METEOROLOGY PANEL

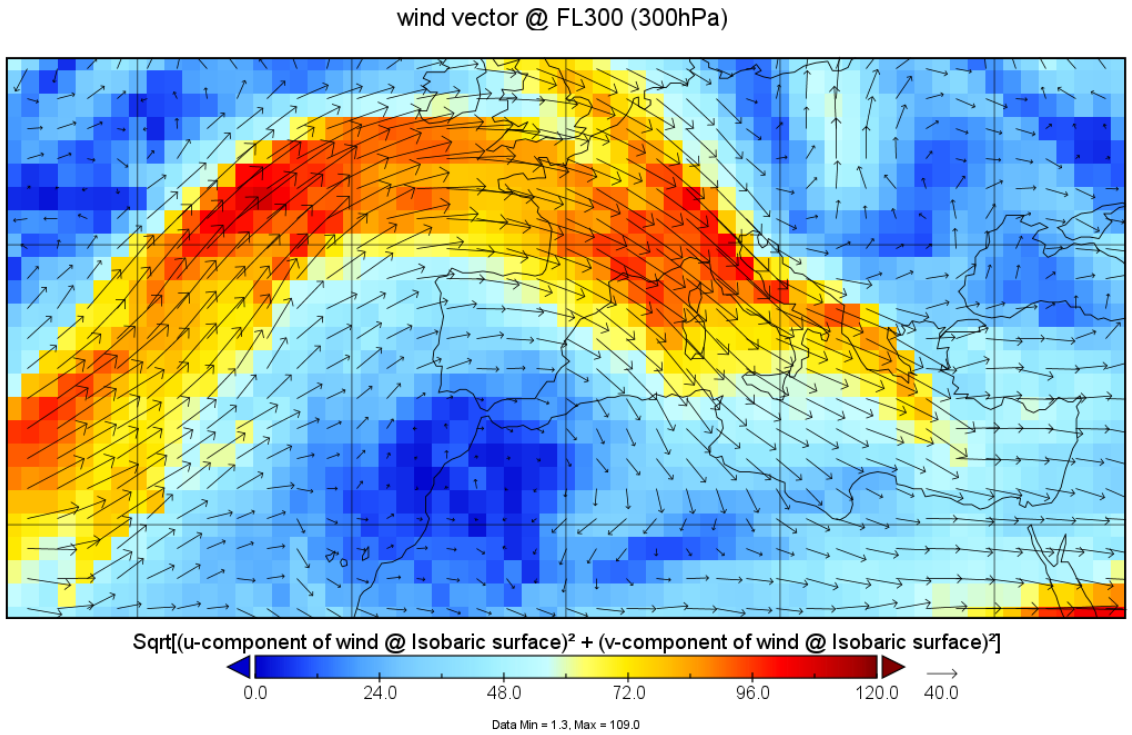
Improvements to the World Area Forecast System (WAFS) – 2023 and 2024

WAFS CHANGES COMING IN WITH AMENDMENT 81 TO ANNEX 3 ….

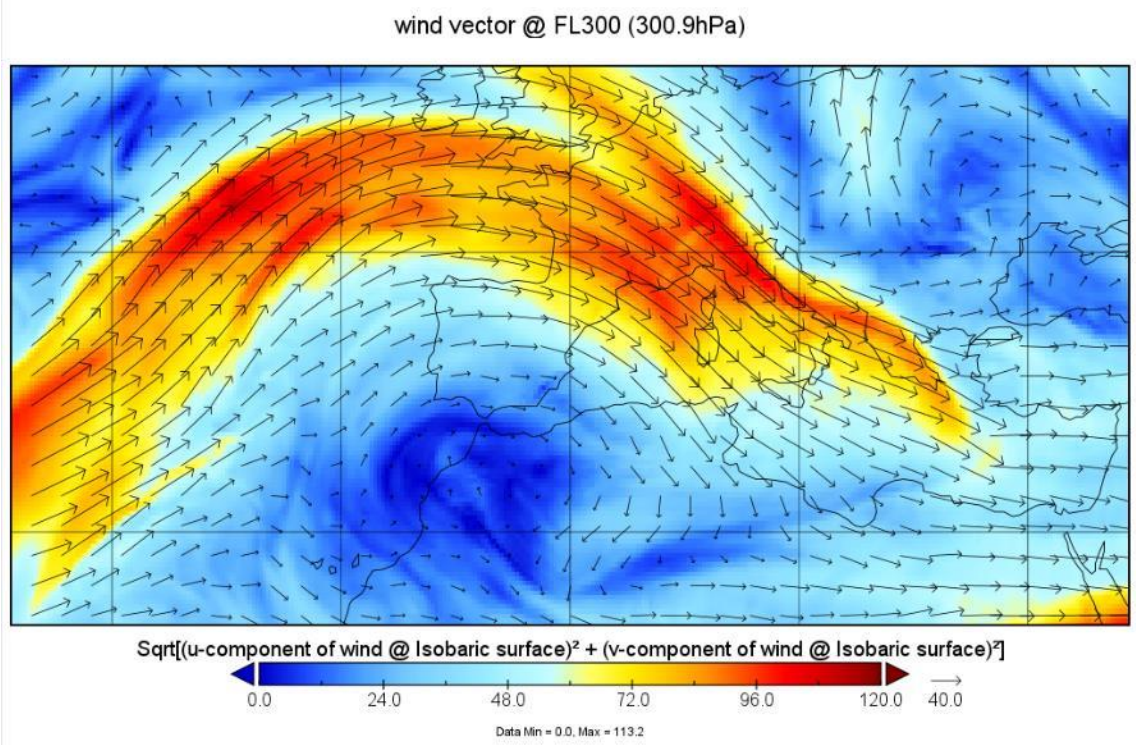
- WAFS gridded data will get a large upgrade:
    - Many more vertical levels
    - More timesteps
    - Wind, temperature, relative humidity, geopotential height at 0.25 degree resolution

- All changes relate to Amendment 81 to ICAO Annex 3, now due for implementation Nov 2024.
- The proposed changes to Annex 3 were agreed at the ICAO Met Panel Meeting in June 2021, and are now being considered by the ICAO Air Navigation Commission for approval/consultation (SL 2023.1 refers)

Current 1.25 degree resolution



New 0.25 degree resolution



WAFS GRIDDED DATA

Flight Level	ICAO Standard Atmosphere pressure level (hPa)	Geopotential Altitude	Wind	Temperature	Turbulence Severity	Icing Severity	Humidity
FL050	843.1	X	X	X		X	X
FL060	812.0	X	X	X		X	X
FL070	781.9	X	X	X		X	X
FL080	752.6	X	X	X		X	X
FL090	724.3	X	X	X		X	X
FL100	696.8	X	X	X	X	X	X
FL110	670.2	X	X	X	X	X	X
FL120	644.4	X	X	X	X	X	X
FL130	619.4	X	X	X	X	X	X
FL140	595.2	X	X	X	X	X	X
FL150	571.8	X	X	X	X	X	X
FL160	549.2	X	X	X	X	X	X
FL170	527.2	X	X	X	X	X	X
FL180	506.0	X	X	X	X	X	X
FL190	485.5	X	X	X	X	X	
FL200	465.6	X	X	X	X	X	
FL210	446.5	X	X	X	X	X	
FL220	427.9	X	X	X	X	X	
FL230	410.0	X	X	X	X	X	
FL240	392.7	X	X	X	X	X	
FL250	376.0	X	X	X	X	X	
FL260	359.9	X	X	X	X	X	
FL270	344.3	X	X	X	X	X	
FL280	329.3	X	X	X	X	X	
FL290	314.9	X	X	X	X	X	
FL300	300.9	X	X	X	X	X	
FL310	287.4	X	X	X	X		
FL320	274.5	X	X	X	X		
FL330	262.0	X	X	X	X		
FL340	250.0	X	X	X	X		
FL350	238.4	X	X	X	X		
FL360	227.3	X	X	X	X		
FL370	216.6	X	X	X	X		
FL380	206.5	X	X	X	X		

FL390	39000	X	196.8	X	X	X		
FL400	40000	X	187.5	X	X	X		
FL410	41000	X	178.7	X	X	X		
FL420	42000	X	170.4	X	X	X		
FL430	43000	X	162.4	X	X	X		
FL440	44000	X	154.7	X	X	X		
FL450	45000	X	147.5	X	X	X		
FL460	46000	X	140.6	X	X			
FL470	47000	X	134.0	X	X			
FL480	48000	X	127.7	X	X			
FL490	49000	X	121.7	X	X			
FL500	50000	X	116.0	X	X			
FL510	51000	X	110.5	X	X			
FL520	52000	X	105.3	X	X			
FL530	53000	X	100.4	X	X			
FL540	54000	X	95.7	X	X			
FL550	55000	X	91.2	X	X			
FL560	56000	X	87.0	X	X			
FL570	57000	X	82.8	X	X			
FL580	58000	X	79.0	X	X			
FL590	59000	X	75.2	X	X			
FL600	60000	X	71.7	X	X			

Data shown in blue is what is currently available.

Note: Data will be produced for exact pressure levels e.g. 392.7hPa for FL240 instead of the current 400hPa

WAFS GRIDDED DATA

Upper-air grid point forecasts	*1-hourly intervals*	*3-hourly intervals*	*6-hourly intervals*
Wind (56), temperature (56), geopotential altitude (56)	6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23 and 24 hours*	27, 30, 33, 36, 39, 42, 45 and 48 hours*	54, 60, 66, 72, 78, 84, 90, 96, 102, 108, 114 and 120 hours* Note data from 72hours onward will only be produced for two of the four daily model runs.
Flight level and temperature of tropopause			
Direction, speed and flight level of maximum wind			
Humidity (14)			
Cumulonimbus extent, base and top	6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23 and 24 hours*	27, 30, 33, 36, 39, 42, 45 and 48 hours*	Not provided
Icing (26)			
Turbulence (36)			

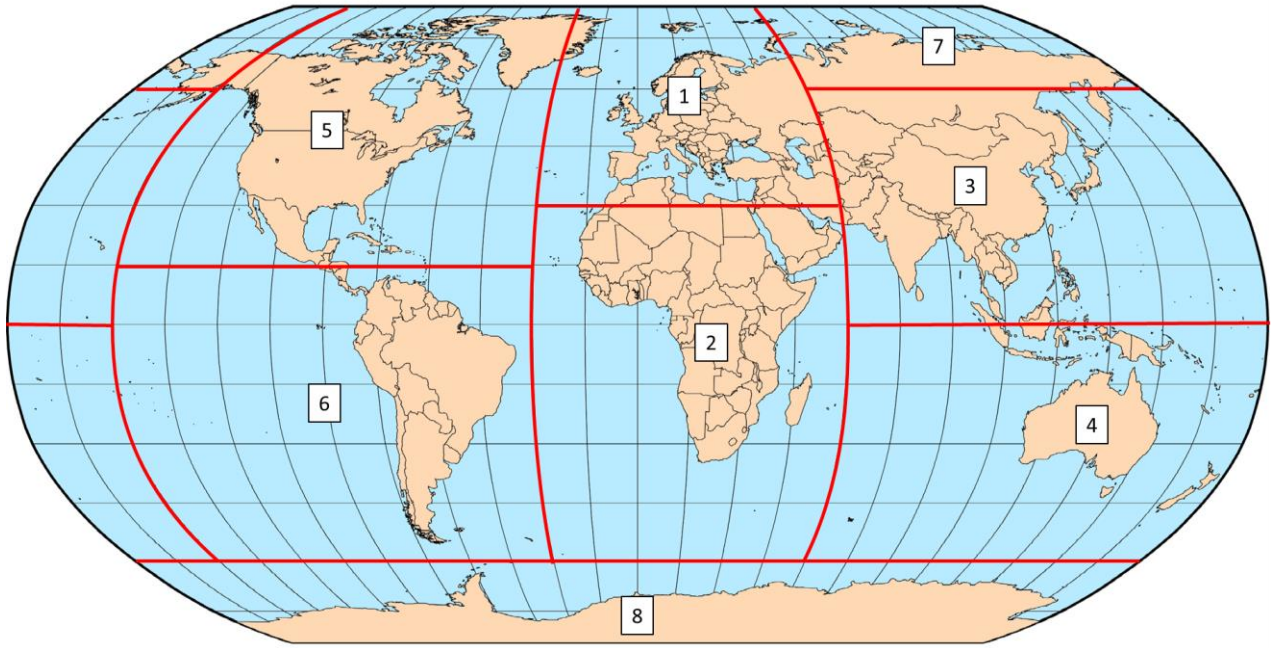
**after the time (0000, 0600, 1200 and 1800 UTC) of the synoptic data on which the forecasts were based.*

The number in blue shows the number of vertical levels that will be available.

WAFS GRIDDED DATA

- The new data will all be provided at 0.25 degree resolution.
- The 1.25 degree wind, temperature, relative humidity, and tropopause and geopotential height data will still be provided for the levels and timesteps produced now (T+6 to T+36 at 3 hourly intervals)
- The way the data is distributed is also being updated.

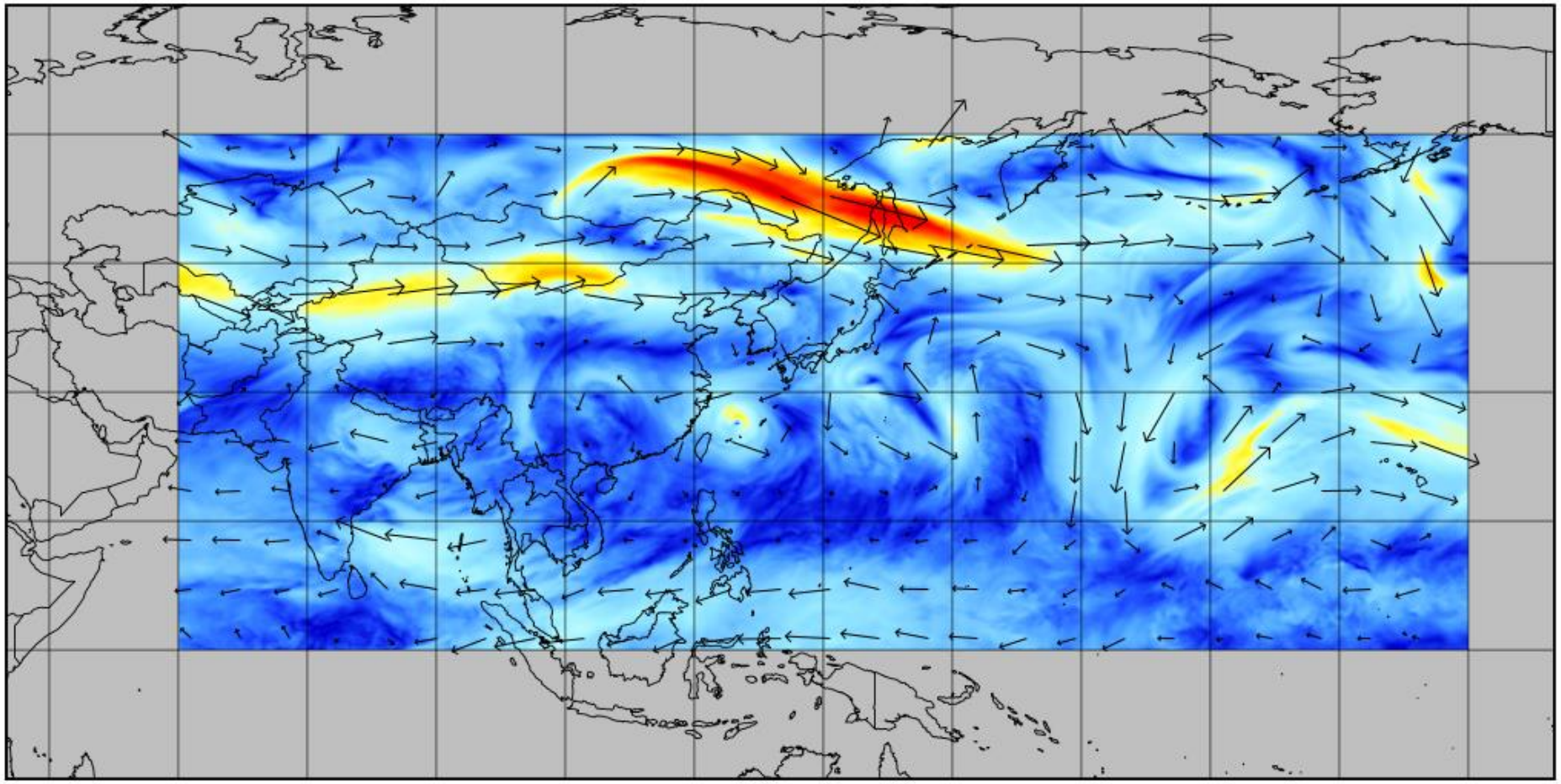
- “Old way” SADIS FTP/WIFS – global data sets with limited choice of what users download.
- “New way” SADIS and WIFS API – users will be able to choose the specific data they are interested in.



- Pre-set map areas will be available
- Users will be able to pick the timesteps of data that are needed. Initially they will get all vertical levels

FL340 wind

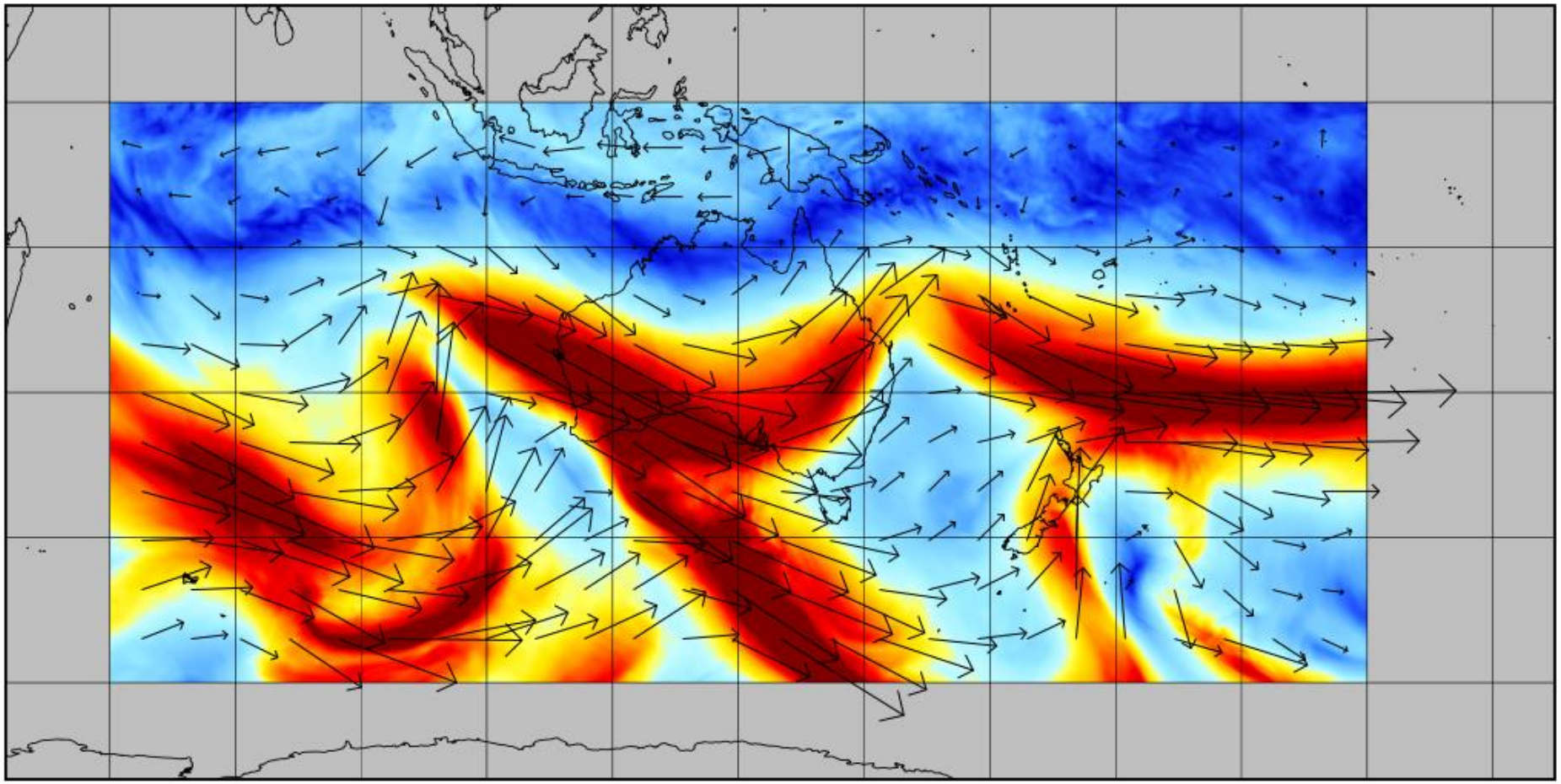
Map tile Area 3



Wind speed (kt)

0.0 10.0 20.0 30.0 40.0 50.0 60.0 70.0 80.0 90.0 100.0 110.0 120.0 → 40.0

FL340 wind



Map tile Area 4

DATA DISTRIBUTION

- The next generation of SADIS and WIFS, the SADIS API and WIFS API, is in development to modernise the way that the WAFS data is provided.
- They use the Open Geospatial Consortium (OGC) Environmental Data Retrieval API https://ogcapi.ogc.org/edr/ framework. This is an industry standard protocol.
- Data is organised into a series of “collections”
- The SADIS API will adhere to the Eurocontrol SWIM yellow profile requirements https://www.eurocontrol.int/concept/system-wide-information-management and will be published in the SWIM registry https://eur-registry.swim.aero/services
- The WIFS API will adhere to similar requirements, and will be published in the FAA SWIM registry https://nsrr.faa.gov/

HOW WILL THE API WORK

Collection name

Users make a request like this

https://xxxxx.api.metoffice.gov.uk/collections/egrr_wafs_windtempgeo_0p25/items/YUVDYA2015_017FLALL

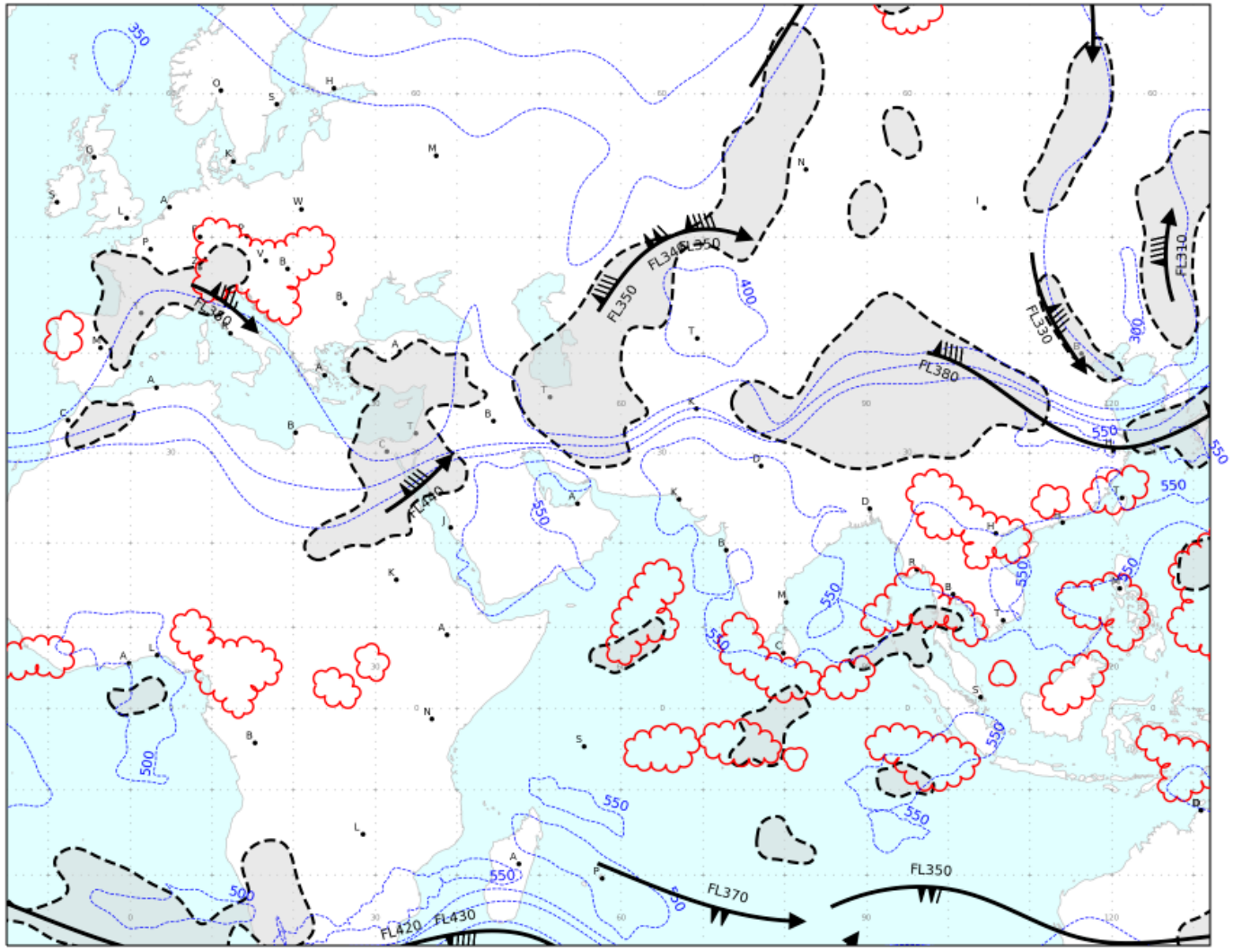
This is the ID for the data set:
Y = WAFS GRIB
UV = u and v wind
D = Deterministic
Y = 0.25 horizontal resolution
A2 = tile area 2
015-017 = forecast timesteps
FLALL = all flight levels.

- Access is controlled with authentication tokens

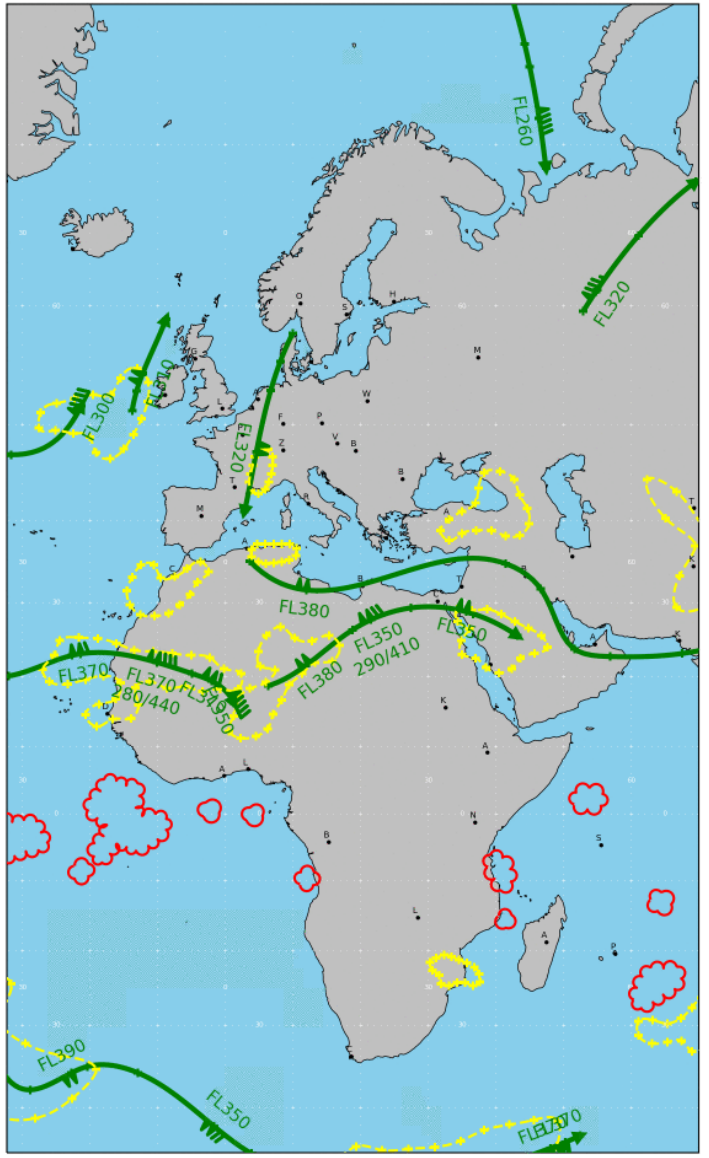
WAFS SIGWX FORECASTS ARE ALSO CHANGING….

- SIGWX forecasts will no longer just be produced for T+24.
- New SIGWX forecasts will be provided for T+6 to T+48 at 3-hourly intervals
- The new SIGWX forecast will go from FL100 to FL600 (i.e. SWH and SWM merged)

SigWx objects - WAFC: EGRR - Area: D - 2023-06-07 18Z T+24 forecast - Python objects



SigWx objects - WAFC: EGRR - Area: C - 2023-04-05 00Z T+06 forecast - Python objects

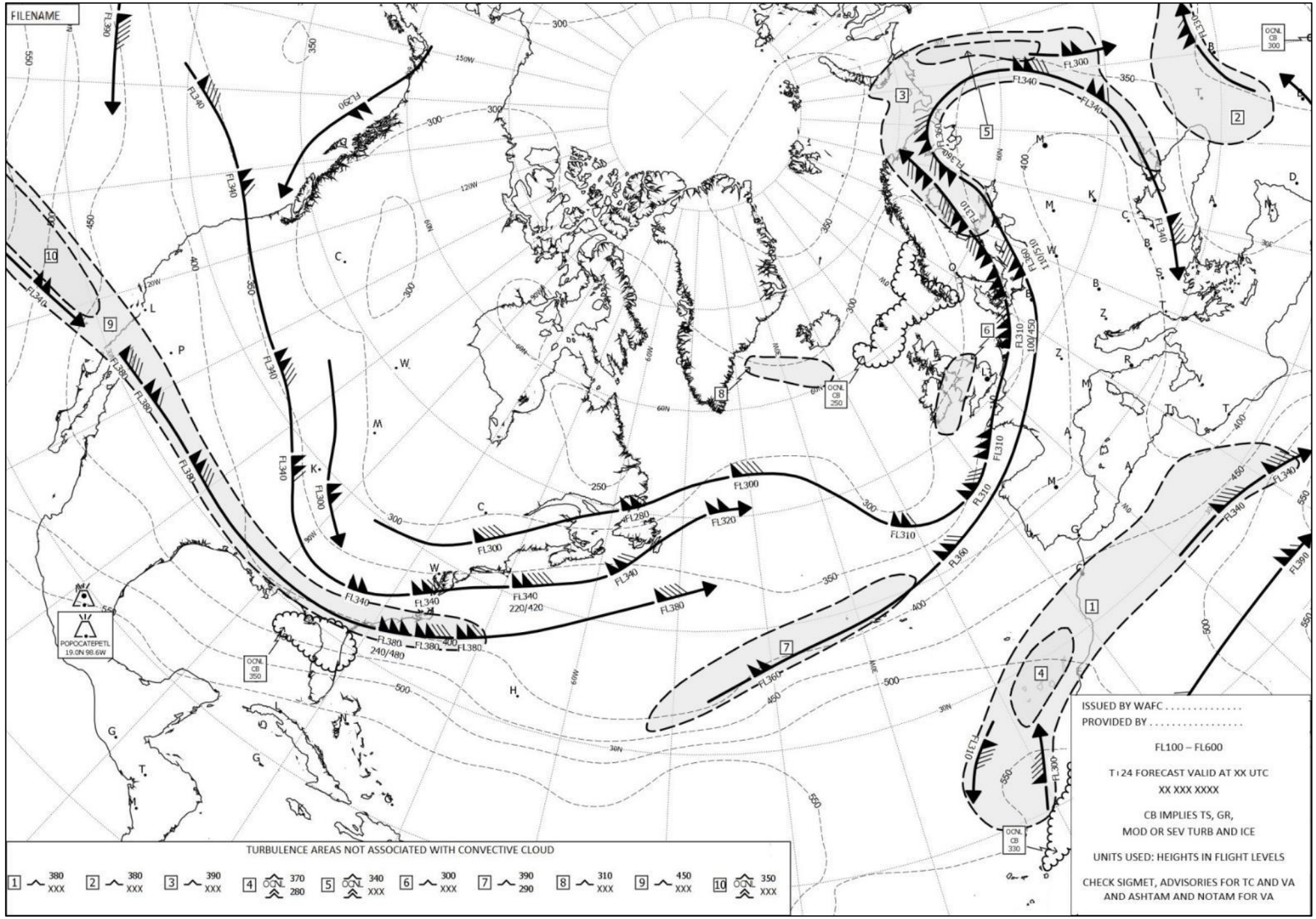


WAFS SIGWX FORECASTS

The content of SIGWX forecasts will change a little:

- Tropopause height as contours
- Icing areas provided for the entire globe
- Turbulence areas will use the new Turbulence Severity field (so CAT + orographic)
- Only areas of OCNL or FRQ CB will be forecast
- Tropical cyclone positions only available until T+24

“Paper copy” (.png) charts will only be provided for ICAO areas A, B, B1, C, D, E, F, G, H, I, J, K, L and M (i.e. the old SWH areas) at T+24, and until 2028 on SADIS FTP.


FILENAME
POPOCATEPETL
19.0N 98.6W
TURBULENCE AREAS NOT ASSOCIATED WITH CONVECTIVE CLOUD
1 380 XXX
2 380 XXX
3 390 XXX
4 370 280
5 340 XXX
6 300 XXX
7 390 290
8 310 XXX
9 450 XXX
10 350 XXX
ISSUED BY WAFC . . . . . .
PROVIDED BY . . . . . .
FL100 – FL600
T+24 FORECAST VALID AT XX UTC
XX XXX XXXX
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

WAFS SIGWX FORECASTS

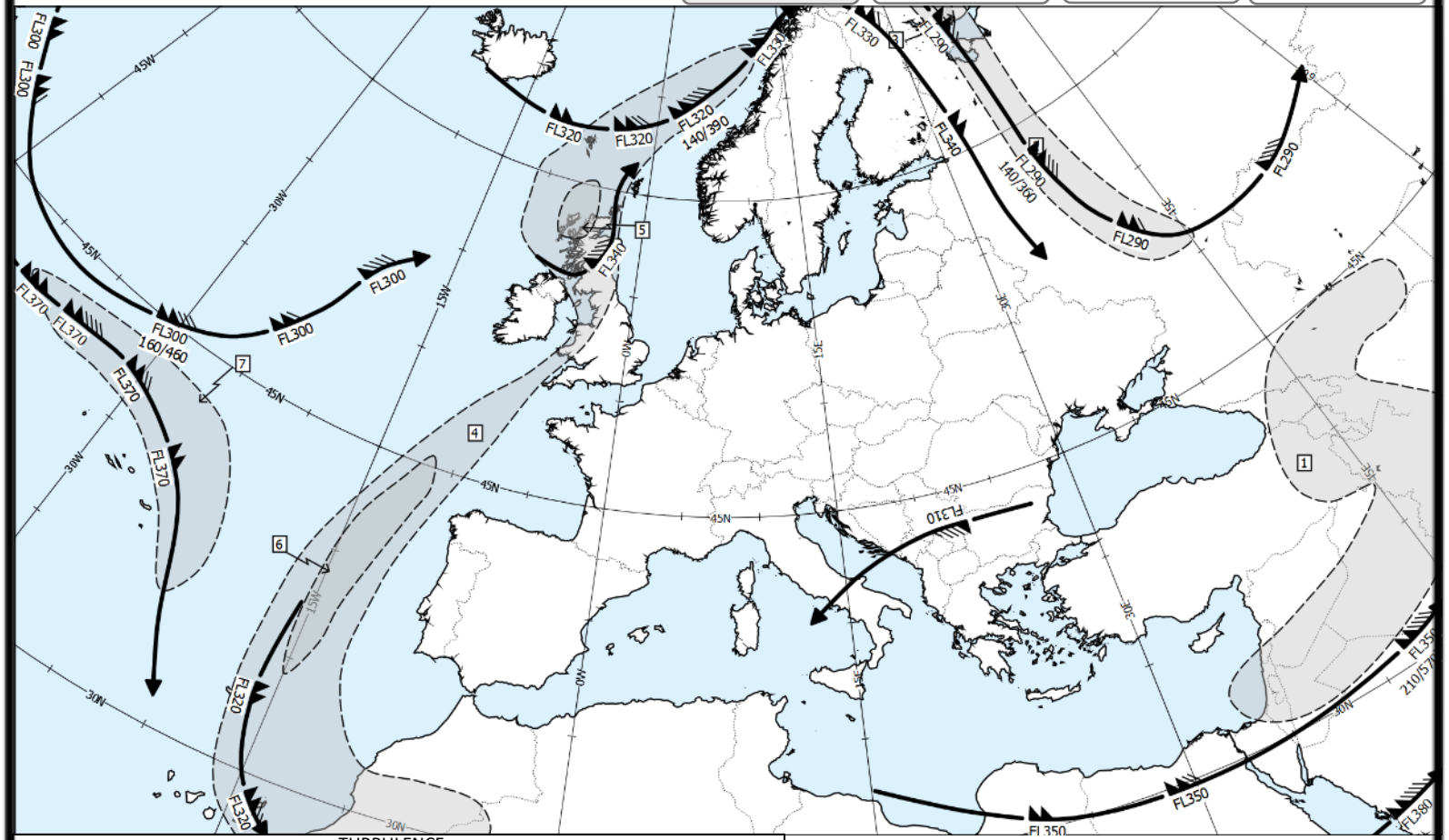
- Benefits of the new SIGWX forecasts
  - Better suited to the needs of the aviation industry particularly for short haul and ultra long haul flights.
  - The gridded and SIGWX data sets will be consistent with each other
  - Designed for digital use, where users will be able to control the content that is shown on the chart (toggling layers on and off, changing time-step, colour schemes)

WAFS SIGWX - FL100-FL600

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

<< **T+12** VT 18 UTC 15/02/2019 >>

Jetstream	Tropopause	Icing	Overlays
Turbulence	CB	VA/TC/N	Flightpath



TURBULENCE

1	2	3	4	5	6	7
400 / 270	350 / XXX	OCNL 300 / XXX	380 / XXX	OCNL 340 / 260	OCNL 340 / 260	450 / 290

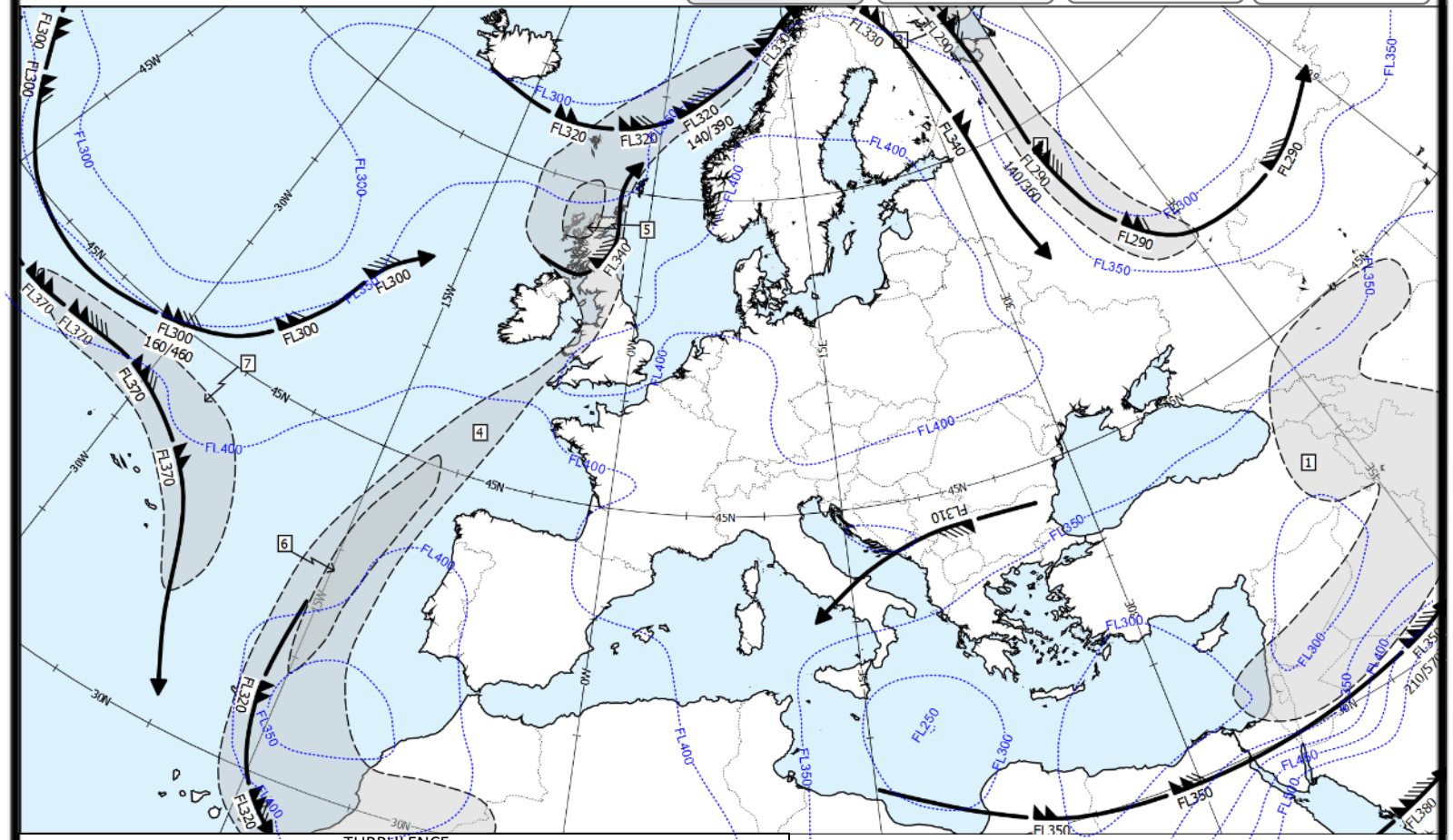
MODEL RUN TIME: 06UTC 15/02/2018
DATA PROVIDED BY WAFC LONDON

WAFS SIGWX - FL100-FL600

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

<< **T+12** VT 18 UTC 15/02/2019 >>

Jetstream | Tropopause | Icing | Overlays
Turbulence | CB | VA/TC/N | Flightpath



TURBULENCE

1 400 270 | 2 350 XXX | 3 OCNL 300 XXX | 4 380 XXX | 5 OCNL 340 260 | 6 OCNL 340 260 | 7 450 290

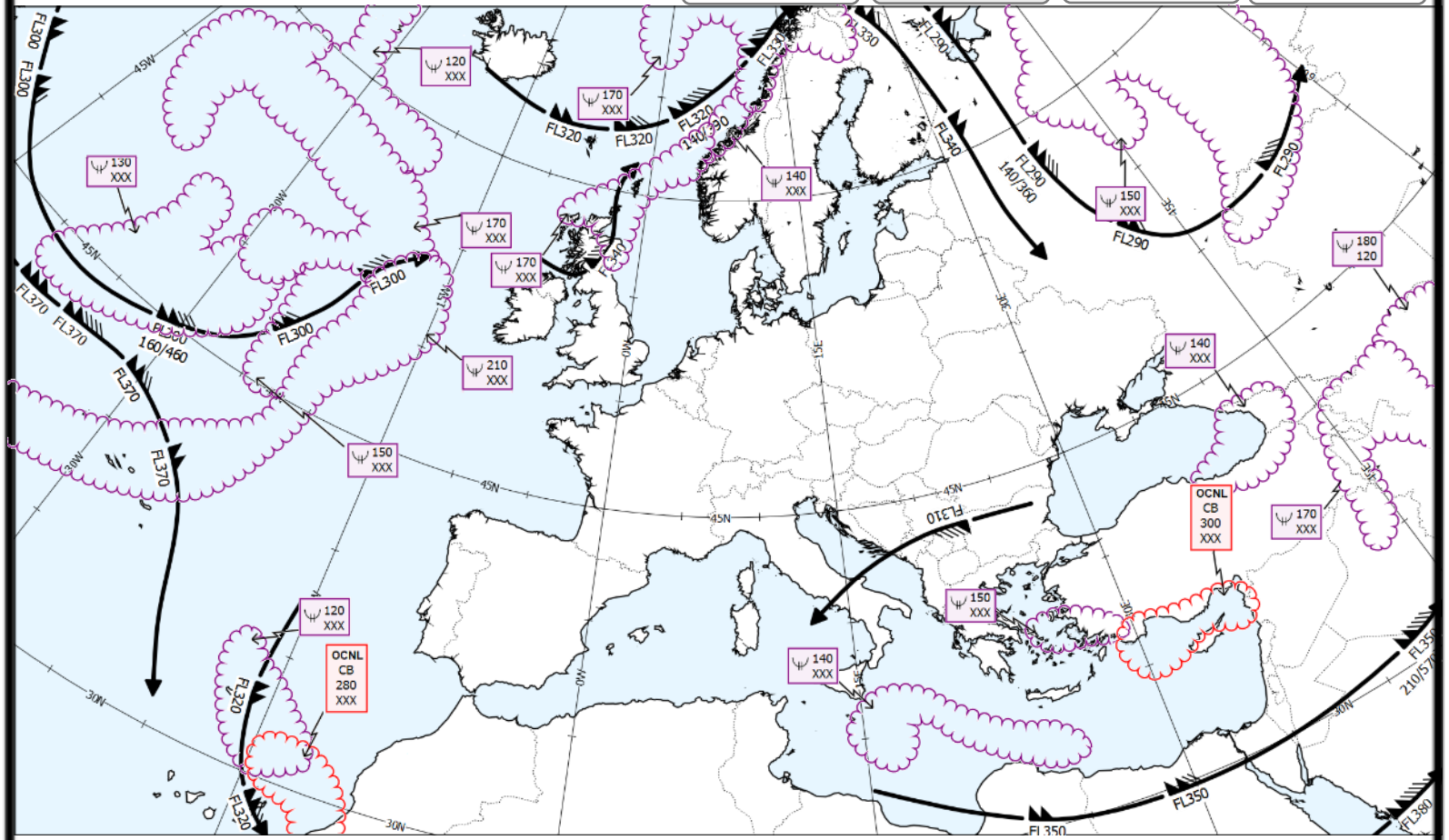
MODEL RUN TIME: 06UTC 15/02/2018
DATA PROVIDED BY WAFC LONDON

WAFS SIGWX - FL100-FL600

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

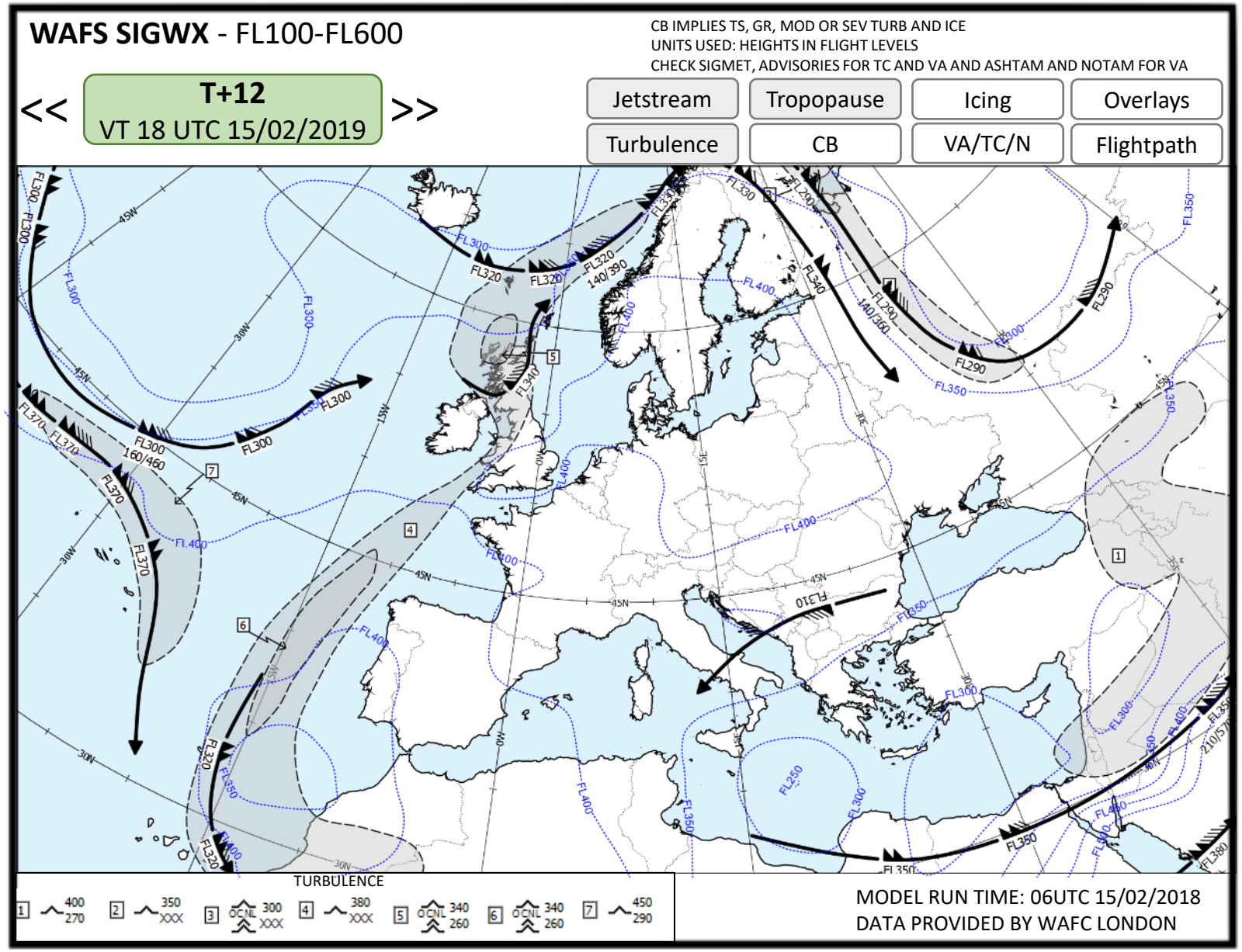
<< **T+12** VT 18 UTC 15/02/2019 >>

Jetstream | Tropopause | Icing | Overlays
Turbulence | CB | VA/TC/N | Flightpath



MODEL RUN TIME: 06UTC 15/02/2018
DATA PROVIDED BY WAFC LONDON

Change Timestep

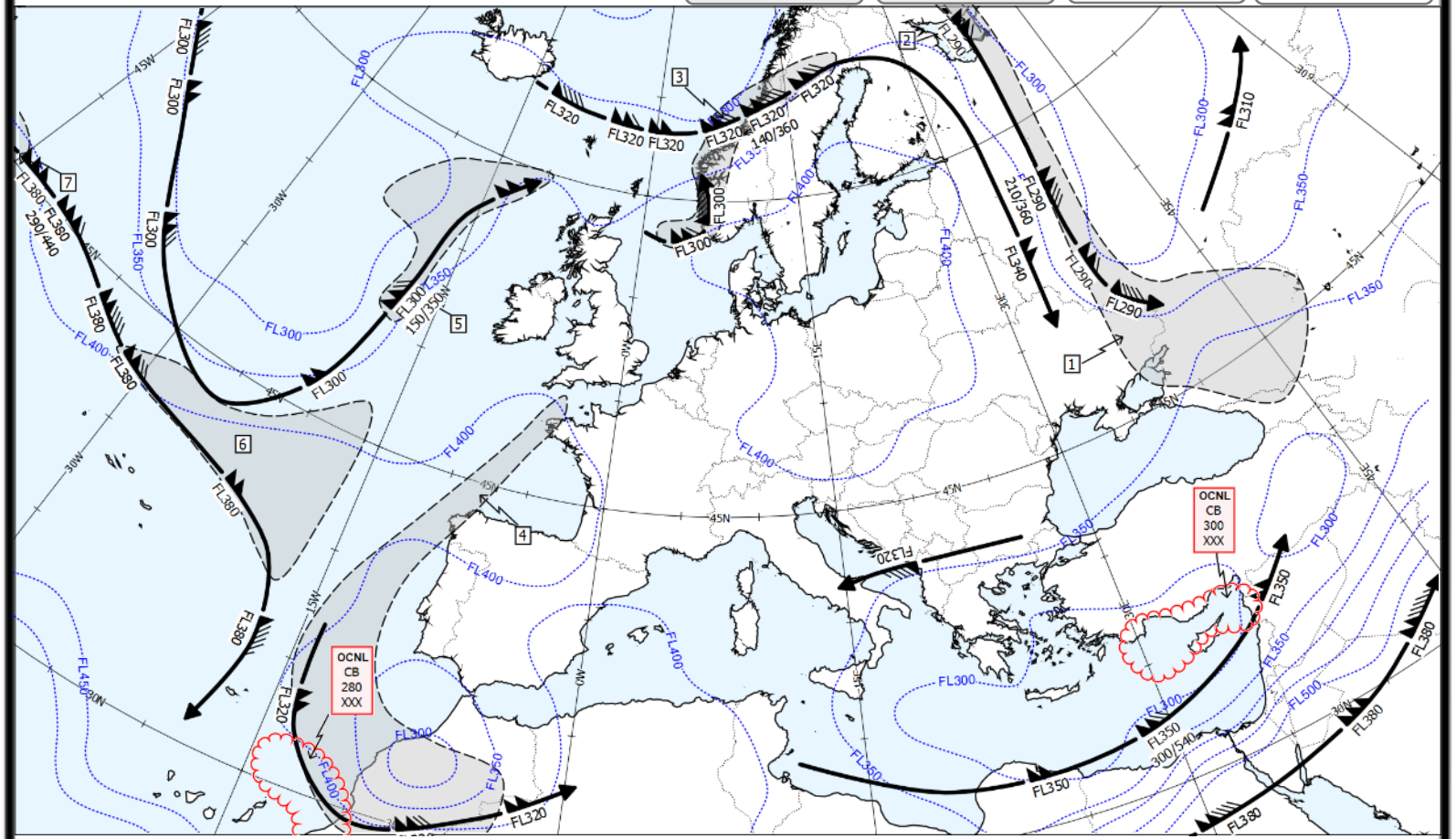


WAFS SIGWX - FL100-FL600

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

<< **T+18** VT 00 UTC 16/02/2019 >>

Jetstream | Tropopause | Icing | Overlays
Turbulence | CB | VA/TC/N | Flightpath



TURBULENCE

1 350 XXX | 2 360 XXX | 3 380 XXX | 4 360 XXX | 5 420 280 | 6 420 280

MODEL RUN TIME: 06UTC 15/02/2018
DATA PROVIDED BY WAFC LONDON

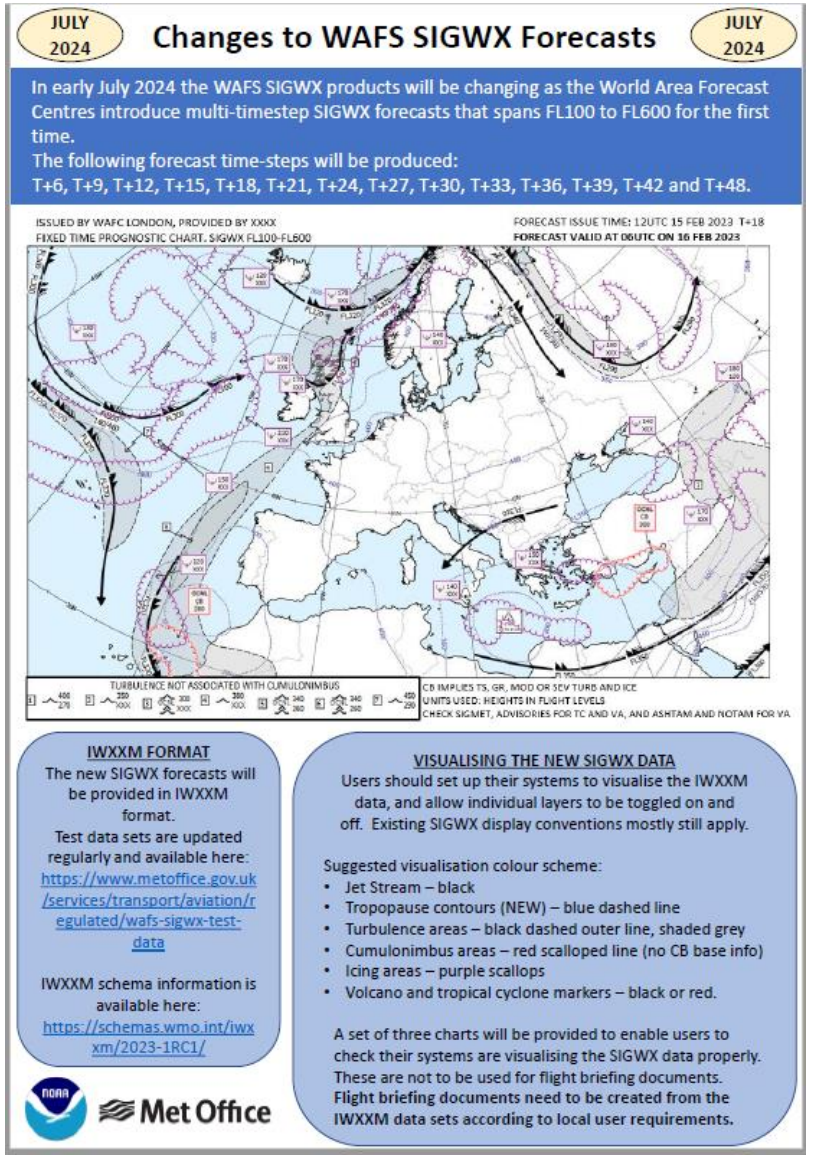
WAFS SIGWX AND OPMET DATA

- The new SIGWX will be provided in IWXXM format using a new IWXXM schema that has been developed and approved by WMO https://schemas.wmo.int/iwxxm/2023-1/WAFSSigWxFC.xsd
- Example/test SIGWX forecasts in IWXXM format are available here: https://www.metoffice.gov.uk/services/transport/aviation/regulated/wafs-sigwx-test-data
- The SWIM compliant SADIS and WIFS APIs for WAFS SIGWX forecasts is expected to become operational in July 2024.

VERY IMPORTANT

- Medium level SIGWX forecasts (BUFR and charts) will be retired in July 2024
- The T+24 BUFR SIGWX will be phased out in July 2026
- All remaining “paper copy” charts will be phased out in Nov 2028 when SADIS FTP and WIFS is retired.

- SIGWX flyer contains all the important information



OPMET DATA ON SADIS

- SADIS and WIFS also provide OPMET products (METAR/TAF/SIGMET etc) and these will also be made available via the new SADIS and WIFS APIs. Data will be available in both TAC and IWXXM formats where available.
- Data is organised into collections:

Id	tac_opmet_reports	iwxxm_opmet_reports	tac_advisory_reports	iwxxm_advisory_reports	graphical_reports	Notices
output format	TAC	IWXXM	TAC	IWXXM	PNG	TAC
parameter names	TAF, METAR, SPECI, SIGMET (all types), AIRMET, GAMET, AIREP	TAF, METAR, SPECI, SIGMET (all types), AIRMET	SWA, VAA, TCA, NEM, NOTAM-ASHTAM	SWA, VAA, TCA	VAG, TCG	Relevant “NO” messages.

OPMET DATA ON SADIS

- The “tac_opmet_reports” and “iwxxm_opmet_reports” will be available globally and for six pre-set geographical regions: EUR-NAT, NAM-CAR, SAM, AFI, MID and ASI-PAC
- Data will be published at 5 minute intervals, and 36 hours worth of data will be held on the system in case users need to recover lost data:

Users will make a request like this:

https://gateway.api.management.metoffice.cloud/ads-sadis-opmet/1/collections/iwxxm_advisory_reports/locations/GLOBAL?interval=PT5M--2007-12-14T15:30

Collection name

5 minute period data is required for

TIMELINES

November 2023

- WAFS gridded data upgrade
- SADIS and WIFS API's for OPMET and gridded data

July 2024

- Introduction of multi timestep WAFS SIGWX forecasts in IWXXM format.
- SADIS and WIFS API's for SIGWX data

July 2026

- Retirement of BUFR format SIGWX

November 2027

- Introduction of probabilistic WAFS forecasts (hazards), made available through the SADIS and WIFS API's

November 2028

- Retirement of SADIS FTP including the T+24 "paper copy" charts

Additional information on the upcoming WAFS changes is available here:
https://www.metoffice.gov.uk/services/transport/aviation/regulated/wafs-2023

Thank you for listening.