International Civil Aviation Organization

WORKING PAPER (WP/18)

ICAO Asia and Pacific (APAC)
Twenty-third Meeting of the Meteorological Information Exchange Working Group (MET/IE WG/23)

Bangkok, Thailand, 25 to 28 March 2025

Agenda Item 6: Meteorological information exchange in IWXXM form

IWXXM: LATEST DEVELOPMENTS AND FUTURE PLANS

(Presented by Hong Kong, China)

SUMMARY

This paper highlights the latest status on the updating of the ICAO Meteorological Information Exchange Model (IWXXM) and the publication plan in connection with the proposed changes to ICAO Annex 3 from the 5th meeting of the ICAO Meteorological Panel (METP/5). It also briefly mentions the development direction regarding new Annex 3/PANS-MET requirements brought up for discussion at METP/6.

1. INTRODUCTION

1.1 WMO TT-AvData has been developing a new version of IWXXM, based on METP/5's proposed changes (which have been incorporated into Amendment 82) to Annex 3, in accordance with a previously agreed arrangement[1] to reduce the time lag between the publication date of the IWXXM schemas and the applicable date of the respective Annex 3 requirements. In April 2024, a release candidate of IWXXM (IWXXM 2025-2RC1) was made publicly available for consultation until 14 October 2024 to collect comments and feedback to fine-tune the draft IWXXM schemas, before submitting through the second 2025 WMO Fast Track approval process by mid-2025. The targeted publication date of the approved new IWXXM schemas is November 2025 which is in line with the applicable date of Amendment 82 to ICAO Annex 3.

1.2 On the other hand, discussions were made at METP/6 in early March 2025 on the development of new information services, viz the Aerodrome Meteorological Observation, Aerodrome Meteorological Forecast and Hazardous Weather Information Services, for provision of such information on the System Wide Information Management (SWIM) environment. These new requirements should allow most ICAO Member States to continue complying with existing SARPs for the provision of information whilst creating flexibility for States with enhanced capabilities to provide aviation decision-makers with additional or improved information. To achieve this, a new IWXXM design is required to establish an overarching framework that will ensure global consistency of information provision.

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[1] See the IWXXM release communication plan at https://community.wmo.int/en/activity-areas/wis/iwxxm/communication-plan

2. DISCUSSION

IWXXM Version 2025-2RC1

2.1 Highlights of changes involved in IWXXM 2025-2RC1 include:

- First introduction of the Quantitative Volcanic Ash Concentration Information (QVACI) package.
- First introduction of the Volcano Observatory Notice for Aviation (VONA) package.
- Changes to the METAR/SPECI, Volcanic Ash Advisory, and Space Weather Advisory packages in accordance with the changes of their respective TAC templates.
- Changes to the METAR/SPECI package to allow the provision of unlimited RVR and temperature reports in tenths of a degree, in contrast to TAC.
- Changes to the WAFS Significant Weather Forecast package with improvements in the modularity of the representation of certain phenomena

2.2 Details regarding IWXXM 2025-2RC1, including the draft schemas, examples, UML model, and release notes, are available at https://schemas.wmo.int/iwxxm/2025-2RC1/. Another release candidate (IWXXM 2025-2RC2) is being prepared by TT-AvData, taking into consideration of the feedbacks received during the public consultation period, for approval by WMO. Table 1 shows the compatibility table of packages across different versions of IWXXM:

Table 1: Compatibility table showing IWXXM versions, associated report packages, and relevant ICAO Annex 3 requirements

IWXXM Version	METAR/ SPECI	TAF	SIGMET	AIRMET	TCA	VAA	SWA	WAFS SIGWX F/C	VONA	QVACI	Requirements
1.1	1.1.0	1.1.0	1.1.0	N/A	N/A	N/A	N/A	N/A	N/A	N/A	Am76
2.1	2.1.1	2.1.1	2.1.1	2.1.1	2.1.1	2.1.1	N/A	N/A	N/A	N/A	Am77
3.0	3.0.0	3.0.0	3.0.0	3.0.0	3.0.0	3.0.0	3.0.0	N/A	N/A	N/A	Am78
2021-2	3.1.0	3.0.1	4.0.0	3.1.0	3.1.0	3.1.0	3.0.1	1.0.0	N/A	N/A	Am79 + Am80
2023-1	3.1.0	3.0.1	4.0.1	3.1.1	3.1.0	3.1.0	3.0.1	1.1.0	N/A	N/A	Am79 + Am80
2025-2	3.2.0	3.0.1	4.0.1	3.1.1	3.1.0	3.2.0	3.1.0	1.1.1	1.0.0	1.0.0	Am82

New IWXXM Design

2.3 An object-based approach is taken in the design of IWXXM WAFS Significant Weather Forecast back in IWXXM Version 2021-2 and the concept has been taken forward in the design of VONA and QVACI in IWXXM Version 2025-2. The idea is to use a WxObject (iwxxm:MeteorologicalFeature) – a self-contained representation of any (meteorological) phenomenon or a WxObject collection (iwxxm:MeteorologicalFeatureCollection) – a collection of those WxObjects, to convey a message. Appendix I shows the basic structure of a WxObject and a WxObject collection.

2.4 Reusable elements (e.g. geometries and properties describing certain phenomena. See Appendix II) have been defined and reusable WxObjects have been identified (e.g. tropical cyclone and volcano. See Appendix III). Future development will focus on enriching the list of reusable elements as well as WxObjects describing specific phenomenon to allow a flexible yet formal way to present "a story" through a WxObject collection.

2.5 While from phenomena description perspective defining reusable WxObjects and their associated properties is trivial, the actual representation (e.g. a time series of WxObjects or a WxObject with time series) will depend on use cases as the cost for consumers to utilise the data will be different. IWXXM designers at this point can only note the existence of possible alternative representations, identify similarities and differences of these representations and determine whether these representations can be used interchangeably under specific situations. Further discussions will have to be made by ICAO METP WG-MRAD and WG-MIE on the "reporting practices" to be adopted, bearing in mind that if the practices are too restrictive (i.e. only a single representation can be used), it may be limit flexibility and hinder Application Program Interface (API) development. Conversely, if the practices are too permissive (i.e. allowing the use of all equivalent representations), ensuring interoperability will be challenging.

3. ACTION BY THE MEETING

3.1 The meeting is invited to

a) note the information in this paper;

b) consider reminding States to ensure systems developed or procured will work with current and upcoming versions of IWXXM; and

c) discuss necessary follow-up actions arising from the activities mentioned in the paper.

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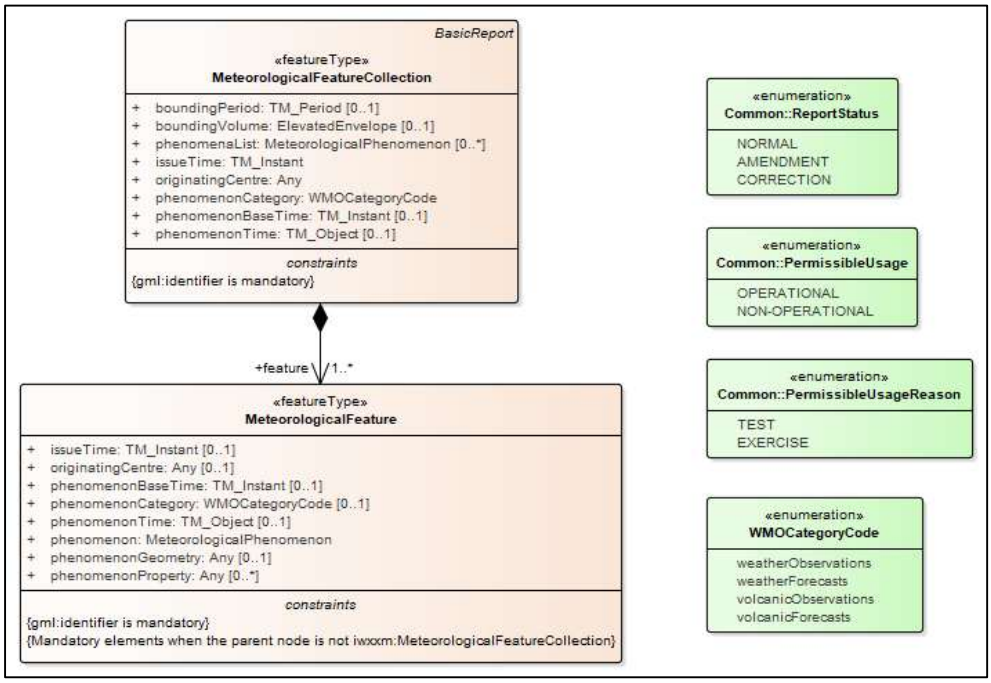
Appendix I

A WxObject:

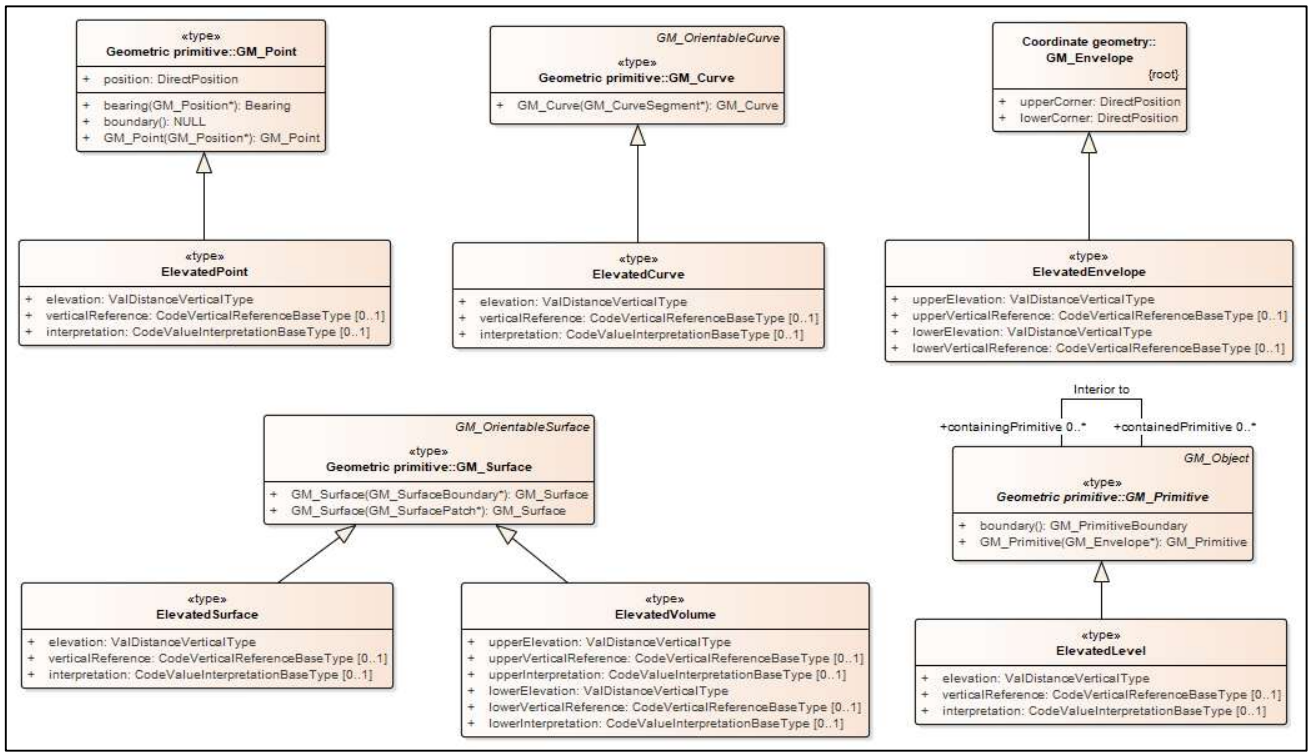
```
<iwxxm:MeteorologicalFeature .../>
   <gml:identifier .../>
   <iwxxm:issueTime .../>
   <iwxxm:originatingCentre .../>
   </iwxxm:originatingCentre>
   <iwxxm:phenomenonCategory .../>
   <iwxxm:phenomenonTime .../>
   <iwxxm:phenomenon .../>
   <iwxxm:phenomenonGeometry .../>
   <iwxxm:phenomenonProperty .../>
</iwxxm:MeteorologicalFeature>
```

A WxObject collection:

```
<iwxxm:ElementExtendingMeteorologicalFeatureCollection ...>
   <gml:identifier .../>
   <iwxxm:boundingPeriod .../>
   <iwxxm:boundingVolume .../>
   <iwxxm:phenomenaList .../>
   <iwxxm:issueTime .../>
   <iwxxm:originatingCentre .../>
   <iwxxm:phenomenonCategory .../>
   <iwxxm:phenomenonTime .../>
   <iwxxm:feature>
      <iwxxm:MeteorologicalFeature .../>
   </iwxxm:feature>
   <!-- Other elements defined when extending iwxxm:MeteorologicalFeatureCollection -->
</iwxxm:ElementExtendingMeteorologicalFeatureCollection>
```



Appendix II


«type»
Geometric primitive::GM_Point
+ position: DirectPosition
+ bearing(GM_Position*): Bearing
+ boundary(): NULL
+ GM_Point(GM_Position*): GM_Point
GM_OrientableCurve
«type»
Geometric primitive::GM_Curve
+ GM_Curve(GM_CurveSegment*): GM_Curve
Coordinate geometry::
GM_Envelope
{root}
+ upperCorner: DirectPosition
+ lowerCorner: DirectPosition
«type»
ElevatedPoint
+ elevation: ValDistanceVerticalType
+ verticalReference: CodeVerticalReferenceBaseType [0..1]
+ interpretation: CodeValueInterpretationBaseType [0..1]
«type»
ElevatedCurve
+ elevation: ValDistanceVerticalType
+ verticalReference: CodeVerticalReferenceBaseType [0..1]
+ interpretation: CodeValueInterpretationBaseType [0..1]
«type»
ElevatedEnvelope
+ upperElevation: ValDistanceVerticalType
+ upperVerticalReference: CodeVerticalReferenceBaseType [0..1]
+ lowerElevation: ValDistanceVerticalType
+ lowerVerticalReference: CodeVerticalReferenceBaseType [0..1]
GM_OrientableSurface
«type»
Geometric primitive::GM_Surface
+ GM_Surface(GM_SurfaceBoundary*): GM_Surface
+ GM_Surface(GM_SurfacePatch*): GM_Surface
Interior to
+containingPrimitive 0..*
+containedPrimitive 0..*
GM_Object
«type»
Geometric primitive::GM_Primitive
+ boundary(): GM_PrimitiveBoundary
+ GM_Primitive(GM_Envelope*): GM_Primitive
«type»
ElevatedSurface
+ elevation: ValDistanceVerticalType
+ verticalReference: CodeVerticalReferenceBaseType [0..1]
+ interpretation: CodeValueInterpretationBaseType [0..1]
«type»
ElevatedVolume
+ upperElevation: ValDistanceVerticalType
+ upperVerticalReference: CodeVerticalReferenceBaseType [0..1]
+ upperInterpretation: CodeValueInterpretationBaseType [0..1]
+ lowerElevation: ValDistanceVerticalType
+ lowerVerticalReference: CodeVerticalReferenceBaseType [0..1]
+ lowerInterpretation: CodeValueInterpretationBaseType [0..1]
«type»
ElevatedLevel
+ elevation: ValDistanceVerticalType
+ verticalReference: CodeVerticalReferenceBaseType [0..1]
+ interpretation: CodeValueInterpretationBaseType [0..1]

Appendix III