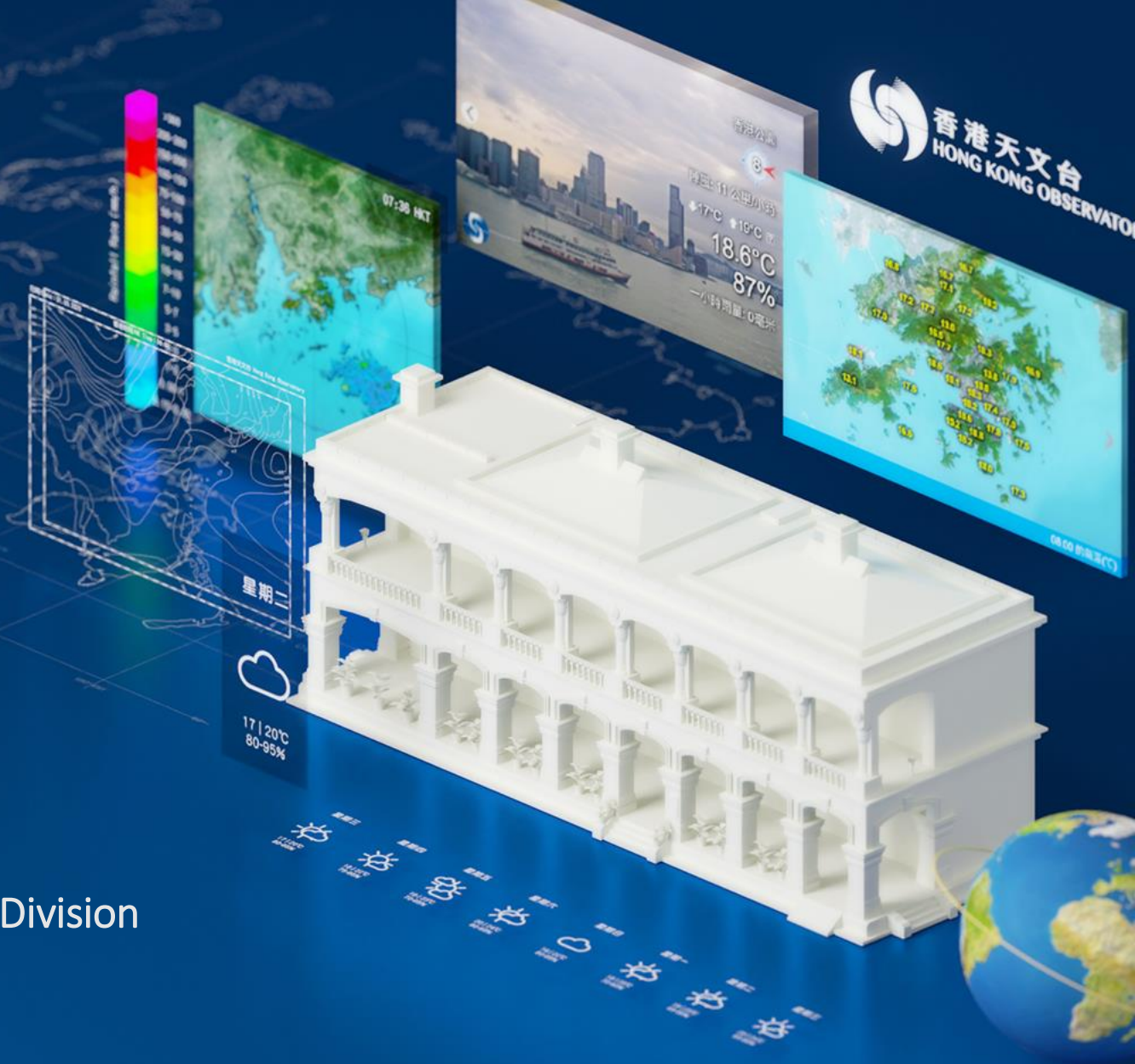
香港天文台
HONG KONG OBSERVATORY

Hong Kong Observatory (HKO) SWIM Journey

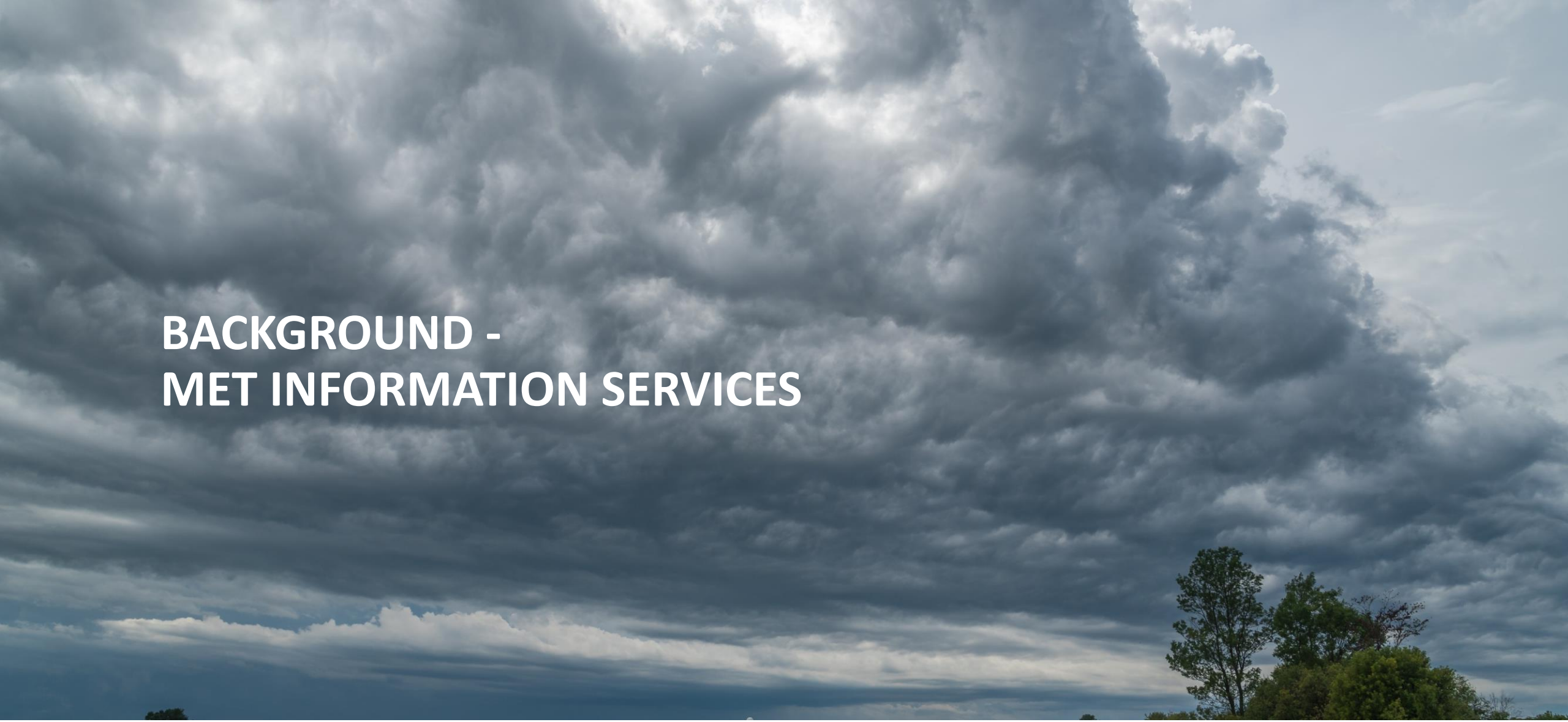


Marco Kok

International Aviation Meteorological Collaboration Division

Hong Kong Observatory

ICAO APAC System-Wide Information Management (SWIM) Seminar, 8 May 2023



BACKGROUND - MET INFORMATION SERVICES

PROVISION OF MET INFORMATION AND SERVICES

- Basically two tiers according to ICAO Annex 3:
  - B2B – Global exchange of Operation MET (OPMET) data (e.g. METAR, TAF, SIGMET) among MET services well as ANSPs
  - B2C – Provision of information and services to end users (airlines, pilots, etc.)
- B2B via AFS (AFTN and AMHS) and B2C via locally agreed methods like Internet
- MET services have been using technologies identified to be used in SWIM for B2C services for a long time
  - e.g. Request/Reply: W3C Web Services, RESTful, etc.
  - as well as Publish/Subscribe: Message queue (e.g. AMQP)
- However, the MET community has yet to reach a consensus on how to deliver B2B and B2C services over SWIM. A hot discussion topic in ICAO METP WG-MIE.

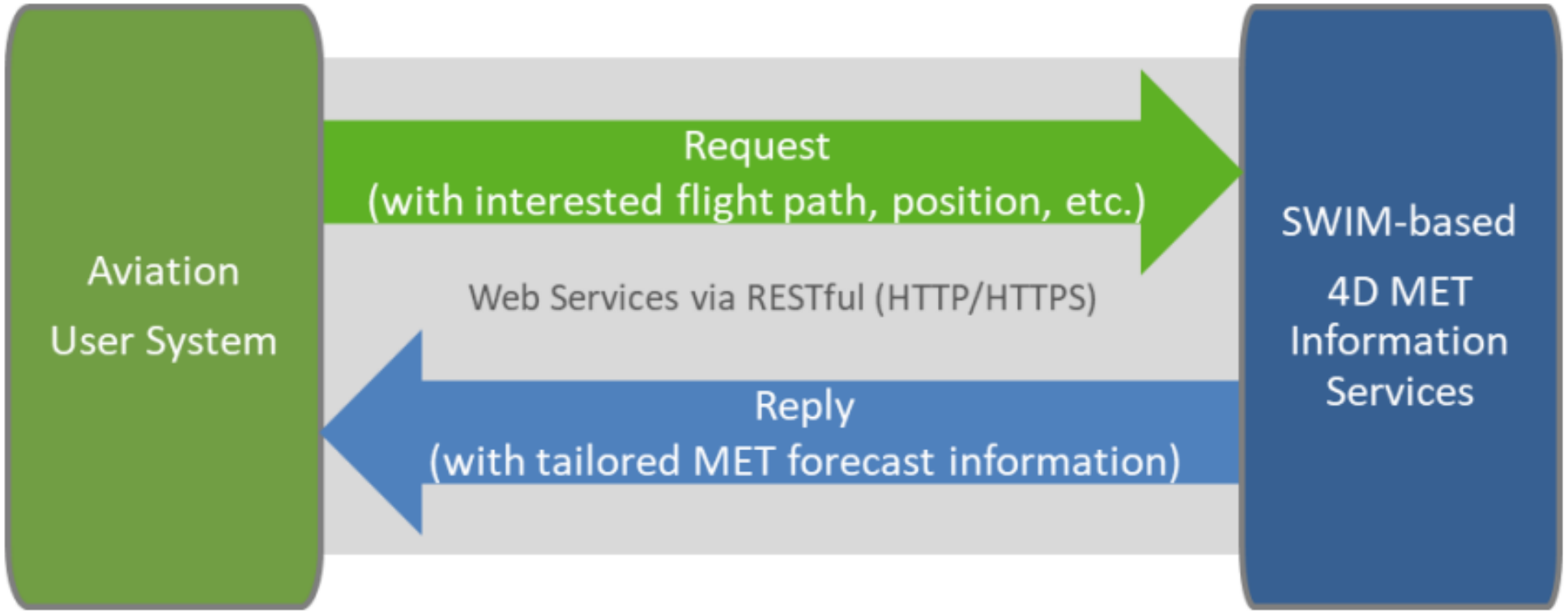
* B2B: Business to Business
B2C: Business to Customer

PROVISION OF MET INFORMATION AND SERVICES

- To decide on the best methodologies to provide B2C services with a view to be applied in the future SWIM environment, HKO is working closely with local airlines to work backwards by establishing use cases and developing solutions to support their operation.
- Initiatives involving SWIM information message exchange mechanism:
  - An iPad EFB MET application, MyFlightWx, for the pilots which was adopted for operational use by a major airline in Hong Kong in late 2019.
  - A web application to demonstrate consolidation of cross-domain (MET and aeronautical) information to assist decision making and a soft-launch was made in late Apr 2023.

HIGHLIGHTS OF DEVELOPMENTS SO FAR

MET INFORMATION EXCHANGE MECHANISM IN SWIM – REQUEST/REPLY



DATA SLICING SERVER

CONCEPT

4D MET information

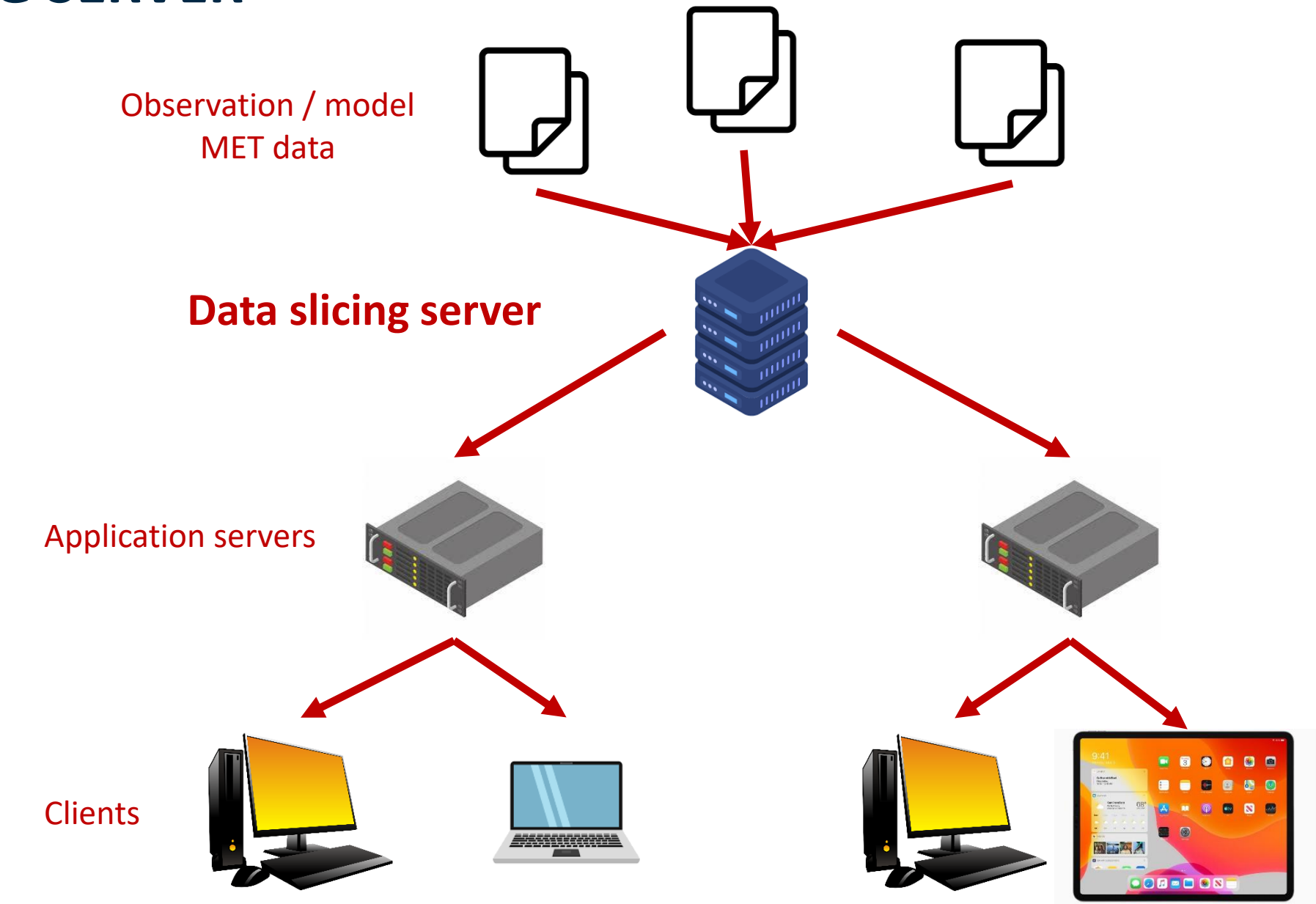
HTTP POST request

Web Service

(by Data Slicing Server)

Reply the request

[Customised data for user systems]
time series, cross section, MET observation, model data, etc.



DATA SLICING SERVER

FEATURES

- Configuration via JSON config file
- Web interface for request and reply
- Support both GRIB and NetCDF input data
- Automatic conversion between meteorological variables
  - e.g. supporting calculate RH, dew point or equivalent potential temperature from pressure, temperature and mixing ratio, or conversion between u/v and speed/direction

DATA SLICING SERVER

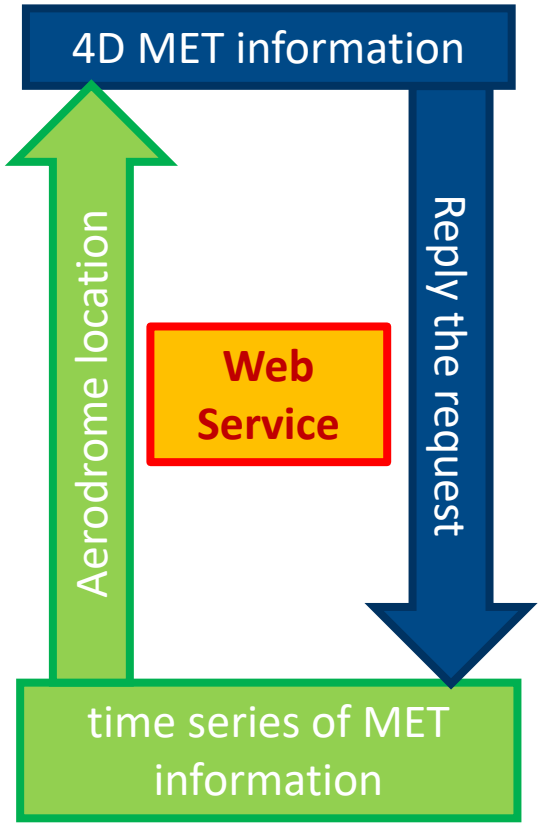
WEB INTERFACES

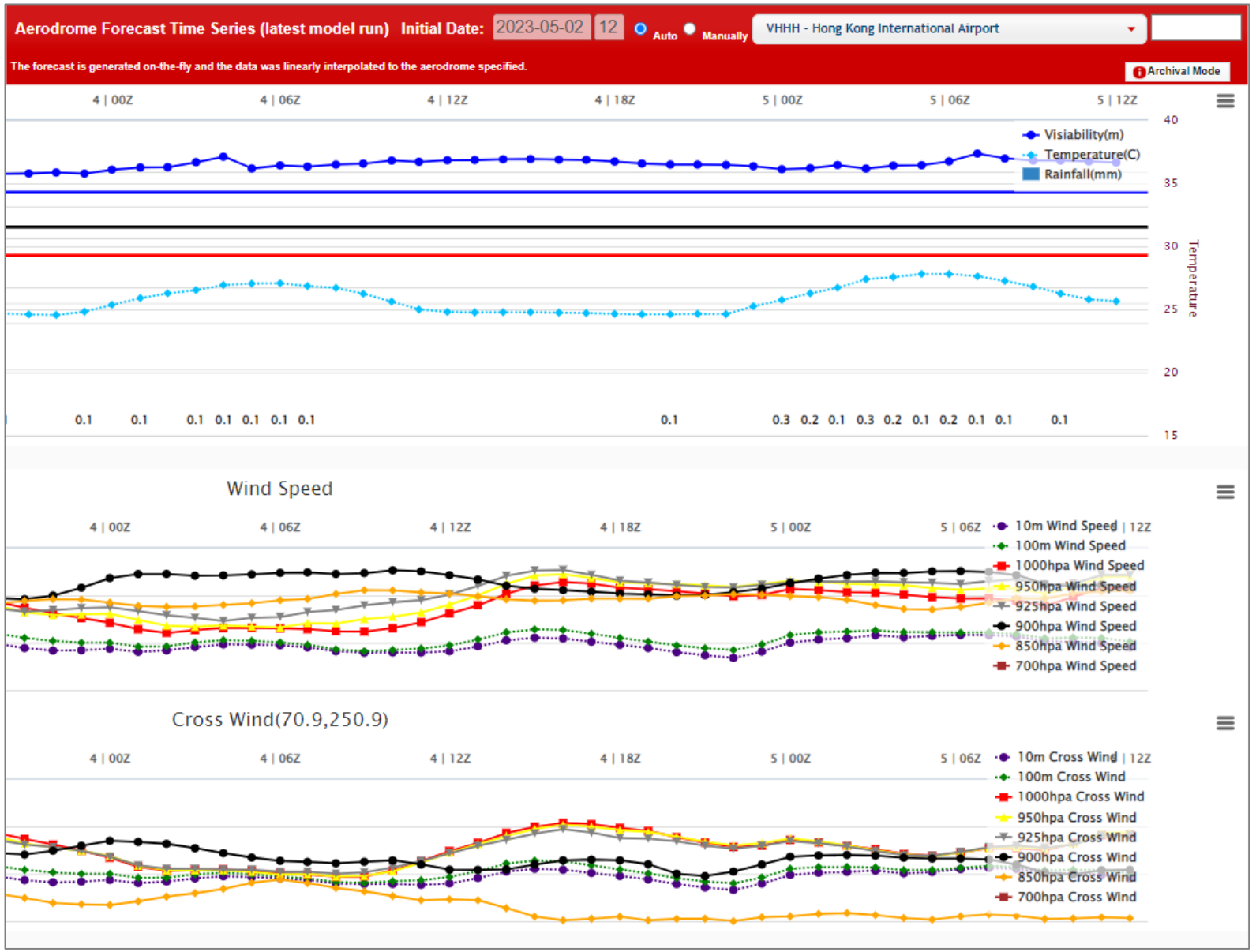
- HTTP POST request based
- Can be executed by HTML, JAVASCRIPT, PYTHON, curl, etc.
- The data slicing server reply the request with the data
- Output data format customisable

TIME SERIES

AT ONE LOCATION

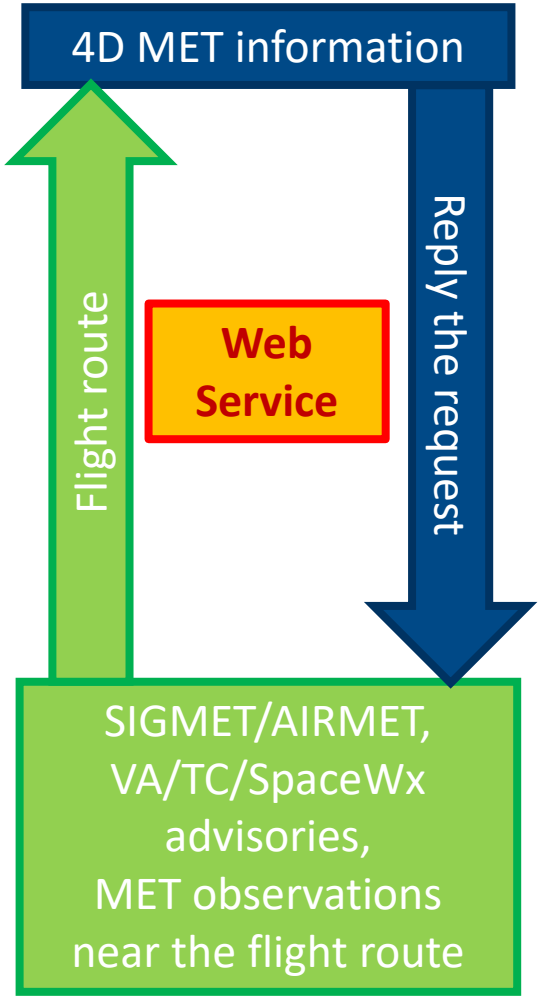
The forecast is generated on-the-fly and the data was linearly interpolated to the aerodrome specified

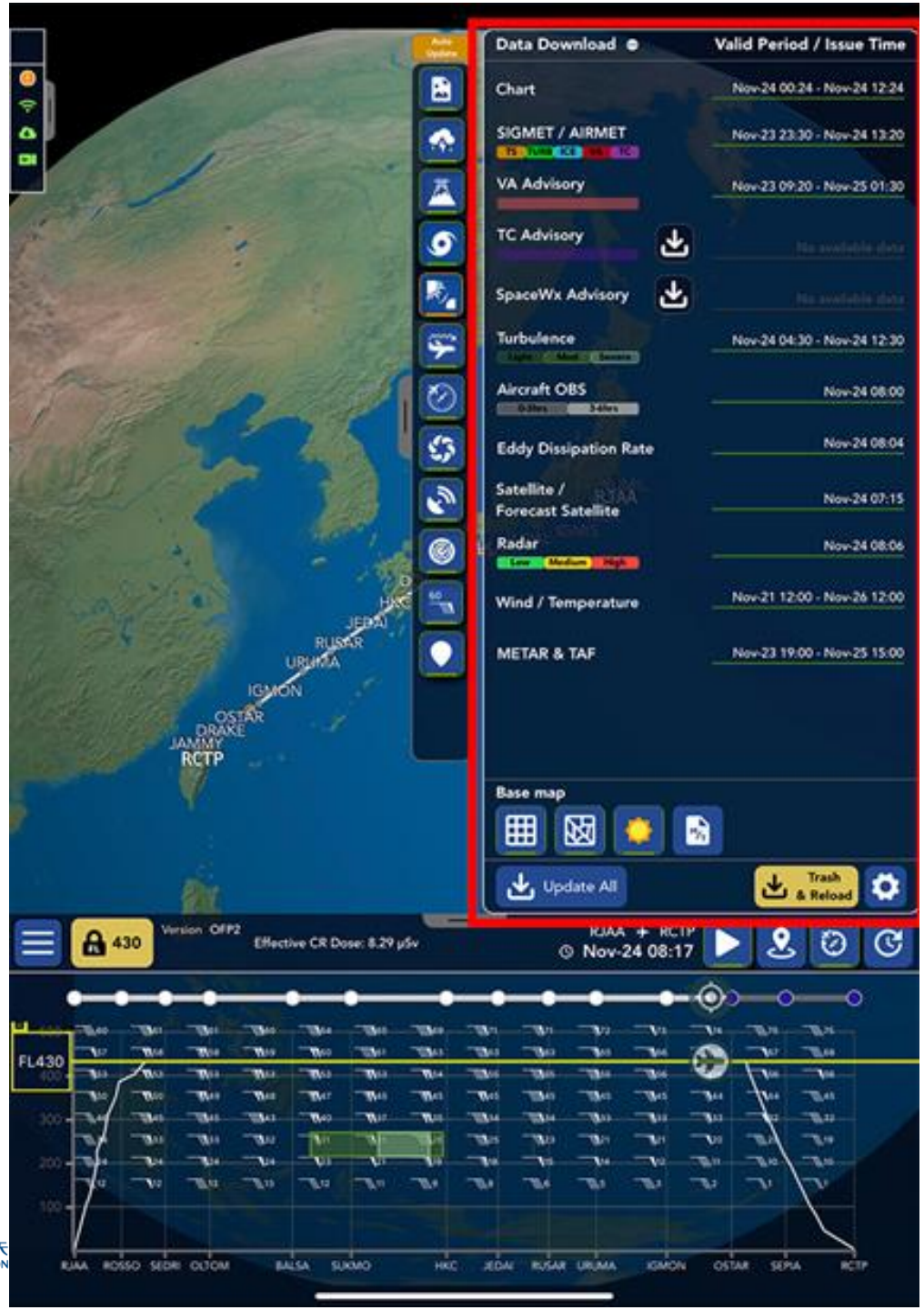




FLIGHT ROUTE

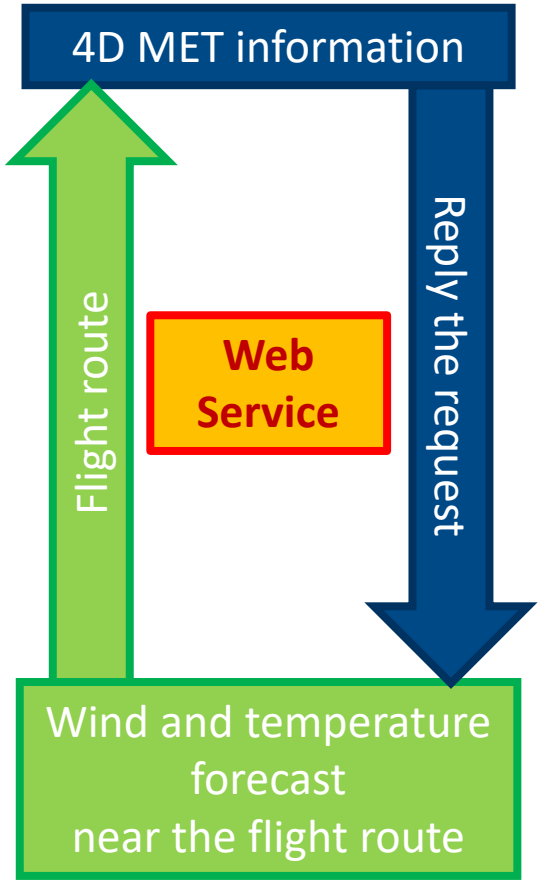
FLIGHT SPECIFIC MET INFORMATION - WARNINGS AND ADVISORIES

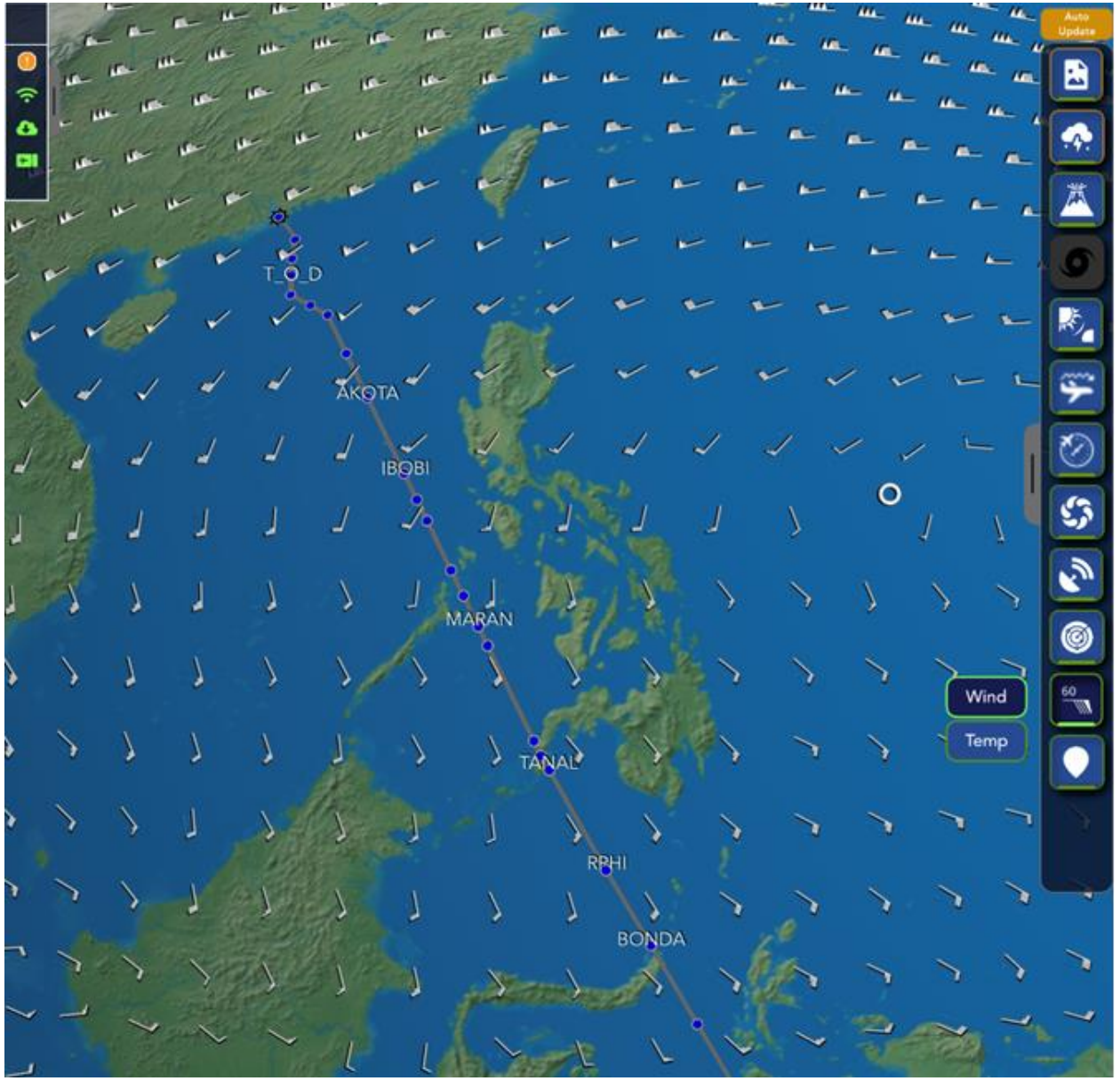




FLIGHT ROUTE

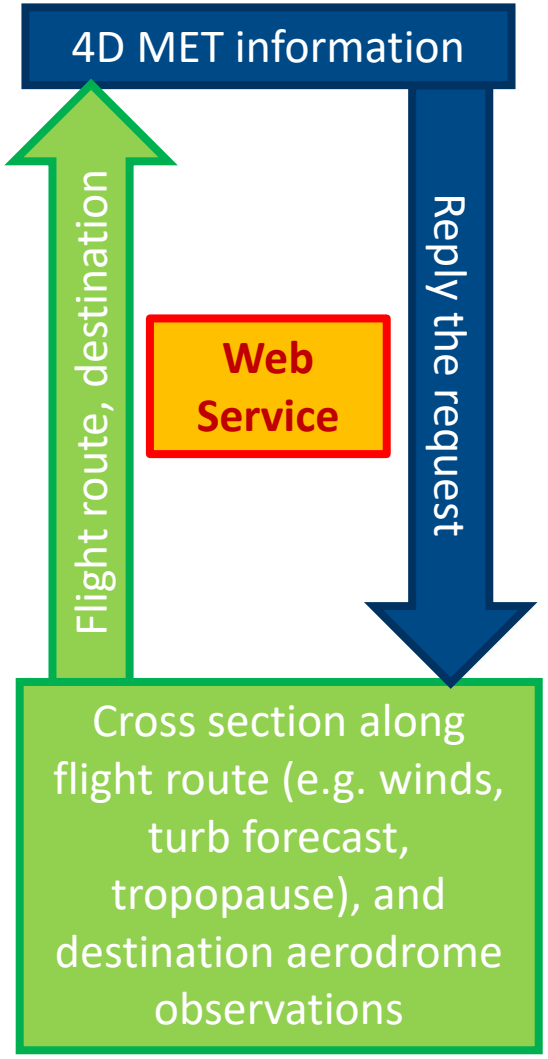
FLIGHT SPECIFIC MET INFORMATION - FORECAST

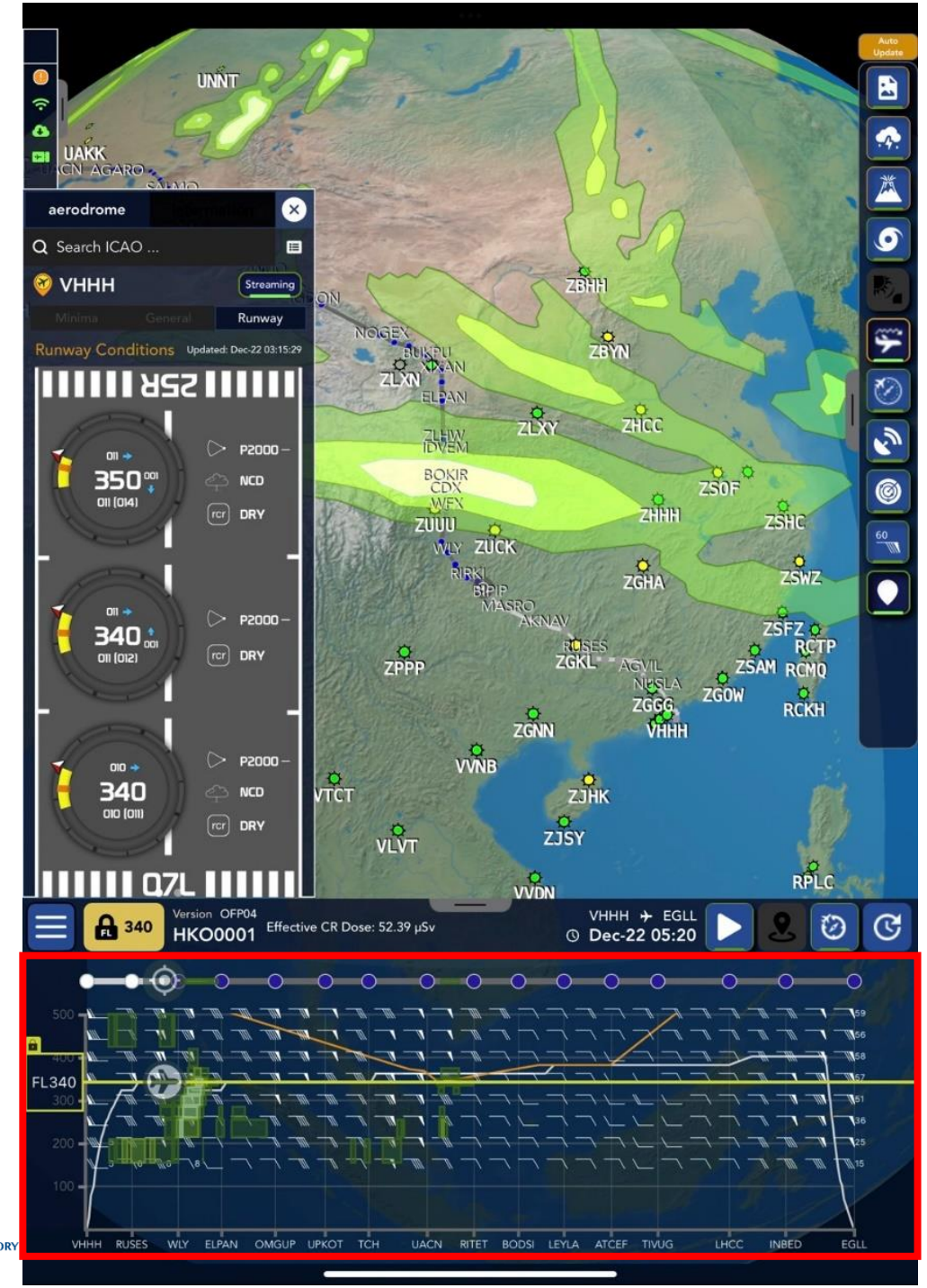




FLIGHT ROUTE

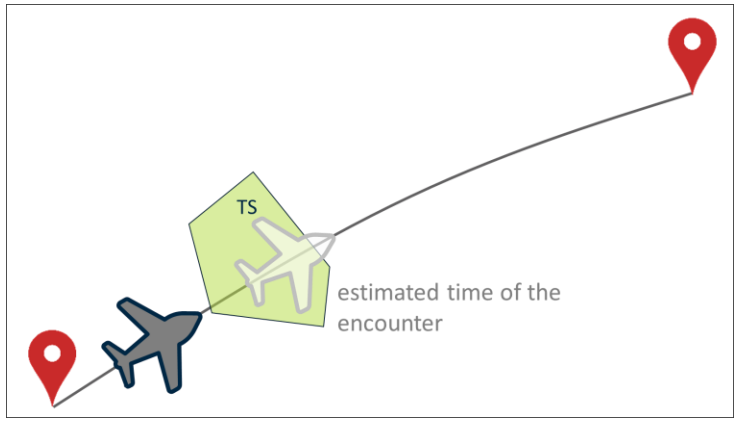
VERTICAL CROSS SECTION

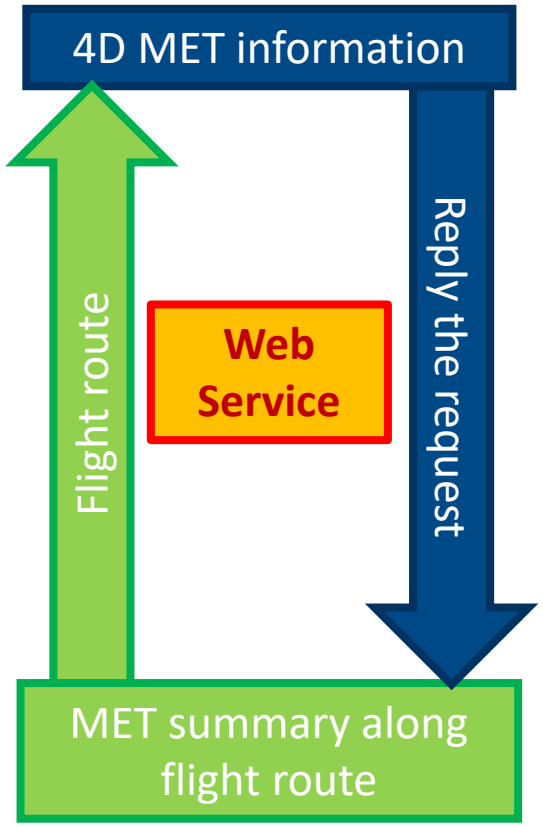


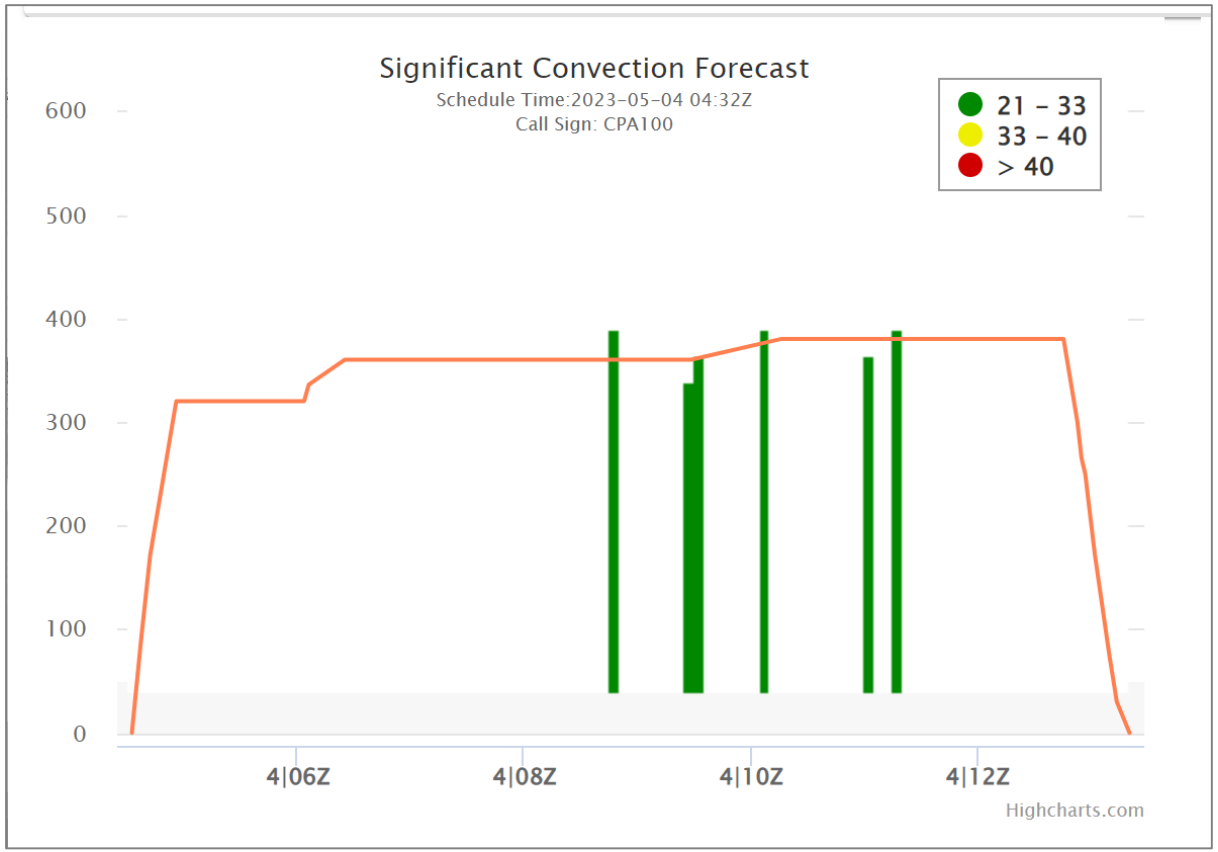


FLIGHT ROUTE

SIGNIFICANT CONVECTION ENCOUNTER STATISTICS







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MODE-S DAP DATA

Display of mode S data

Please choose date and time (UTC) to show the mode S data:

Date (YYYY-MM-DD) 2023-04-04

Time (HH:MM) 21 : 00

Plot

ICAO Address	Height (ft)	Temperature (°C)	Wind Speed (m/s)	Wind Direction (°)
filter data.				
780A5D	37225	-47.7	22.5	93.2
780AA7	33100	-38.2	26.8	81.9
06A0DF	41100	-57.3	25.6	88
710102	34100	-40.9	27.7	74.9
71BF33	37000	-50.3	21.2	96.2
71C063	33000	-38.1	17.8	107.4
4BB474	35700	-42.7	26.8	100.7
89907E	39000	-52.7	25.1	93.8
88818F	33100	-39.3	27.8	85.4
750263	12125	5.4	15.7	74.4

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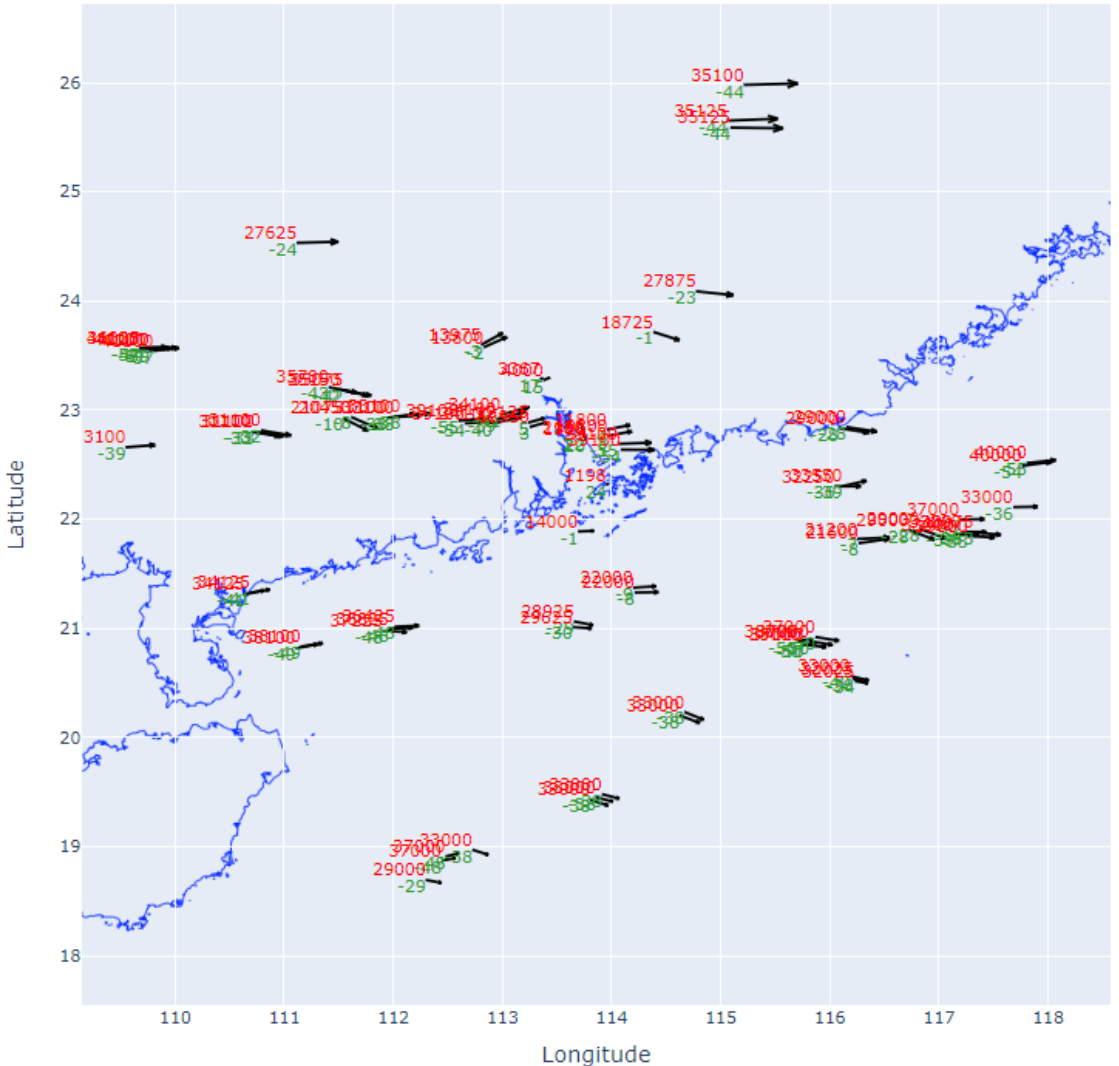
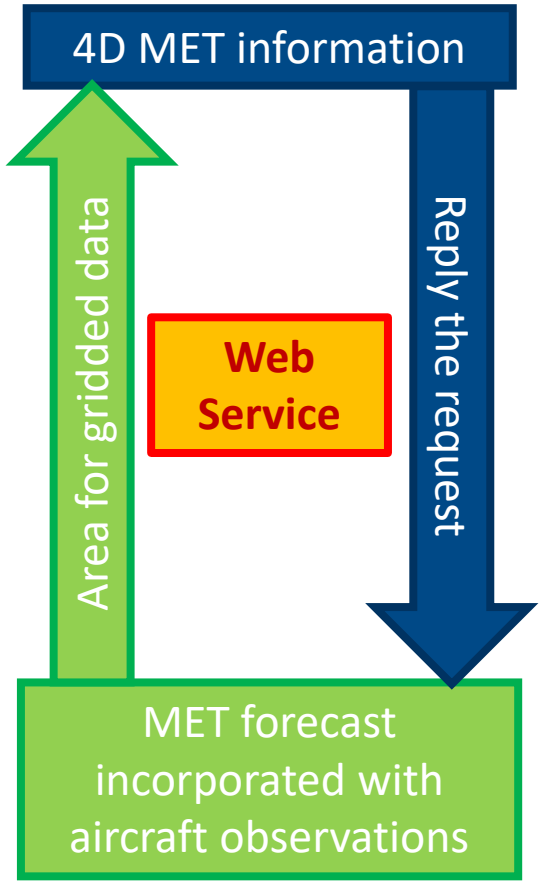
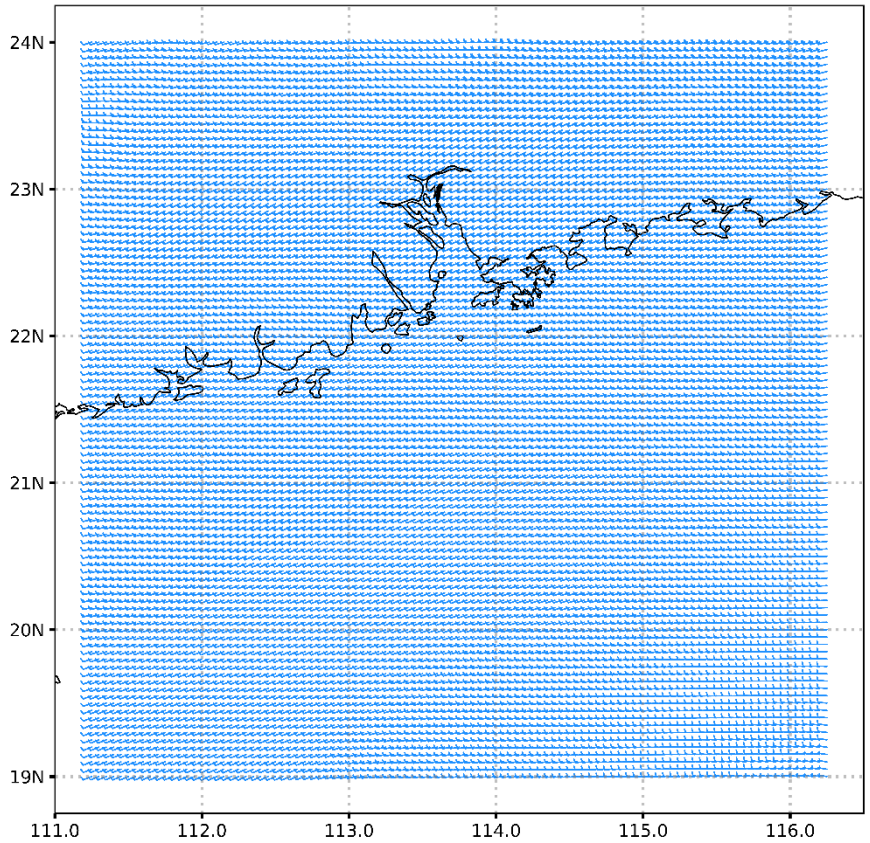


MODE-S DAP DATA

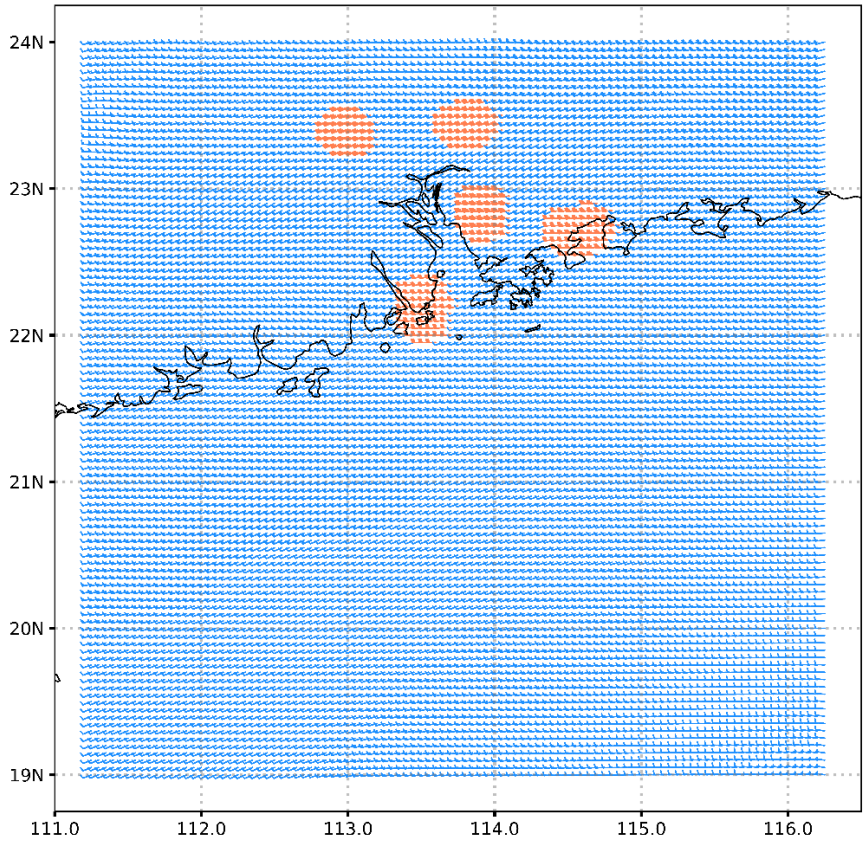
NEAR REAL TIME DATA ASSIMILATION



Wind information at different levels



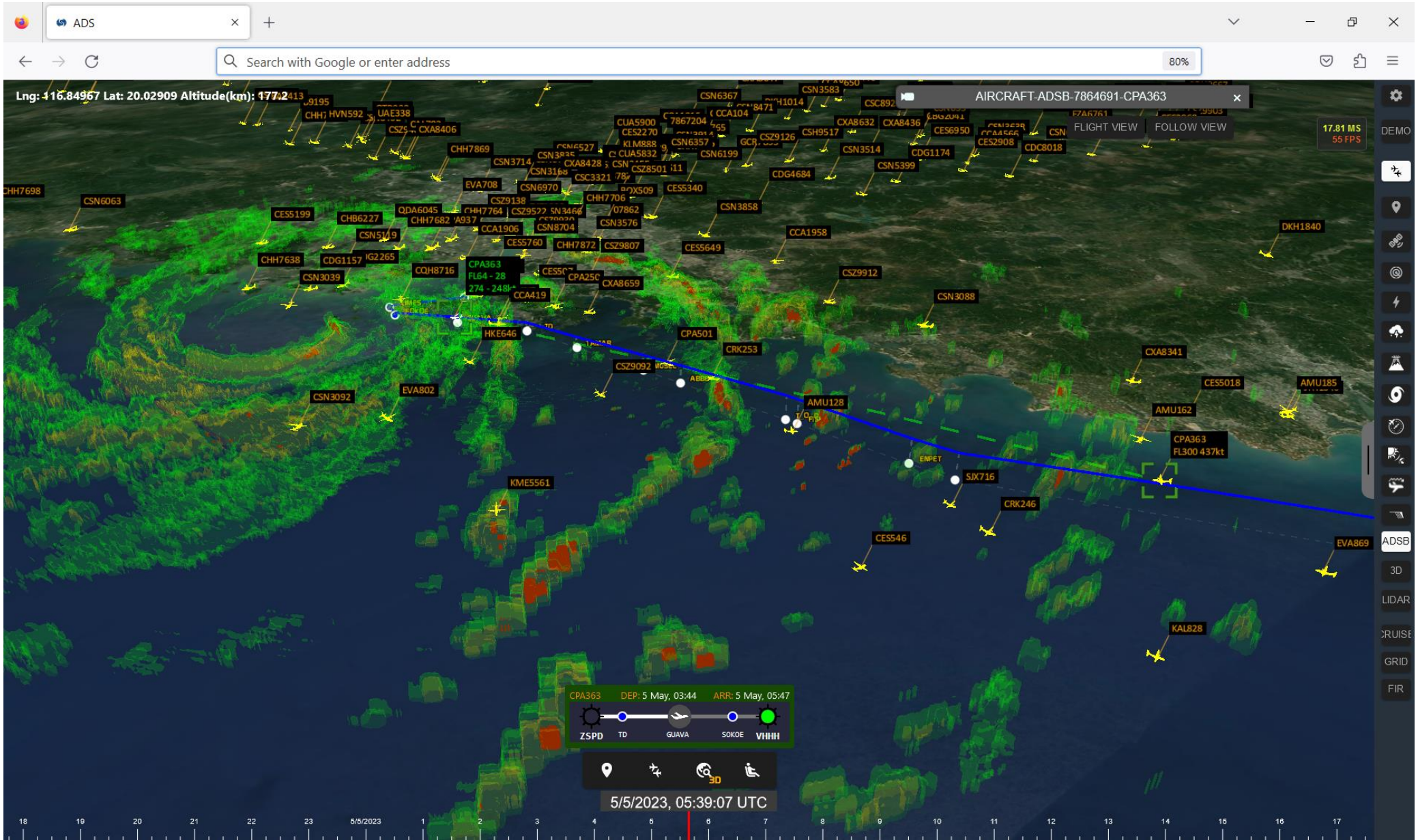
Without Mode S data assimilation



With Mode S data assimilation (rapid update)

INFORMATION CONSOLIDATION

* For illustration purpose, not reflecting real weather situation.



LESSON LEARNED SO FAR

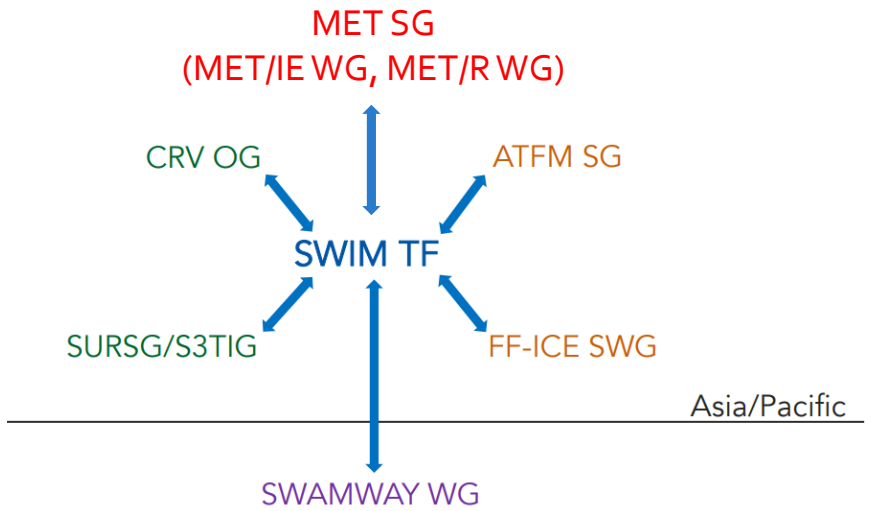
- MET information is normally being used together with information in other aviation domains to support decision making. Its specifications, which in turn depends on the environment it is served (e.g. AFS vs SWIM), affects how it can be consumed.
- Integration of various aviation information shared via SWIM would facilitate the development of new SWIM-enabled MET application tailored for users' operations.
- Need operational use cases to drive the SWIM implementation
- Need throughout consultation with users on their operational needs
- Need to highlight the operational benefits to be brought by SWIM so that different aviation stakeholders and users have the incentive to change and develop SWIM

EXPECTATION FROM SWIM TF

WHAT WOULD BE REQUIRED FROM SWIM TF?

- Promulgate the ongoing SWIM-related development and discussions at IMP or other global groups in APAC meetings
  - To increase awareness of aviation stakeholders in APAC on SWIM implementation as early as possible
- Promulgate the on-going work of SWIM TF to the MET community via MET SG and its contributories bodies (e.g. MET/IE WG, MET/R WG), to collect requirements from the MET community regarding the SWIM implementation
  - Recall: Decision APANPIRG/32/12: Meteorological expert contribution to SWIM/TF

Decision APANPIRG/32/12: Meteorological expert contribution to SWIM/TF		
That, States consider identifying meteorological experts to contribute to the APAC SWIM/TF to ensure meteorological aspects are fully considered.	Expected impact: ☐ Political / Global ☐ Inter-regional ☐ Economic ☐ Environmental ☒ Ops/Technical	
Why: Currently, few members of the SWIM/TF come from a meteorological background. The SWIM/TF would benefit from a greater understanding of the requirements and plans for meteorological information services.		
When: Now	Status: Adopted by PIRG	
Who: ☒Sub groups ☒APAC States ☐ICAO APAC RO ☐ICAO HQ ☐Other: ROs		



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Thank you!