: SIGWX forecasts based upon an analysis time of 0600 UTC on 12th February 2024 will have a fixed validity time of 0600 UTC on 13th February 2024 and would normally be expected to be made available at 11:45 on 12th February 2024.

2.2. SIGWX forecast data

2.2.1. WAFC SIGWX forecasts are issued to cover two different height ranges. High level SIGWX (SWH) covers the height range FL250-FL600 (prior to January 2024 this was FL250 to FL630) and Medium Level SIGWX (SWM) covers the height range FL100 to FL450[2].

2.2.2. WAFC SIGWX forecasts are provided in PNG image format for 'ICAO Fixed Chart Areas', as specified in ICAO Annex 3. Each WAFC routinely produces the PNG Charts detailed in table 2. These PNG charts will be retired in November 2028.

2.3. Both WAFCs produce their T+24 SIGWX forecasts in BUFR format which enables the end user to generate bespoke and custom visualisations relevant to the flight or flights being undertaken. This also permits overlaying of the SIGWX forecast with other features (navigation aids for example) as the user wishes. Note, the processing of the SIGWX BUFR data is beyond the scope of this document however differences in the BUFR data sets and what is provided on WAFC produced SIGWX charts will be explained. Data in this format will be retired in early 2027.

[2] The upper limit to the forecast (FL450) exceeds the stated requirement in ICAO Annex 3 of FL250 for Medium Level SIGWX.

2.3.1. SWH forecast BUFR data covers the entire globe, and each WAFC produces a version that uses wind and tropopause information from its own WAFS gridded data sets.

2.3.2. SWM forecasts do not cover the entire globe, and are only issued to cover four specific regions, as shown in table 2. It is essential that any visualisations of SWM forecasts clearly identify (by cross hatching for example) the areas of the globe for which forecast information is not provided. This is to ensure that the absence of features in areas not covered by the SWM forecasts are not interpreted as areas that are free from potential hazardous weather.

SIGWX Format	Chart Area	ICAO equivalent name	Produced by	Chart projection
SWH PNG (FL250-FL600)	AREA_A	AMERICAS	WAFC Washington	Mercator
	AREA_B	EURSAM	WAFC London	Mercator
	AREA_B1	AREA B1	WAFC Washington	Mercator
	AREA_C	EURAFI	WAFC London	Mercator
	AREA_D	ASIA	WAFC London	Mercator
	AREA_E	INDOC	WAFC London	Mercator
	AREA_F	S PACIFIC	WAFC Washington	Mercator
	AREA_G	MID	WAFC London	Polar Stereographic
	AREA_H	NAT	WAFC London and WAFC Washington	Polar Stereographic
	AREA_I	N PACIFIC	WAFC Washington	Polar Stereographic
	AREA_J	S POLAR	WAFC Washington	Polar Stereographic
	AREA_K	SIO	WAFC London	Polar Stereographic
	AREA_M	N PACIFIC	WAFC Washington	Mercator
SWM PNG (FL100 -FL450)	AREA_ASIA_SOUTH	ASIA SOUTH	WAFC London	Mercator
	AREA_EURO	EURO	WAFC London	Polar Stereographic
	AREA_MID	MID (or MEA)	WAFC London	Mercator
	AREA_NAT	NAT	WAFC Washington	Polar Stereographic
SWH BUFR (FL250-FL600)	Global		WAFC London and WAFC Washington	n/a
SWM BUFR (FL100 -FL450)	Covering the Asia-South, Euro, MID/MEA and NAT areas		WAFC London and WAFC Washington	n/a

Table 2: Vertical extent and domain of WAFC SIGWX forecasts.

3. Interpreting WAFC SIGWX Forecasts

The information provided in this section presumes the PNG charts issued directly by the WAFC's are being used, but also takes into account how data may be presented by suppliers using the BUFR data sets in the legacy SIGWX style. It is beyond the scope of this document to describe how software should process WAFC SIGWX BUFR data.

It is the responsibility of software providers to correctly process WAFC SIGWX BUFR data to meet the required standards of visualisation. Information is available in the Representing WAFC Significant Weather (SIGWX) data in BUFR available via the ICAO webpage

In January 2025 the PNG charts produced by the WAFCs were changed to use colour and a different representation for icing areas and tropopause height. The previous representation styles are also covered in this document as some suppliers will still use them.

3.1. Basic Information - Legend

3.1.1. PNG charts and visualised data must show a legend. The legend provides essential information identifying the issuer, the provider, the area of coverage, the height range, and the validity time.

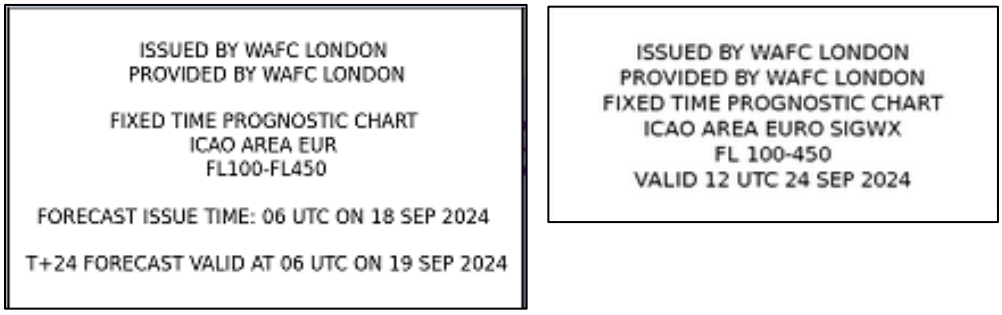


Figure 1: WAFC SIGWX Chart legend. Two examples are shown as there are multiple ways in which the forecast validity date/time information can be presented. The Legend also indicates issuer, provider, ICAO area, height range, and validity time information.

3.1.2. For PNG forecasts issued by the WAFCs, the 'ISSUED BY' and 'PROVIDED BY' will each specify the WAFC concerned.

3.1.3. If the image (visualised on screen or in hard copy) is generated from BUFR data by an entity other than one of the WAFCs, then the 'ISSUED BY' will specify the source of the WAFC BUFR data being used (i.e. WAFC London or WAFC Washington) and the 'PROVIDED BY' will specify the organisation that is visualising the data. Only the WAFCs are permitted to issue WAFC SIGWX forecasts in PNG format where both the 'ISSUED BY' and 'PROVIDED BY' fields reference WAFC London/WAFC Washington.

3.1.4. Visualisations of WAFC SIGWX (including the PNG versions issued by the WAFCs) based upon the ICAO Fixed Areas should indicate the chart area concerned. In the examples above, that is ICAO AREA "EUR". See Appendix A for more detail on the fixed ICAO chart areas.

3.1.5. The vertical extent of the forecast will be indicated. In the example in figure 1 the range is FL100 to 450, and is therefore Medium Level SIGWX (SWM).

3.1.6. The validity is, strictly, a fixed time. However, ICAO note that the forecasts may be used for a period extending from 3 hours before the specified validity time to 3 hours after.

3.2. Basic Information – User Advisory Information

3.2.1. A standard legend should be included advising users of the hazards to expect in cumulonimbus cloud (CB); the units used, and guidance to check SIGMET, NOTAMS and other advisories in the event these phenomena occur. Figure 2 gives examples of the legend.

CB IMPLIES TS, GR, MOD OR SEV TURB AND ICE UNITS USED: HEIGHT LEVELS IN FLIGHT LEVELS CHECK SIGMET, ADVISORIES FOR TC AND VA, ASHTAM AND NOTAM FOR VA, AND SIGMET AND NOTAM FOR RDOACT CLD"		CB IMPLIES TS, GR, MOD OR SEV TURB AND ICE UNITS USED: HEIGHT LEVELS IN FLIGHT LEVELS CHECK SIGMET, ADVISORIES FOR TC AND VA, AND ASHTAM AND NOTAM FOR VA. CHECK SIGMET AND NOTAM FOR RDOACT CLD

Figure 2: Example Legends. A mention of information to check for radioactive cloud can be included in the legend as standard (left), or only added to the legend when charts include a radiological incident (right, blue text)

3.3. Basic Information - Header/File Name

3.3.1. In the top left corner of WAFC produced PNG format charts, the WMO Abbreviated Header (or bulletin header) of the chart is shown. This is essentially its file name. Only the WAFCs may identify visualisations of WAFC SIGWX forecasts using EGRR and KKCI.

3.3.2. Figure 3 shows how this information can be decoded.

PGCE05 EGRR 161200	**PGCE05** - represents the reference to the specific chart. **EGRR** - represents the WAFC issuing the data. EGRR is WAFC London and KKCI is WAFC Washington. In the case of a backup situation, this will remain the same even if the data is issued by the other WAFC. **161200** represents the day of the month (16 in this case) and the hour in UTC (1200 in this case) of the analysis on which the forecast is based. This is always 24 hours earlier than the validity time of the forecast

Figure 3: Header/File name information decode

3.4. Basic Information – base map

3.4.1. WAFC produced SIGWX charts will include lines of latitude and longitude as a grey dotted grid, and will show the ocean and large bodies of water in a pale blue colour. Cities served by major aerodromes are also indicated to assist with orientation. The convention is for the initial letter of the city to be placed next to a dot indicating the location of the aerodrome.

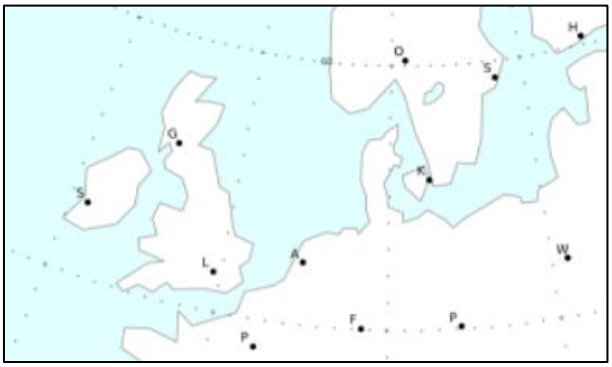


Figure 4: Background WAFC map, with lines of latitude and longitude and city markers. In this example, London (L), Amsterdam (A), Paris (P), København/Copenhagen (K), and Warsaw (W) amongst others can be seen.

3.5. Jet streams

3.5.1. Jet stream information is indicated in WAFC SIGWX forecasts when the jet core equals or exceeds 80KT.

3.5.2. The jet is depicted as a thick, continuous line. The direction and speed of the jet is depicted by the 'wind fleche' (also known as feather and pennant) symbols.

- Half feathers correspond to 5 KT
- Feathers correspond to 10 KT
- Pennants correspond to 50 KT

3.5.3. An arrow is also included at the end of the jet core (the arrow is omitted if the jet continues beyond the edge of a chart area to prevent the user assuming the strength of the wind has fallen below 80 KT at that point).

3.5.4. The orientation of the fleches on the jet core, as per convention, are such that the feathers/pennants are located on the low pressure (or low contour) side of the jet stream[3]. This means that in the *northern hemisphere* (and on the equator), the feathers/pennants are on the *left side* of the jet core as looking in the direction towards which the wind is blowing. In the *southern hemisphere* the feathers/pennants are on the *right side* of the jet core as looking in the direction towards which the wind is blowing. Example jet speed decodes are shown in figure 5.

	A jet core of 75 knots (50+10+10+5) in the northern hemisphere
	A jet core of 105 knots (50+50+5) in the northern hemisphere
	The above indicates a jet core of 125 knots (50+50+10+10+5) in the northern hemisphere
	A jet core of 105 knots (50+50+5) in the southern hemisphere

Figure 5: Jet Speed depiction and decode

[3] An easy way to remember this is to recall Buys Ballot's law '*In the Northern Hemisphere, if a person stands with their back to the wind, the atmospheric pressure is low to the left, high to the right*'. Accordingly, in the Southern Hemisphere if a person stands with their back to the wind, the atmospheric pressure is low to the right, and high to the left.

3.5.5. The flight level of the jet core is indicated at points along its length using the normal convention 'FL250' for 25000 FT; 'FL450' for 45000 FT etc. An example is shown in figure 6.

	A jet core of 145 knots, at an altitude of 32000 FT in the ICAO Standard Atmosphere (FL320) in the northern hemisphere

Figure 6: Jet speed and height depiction and decode

3.5.6. The conventions described above will ensure that the user can always determine the direction of the jet stream. The direction of the jet is always relative to the underlying map projection. This is relevant when viewing visualisations on, for example, a polar stereographic projection.

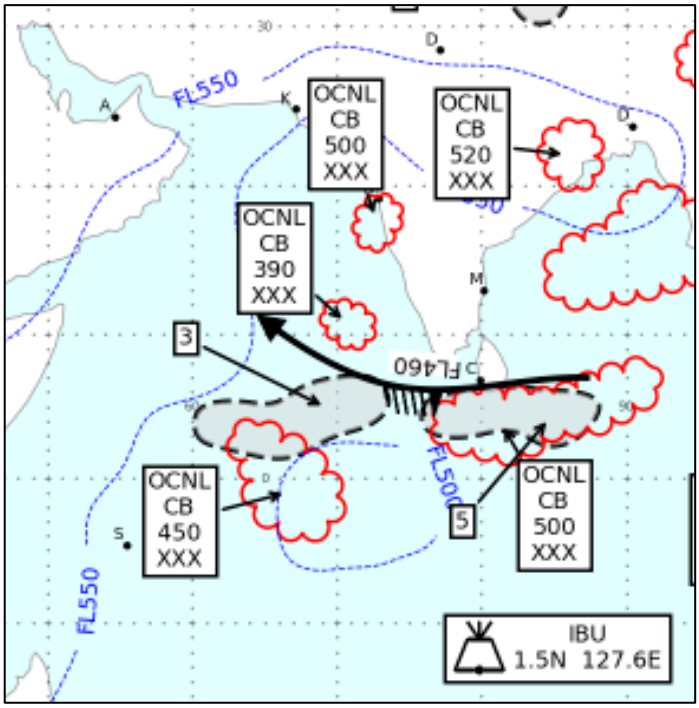


Figure 7: Example WAFC SIGWX forecast with an easterly jet. Note the orientation of the jet pennants and flight level information indicating a jetstream that flows from the Bay of Bengal over Sri Lanka and into the Arabian Sea. The figures are deliberately 'upside down' to help confirm the jet is truly intended to indicate jet core winds form east to west.

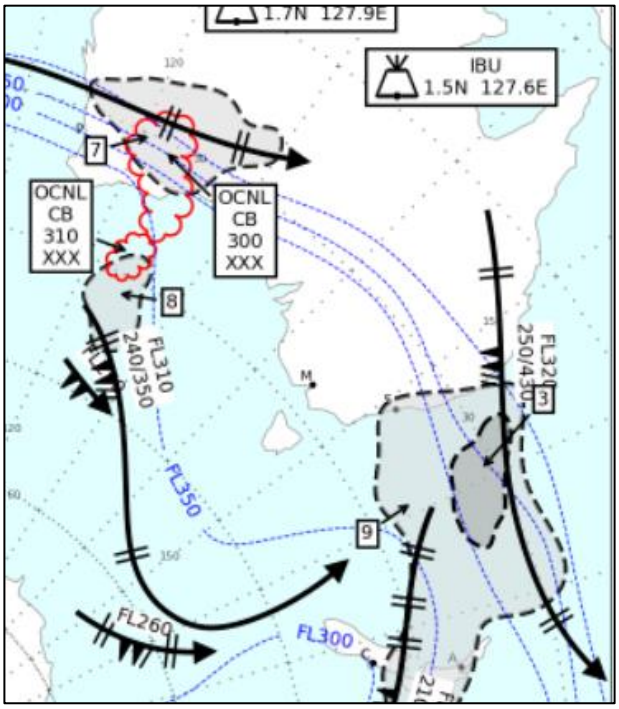


Figure 8: At first glance the jet stream over eastern Australia may appear to be flowing from north to south, however this is a polar stereographic map projection and when comparing the jet stream to the latitude and longitude lines it can be seen that the jet is actually flowing from north-west to south-east.

3.5.7. In the event that the maximum wind speed along the jet core is 120 knots or greater, then at the location of the maximum wind additional 'vertical extent' information will be provided. Upper and lower flight level information will be specified that define the depth through which winds of 80 knots or greater extend at that point. Examples are shown in figure 9.

3.5.8. Change bars (two thin lines perpendicular to the jet core line, may be used to indicate changes in windspeed of 20 KT along the jet stream where there is insufficient space to include pennant/feather symbols (northern hemisphere example below); or where the jet core height changes by 3000 FT. Examples are shown in figure 10 and 11.

	A jet core in the northern hemisphere with wind speed increasing from 105 knots to a maximum of 125 knots then decreasing to 105 knots. The jet core is at FL380 and at the location of the maximum wind speed the wind speed is 80 knots or greater between FL280 and FL420.
	A jet core in the southern hemisphere with wind speed increasing from 105 knots to a maximum of 125 knots then decreasing to 105 knots. The jet core is at FL380 and at the location of the maximum wind speed the wind speed is 80 knots or greater between FL280 and FL420.

Figure 9: Jet core information when the maximum jet speed is 120KT or greater

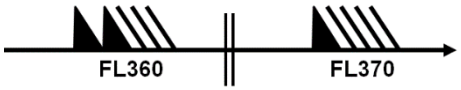
	The jet core has a wind speed of 130 knots and an altitude of FL360. At the point indicated by the 'change bars' (two, thin parallel lines perpendicular to the jet stream line) the wind speed is 110 knots, decreasing further to 90 knots as indicated by the pennant/feathers on the right.

Figure 10: Interpretation of wind speed "change bars"

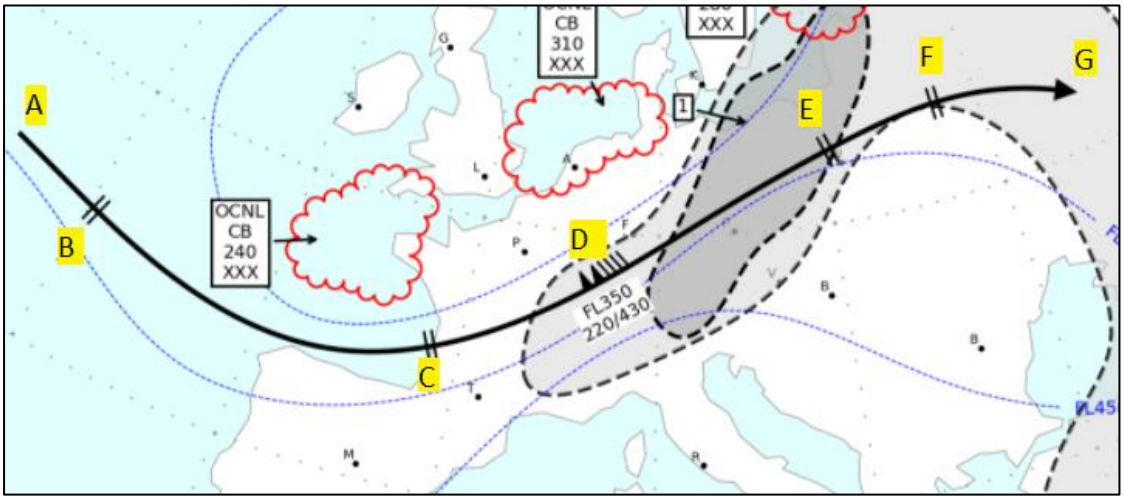


Figure 11: Worked Example. The jet stream information at each of the points A to G is described below.

A: Start of Jet core. Jet speed = 80kt.

B: speed +20KT. Jet speed now 100KT.

C: speed +20KT. Jet speed now 120KT

D: Jet Max speed 140KT at FL350 (entire jet from A to G is at FL350)

E: speed -20KT. Jet speed now 120KT

F: speed -20KT. Jet speed now 100KT

G: End of Jet Core. Jet Speed 80KT.

3.6. **Turbulence**

How do we forecast turbulence?

The WAFS gridded turbulence data sets are used in the calculation of SIGWX Turbulence areas. They use a multi-diagnostic algorithm that was developed by the National Center for Atmospheric Research (NCAR) in the United States. The algorithm is able to forecast both turbulence caused by wind shear and turbulence caused by mountains. Horizontal and vertical wind shear particularly occurs around a jet stream, often in clear air and known as Clear Air Turbulence (CAT) but can also occur within clouds. Mountains cause a mainly vertical disturbance in the wind flow, again creating wind shear or turbulent flow.

It is important to note that the WAFC turbulence forecasts do not include turbulence caused by convective cloud, particularly cumulonimbus clouds.

3.6.1. Regions of turbulence are marked on the SIGWX charts using thick dashed lines. Each region will be identified by a reference number which links to a corresponding key. Some visualisation systems may not use grey shading, and may also display a direct 'call-out' symbol specifying the nature of the expected turbulence. In either case, the turbulence symbols used are standard.

3.6.2. WAFC SIGWX forecasts *only* indicate regions of moderate (MOD) and severe (SEV) turbulence. Severe turbulence areas, indicated with the ⩚ symbol will always be surrounded by an area of moderate turbulence (indicated with the ⩙ symbol).

3.6.3. WAFC produced PNG charts will depict turbulence using a thick dashed black line and shaded in a grey colour. A darker grey is used for severe turbulence. Figure 12 shows a jet stream with associated turbulence crossing the tip of South Africa.

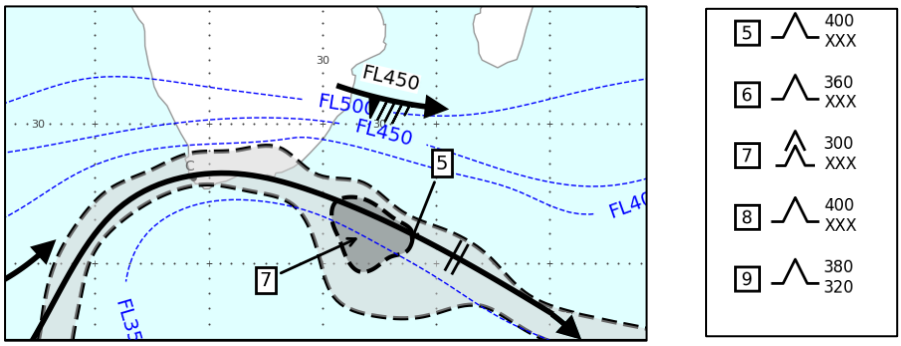


Figure 12: Areas of turbulence marked by a dashed line and grey shading (left). A label containing a reference number is used which links to a corresponding entry on the turbulence key (right). This key provides information on the turbulence intensity and the flight level of the base and top of the turbulence area.

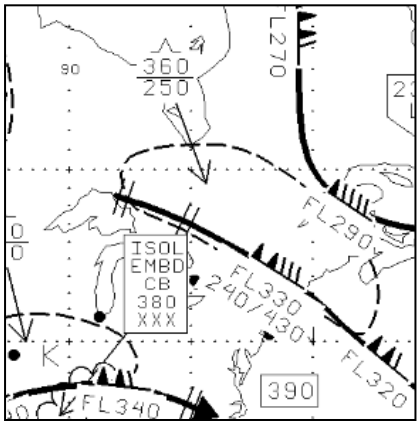
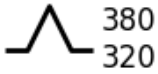
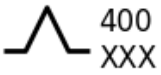
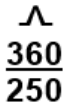


Figure 13: "Call-out" style of depicting turbulence information that may be used by some visualisation systems.

3.6.4. Figure 14 provides information on decoding turbulence keys and call out turbulence information

Figure 14: Turbulence key and call-out Interpretation

	Moderate turbulence is forecast between FL320 and FL380.
	On a high level SIGWX chart (which covers FL250 to FL600) moderate turbulence is forecast to extend from below the valid range of the chart – in this case FL250 (indicated by XXX) up to FL400.
	On a high level SIGWX chart (which covers FL250 to FL600) severe turbulence is forecast to extend from below the valid range of the chart – in this case FL250 (indicated by XXX) up to FL300.
	Call-out label style indicating moderate turbulence between FL250 and FL360.

3.7. **Cumulonimbus Cloud**

3.7.1. Areas of cumulonimbus (CB) cloud are indicated by 'scalloped' lines. In the WAFC produced PNG charts the scalloped areas are shown in red, when they are created from the BUFR data a black scalloped line may be used. The areas will be identified using 'call-out' boxes that describe the horizontal extent of the CB and the base and top of the CB cloud. An example is shown in figure 15.

Note: Embedded (EMBD) cumulonimbus cloud regions used to be included in SIGWX forecasts, but was discontinued in January 2025.

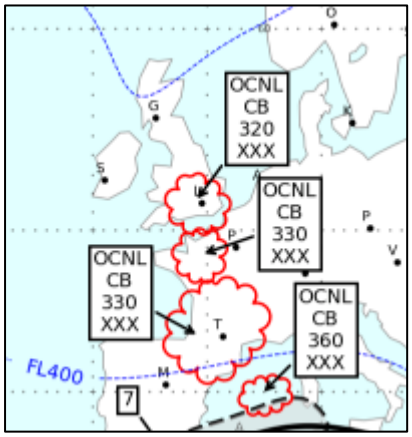


Figure 15: CB depiction on SIGWX charts using red scalloped lines and call-out labels

3.7.2. Where there is sufficient space, the call-out box may be placed within the relevant area of CB (and no arrow is required).

3.7.3. Figure 16 contains information on interpreting the CB call-out information.

3.7.4. It is important to note the advisory information contained in the legend (3.2.1) which advises that where CB cloud is forecast this implies thunderstorms (TS), hail (GR), moderate or severe turbulence and moderate or severe icing may also occur.

Figure 16: CB call-out interpretation

OCNL CB 320 XXX	Occasional (OCNL) areas of CB with a maximum spatial coverage between 50 and 75% of the marked area. CB base below the valid range of the chart (XXX) and a CB top at FL320.
FRQ CB 320 XXX	Frequent (FRQ) areas of CB with a maximum spatial coverage greater than 75% of the marked area. CB base below the valid range of the chart (XXX) and a CB top at FL320.
OCNL CB XXX XXX	It is feasible, in SWM SIGWX forecasts, for CB to have a base below the lower bound of the forecast, and a top above the upper bound of the forecast, and this would be indicated with two XXX describing the base and top.

3.8. **Icing**

3.8.1. WAFC SWM SIGWX forecasts indicate regions of moderate (MOD) and severe (SEV) icing that occurs within cloud. Severe icing areas, indicated with the ⫛ symbol will always be surrounded by an area of moderate icing (indicated with the ⫛ symbol).

3.8.2. Icing areas on WAFC produced PNG charts are marked with a purple "T" line, and purple shading as shown in figure 17. The darker purple shade indicates where the icing is severe. Icing areas and CB areas can overlap.

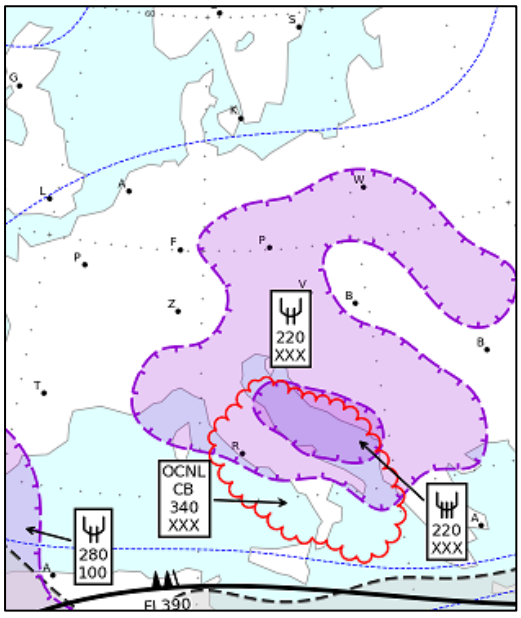


Figure 17: Icing depiction on WAFC produced charts using a purple "T" line and purple shading to indicate icing areas.

3.8.3. Figure 18 contains information on interpreting the icing call-out information.

280 100	Severe icing is forecast between FL100 and FL280.
190 XXX	Moderate icing is forecast from below the valid range of the chart – in this case FL100 (indicated by XXX) up to FL190.

Figure 18: Icing call-out interpretation

3.8.4. In WAFC charts produced from the SWM BUFR data sets, icing areas that lie inside of the CB areas has been removed. This is to ensure that the forecast information remains clear for display systems that cannot use different line styles or colours to differentiate between icing and CB. An example visualisation is shown in figure 19. Note that scalloped lines are used for both icing and CB areas.

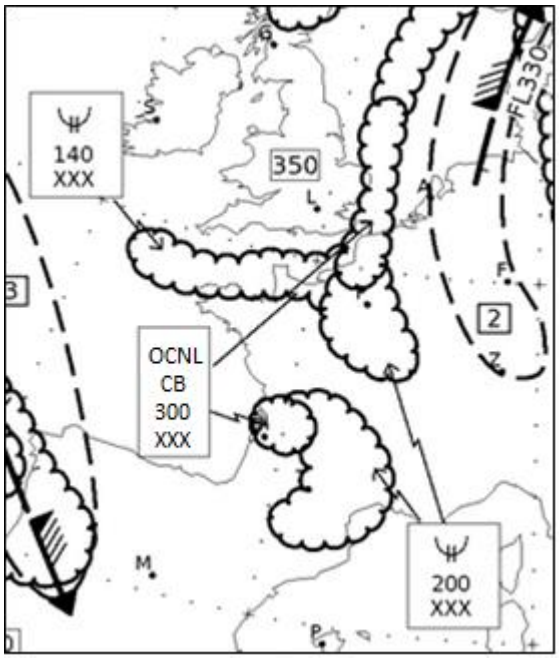


Figure 19: SWM Icing and CB depiction using data visualised from the SWM BUFR data sets. Icing areas and CB areas are both marked by black scalloped lines. The CB areas are given priority, and icing areas may adjoin them. This can be seen where a CB area to the east of the United Kingdom has an icing area (located in the English Channel and France) meeting its boundaries without extending inside of the CB area. An additional example can be seen over central and southern France.

3.9. **Flight level of tropopause**

3.9.1. On WAFC produced SIGWX PNG charts, the height of the tropopause is indicated as contours spaced at 5000ft vertical flight level intervals (e.g. FL300, FL350, FL400 etc). SIGWX created using the BUFR data sets contains point source information on the height of the tropopause, expressed as a flight level. Tropopause interpretation information is included in figure 20.

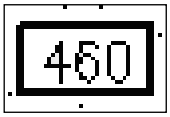
	Tropopause contour. This example indicates the tropopause along that line is at FL400. Where contours are close together this indicates a rapid change in the level of the tropopause.
	Spot height representation of tropopause height. This example indicates a spot height of FL460. Note: information on the tropopause maximum/high and minimum/low are no longer included.

Figure 20: Tropopause information interpretation

3.9.2. Figure 21 shows a wider view of tropopause contours. Where tropopause contours are close together this indicates a sudden change in the tropopause. This often coincides with the location of a jet stream.

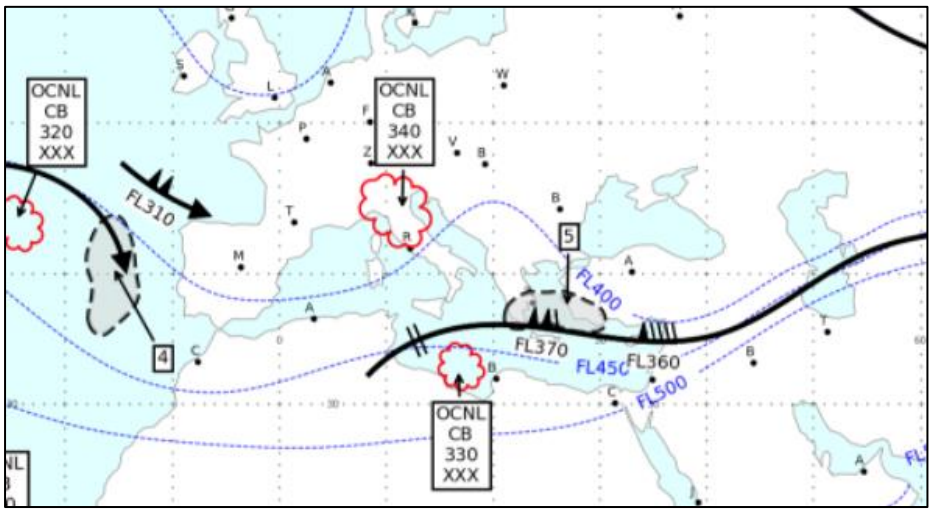


Figure 21: WAFC produced SIGWX charts will use a thin blue dotted line to indicate tropopause height contours. Each contour is marked with a flight level. Where contours are close together this indicates a sudden change in tropopause height.

3.10. **Tropical Cyclones**

3.10.1. Tropical Cyclones are indicated on WAFC SIGWX forecasts using the symbols shown in figure 22. They are included on the basis of information provided from the Tropical Cyclone Advisory Centres and from Tropical Cyclone SIGMETs.

3.10.2. They are included on the basis of information extracted from Tropical Cyclone Advisory messages and from Tropical Cyclone SIGMETs. The centre of the symbol represents the centre of the tropical cyclone.

3.10.3. Additionally, a 'call-out' box will be positioned in proximity to the symbol with the name of the Tropical Cyclone (or 'NN' if not formally named), and the latitude and longitude. (Note in visualisations from BUFR data only the first 8 characters of the Tropical Cyclone name will be provided).

	Tropical cyclone symbol (northern hemisphere)
	Tropical symbol cyclone (southern hemisphere)
 "EMILY"	Tropical cyclone Emily (northern hemisphere)
 "TC NN"	Tropical cyclone which has not yet been formally named (southern hemisphere)

Figure 22: Tropical cyclone information

3.11. **Volcanic Eruptions**

3.11.1. The location of volcanic events that are producing ash clouds of significance to aircraft operations will be identified on WAFC SIGWX forecasts.

3.11.2. They are included on the basis of information extracted from Volcanic Ash Advisory messages and from Volcanic Ash SIGMETs. The centre of the symbol represents the centre of the volcano.

3.11.3. The 'dot' in the base of the symbol represents the location of the eruption. Additionally, a 'call-out' box will be positioned in proximity to the symbol with the name of the volcano (if known) and the latitude and longitude. Figure 23 provides interpretation information.

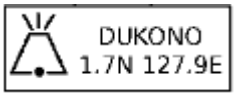
	Volcano marker symbol positioned on the chart at the location of the volcano.
 or  	Call out box containing the name of the volcano and its latitude and longitude.

Figure 23: Volcanic Ash information

3.12. **Location of a release of radioactive materials into the atmosphere of significance to aircraft operations**

3.12.1. The location of a release of radioactive materials into the atmosphere of significance to aircraft operations will be identified on WAFC SIGWX forecasts using the symbol shown in figure 24.

3.12.2. The centre of the symbol represents the location of the incident. Additionally, a 'call-out' box will be positioned in proximity to the symbol with the name of the site (if known) and the latitude and longitude of the source.

	Radioactive Release marker symbol positioned on the chart at the location of the incident.
	Call out box containing the location name of the incident its latitude and longitude.

Figure 24: Radioactive Release information

3.13. **Location of widespread sandstorm/dust-storm**

3.13.1. SIGWX forecasts are able to provide information on the location of widesspread sand and dust storms. In order for them to be included they must extend above FL100 (in the SWM forecast area) or FL250. This is an extremely rare occurrence. The inclusion of sand and dust storms will be formally retired from the ICAO Annex 3 requirements in November 2027. For reference, the symbol used is 

4. Corrections and Backups

4.1. From January 2025 SIGWX charts will be produced automatically from underpinning WAFS data and advisory messages. It will not be possible to amend or correct the forecasts and re-issue them.

- In the event that a discrepancy between the observed weather conditions differ significantly from the forecast conditions the WAFC's would like to be notified. This can be done by e-mailing the WAFC who produced the data. WAFC London**:** SADISmanager@metoffice.gov.uk **and** sma@metoffice.gov.uk
- WAFC Washington: wifs.admin@noaa.gov

4.2. Please use the words "SIGWX feedback" in the title of your e-mail and include information on which forecast validity time and type is impacted, as well as the location and nature of the discrepancy.

5. Contacting the WAFCs for further information.

5.1. If further information is required, then the WAFCs can be contacted as follows;

WAFC London:

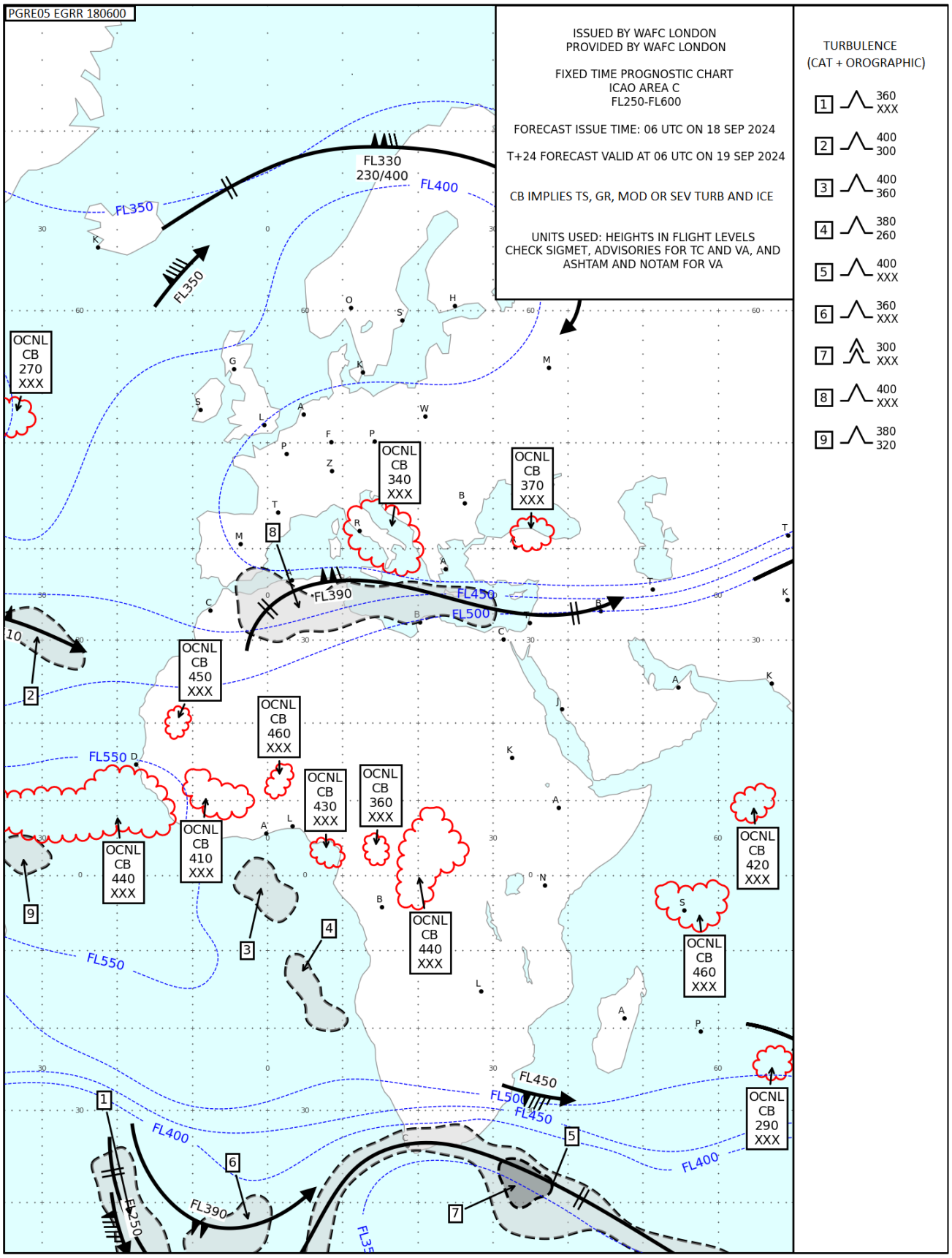
Service Desk Met Office, Fitzroy Road, Exeter, Devon, EX1 3PB, United Kingdom Tel from UK: 0370 900 0100 Tel from outside the UK: +44 330 135 0000 E-mail: enquiries@metoffice.gov.uk

WAFC Washington:

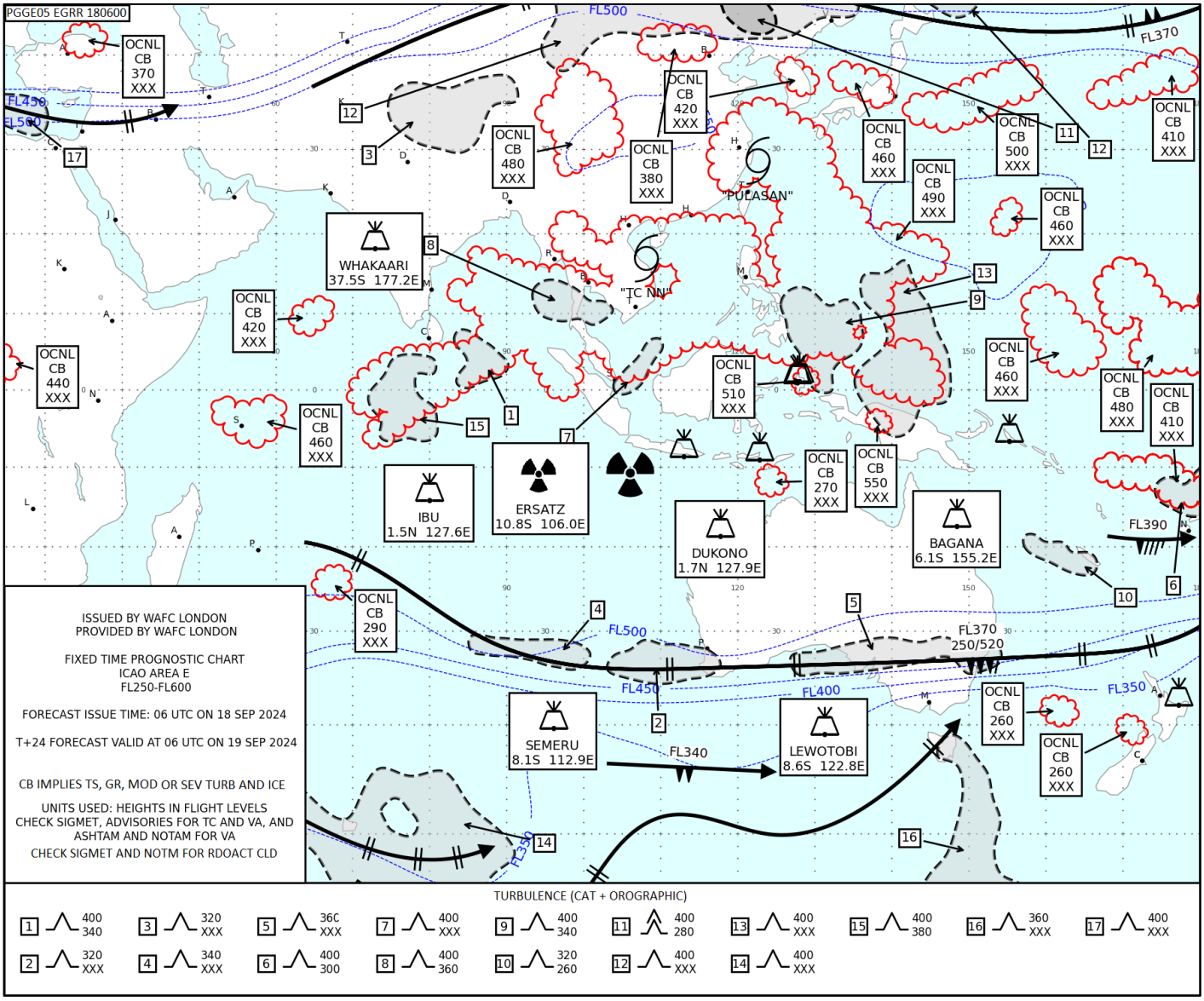
Aviation Weather Center, 7220 NW 101st Terrace, Room 101, Kansas City, Missouri 64153-2371, United States Tel: +1 (816) 584 7203 Email: wifs.admin@noaa.gov

APPENDIX A: Example charts

Area C, SWH chart.

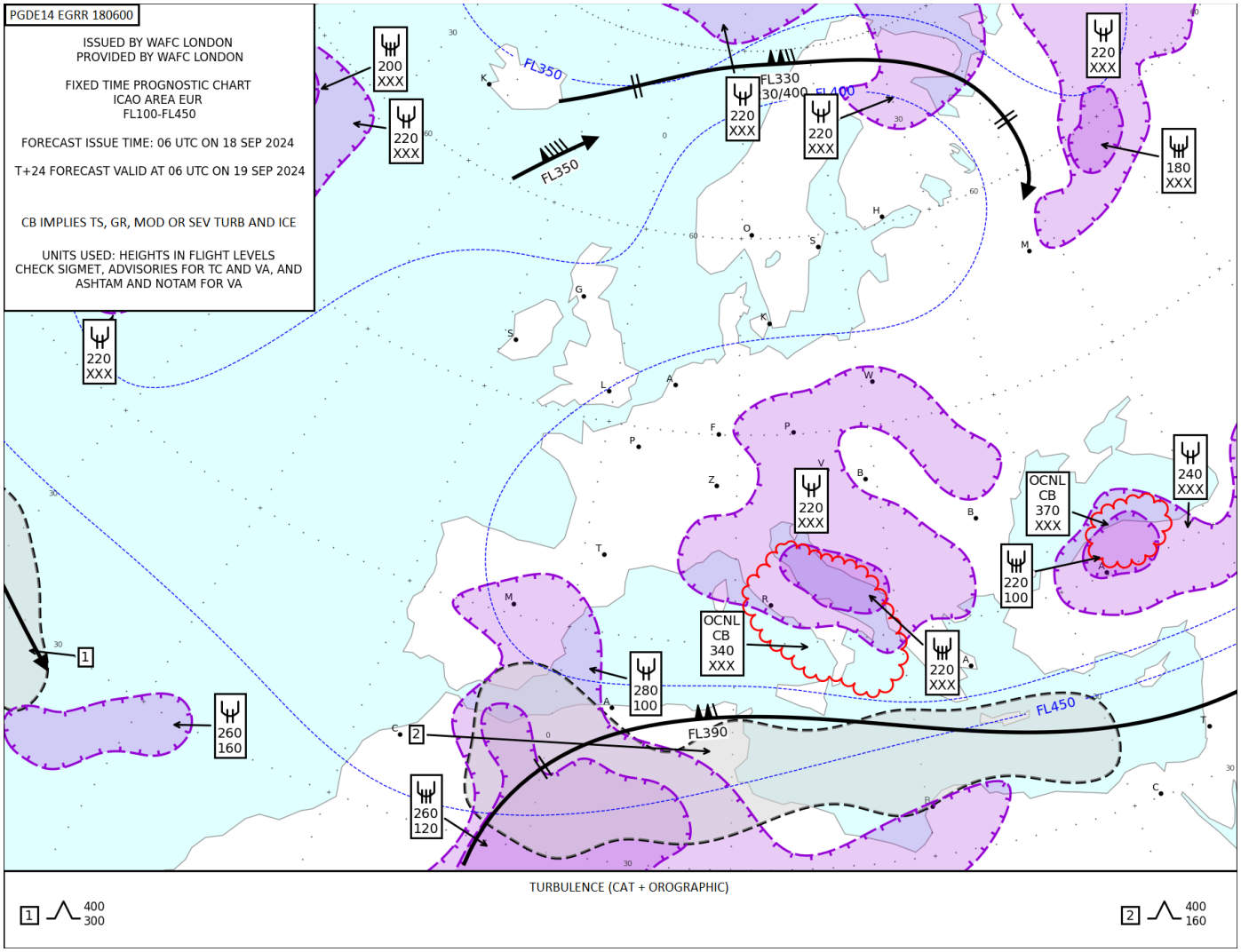


Area E, SWH Chart



Please note the radioactive release shown on this chart is not for a real incident, and is included to demonstrate the depiction of radioactive release markers within the SIGWX.

EUR SWM Chart



APPENDIX B – SIGWX Fixed chart coverage areas.

(from Appendix 8 to ICAO Annex 3 – *Meteorological Service for International Air Navigation*

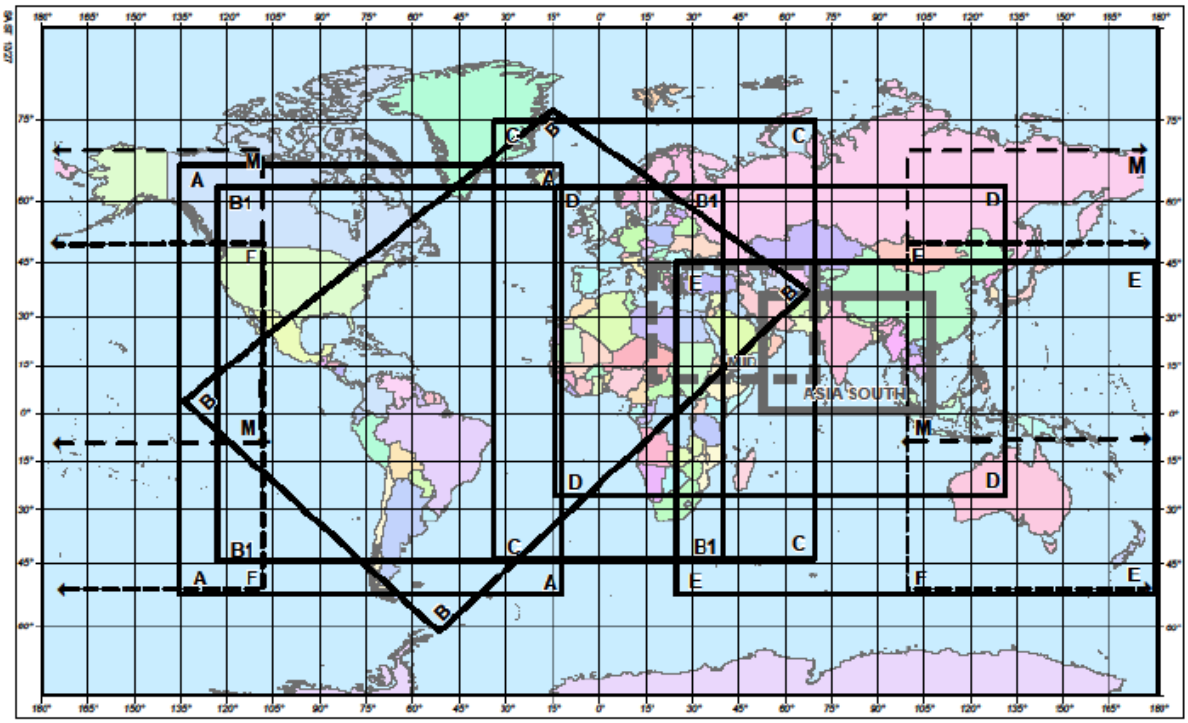


CHART	LATITUDE	LONGITUDE	CHART	LATITUDE	LONGITUDE
A	N6700	W13724	D	N6300	W01500
A	N6700	W01236	D	N6300	E13200
A	S5400	W01236	D	S2700	E13200
A	S5400	W13724	D	S2700	W01500
ASIA	N3600	E05300	E	N4455	E02446
ASIA	N3600	E10800	E	N4455	E18000
ASIA	0000	E10800	E	S5355	E18000
ASIA	0000	E05300	E	S5355	E02446
B	N0304	W13557	F	N5000	E10000
B	N7644	W01545	F	N5000	W11000
B	N3707	E06732	F	S5242	W11000
B	S6217	W05240	F	S5242	E10000
B1	N6242	W12500	M	N7000	E10000
B1	N6242	E04000	M	N7000	W11000
B1	S4530	E04000	M	S1000	W11000
B1	S4530	W12500	M	S1000	E10000
C	N7500	W03500	MID	N4400	E01700
C	N7500	E07000	MID	N4400	E07000
C	S4500	E07000	MID	N1000	E07000
C	S4500	W03500	MID	N1000	E01700

Facsimile of Figure A8-1 to ICAO Annex 3.

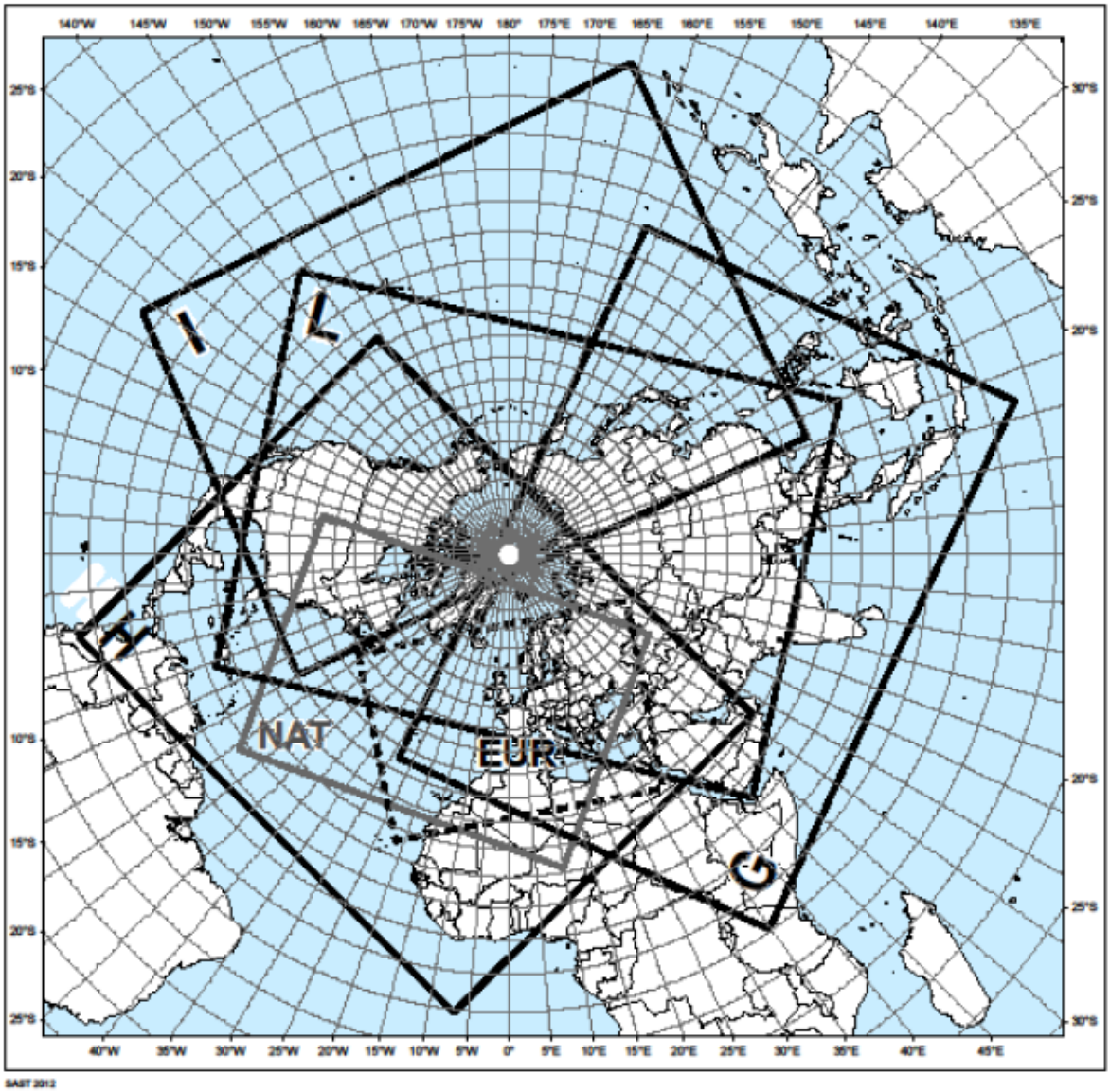


CHART	LATITUDE	LONGITUDE	CHART	LATITUDE	LONGITUDE
EUR	N4633	W05634	I	N1912	E11130
EUR	N5842	E06824	I	N3330	W06012
EUR	N2621	E03325	I	N0126	W12327
EUR	N2123	W02136	I	S0647	E16601
G	N3552	W02822	L	N1205	E11449
G	N1341	E15711	L	N1518	E04500
G	S0916	E10651	L	N2020	W06900
G	S0048	E03447	L	N1413	W14338
H	N3127	W14836	NAT	N4439	W10143
H	N2411	E05645	NAT	N5042	E06017
H	S0127	W00651	NAT	N1938	E00957
H	N0133	W07902	NAT	N1711	W05406

Facsimile of Figure A8-2 to ICAO Annex 3.

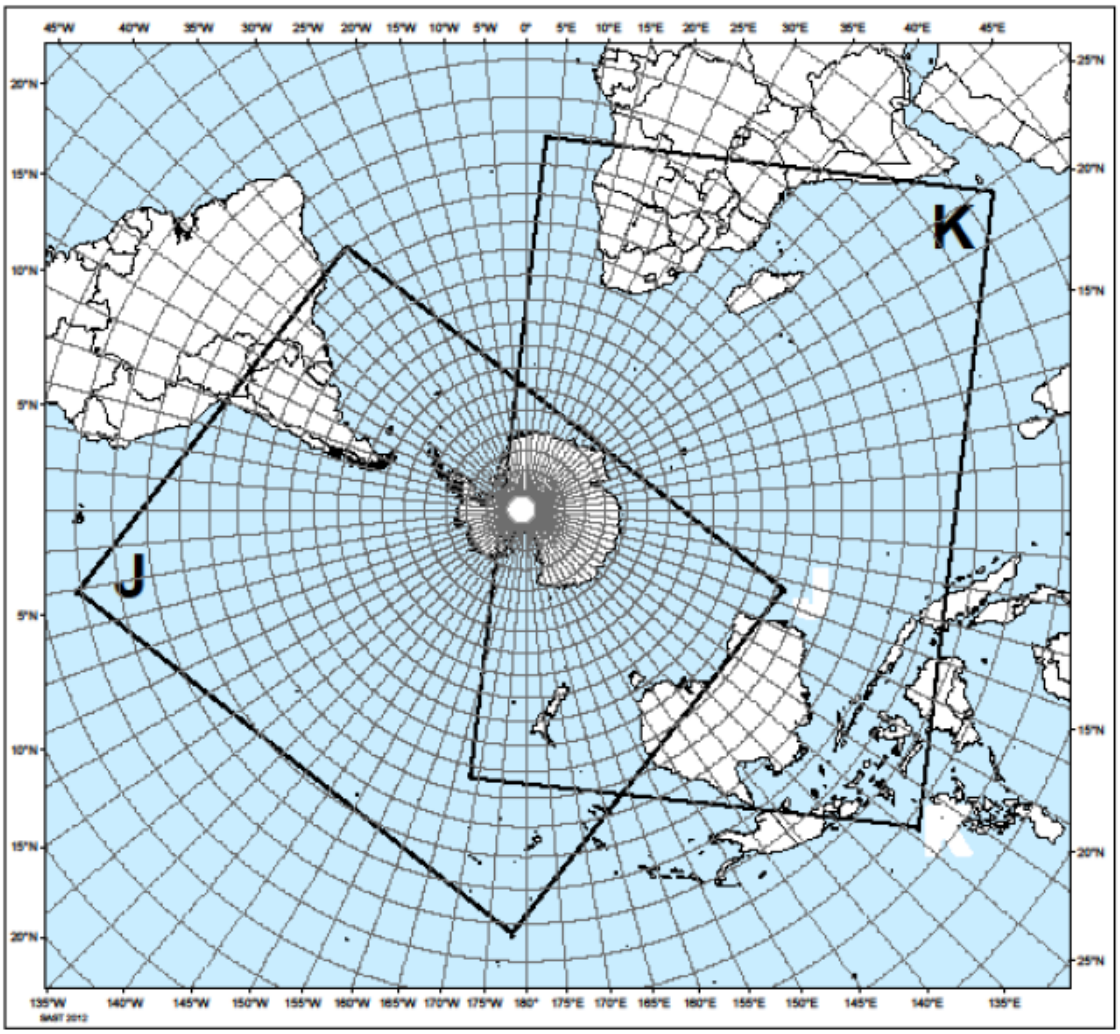


CHART	LATITUDE	LONGITUDE
J	S0318	W17812
J	N0037	W10032
J	S2000	W03400
J	S2806	E10717
K	N1255	E05549
K	N0642	E12905
K	S2744	W16841
K	S1105	E00317

Facsimile of Figure A8-3 to ICAO Annex 3.

APPENDIX C: Abbreviations

Abbreviation/Acronym	Meaning
WAFC	World Area Forecast Centre
WAFS	World Area Forecast System
ICAO	International Civil Aviation Organization
CB	Cumulonimbus cloud
CAT	Clear Air Turbulence
ISOL	Isolated. In the context of CB cloud in WAFC SIGWX forecasts: *maximum spatial coverage less than 50% of the area concerned*
OCNL	Occasional: In the context of CB cloud in WAFC SIGWX forecasts: *maximum spatial coverage between 50% and 75% of the area concerned*
FRQ	Frequent: In the context of CB cloud in WAFC SIGWX forecasts: *maximum spatial coverage greater than 75% of the area concerned*
TC	Tropical Cyclone
SIGWX	Significant Weather (in the context of this document, WAFC SIGWX forecasts.
SWH	High Level WAFC SIGWX forecasts.
SWM	Medium Level WAFC SIGWX forecasts.
FL	Flight Level
FT	Feet
KT	Knot (nautical mile per hour)
RDOACT	Radioactive (used with CLD)
CLD	Cloud
GR	Graupel (hail)
TS	Thunderstorm
VA	Volcanic Ash
NOTAM	Notice to Airmen
ASHTAM	NOTAM series relating to volcanic ash.
SIGMET	Information issued by a meteorological watch office concerning the occurrence or expected occurrence of specified en-route weather and other phenomena in the atmosphere that may affect the safety of aircraft operations.
BUFR	Binary Universal Form for the Representation of meteorological data, developed and maintained by the World Meteorological Organization (WMO)
PNG	Portable Graphic Network – an image format. In the context of WAFC SIGWX, these are a backup format to the BUFR data.
UTC	Universal Time Coordinated.
EURO	The European (and environs) domain of one of the Medium Level SIGWX forecasts.
MEA/MID	The Middle East (and environs) domain of one of the Medium Level SIGWX forecasts.
NAT	The North Atlantic (and environs) domain of one of the Medium Level SIGWX forecasts.
ASIA SOUTH	The South Asia (and environs) domain of one of the Medium Level SIGWX forecasts.