SADIS API WORKSTATION SOFTWARE EVALUATION GUIDE

Version number	Changes
1.0 (June 2024)	Initial Version

This guide is intended to be used to facilitate the self-assessment of any systems or software that is designed to visualise the data sets that are available on the SADIS API (Secure Aviation Data Information System) operated by WAFC London.

There are a number of scenarios that this guide could be used in:
1) When assessing the suitability of a new system during the procurement phase
2) To identify whether an existing system is fit for use
3) To identify if there are any issues/problems with functionality that may need to be raised with the software supplier.

Top level functionality

The system must be able to :

1. connect to the SADIS API and retrieve WAFS gridded, WAFS SIGWX and OPMET data sets
2. display WAFC gridded data in GRIB2 format
3. display WAFC SIGWX data
4. display all available types of OPMET data in TAC format as reports/lists according to data type and/or location
5. display all available types of OPMET data in IWXXM format in a human readable form
6. display a selection of TAC format OPMET data on a map
7. display IWXXM format OPMET data on a map
8. display tropical cyclone advisory graphics and volcanic ash advisory graphics
9. alert users when advisory type data is received

Note: It is advisable that the system has the capability to process and display IWXXM format data sets, as many of the TAC format data types will be retired in approx. 2030. At present full global coverage of IWXXM data is not available due to an incomplete inter-regional exchange of IWXXM data, but as the remaining inter-regional connects are put in place more data will be automatically added to SADIS.

The assessment of compliance should be based on the more detailed requirements that follow in the following sections of this document. Each main function is broken down into smaller objectives.

Appendix C contains a checklist that can be used to collate the results of the assessment.

1. Connect to the SADIS API and retrieve WAFS gridded, WAFS SIGWX and OPMET data sets

The system must automatically be able to connect to, and download data from the SADIS API at regular intervals

1A) Data should be downloaded from the SADIS API: a) At 5-minute intervals for OPMET data b) within 1 hour of a published set of WAFS gridded data c) within 1 hour of a published set of WAFS SIGWX data	*The back end to the system must be able to interact with the SADIS API to call for the available WAFS gridded, WAFS SIGWX and OPMET data sets. This includes polling to check when new data is available (for the WAFS data) prior to downloading it, and automatic retries if a download fails or the connection is interrupted.* *The display part of the system must be able to process the data supplied via the system back end.*

2. Display WAFS gridded data in GRIB2 format

The system must be able to display ICAO style wind/temperature maps/charts created from the WAFC London and WAFC Washington GRIB2 data sets

2A) Users should be able to display ICAO style wind and temperature data on a map for a range of flight levels and forecast timesteps at 1.25 and 0.25 degree resolution Wind and temperature map/chart requirements: a) Wind data should be depicted by arrows with feathers and pennants (wind fletches) b) Temperature data should be shown in Celsius and only be prefixed by a "+" or "PS" if the temperatures are positive. c) Wind data should be shown using the correct conventions for both the northern and southern hemispheres. d) Latitude/longitude lines and the coastline should be shown. e) On screen, there should be the ability to pan, zoom and change the map projection while maintaining the integrity of the data f) Show an appropriate legend/label that identifies which WAFC issued the data, validity date/time for the data, and flight level the data is valid for.	*Charts can be produced in colour if required.* *The display of data should follow the guidance contained in ICAO Annex 3 and Appendix A of this document.*
2B) If "printed copy" ICAO style charts are required it should be possible to create these from the on screen display of the data on demand and/or by automatically pre-generating charts. These charts should be: a) clear and unambiguous	*An example ICAO style wind and temperature chart is provided in Appendix A.*

b) follow the conventions in 2A and Annex 3.	

The system must be able to display wind, temperature, relative humidity, geopotential height, tropopause and jet stream (max wind) maps created from WAFC London and WAFC Washington GRIB2 data

2C) Users should be able to display wind data on a map for a range of flight levels and forecast timesteps at 1.25 and 0.25 degree resolution using an appropriate colour scheme. a) using wind fletches b) using wind speed contours or coloured grid cells c) with the ability to pan, zoom and change the map projection d) that shows an appropriate legend and key	*An example chart is provided in Appendix A.*
2D) Users should be able to display temperature data on a map for a range of flight levels and forecast timesteps at 1.25 and 0.25 degree resolution using an appropriate colour scheme. a) using numbers, contours or coloured grid cells b) with the ability to pan, zoom and change the map projection c) that shows an appropriate legend and key	*An example chart is provided in Appendix A.*
2E) Users should be able to display relative humidity data on a map for a range of flight levels and forecast timesteps at 1.25 and 0.25 degree resolution using an appropriate colour scheme. a) using relative humidity contours or coloured grid cells b) with the ability to pan, zoom and change the map projection c) that shows an appropriate legend and key	*An example chart is provided in Appendix A.*
2F) Users should be able to display geopotential altitude data on a map for a range of flight levels and forecast timesteps at 1.25 and 0.25 degree resolution using an appropriate colour scheme. a) using geopotential altitude contours (units gpm) b) with the ability to pan, zoom and change the map projection c) that shows an appropriate legend and key	*An example chart is provided in Appendix A.*

2G) Users should be able to display tropopause height and tropopause temperature data on a map for a range of flight levels and forecast timesteps at 1.25 and 0.25 degree resolution using an appropriate colour scheme. a) using contours or coloured grid cells b) with the ability to pan, zoom and change the map projection c) that shows an appropriate legend and key	*An example chart is provided in Appendix A.*
2H) Users should be able to display maximum wind (jet stream) and max wind height data on a map for a range of flight levels and forecast timesteps at 1.25 and 0.25 degree resolution using an appropriate colour scheme. a) using wind fletches b) using contours or coloured grid cells c) with the ability to pan, zoom and change the map projection d) that shows an appropriate legend and key	*An example chart is provided in Appendix A.*
2I) Users should be able to display turbulence data on a map for a range of flight levels and forecast timesteps at 0.25 degree resolution using an appropriate colour scheme. a) using contours or coloured grid cells b) with the ability to pan, zoom and change the map projection c) that shows an appropriate legend and key	*An example chart is provided in Appendix A.*
2J) Users should be able to display icing data on a map for a range of flight levels and forecast timesteps at 0.25 degree resolution using an appropriate colour scheme. a) using contours or coloured grid cells b) with the ability to pan, zoom and change the map projection c) that shows an appropriate legend and key	*An example chart is provided in Appendix A.*
2K) Users should be able to display cumulonimbus extent, cumulonimbus base and cumulonimbus top data on a map for a range of flight levels and forecast timesteps at 0.25 degree resolution using an appropriate colour scheme. a) contours or coloured grid cells b) with the ability to pan, zoom and change the map projection c) that shows an appropriate legend and key	*An example chart is provided in Appendix A.*

3. Display WAFS SIGWX data

The system must be able to display SIGWX forecasts using the IWXXM data set using both the WAFC London and WAFC Washington data sets

3A) Users should be able to display SIGWX data on a map for a range forecast timesteps The following parameters must be displayed using the standard conventions described in Annex 3: a) Jet stream (core position, speed, height of the jet core, and jet depth (where the jet speed exceeds 120kt)) b) Tropopause height contours c) Turbulence areas, intensity and base/top information. d) Cumulonimbus areas and top information. e) Icing areas and base/top information f) Active tropical cyclones g) Active volcanic eruptions h) Radioactive release information	*Guidance on the depiction of SIGWX data is provided in Appendix B.* *Note: there will be a discrepancy between the guidance in Annex 3 and this document until the publication of Amendment 82 to Annex 3 which will be updated to reflect the new SIGWX forecast products.*
3B) When viewed digitally the SIGWX should: a) be identical as far as the meteorological situation is concerned to the cross-check png charts that are provided on the SADIS API b) use line styles/conventions as described in Annex 3 (or the PANS-MET) c) use an appropriate colour scheme d) have clear arrows and labels that don't overlap e) have the ability to toggle fields on and off f) have the ability to pan, zoom and change the map projection whilst maintaining the integrity and clarity of the SIGWX features g) show an appropriate legend and key	*Note: If the software allows the user to modify any of the plotted meteorological parameters, reference to either WAFC must be automatically removed.* *Guidance on the display of SIGWX data is provided in Appendix B.*
3C) If a "hard copy" SIGWX charts are required it should be possible to create these on demand by choosing to print from the on screen display of the data and/or by automatically pre-generating charts. These hard copy charts should: a) clearly show the provider of the data, (WAFC London or WAFC Washington) b) show validity date/time and issue date/time of the data c) show the data is valid for FL100 to FL600	*Note: If the software allows the user to modify any of the plotted meteorological parameters, reference to either WAFC on any hard copy charts must be automatically removed.*

d) follow the display conventions in 3B and Annex 3 and be clear and unambiguous e) be able to be quickly created for ICAO map areas: A, B, B1, C, D, E, F, G, H, I, J, K and M f) contain the following statement: "CB IMPLIES TS, GR, MOD OR SEV TURB AND ICE. UNITS USED: HEIGHTS IN FLIGHT LEVELS. CHECK SIGMET, ADVISORIES FOR TC AND VA, AND ASHTAM AND NOTAM FOR VA" g) contain a statement that says "TC INFORMATION IS NOT PROVIDED FOR THIS TIMESTEP" for forecasts beyond T+24.	

4. Display OPMET data in lists/reports according to data type and/or location using TAC format data

4A) Users should be able to display the following types of OPMET data as a list/report: i. METAR and SPECI (SA, SP) ii. TAF (FC, FT) iii. SIGMET (WS, WV, WC) iv. AIRMET (WA) v. GAMET (FA) vi. Tropical Cyclone Advisory (FK) vii. Volcanic Ash Advisory (FV) viii. Space Weather Advisory (FN) ix. Special Air Reports (UA) x. Radioactive release messages (NN) xi. NOTAM/ASHTAM relating to volcanic ash (NWXX01)	
4B) Users should be able to: a) create lists/reports of the chosen OPMET data type b) retrieve individual pieces of OPMET data based on the WMO header, issuing airport, FIR or country c) retrieve data from each of the following regions: CARSAM, NAM, EUR/NAT, MID, and ASIAPAC d) retrieve advisory messages from each of the issuing centres	
4C) For METARS and TAFS users should also be able to: a) view a time-series of METARs or TAFs from their chosen airports. b) colour code elements of the METAR/TAF when chosen thresholds are exceeded	

5. Display OPMET data in a human readable form sorted according to data type and/or location using IWXXM format data

Note: Many of the TAC format OPMET products are expected to be retired in around 2030 so users are advised to ensure that their systems can handle IWXXM format data. This means users would be able to switch to use the IWXXM data operationally as soon a fully global data set is available.

5A) Users should be able to display the following types of IWXXM format OPMET data in a human readable form i. METAR and SPECI (LA, LN) ii. TAF (LC, LT) iii. SIGMET (LS, LV, LY) iv. AIRMET (LW) v. Tropical Cyclone Advisory (LK) vi. Volcanic Ash Advisory (LU) vii. Space Weather Advisory (LN)	*In order to use the IWXXM data sets they must be turned into a human readable form. This could be similar to the TAC format messages or in some newer more innovative way.*
5B) Users should be able to: a) create lists/charts/reports of the chosen OPMET data type based off the IWXXM data b) retrieve individual pieces of OPMET data based on the WMO header, issuing airport, FIR or country c) retrieve data from each of the following regions: CARSAM, NAM, EUR/NAT, MID, and ASIAPAC d) retrieve advisory messages from each of the issuing centres	*Note: Full global coverage of IWXXM data is not currently available due to some missing inter-regional exchange pathways. It should be possible to display data from at least three regions or the advisory issuing centres that are internationally exchanging data.*
5C) For METARS and TAFS users should also be able to: a) view a time-series of METARs and TAFs from their chosen airports. b) colour code elements of the METAR/TAF when chosen thresholds are exceeded	

6. Display OPMET on a map view based on the TAC format data

6A) Users should be able to display the following types of TAC format OPMET data in on a map display: i. METAR and SPECI (SA, SP) ii. TAF (FC, FT) iii. SIGMET (WS, WV, WC) iv. Special Air Report (UA)	

The map view should have appropriate regional and/or global coverage	
6B) For METAR and TAFS the map display should provide the ability to: a) indicate key elements of interest to users b) view METARs and TAFs colour coded according to chosen thresholds c) easily access time series of METARs and TAFs when required	*This may take the form of colour coded airport markers or "synoptic station circle" type of presentations.*
6C) For SIGMET and Special Air Reports the map display should provide the ability to: a) show the geographical location of phenomena described in a SIGMET* with appropriate labels and colour scheme b) show the location that the Special Air Report was made	*For SIGMETS: This may be not be provided as the parsing of TAC format SIGMET data in order to draw the feature areas can be difficult.*
6D) Optional: map display of information from the tropical cyclone advisories, volcanic ash advisories and space weather advisories highlighting key elements of interest to users.	*Areas of volcanic ash obtained by the advisories and tropical cyclone information may be drawn on the map by some providers.*

7. Display OPMET on a map view based on the IWXXM format data

Note: Many of the TAC format OPMET products are expected to be retired in around 2030 so users are advised to ensure that their systems can handle IWXXM format data. This means users would be able to switch to use the IWXXM data operationally as soon a fully global data set is available.

7A) Users should be able to display the following types of IWXXM format OPMET data in on a map display: i. METAR and SPECI (LA, LN) ii. TAF (LC, LT) iii. SIGMET (LS, LV, LY) The map view should have appropriate regional and/or global coverage	
7B) For METAR and TAFS the map display should provide the ability to: a) indicate key elements of interest to users b) view METARs and TAFs colour coded according to chosen thresholds c) easily access time series of METARs and TAFs when required	*This may take the form of colour coded airport markers or "synoptic station circle" type of presentations.*

7C) For SIGMET the map display should provide the ability to: a) show the geographical location of phenomena described in a SIGMET with appropriate labels and colour scheme	
7D) Optional: map display of information from the tropical cyclone advisories, volcanic ash advisories and space weather advisories highlighting key elements of interest to users	*Areas of volcanic ash obtained by the advisories and tropical cyclone information may be drawn on the map by some providers.*

8. Display tropical cyclone advisory graphics and volcanic ash advisory graphics

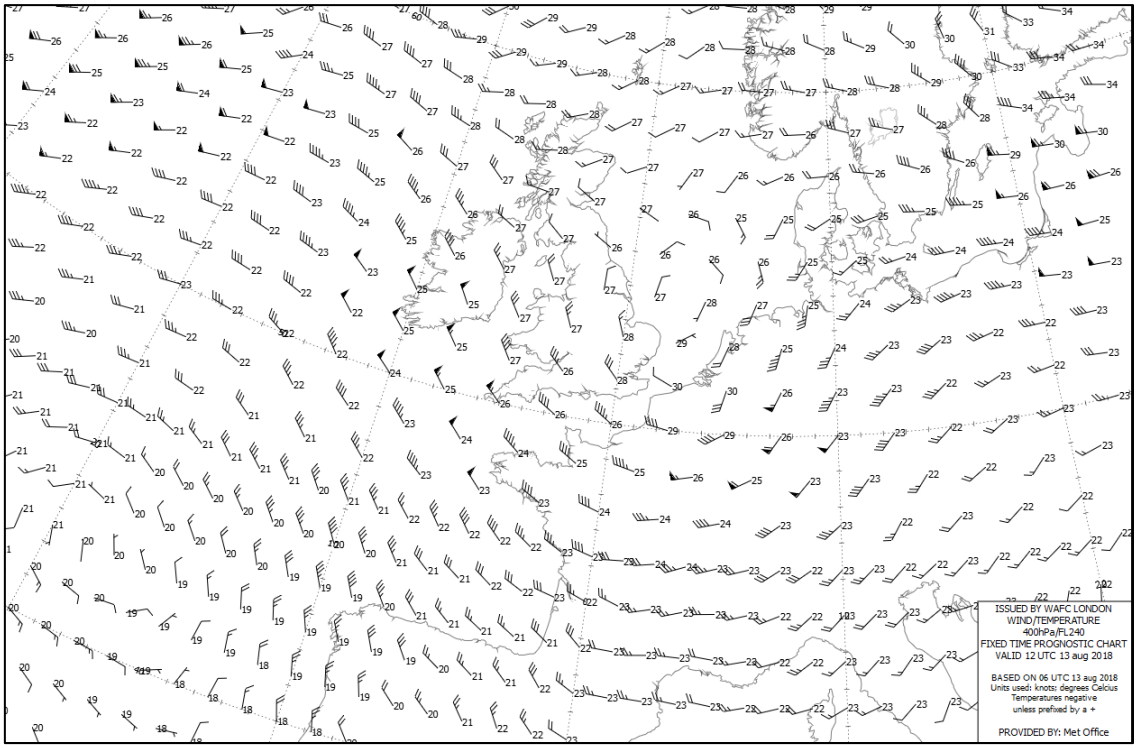
8A) Users should be able to view tropical cyclone advisory graphics (PZXD) and volcanic ash advisory graphics (PFXD)	

9. Alert users when advisory type data is received

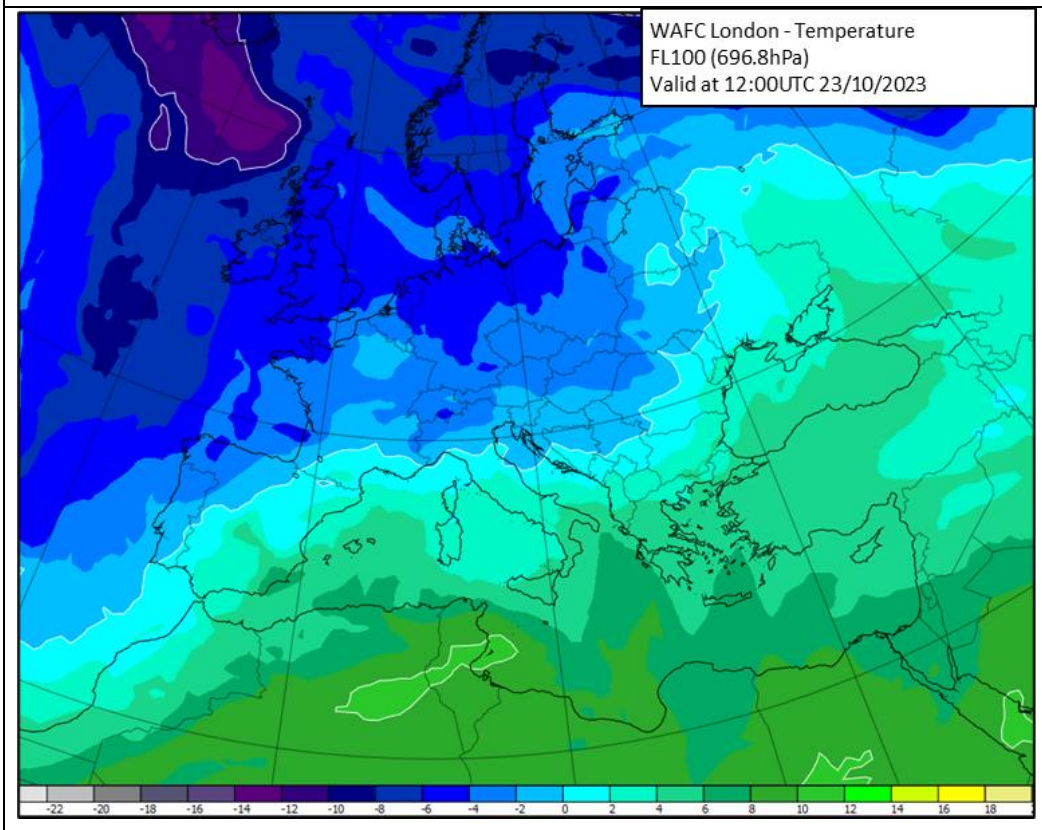
9A) The software/system should alert users when the following types of OPMET data are received: i. SIGMET ii. Volcanic Ash Advisory iii. Tropical Cylone Advisory iv. Space Weather Advisory v. Radioactive Release message vi. Special Air Report	*The software should make an audible or visual alert when OPMET data of these types is received.* *The ability for users to be able to configure the type and coverage areas of alerts they are interested in is beneficial.*

Appendix A – Example WAFS Gridded Data presentation

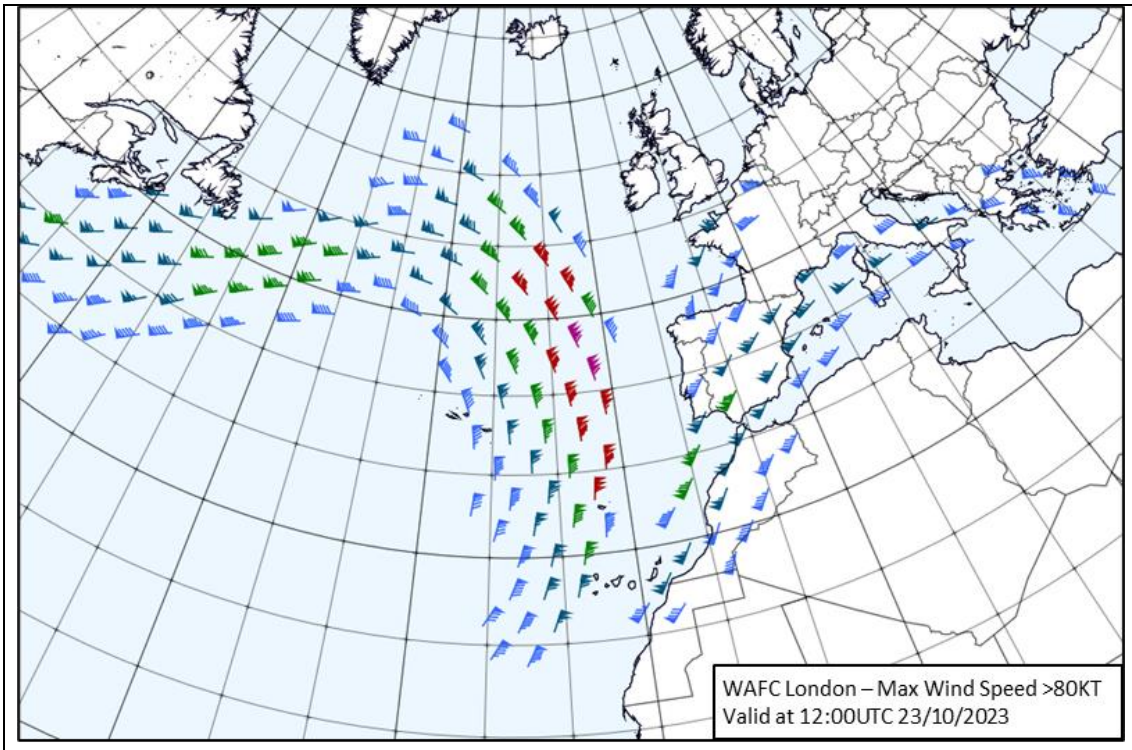
Note: colour schemes shown here are illustrative and alternative schemes can be used.



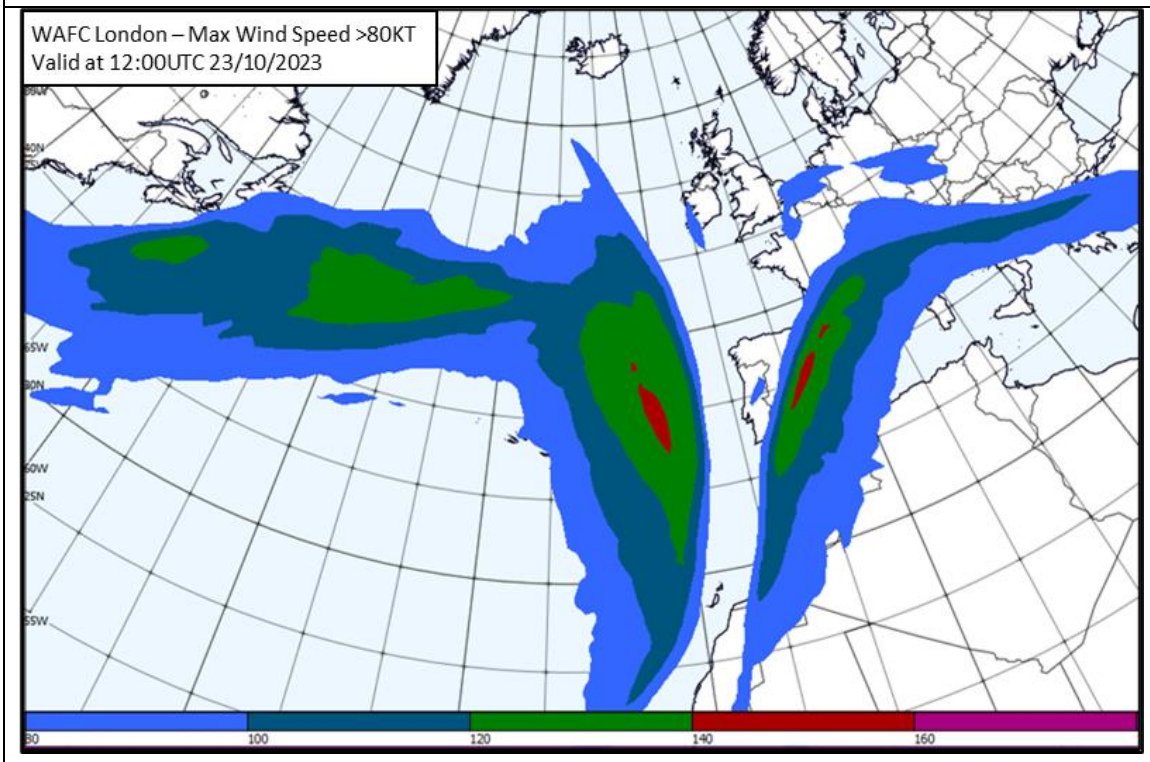
Example 1, ICAO Style Wind and temperature chart at FL240



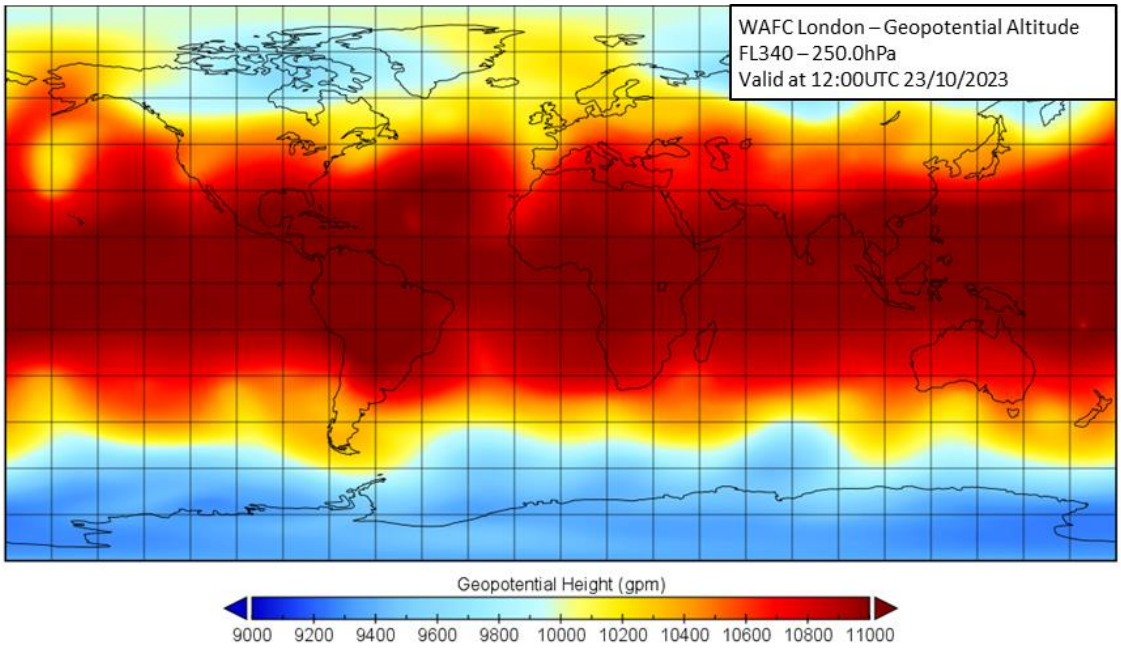
Example 2, Temperature in Celsius at FL100 (696.8hPa)



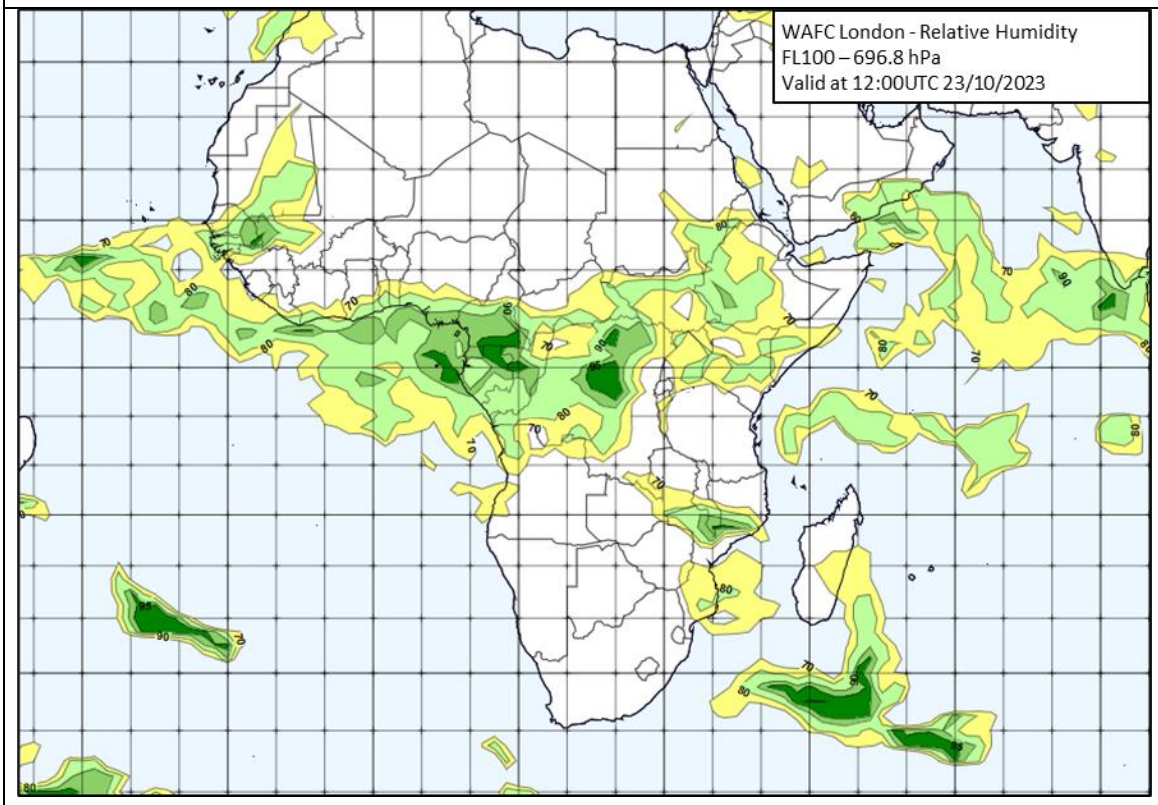
Example 3, Maximum wind speed and direction shown as wind fletches. Only wind speeds of 80KT or more are displayed in this example.



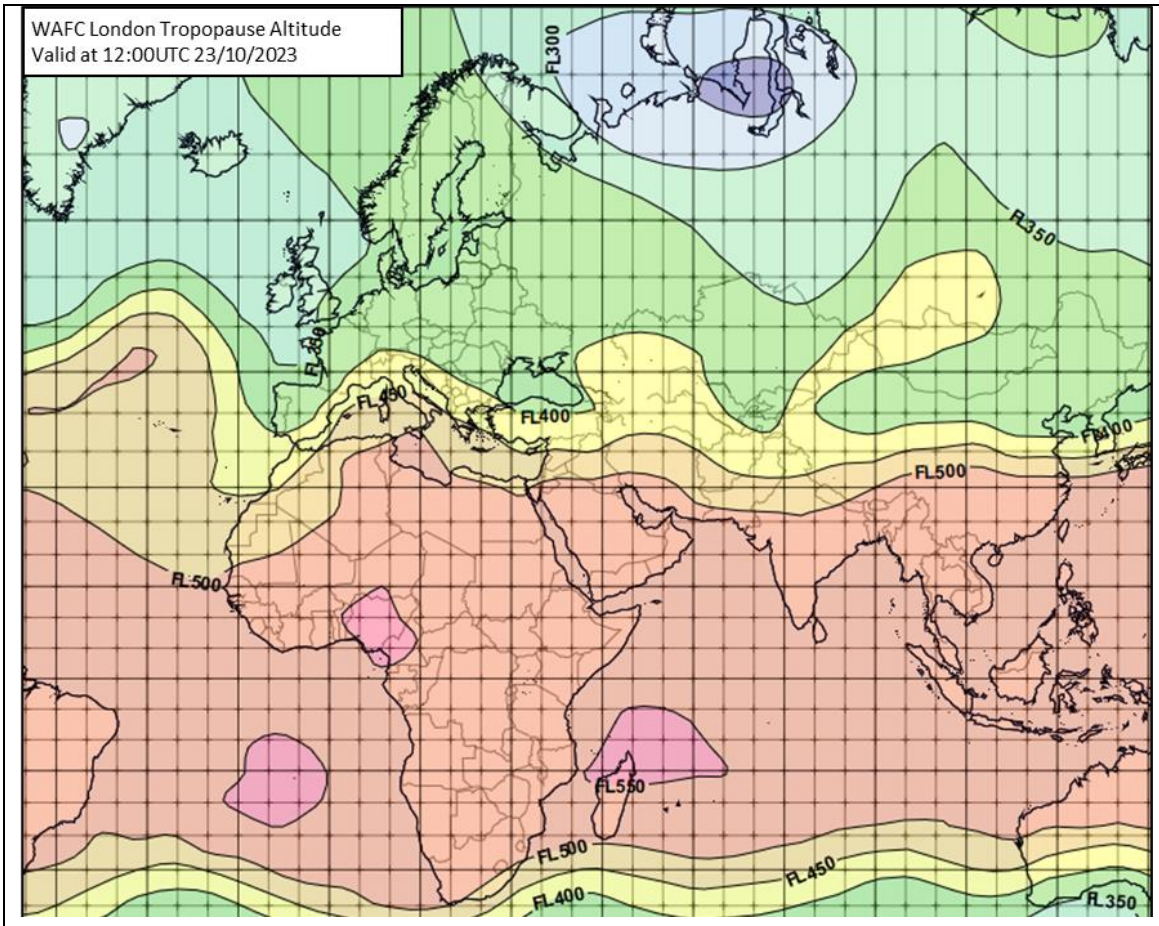
Example 4, Maximum wind speed shown as wind contours. Only wind speeds of 80KT or more are displayed in this example.



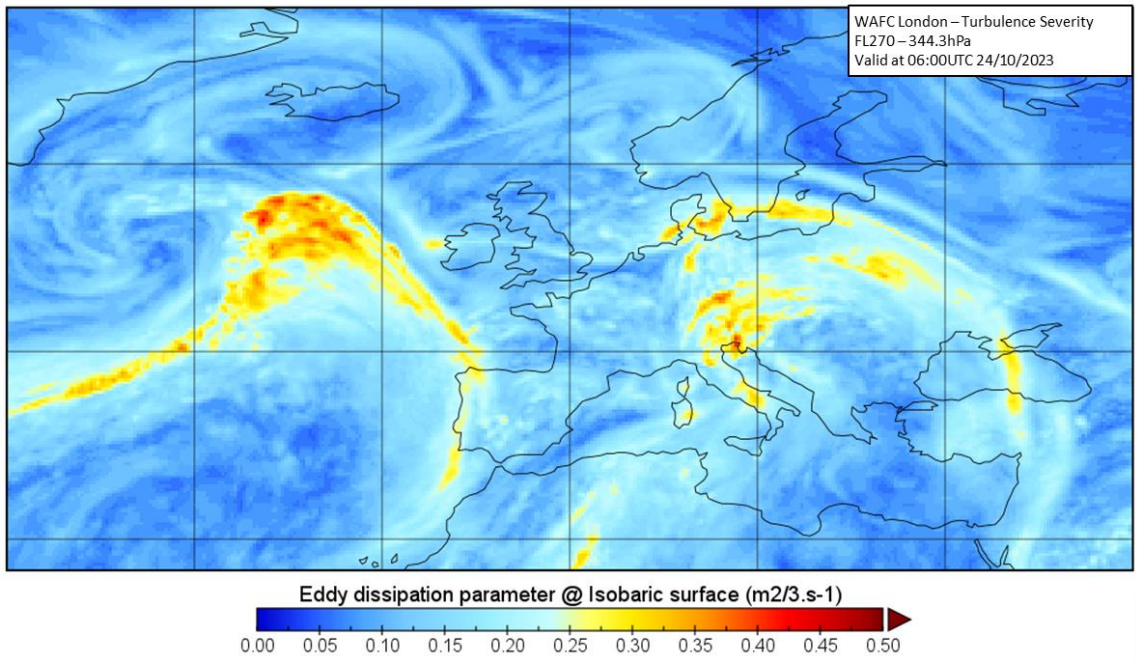
Example 5, Geopotential Altitude at FL340 (250.0hPa)



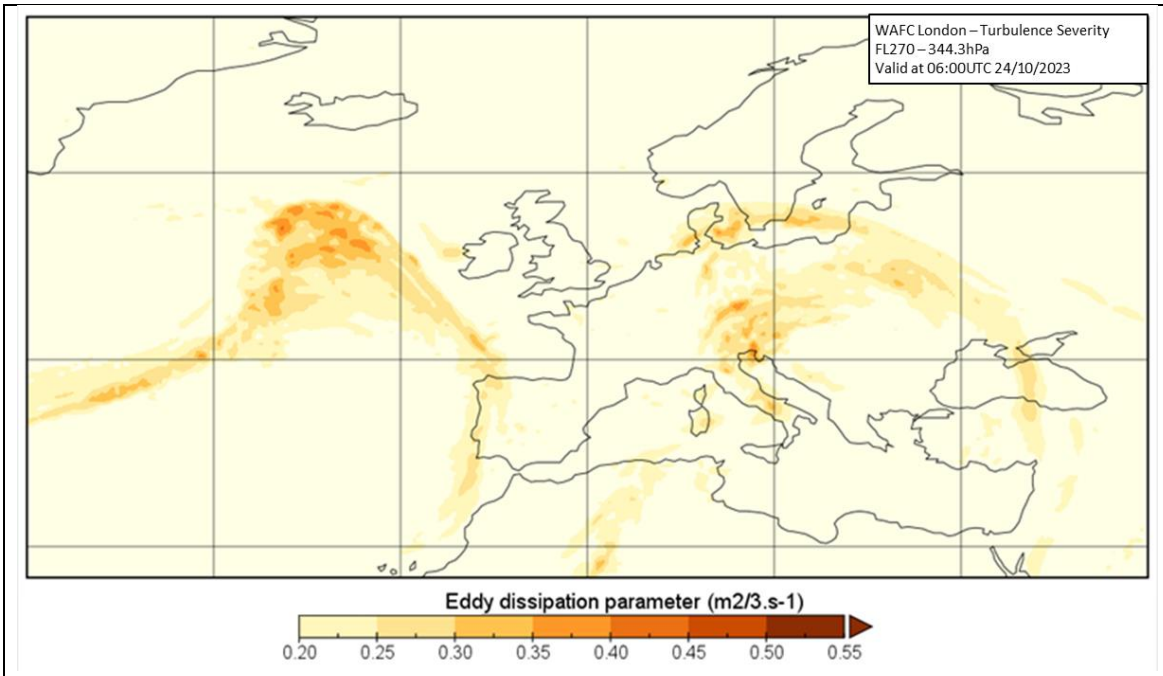
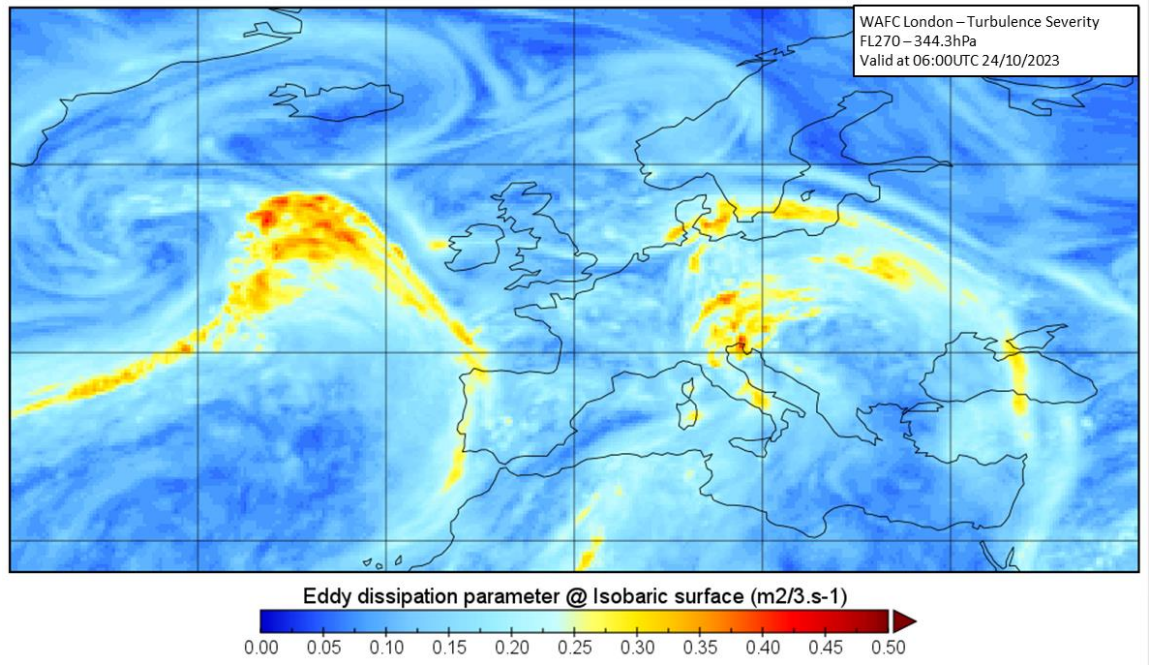
Example 6, Relative Humidity at FL250 (250.0hPa)

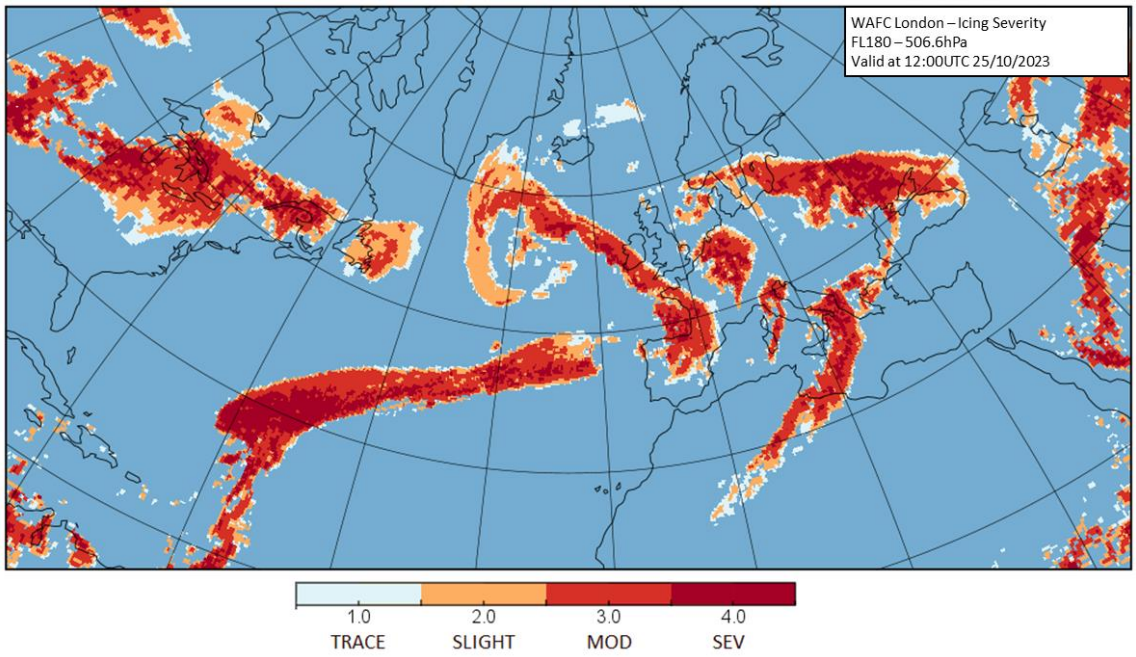


Example 7, Tropopause Altitude displayed as Flight levels.

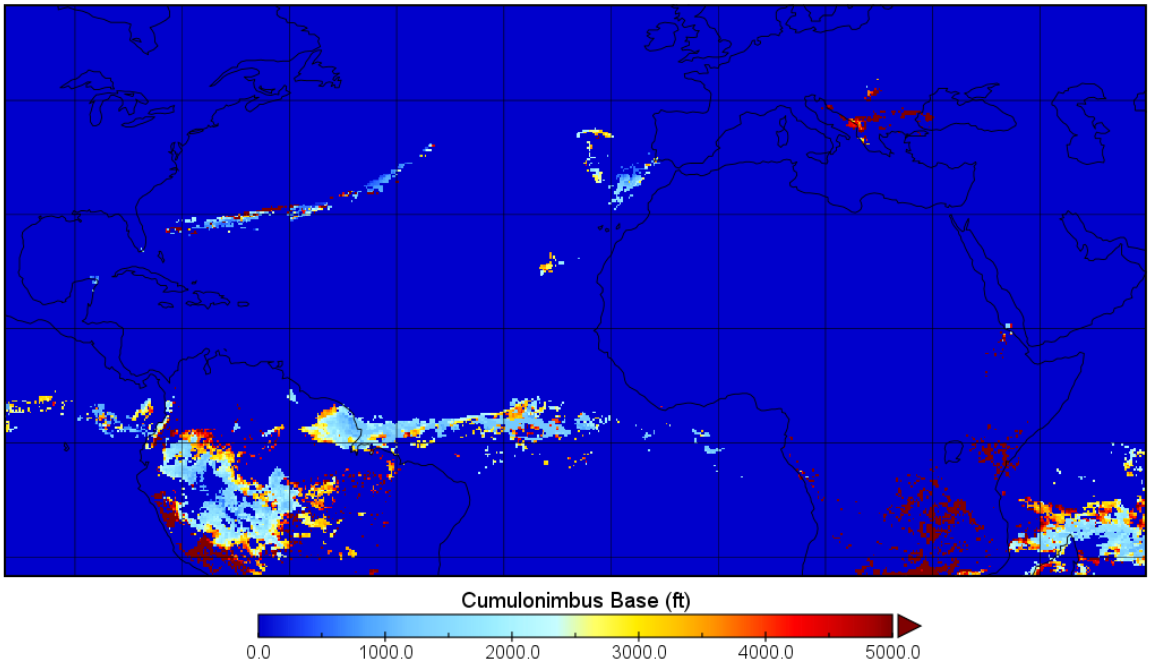


Example 8a, Turbulence Severity at FL270

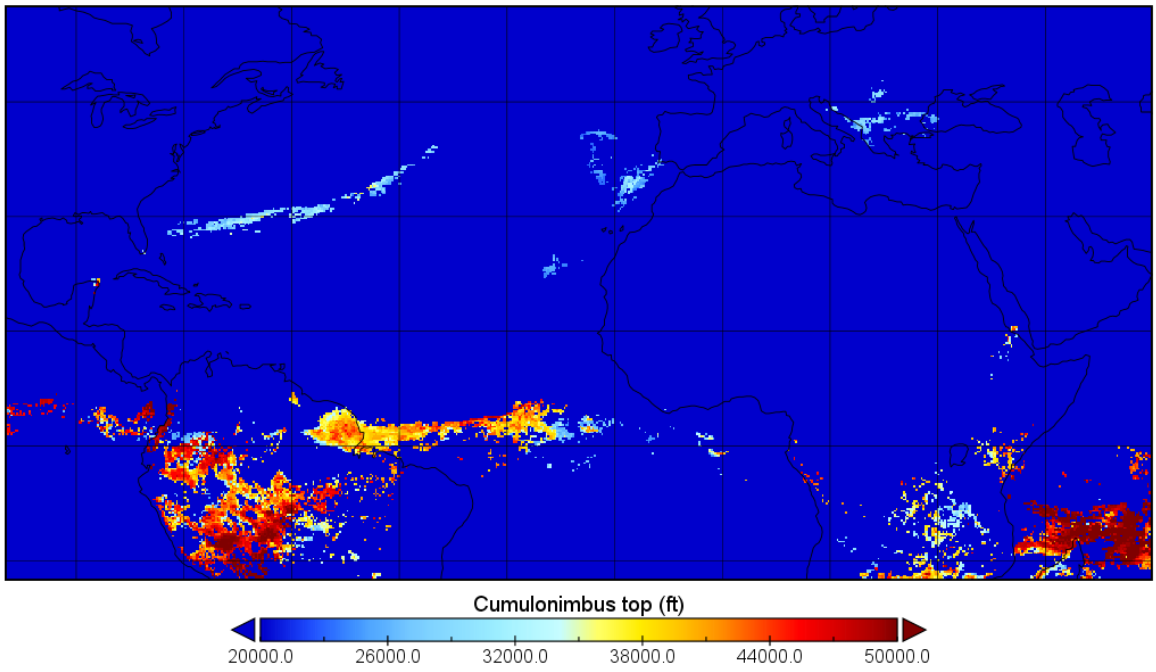
	*Example 8b, Turbulence Severity at FL270, threshold applied so only turbulence EDR values above 0.2 are shown.*
	*Example 9, Turbulence Severity at FL270, with all turbulence EDR values shown.*



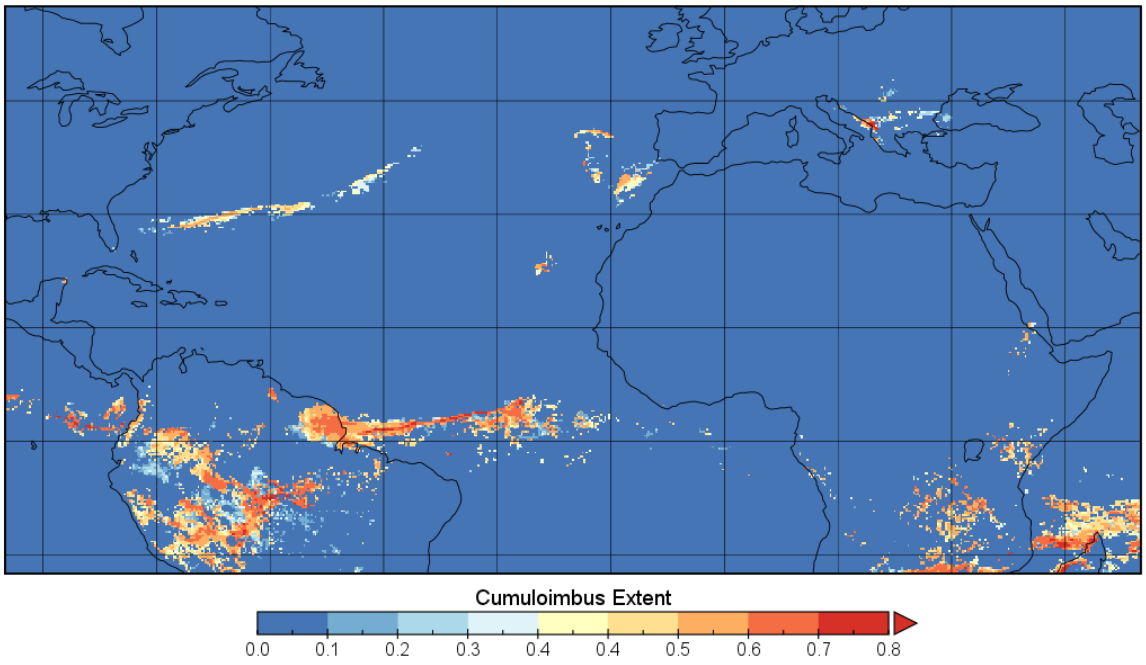
Example 10, Icing Severity at FL180 (506.6hPa)



Example 11, Cumulonimbus base



Example 12, Cumulonimbus Top



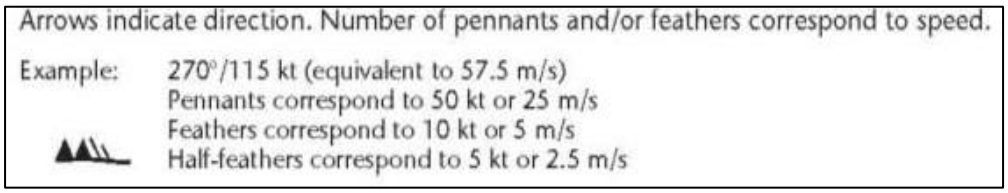
Example 13, Cumulonimbus Extent

Additional guidance on 2A/2B - WAFC Wind and Temperature Charts

The key objective when producing a wind and temperature chart from the WAFC GRIB 2 data sets is for the chart to be clear, unambiguous, and meteorologically correct.

What to look out for:

1) are the correct conventions used for the wind pennant/feathers?



2) are the wind pennant/features depicted correctly on either side of the equator?
   For winds in the northern hemisphere the pennants and/or feathers should be plotted on the clockwise side whilst in the southern hemisphere they should be on the anticlockwise side.

3) temperature values should generally not be obscured by, or be obscuring the wind fletches

4) positive temperature values should be prefixed with a + or PS

5) latitude/longitude lines should be used
6) the chart legend should be clear and contain the following information:
   i) The name of the WAFC who has issued the wind/temperature data set
   ii) Clear information on the flight level that the chart is for
   iii) Information that states which model run the chart is based on, and the validity time/date for the chart
   iv) A statement that says “Units used: knots, degrees Celsius” and “Temperatures negative unless prefixed by ‘+’
   v) The name of the company/organisation that has generated/provided the chart

Appendix B - Example WAFS SIGWX presentation

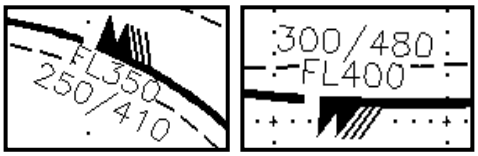
The key objective when producing a WAFC SIGWX chart is that it should be clear, unambiguous, and meteorologically correct. The relevant WAFC produced SIGWX cross checking chart (in .png format) should be closely consulted and compared to the version produced on your software.

Note: there will be a discrepancy between the guidance in Annex 3 and this document until the publication of Amendment 82 to Annex 3 which will be updated to reflect the new SIGWX forecast products.

1. Jet streams

a) Jet streams should correctly show the direction of the wind, with the arrow pointing where the wind is going to. Jet streams must not cross.

b) For a jet stream that starts in the northern hemisphere the speed symbols should be plotted to the left of the jet core, whilst a jet that starts in the southern hemisphere should have the speed symbols on the right.



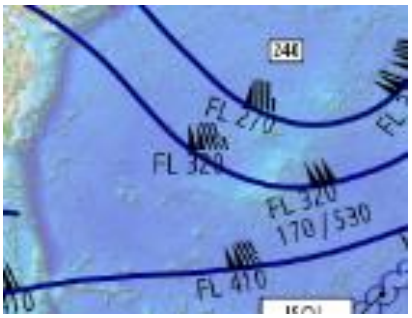
Left: northern hemisphere example
Right: southern hemisphere example

c) Jet core height information (in FL) should be plotted along the length of the jet, on the opposite side to the speed symbols.

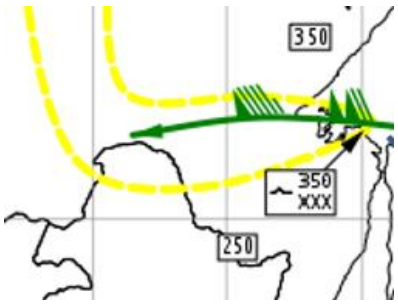
d) A "change bar" (two short lines perpendicular to the jet stream) should be used where there is a change of speed of 20 knots but insufficient speed to plot the full wind symbol.

e) Vertical jet depth information should be shown where the jet stream has a speed of 120kt or more.

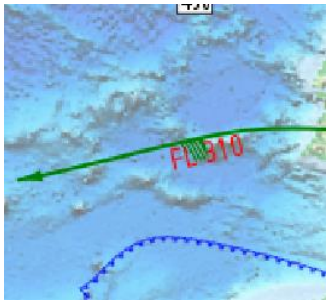
Some examples of poorly depicted Jetstreams:



a) Wind pennants/fleches are not aligned with the flow



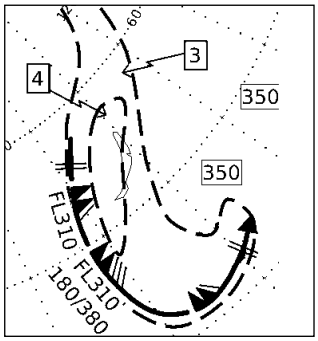
b) The wind fleches oppose the jet direction indicated by the jet core arrow.

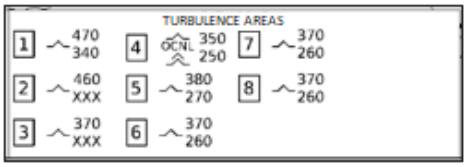


c) The jet core height information is on the wrong side of the jet.

2. Turbulence

a) Areas of turbulence are generally represented by a dashed and/or shaded area and a feature label. This feature label can take two forms:
   i) a reference number, which relates to a legend shown elsewhere on the chart.



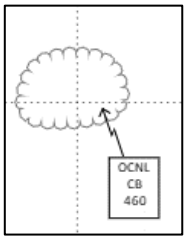


   ii) a pictorial/numerical representation of with the turbulence severity and base/top information

b) turbulence that extends above the top of the chart (FL600) or below the bottom of the chart (FL100) should be marked as XXX.

3. Cumulonimbus Cloud

a) CB cloud is generally depicted as a scalloped area, with an associated label which provides information on the CB amount/type and CB top information.
b) CB that extend above the top of the chart (FL600) should be marked as XXX
c) Labels can be displayed wholly within the marked CB area, or be linked with a call out arrow.

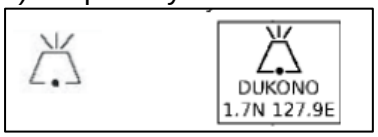


4. Tropopause Height

Tropopause is indicated as a contour with a flight level label:

5. Volcanoes, sandstorms, tropical cyclones and radiation

a) Tropical cyclones and volcanoes should be accompanied by a label which gives their name.



b) The tropical cyclone symbol changes between the northern and southern hemisphere to indicate the different directions of rotation.

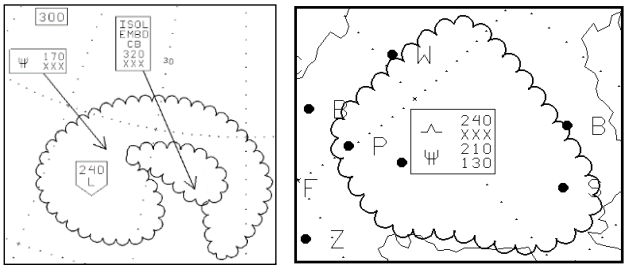
Left;- Northern hemisphere tropical cyclone (Fred),
Right;- Southern hemisphere tropical cyclone (Boloetse)

c) Release of radioactive material should be represented by the radiation symbol

6. Icing

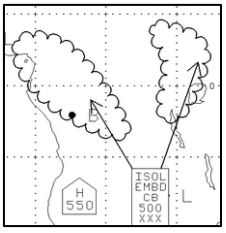
Icing areas should be encompassed by a scalloped line, and have an associated label which provides information on the forecast intensity and base/top information.

a) Bases that fall below the lower vertical boundary of the chart, or tops that extend above the top of the chart should be marked as XXX



7. General Guidelines - Feature labels

a) should not overlap
b) should not be underneath, or over the top of other SIGWX features
c) can be used for more than one feature if each feature shares the same attributes.

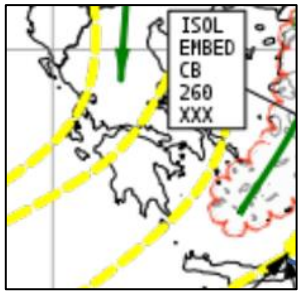


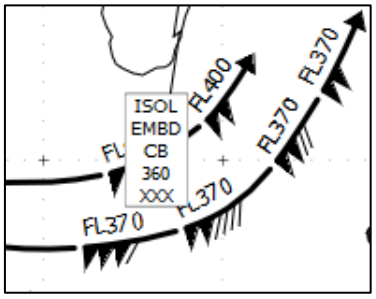
d) Should follow the correct format, using the correct abbreviations or symbols

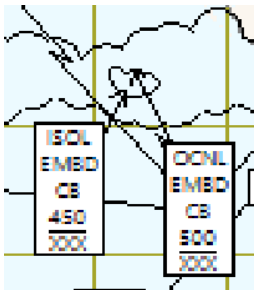
e) It should be clear what a feature label corresponds to:
   i) The arrow should point either to the boundary of the cloud/CAT/icing area or end within the area of the feature
   ii) Ideally the arrow should not cross feature label boxes as it may make them difficult to read

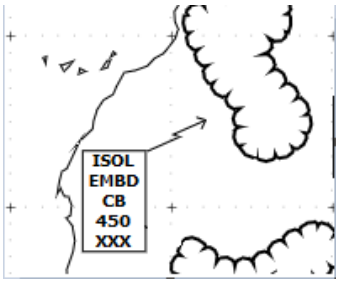
The examples below give examples of poor feature labelling:

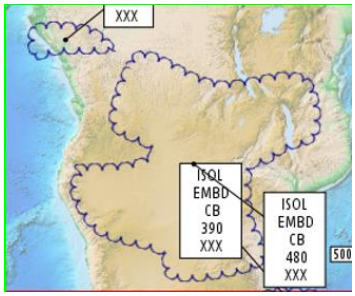
<table>
<tr>
<td> 

a)overlapping text boxes</td>
<td> 

b)the wrong abbreviation for embedded has been used</td>
<td> 

c) this CB label is overlapping the jet stream information</td>
</tr>
<tr>
<td> 

d) there are two different labels attached to a single CB area making it impossible to know which one is correct</td>
<td> 

e) this arrow terminates outside of a cloud area</td>
<td> 

f) a label inside of a feature suggests that it applies to that feature. However in this example there is another label which indicates alternative attributes.</td>
</tr>
</table>

8. General Guidelines – Legends

There should be a clear legend containing the elements shown below:
a) The name of the WAFC who has issued the data set
b) Clear information on the flight level(s) that the chart is for
c) The ICAO area the chart is applicable for (if a standard area is used)
d) Information that states which model run the chart is based on, and the validity time/date for the chart
e) For SIGWX charts: A statement that says "CB IMPLIES TS, GR, MOD or SEV TURB AND ICE" and "Units used: heights in Flight Levels. Check SIGMET, advisories for TC and VA, and ASHTAM and NOTAM for VA"
f) An additional statement must be used for forecasts valid for 27-hours onwards that say "TC INFORMATION IS NOT PROVIDED FOR THIS TIMESTEP"
g) The name of the company/organisation that has generated/provided the chart

ISSUED BY WAFC {WAFC NAME}
PROVIDED BY {PROVIDER ORGANISATION}

FIXED TIME PROGNOSTIC CHART
ICAO AREA X SIGWX
FL100-FL600

FORECAST ISSUE TIME: <HH> UTC <DD> <MMM> <YYYY>

T+XX FORECAST VALID AT <HH> UTC ON <DD> <MMM> <YYYY>

UNITS USED: HEIGHTS IN FLIGHT LEVELS
CHECK SIGMET, ADVISORIES FOR TC AND VA, AND ASHTAM AND NOTAM FOR VA

<ADDITIONAL STATEMENT>

APPENDIX C– SOFTWARE EVALUATION FORM

	Compliant ✓/✗	Comments/notes
1. Connect to the SADIS API and retrieve WAFS gridded, WAFS SIGWX and OPMET data		
1A) Data can be downloaded from the ADIS API		
a) at 5-minute intervals for OPMET data		
b) within 1 hour of a published set of WAFS gridded data		
c) within 1 hour of a published set of WAFS SIGWX data		
2. Display WAFS gridded data in GRIB2 format		
2A ICAO Style wind and temperature charts/maps		
a) can be created from 1.25 degree and 0.25 degree data for a range of flight levels and forecast timesteps		
b) wind data is depicted by arrows with features and pennants		
c) temperature is only prefixed by a "+" or "PS" if the temperatures are positive		
d) the correct convention for northern and southern hemispheres is used		
e) latitude/longitude lines and the coastlines can be shown		
f) on screen the maps can be panned, zoomed and the map projection changed		
g) have an appropriate legend/label		
2B – printed copies of ICAO wind and temperature charts		
a) created from the on screen display are clear and unambiguous		
b) automatically created (pre-set charts) correspond to the on-screen versions and if required ICAO map areas		
c) follow the conventions in 2A.		
2C – Wind charts/maps		
a) can be created from 1.25 degree and 0.25 degree data for a range of flight levels and forecast timesteps		
b) data is depicted by arrows with feathers and pennants (wind fletches) or coloured grid cells		
c) on screen the maps can be panned, zoomed and map projection changed		
d) have an appropriate legend/label		
2D – Temperature charts/maps		
a) can be created from 1.25 degree and 0.25 degree data for a range of flight levels and forecast timesteps		

b) data can be depicted using numbers and/or contours and/or coloured grid cells		
c) on screen the maps can be panned, zoomed and map projection changed		
d) have an appropriate legend/label		
2E – Relative humidity charts/maps		
a) can be created from 1.25 degree and 0.25 degree data for a range of flight levels and forecast timesteps b) data can be depicted using contours and/or coloured grid cells c) on screen the maps can be panned, zoomed and map projection changed d) have an appropriate legend/label		
2F – Geopotential altitude charts/maps		
a) can be created from 1.25 degree and 0.25 degree data for a range of flight levels and forecast timesteps		
b) data can be depicted using contours and/or coloured grid cells		
c) on screen the maps can be panned, zoomed and map projection changed		
d) have an appropriate legend/label		
2G – Maximum wind charts/maps		
a) can be created from 1.25 degree and 0.25 degree data for a range of flight levels and forecast timesteps b) max wind data can be depicted using wind fletches c) max wind speed or max wind level can be depicted using contours and/or coloured grid cells d) on screen the maps can be panned, zoomed and map projection changed e) havean appropriate legend/label		
2H – Turbulence charts/maps		
a) can be created from 0.25 degree data for a range of flight levels and forecast timesteps		
b) data can be depicted using contours and/or coloured grid cells		
c) data values above a chosen threshold can be shown		
d) on screen the maps can be panned, zoomed and map projection changed		
e) have an appropriate legend/label		

2I – Icing charts/maps		
a) can be created from 0.25 degree data for a range of flight levels and forecast timesteps b) datacan be depicted using contours and/or coloured grid cells c) on screen the maps can be panned, zoomed and map projection changed d) have an appropriate legend/label		
2J – Cumulonimbus charts/maps		
a) can be created from 0.25 degree data for a range of flight levels and forecast timesteps		
b) cumulonimbus extent can be depicted using contours and/or coloured grid cells		
c) cumulonimbus tops can be depicted using contours and/or coloured grid cells		
d) cumulonimbus bases can be depicted using contours and/or coloured grid cells		
e) on screen the maps can be panned, zoomed and map projection changed		
f) have an appropriate legend/label		
3. Display WAFS SIGWX data (using IWXXM data)		
3A - Display of SIGWX forecast data		
a) can be created from EGRR and KKCI data sets for all forecast timesteps		
b) Depicts the following parameters: i. Jet stream (core position, speed, height of the jet core, and jet depth (where the jet speed exceeds 120kt)) ii. Tropopause height contours at 5000ft vertical intervals iii. MOD and SEV Turbulence areas with base/top information. iv. OCNL and FRQ Cumulonimbus areas with CB top top information. v. MOD and SEV Icing areas with base/top information vi. Active tropical cyclones vii. Active volcanic eruptions viii. Radioactive release information		

3B - Digital presentation of SIGWX forecast data		
a) is identical as far as the meteorological situation is concerned to the SIGWX cross-check charts that are provided on the SADIS API		
b) uses appropriate line styles and conventions to depict the SIGWX features		
c) has clear arrows, labels, and colour scheme		
d) has the ability to toggle different features on and off		
e) can be panned, zoomed and the map projection changed whilst maintaining the integrity of the SIGWX features		
f) shows a clear and appropriate key, legend and labels		
3C - Display of SIGWX forecast data on a "hard copy" chart		
a) if created from the on screen display are clear and unambiguous		
b) if automatically created (pre-set charts) correspond to the on-screen versions		
c) show the provider of the data, validity date/time and issue date/time		
d) show the data is valid for FL100 to FL600		
e) follow the conventions in 3B.		
f) contains the following statements: "CB IMPLIES TS, GR, MOD OR SEV TURB AND ICE. UNITS USED: HEIGHTS IN FLIGHT LEVELS. CHECK SIGMET, ADVISORIES FOR TC AND VA, AND ASHTAM AND NOTAM FOR VA" and for forecasts beyond T+24 "TC INFORMATION IS NOT PROVIDED FOR THIS TIMESTEP"		
4. Display OPMET data in lists/reports using the TAC format data		
4A Display of different types of TAC format OPMET		
a) the following data types must be available: i. METAR and SPECI (SA, SP) ii. TAF (FC, FT) iii. SIGMET (WS, WV, WC) iv. AIRMET (WA) v. GAMET (FA) vi. Tropical Cyclone Advisory (FK) vii. Volcanic Ash Advisory (FV) viii. Space Weather Advisory (FN) ix. Special Air Reports (UA) x. Radioactive release messages (NN)		

xi. NOTAM/ASHTAM relating to volcanic ash (NWXX01)		
4B – Retrieve lists/reports of TAC format OPMET data		
a) individual pieces of OPMET data can be retrieved based on the WMO header, issuing centre, FIR or country. The latest data for each of the OPMET types listed in 4A should be discoverable.		
b) data can be retrieved from each of the following regions: CARSAM, NAM, EUR/NAT, MID, and ASIAPAC		
c) for chosen airport, geographical region or time period		
d) as a METAR or TAF time series for a chosen airport		
5. Display OPMET data in human readable form using the IWXXM format data		
5A Display of different types of IWXXM format OPMET		
a) the following data types must be available: i. METAR and SPECI (LA, LN) ii. TAF (LC, LT) iii. SIGMET (LS, LV, LY) iv. AIRMET (LW) v. Tropical Cyclone Advisory (LK) vi. Volcanic Ash Advisory (LU) vii. Space Weather Advisory (LN)		
5B – View OPMET data in human readable form based on IWXXM format data		
a) individual pieces of OPMET data can be retrieved based on the WMO header, issuing centre, FIR or country. The latest data for each of the OPMET types listed in 5A should be discoverable.		
b) data can be retrieved from each of the following regions: CARSAM, NAM, EUR/NAT, MID, and ASIAPAC		
c) for chosen airport, geographical region or time period		
5C - Show a time series of METAR and TAF data		
a) as a METAR or TAF time series for a chosen airport		
b) colour code elements of the METAR/TAF when chosen thresholds are exceeded		
6. Display OPMET data on a map based on the TAC format data		
6A – Display TAC format OPMET data on a map		
a) the following data types should be available: i. METAR and SPECI (SA, SP) ii. TAF (FC, FT) iii. SIGMET (WS, WV, WC)		

iv. Special Air Reports (UA)		
b) the map view has appropriate regional and/or global coverage		
6B – METAR and TAF display requirements		
a) the display should indicate key METAR and TAF elements of interest to users		
b) colour code elements of the METAR/TAF when chosen thresholds are exceeded		
c) easy access to time series of METARs and TAFs when required		
6C – SIGMET and Special AIREP display		
a) shows the correct geographical location of phenomena described in a SIGMET with appropriate labels and colour scheme		
b) shows the location that the Special Air Report relates to and highlights relevant phenomena		
6D – Advisory display requirements (OPTIONAL)		
a) the map display should indicate key elements of interest to users for the following data types: i. Tropical Cyclone Advisory (FK) ii. Volcanic Ash Advisory (FV) iii. Space Weather Advisory (FN) iv. Radioactive release messages (NN) v. NOTAM/ASHTAM relating to volcanic ash (NWXX01)		
7. Display OPMET data on a map based on the IWXXM format data		
7A – Display IWXXM format OPMET data on a map		
a) the following data types should be available: i. METAR and SPECI (LA, LN) ii. TAF (LC, LT) iii. SIGMET (LS, LV, LY)		
b) the map view has appropriate regional and/or global coverage		
7B – METAR and TAF display requirements		
a) the display should indicate key METAR and TAF elements of interest to users		
b) colour code elements of the METAR/TAF when chosen thresholds are exceeded		
c) easy access to time series of METARs and TAFs when required		
7C – SIGMET display		

a) shows the correct geographical location of phenomena described in a SIGMET with appropriate labels and colour scheme		
7D – Advisory display requirements		
a) the map display should indicate key elements of interest to users for the following data types: i. Tropical Cyclone Advisory (LK) ii. Volcanic Ash Advisory (LU) iii. Space Weather Advisory (LN)		
8. Display of tropical cyclone and volcanic ash advisory graphics		
8A – chart display requirements		
a) tropical cyclone advisory graphics (PZXD) and volcanic ash advisory graphics (PFXD) are available to view on demand		
9. Alert users when advisory type data is received		
9A – Advisory alerting requirements		
a) users are alerted by a visual or audible alert when the following types of OPMET data are received: i. SIGMET ii. Volcanic Ash Advisory iii. Tropical Cylone Advisory iv. Space Weather Advisory v. Radioactive Release message vi. Special Air Report		