

AvXML version 1.0 RC1
Logical Model Teleconference
(Europe, 2013-01-11)

Aviation XML version 1.0 Release Candidate 1:
information seminar

(WMO METCE & ICAO IWXXM)

Jeremy Tandy
(on behalf of TT-AvXML)





Agenda

- *Session Objectives*
- *Overview of AvXML 1.0RC1 components*
- *Regulatory & geographic information standards context*
- *Observations and measurements: a generic framework*
- *WMO METCE model*
- *OGC Observable Property Model*
- *ICAO Weather Information Exchange Model & relationship with WMO METCE*
- *WMO Meteorological Basic Types model*
- *Publishing WMO code-tables as web-accessible resources*
- *Worked XML examples; METAR, VA SIGMET*
- *Questions & answers*



Seminar objective

- *This seminar is intended to enable participants to provide feedback and review for release candidate 1 (RC1) of the Aviation XML standard currently in conjoint development by WMO & ICAO in order to support Amendment 76 of ICAO Annex 3 Regulation*
- *The objective of the session is to provide sufficient expertise to participants to enable their independent review of the proposed Aviation XML standard following the completion of this seminar*
- *The deadline for submission of feedback is 1st Feb 2013*



Components of Release Candidate 1

- *AvXML 1.0RC1 is published for review at the WMO wiki:*
<http://www.wmo.int/pages/prog/www/WIS/wiswiki/tiki-index.php?page=METCE-1.0RC1>
- *AvXML 1.0 RC1 includes:*
 - [Release notes](#)
 - *Conceptual model (UML)*
 - [Enterprise Architect Project File \(EAP\)](#)
 - [XMI format](#)
 - [HTML documentation package](#) (requires local deployment)
 - *XML Schemas*
 - [Published online](#)
 - [Compressed file bundle](#)
 - [Java bindings for XML Schemas](#)
 - [Simple tutorial describing METAR and VA SIGMET XML instances](#)



Further information on Release Candidate 1

- *FAQ page:*

<http://www.wmo.int/pages/prog/www/WIS/wiswiki/tiki-index.php?page=METCE-1.0RC1-FAQ>

- *Moderated public review comments:*

[*CBS-TT-AvXML Google Group*](#)

Note that comments on AvXML 1.0RC1 should be submitted to the Google group using a subject line beginning with the text “[1.0RC1-feedback]”



AvXML 1.0 standard development schedule

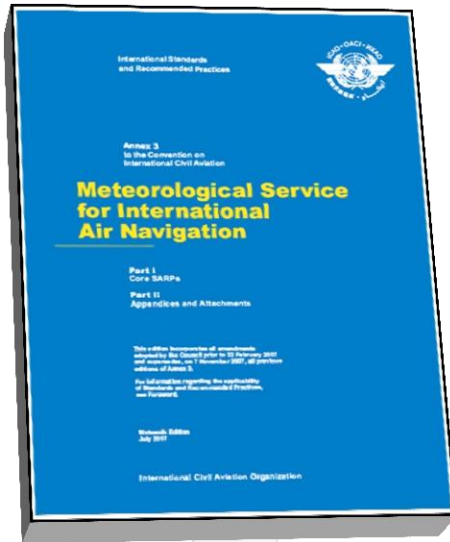
- [1st Feb 2013] *1.0RC1 review closes*
- [1-8 Feb 2013] *1.0RC1 feedback clarification*
- [Feb-Mar 2013] *Amendments incorporated for 1.0RC2*
- [Mar 2013] *1.0RC2 published for review*

Note that further information and training sessions are planned for the '4th Workshop on the use of GIS in meteorology' to be hosted at ECMWF, Reading, UK in early March 2013

- [July 2013] *AvXML 1.0 published*



Technical regulation: Meteorological Service for International Air Navigation



ICAO Annex 3 / WMO No. 49 II

Meteorological Service for International Air Navigation

Management of data exchange standards in support of meteorological services for international air navigation (OPMET) are delegated by ICAO to WMO



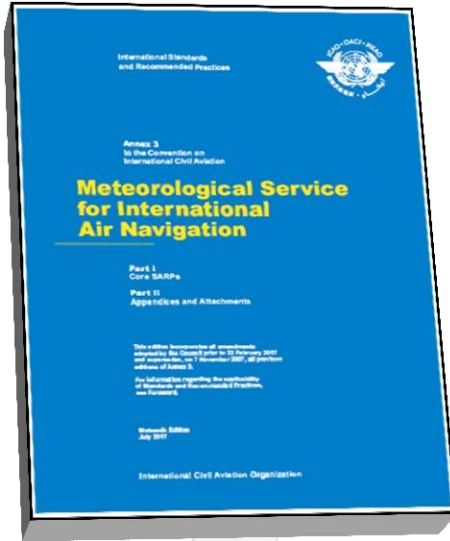
WMO No. 306 Vol I.1

Manual on Codes

Part A – Alphanumeric Codes



Amendment 76 to ICAO Annex 3 (Nov 2013)



ICAO Annex 3 / WMO No. 49 II

Meteorological Service for International Air Navigation

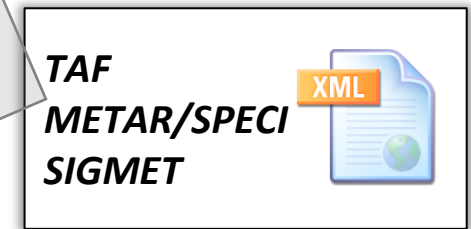
Amendment 76 (2013) to ICAO Annex 3 shall, for states in a position to do so to, permit bilateral exchange of OPMET data via XML



WMO No. 306 Vol I.1

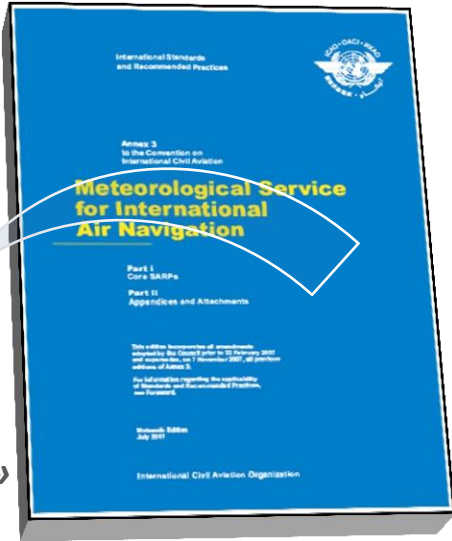
Manual on Codes

Part A – Alphanumeric Codes





Model-driven data exchange standards



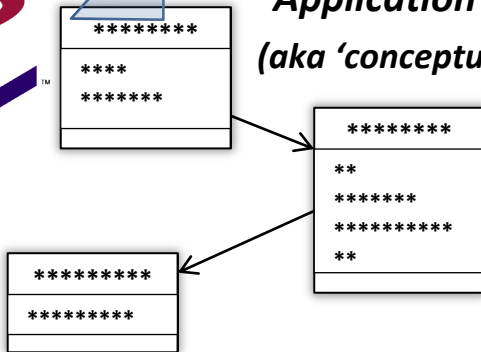
ICAO Annex 3 / WMO No. 49 II

Meteorological Service for International Air Navigation

« formalised as »



Application Schema
(aka 'conceptual model')



Technology independent description of content and structure of information to be exchanged for a given application

XML Schema 1.0
Schematron



FullMoon

« derive from »

Validation schema and rules

« conforms to »

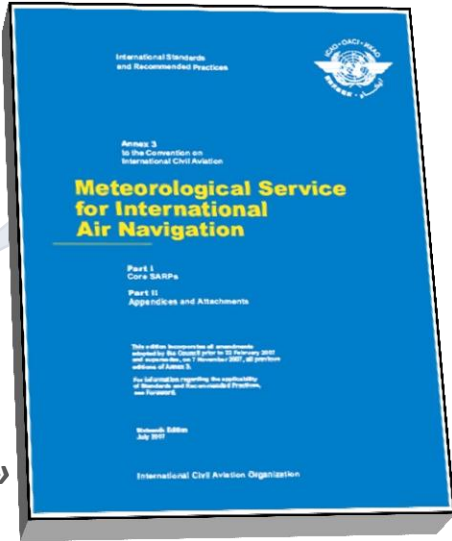
TAF
METAR/SPECI
SIGMET



Validatable data products



ICAO Weather Information Exchange Model (IWXXM)



Formal representation of ICAO Annex 3 reports as UML model:

ICAO Annex 3 / WMO

TAF, METAR/SPECI and SIGMET

Meteorological Service for International Air Navigation

« formalised as »



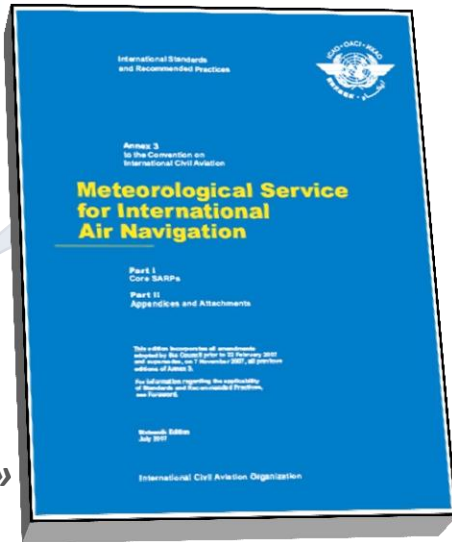


Simple Aeronautical Features (SAF)

Simplified representations of aviation features (runway, aerodrome, flight information region, air traffic services unit)

ICAO Annex 3 / WMO ... simplified, referenceable versions of existing AIXM constructs

Meteorological Service for International Air Navigation ... developed in a cross-domain manner with AIXM and FIXM developers (aeronautical information and flight information groups)



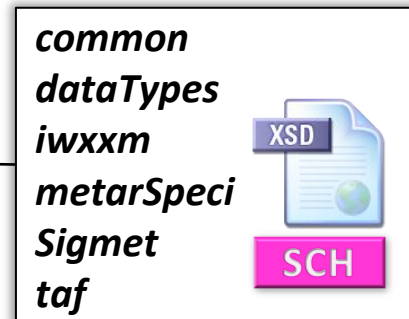
« formalised as »



« imports »

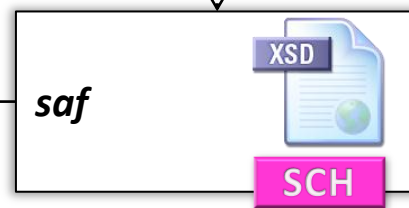


« derived from »



« imports »

« derived from »



« conforms to »





Air Traffic Management information framework: geographic information standardisation

AIR TRAFFIC MANAGEMENT INFORMATION



**Aeronautical
Information
Exchange
Model**




**Flight
Information
Exchange
Model**



**Weather
Information
Exchange
Model**



**TAF
METAR/SPECI
SIGMET**




*Aviation XML is based on International Standards for representing geographic information:
Geography Markup Language
GML/XML*



Geographic Information / Geomatics standards

- ISO 19103 Conceptual schema language**
- ISO 19107 Spatial schema**
- ISO 19108 Temporal schema**
- ISO 19111 Spatial referencing by coordinates**
- ISO 19115 Metadata**
- ISO 19156 Observations and measurements**

**ISO 19136
Geography
Markup
Language**



ISO 19156 Observations and measurements

AIR TRAFFIC MANAGEMENT INFORMATION



**Aeronautical
Information
Exchange
Model**



**Flight
Information
Exchange
Model**



**Weather
Information
Exchange
Model**



ISO 19156 'Observations and measurements' provides a conceptual schema for observations and the features involved in sampling when making observations



Geographic Information / Geomatics standards

ISO 19103 Conceptual schema language

ISO 19107 Spatial schema

ISO 19108 Temporal schema

ISO 19111 Spatial referencing by coordinates

ISO 19115 Metadata

ISO 19156 Observations and measurements

*ISO 19136
Geography
Markup
Language*

The model is specifically designed to support the exchange of information describing both the observing event and the results of the observation between different scientific and technical communities

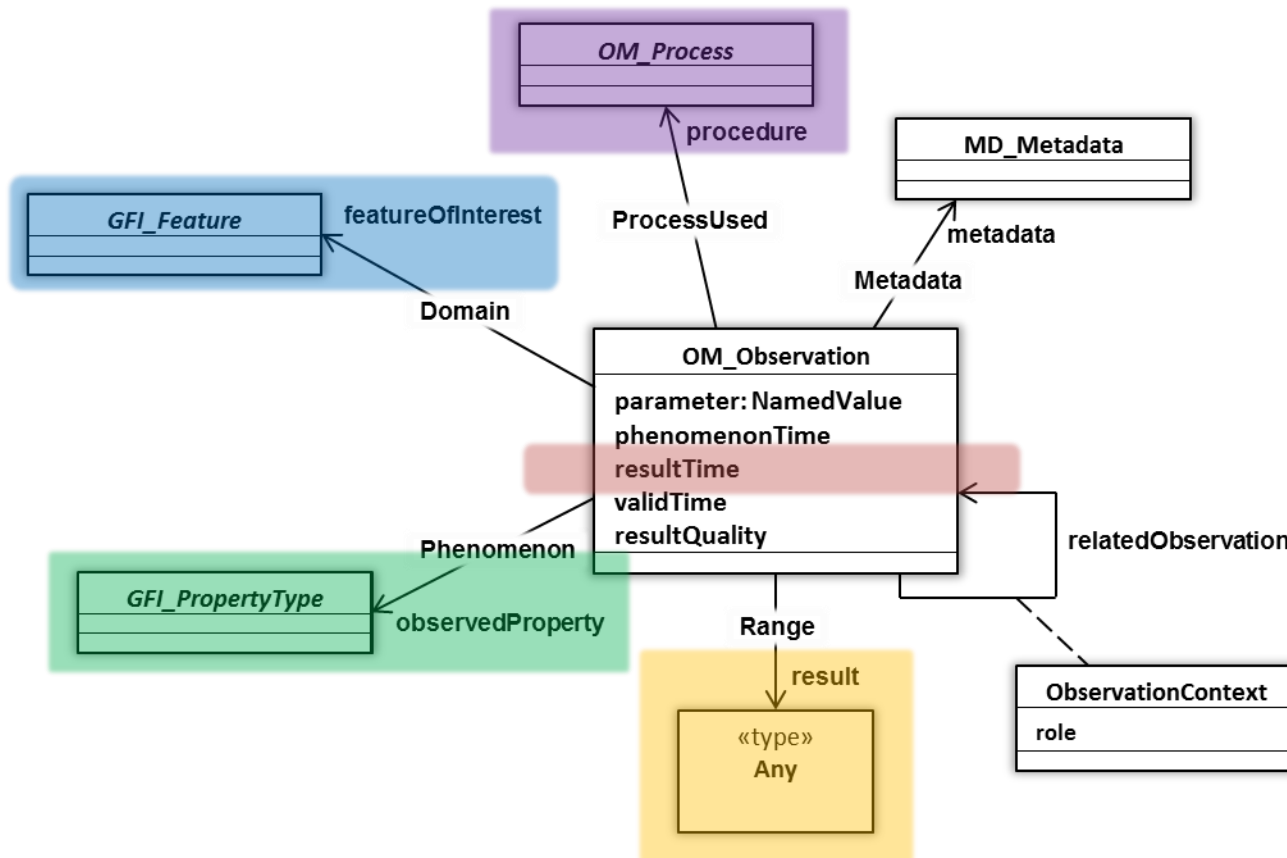
**OMXML
OGC #10-025**





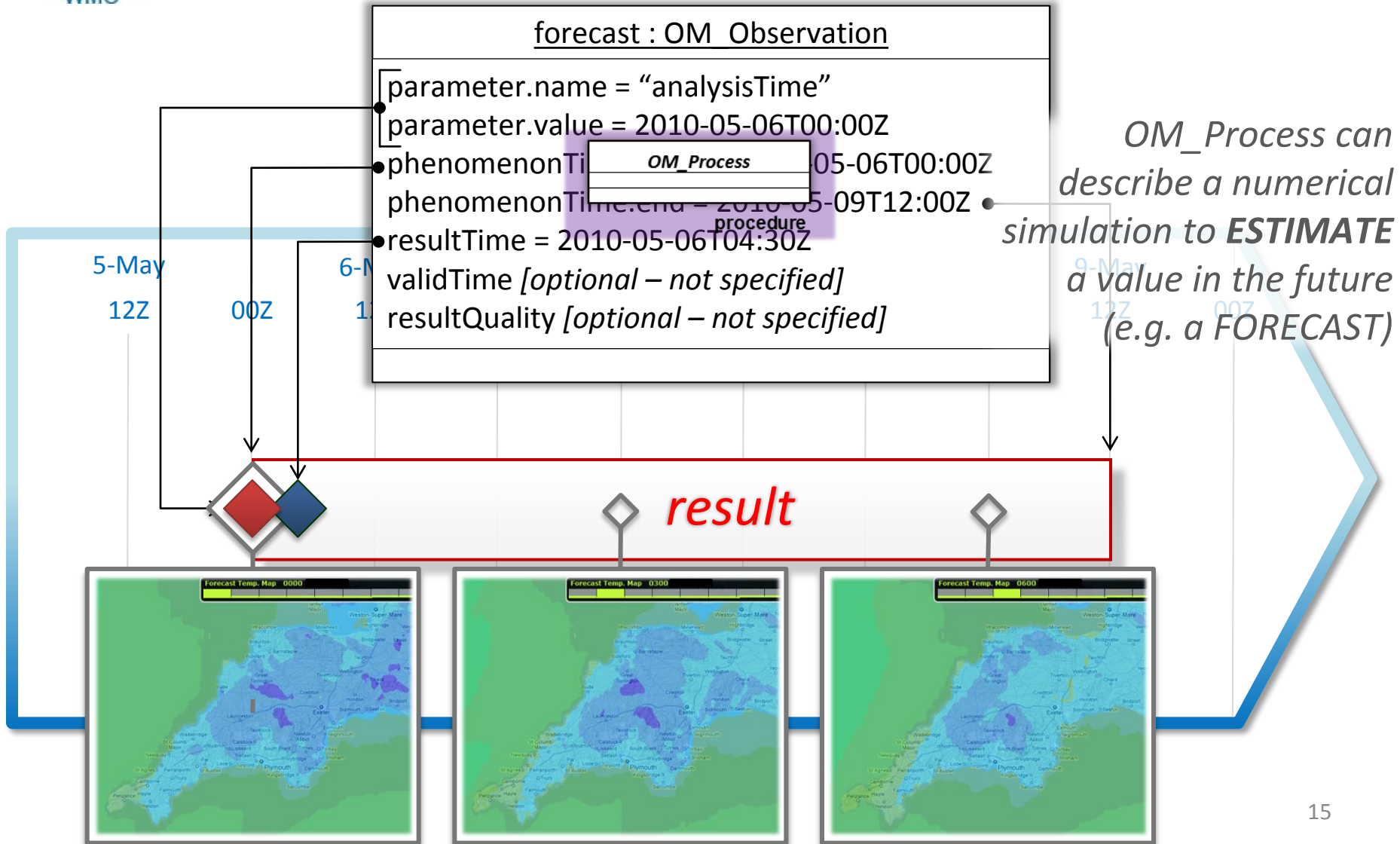
ISO19156 Observations and measurements

*OM_Observation: an EVENT whose RESULT is an *estimate* of a value of some PROPERTY of some THING obtained using a specified PROCEDURE ...*





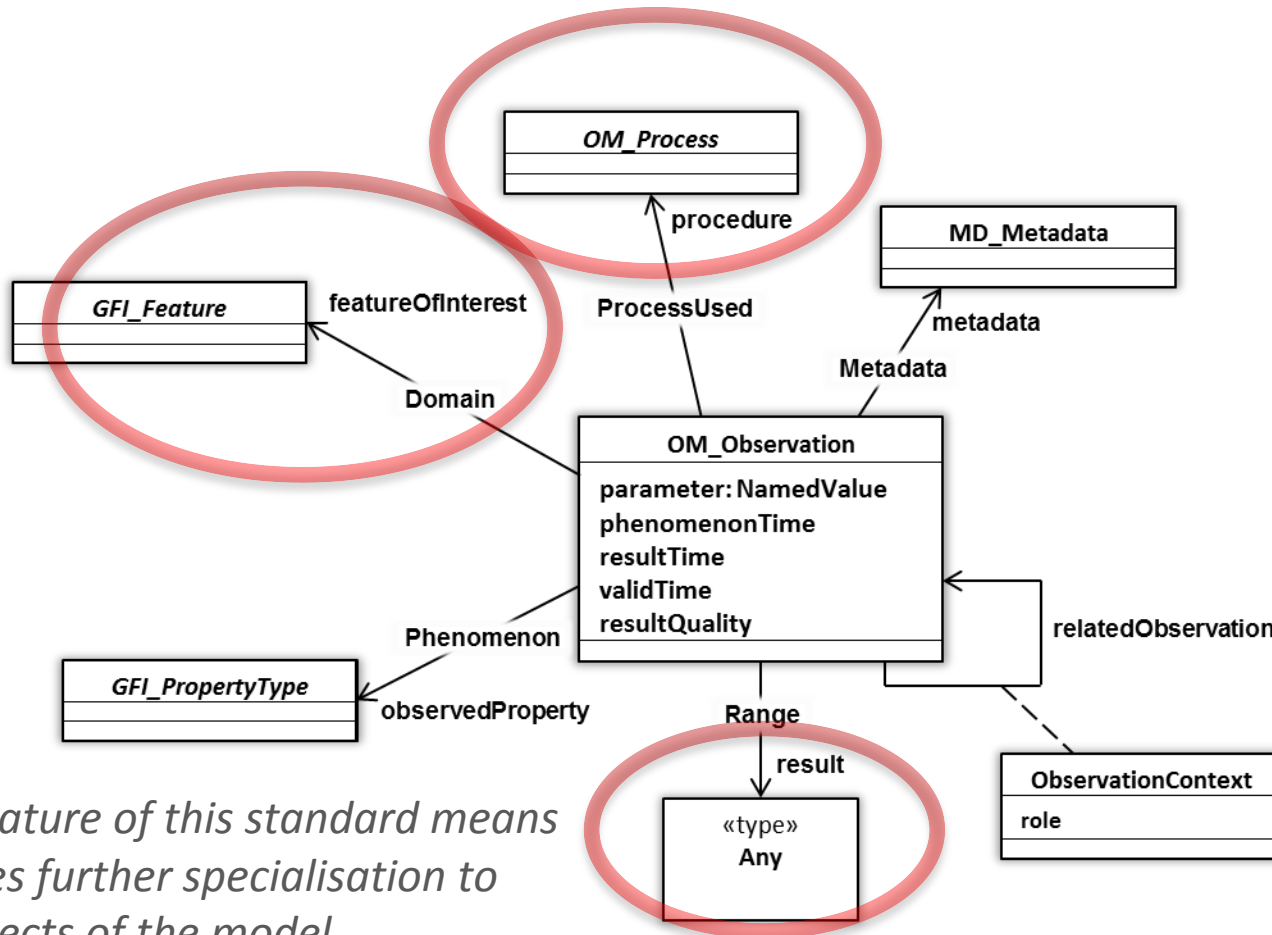
ISO19156 Observations and measurements: also suitable for numerical simulations – including forecasts





Profiling ISO 19156 O&M

ISO 19156 'Observations and measurements' provides a generic framework for describing both the observing event and the results of the observation. It is applicable to a wide range of scientific and technical domains.



The generic nature of this standard means that it requires further specialisation to constrain aspects of the model ...



METCE: **M**odèle pour l'**É**change des informations sur le **T**emps, le **C**limate et l'**É**au



WMO Logical Data Model:

... provides foundation of generic meteorological concepts, phenomena and entities upon which domain-industry- or community-specific Application Schema can be built

... based on conceptual modelling framework from ISO 19100 series

... scope intended to match WMO UN mandate: weather, climate and water

... intended to complement existing WMO Table-Driven Code Forms

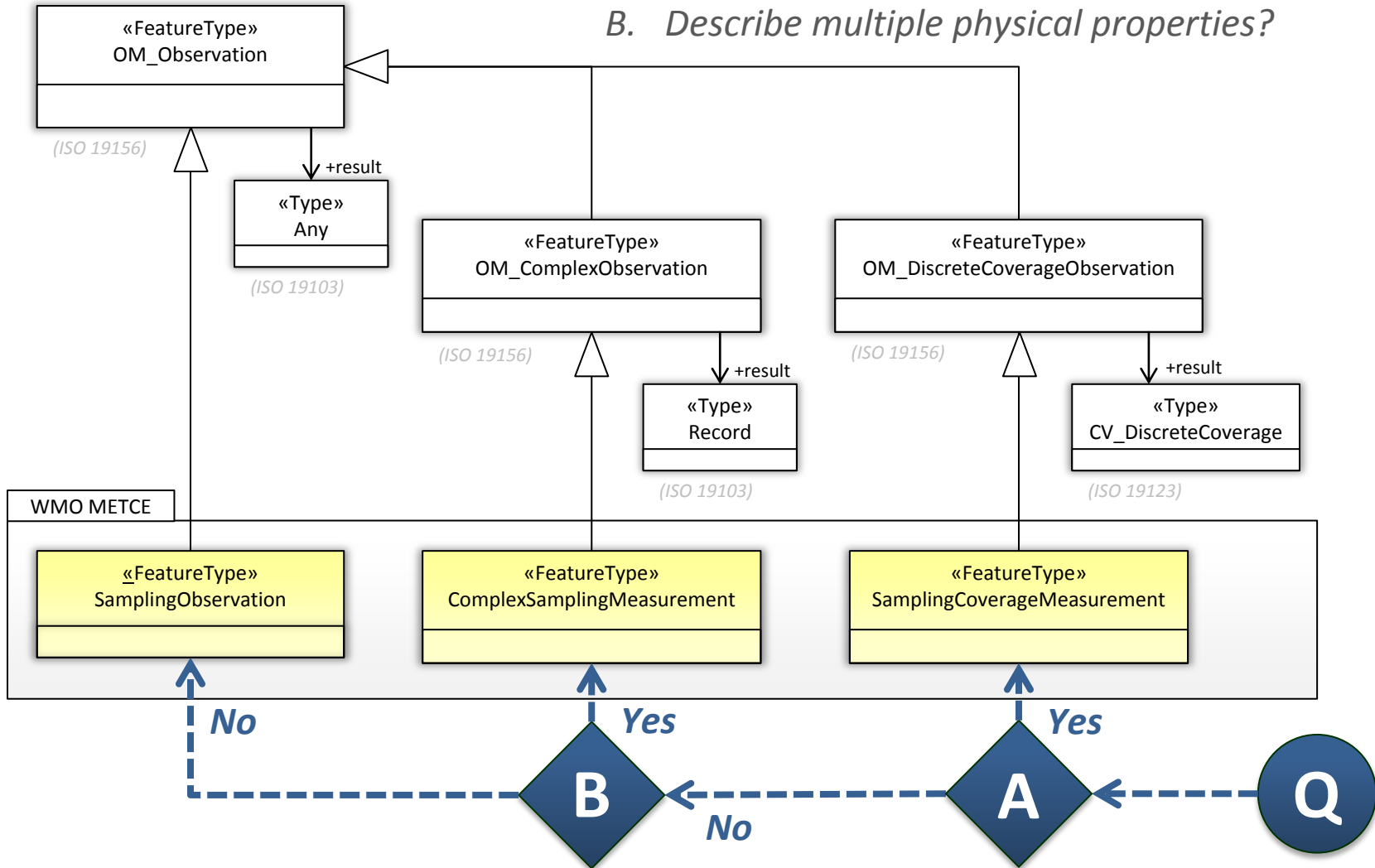


METCE: specialisations of OM_Observation

Does the data collected (e.g. the 'result') from the Observation event:

A. Vary in space and or time?

B. Describe multiple physical properties?





Which type of OM_Observation?

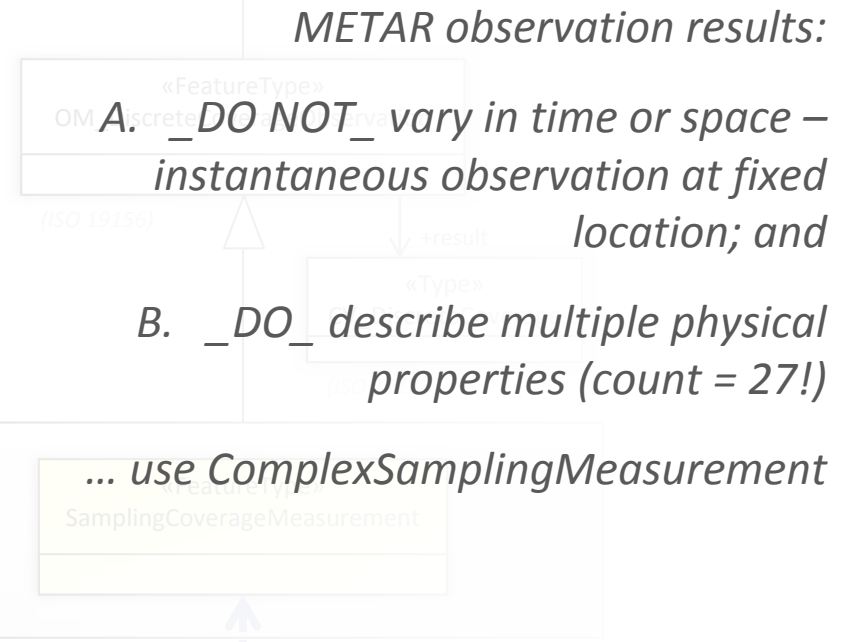
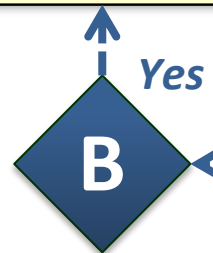
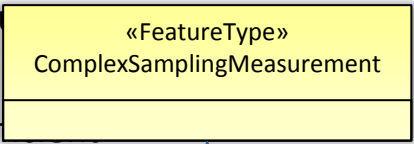
Does the data collected from the Observation event:

- A. Vary in space and or time?
- B. Describe multiple physical properties?



METAR

- Routine observations at specific locations (aerodromes) for an instant in time
- Parameters:
 - Air temperature
 - Dew-point temperature
 - Altimeter setting
 - Runway friction coefficient
 - Runway contamination
 - Runway deposits
 - ... etc. ...



METAR observation results:

- A. DO NOT vary in time or space – instantaneous observation at fixed location; and
- B. DO describe multiple physical properties (count = 27!)

... use ComplexSamplingMeasurement



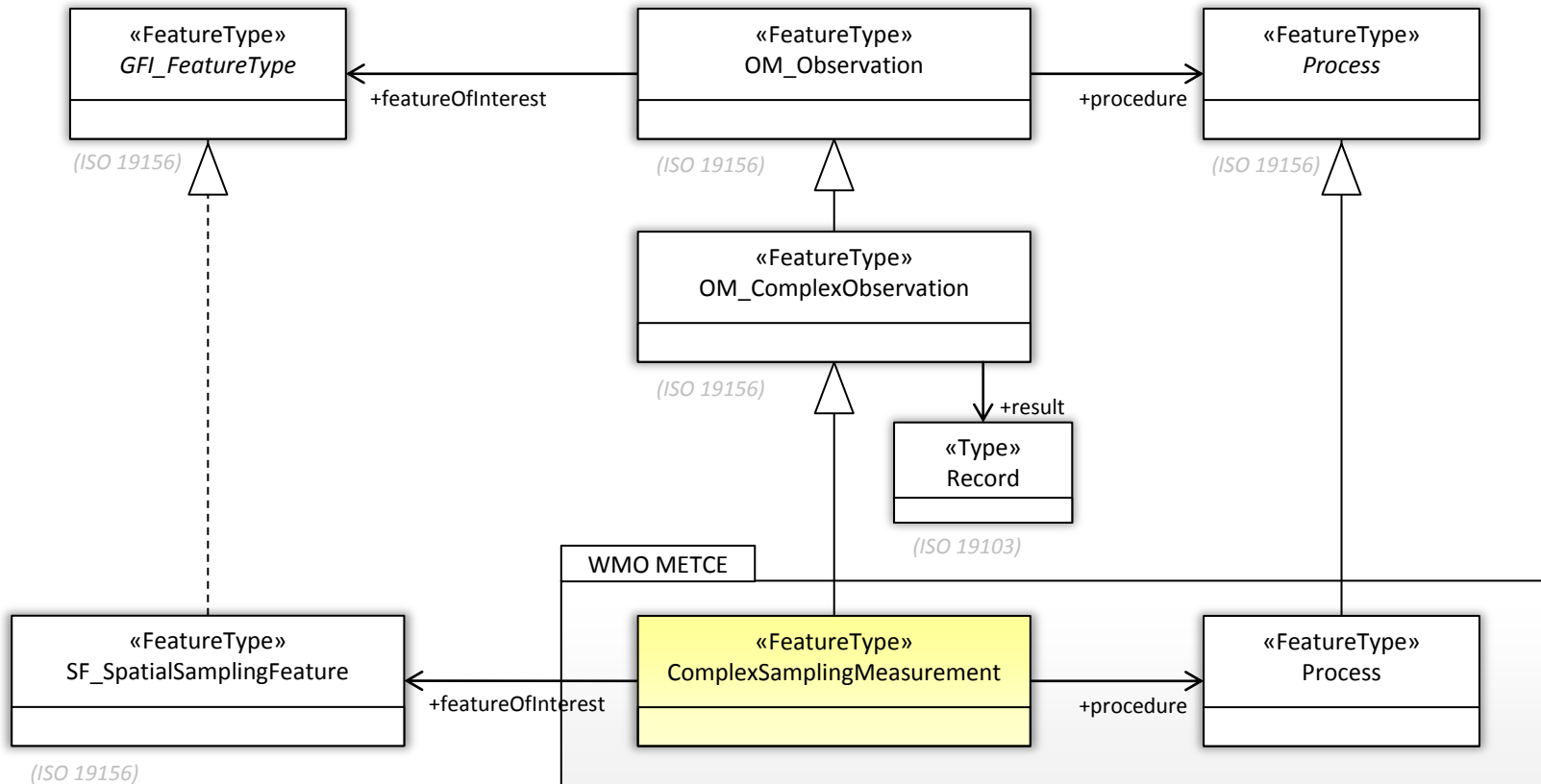
No



Common constraints applicable to all WMO METCE Observation types

All specialisations of *OM_Observation* defined in WMO METCE require:

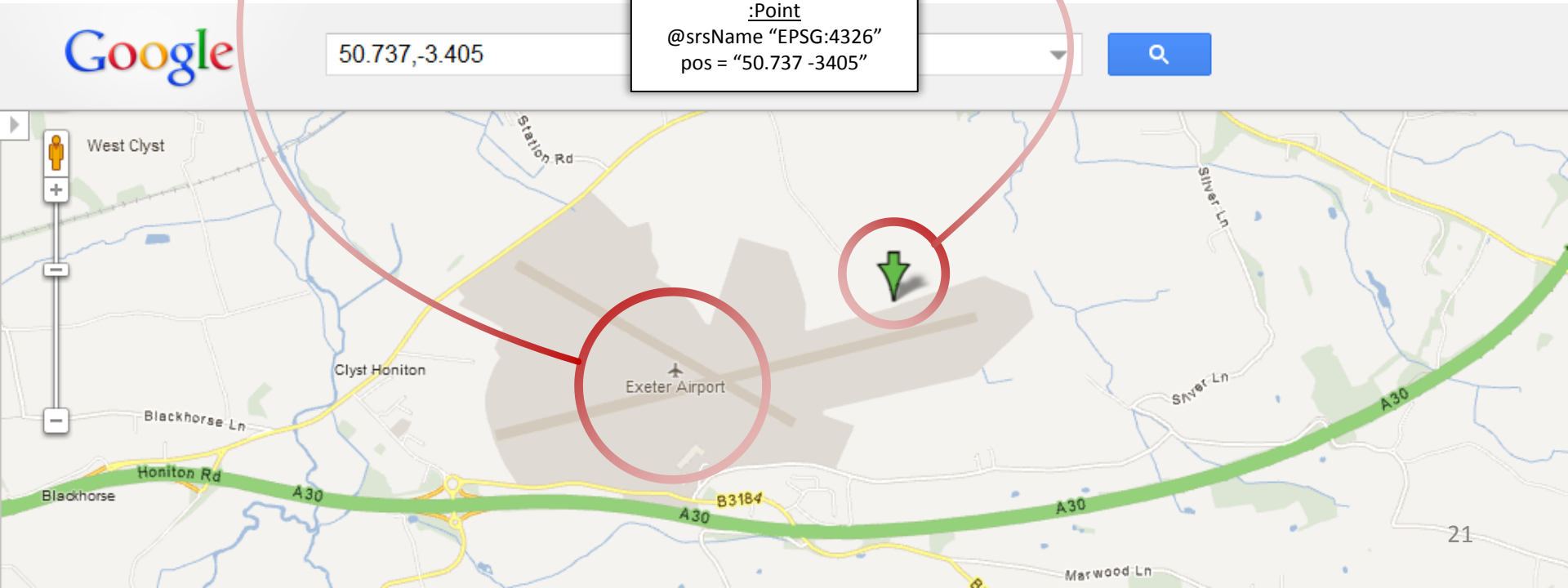
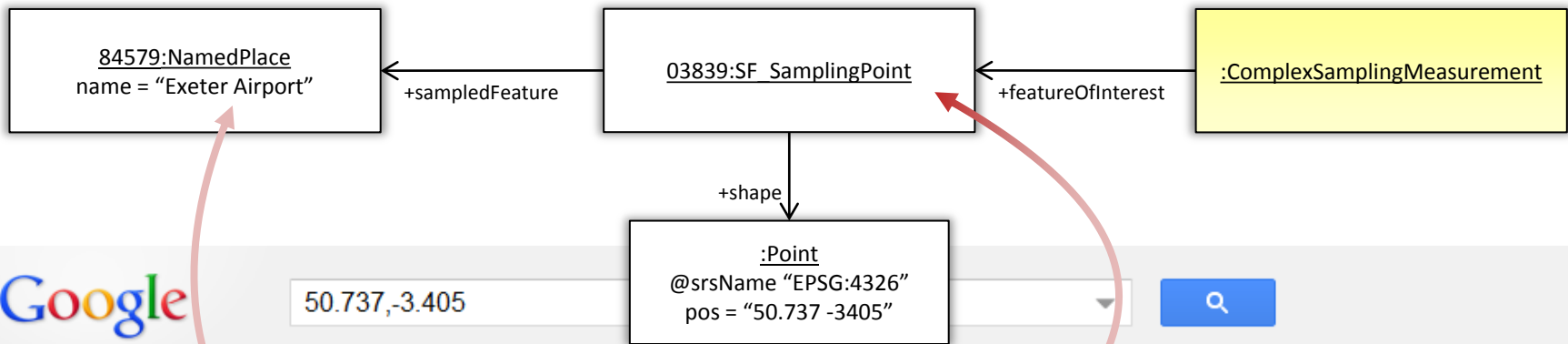
- association role 'featureOfInterest' shall be of type *SF_SpatialSamplingFeature*
- association role 'procedure' shall be of type *Process* (from WMO METCE)





SamplingFeature as OM_Observation.featureOfInterest

In meteorology, we define a sampling regime that enables us to observe, measure or simulate the real-world. Sampling Features (from ISO 19156 'Observations and measurements') provide a way to characterise this sampling regime and the relationship to the real-world.





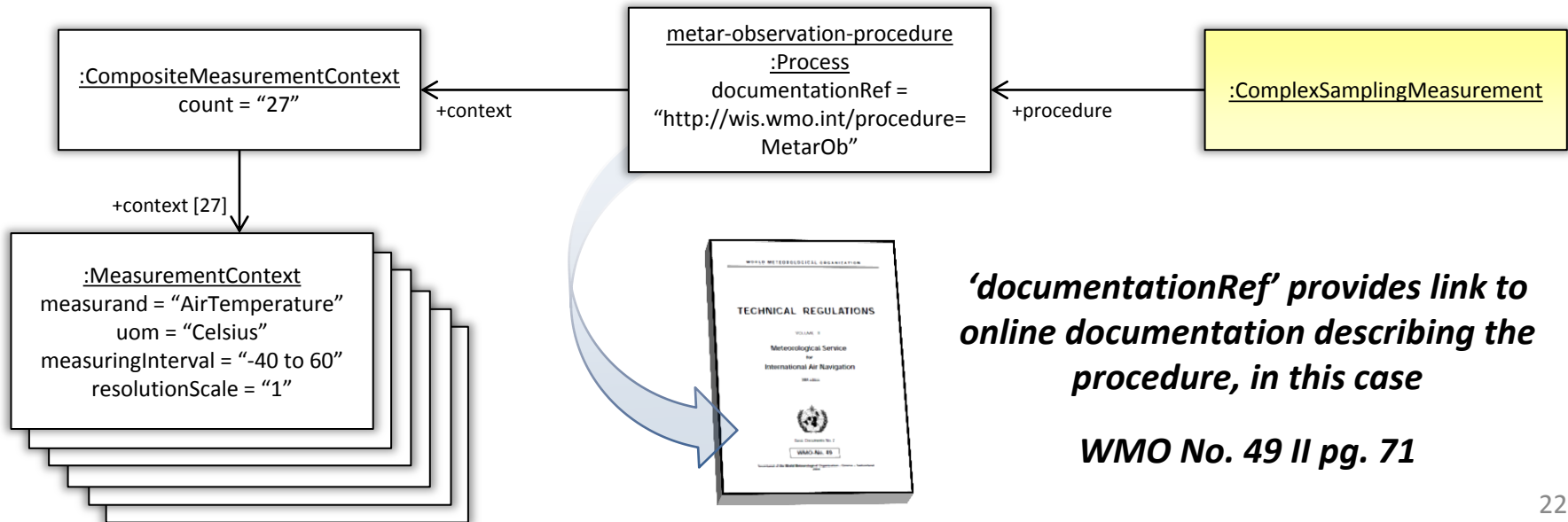
Process: a concrete implementation of OM_Process

The abstract OM_Process class (from ISO 19156) is used to define the process(es) involved in generating an observation.

An instance of OM_Process may be a specific instrument or sensor, a human observer executing a set of instructions, a simulator or process algorithm.

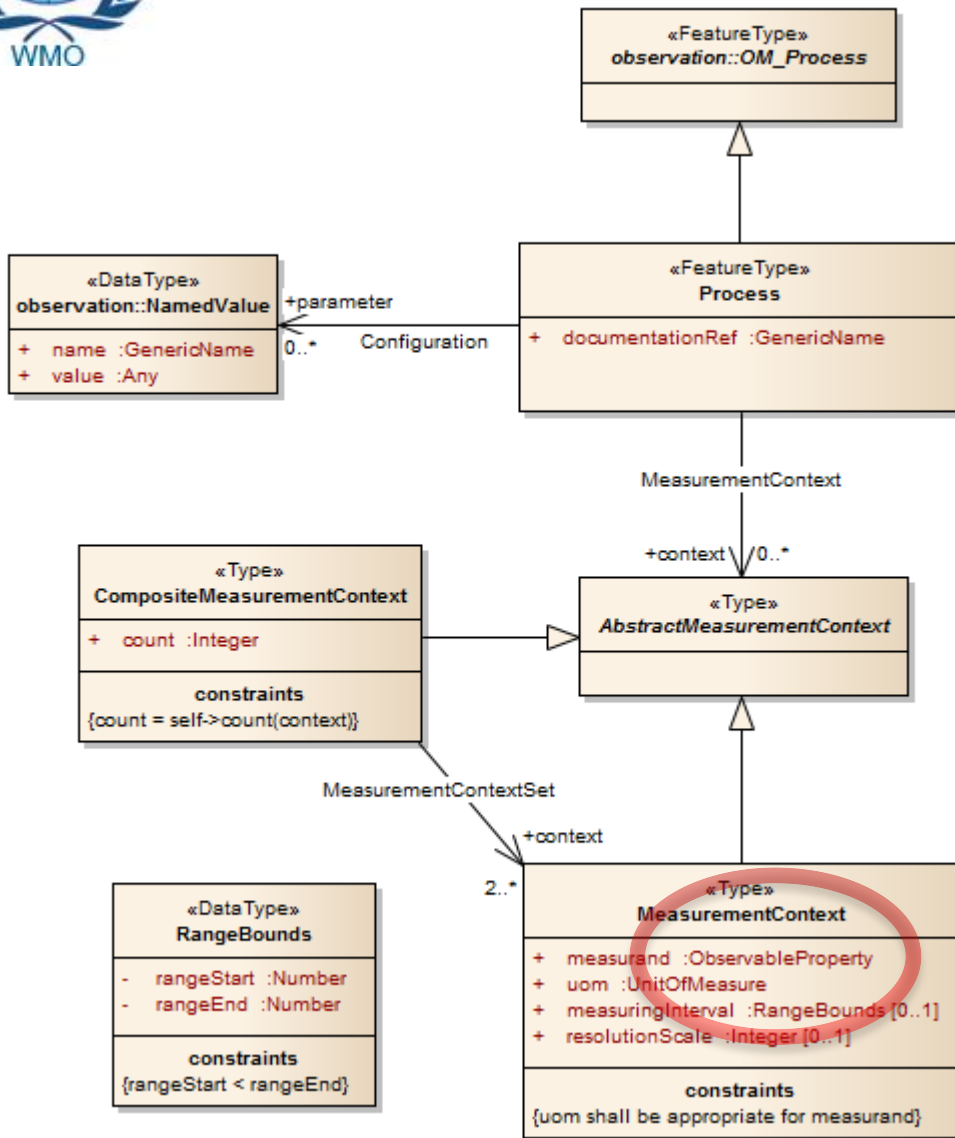
Process (from WMO METCE) provides a concrete implementation of OM_Process supporting the following requirements:

(i) reference to supporting documentation, (ii) specification of configuration parameters, (iii) specification of the measurement resolution and/or measurement range for each measurand.





UML Class diagram for METCE:Process



The MeasurementContext/measurand property is specified as type "ObservableProperty"

This may be implemented as a simple reference to an existing definition of a physical property such as 'AirTemperature' (e.g. from an authoritative controlled vocabulary published online such as [NASA SWEET](#))

However, in many situations it is desirable to formally describe constraints and/or statistical qualification of such abstract physical properties

:MeasurementContext
 measurand = "AirTemperature"
 uom = "Celsius"
 measuringInterval = "-40 to 60"
 resolutionScale = "1"



OPM: **O**bservable **P**roperty **M**odel



Geographic Information / Geomatics

The Observable Property Model (OPM) has been developed under the leadership of Dominic Lowe (UK) within the OGC 'Sensor Web Enablement' Standards Working Group & INSPIRE Thematic Working Group

As an interim measure, a stable version of this information is managed under the governance of WMO

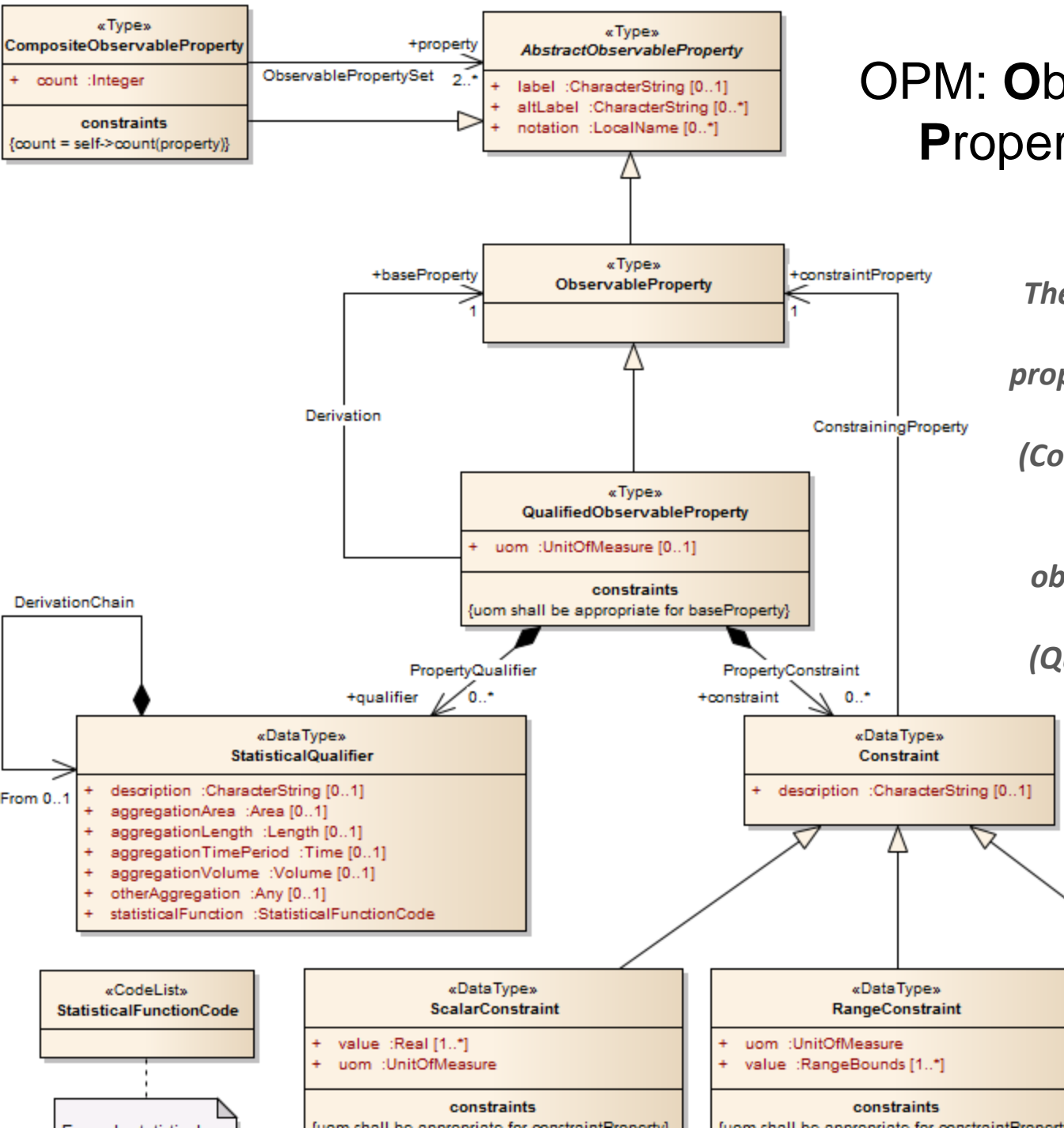
Discussions between WMO and OGC regarding the management and maintenance of the authoritative version of OPM are pending

Given that OPM is likely to be managed under a different governance regime, the model has been factored into a separate Application Schema



OPM: Observable Property Model

The Observable Property Model enables observed physical properties to be aggregated into composite properties (CompositeObservableProperty) and for any qualification or constraint relating to the observed physical properties to be explicitly described (QualifiedObservableProperty).

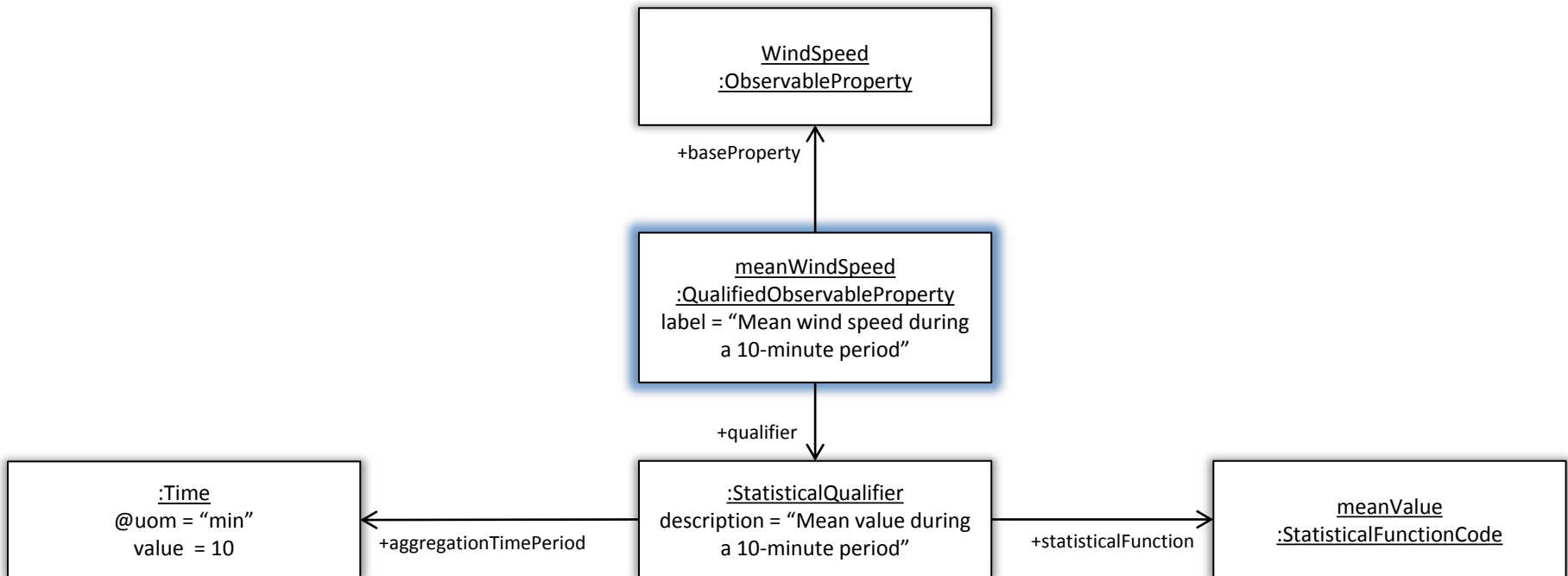




Observable Property Model: qualifying observed properties

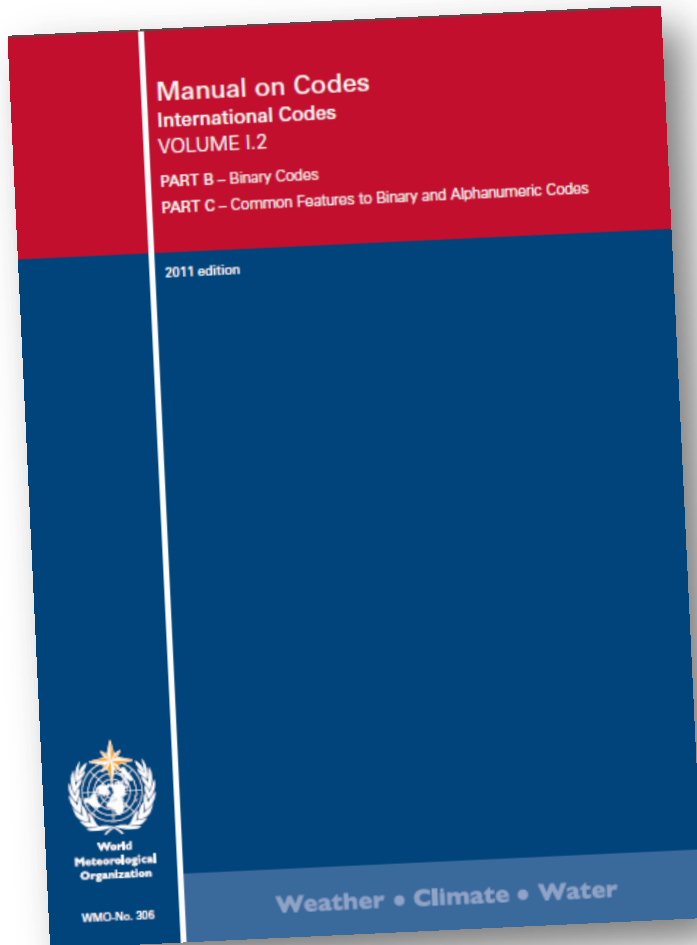
The “Observable Property model” (OPM) enables each physical property to be qualified according to the specific observation context ...

e.g. within a METAR, the property ‘wind speed’ is formally defined as the mean wind speed within the 10-minute period preceding the observation





WMO governance of definitions: WMO No. 306 Manual on Codes



The Code-Tables underpinning WMO Table-Driven Code Forms (GRIB and BUFR) are WMO's crown jewels ...

Decades of expert effort have gone into establishing authoritative terminologies to describe meteorological phenomena

WMO CBS stressed the importance of ensuring a strong linkage between the TDCF Code-tables and the WMO data models. [CBS-Ext.(10)]

'Strong linkage': a critical objective for TT-AvXML



Publication of web-accessible definitions for meteorology

As the UN's authoritative voice on weather, water and climate it within WMO's mandate to publish authoritative on-line definitions of meteorological phenomena and properties

Each 'concept' will be assigned an HTTP URI identifier within the wmo.int domain based on existing codes and structures from the WMO code-tables

It is anticipated that in RC2 the definitions of those physical properties required to support International Air Navigation will resolve to useful information ...

FM 92 GRIB - ver. 8.0.0

Code table 4.2 - Parameter number by product discipline and parameter category

Product discipline 0 - Meteorological products, parameter category 2: momentum

Number	Parameter	Units	Status
0	Wind direction (from which blowing)	degree true	Operational
1	Wind speed	$m\ s^{-1}$	Operational
2	u-component of wind	$m\ s^{-1}$	Operational
3	v-component of wind	$m\ s^{-1}$	Operational
4	Stream function	$m^2\ s^{-2}$	Operational
5	Vertical velocity	s^{-1}	Operational
6	Montgomery stream function	$m^2\ s^{-2}$	Operational

<http://data.wmo.int/def/grib2/codeflag/4.2/0.2.1>

Excerpt from GRIB2 Code- and Flag-tables



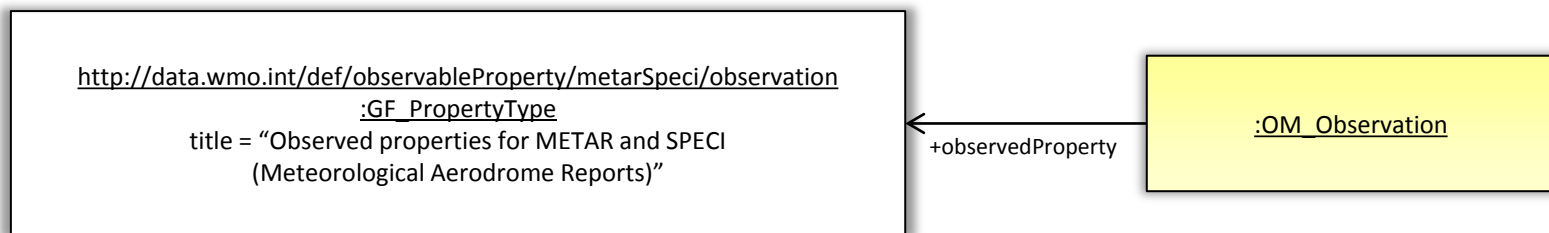
A note on the use of OM_Observation/observedProperty

OM_Observation/observedProperty is intended to enable semantic or thematic classification of observations – a high-priority requirement for discovery and data fusion.

observedProperty has a cardinality of 1; each observation may only observe a single property.

observedProperty need not be modelled as a GF_Property (General Feature Model, ISO 19109) – one only needs to reference an appropriate definition for the physical property being observed; e.g. for the METAR example, the observed physical property may be “ObservedPropertiesForMETAR/SPECI”.

One can either re-use an existing well-known definition, or mint your own.



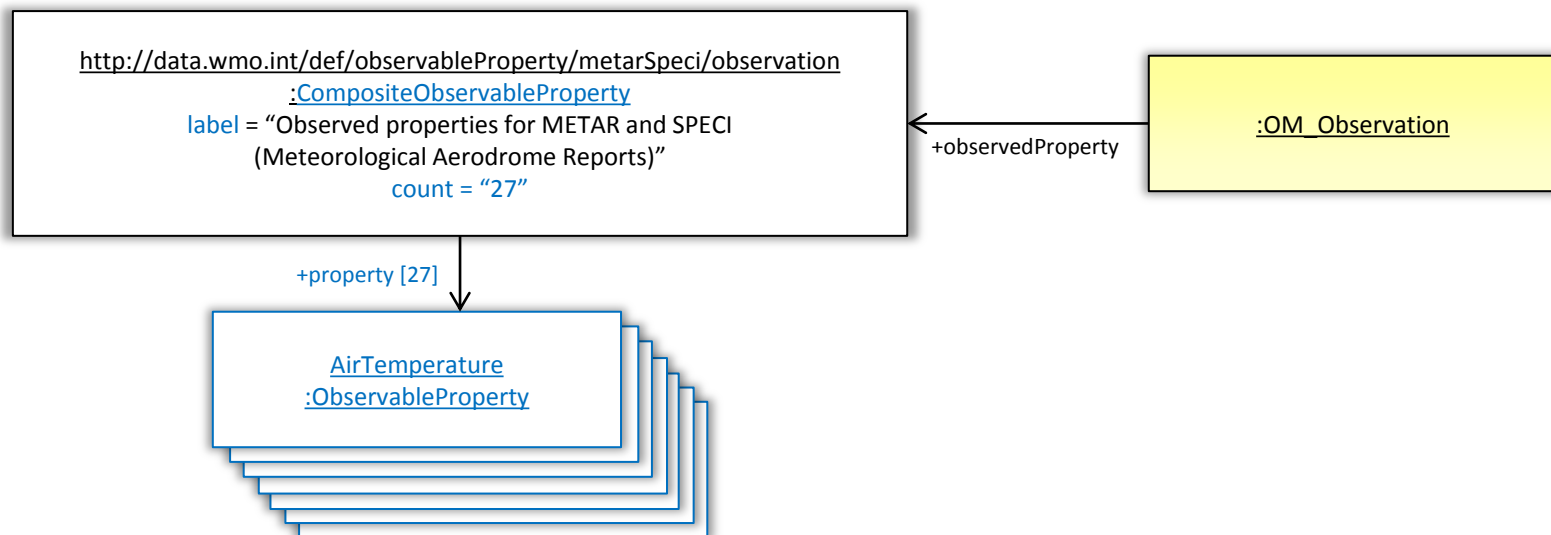


Specifying a composite observedProperty

However, often observation events record information about MULTIPLE physical properties.

OPM enables each of the physical properties observed to be aggregated into single composite entity that can be referenced from the OM_Observation.

As each physical property is explicitly listed, the OM_Observation can be indexed according to those physical properties supporting discovery based on individual physical property types rather than the aggregate property referenced by OM_Observation/observedProperty.



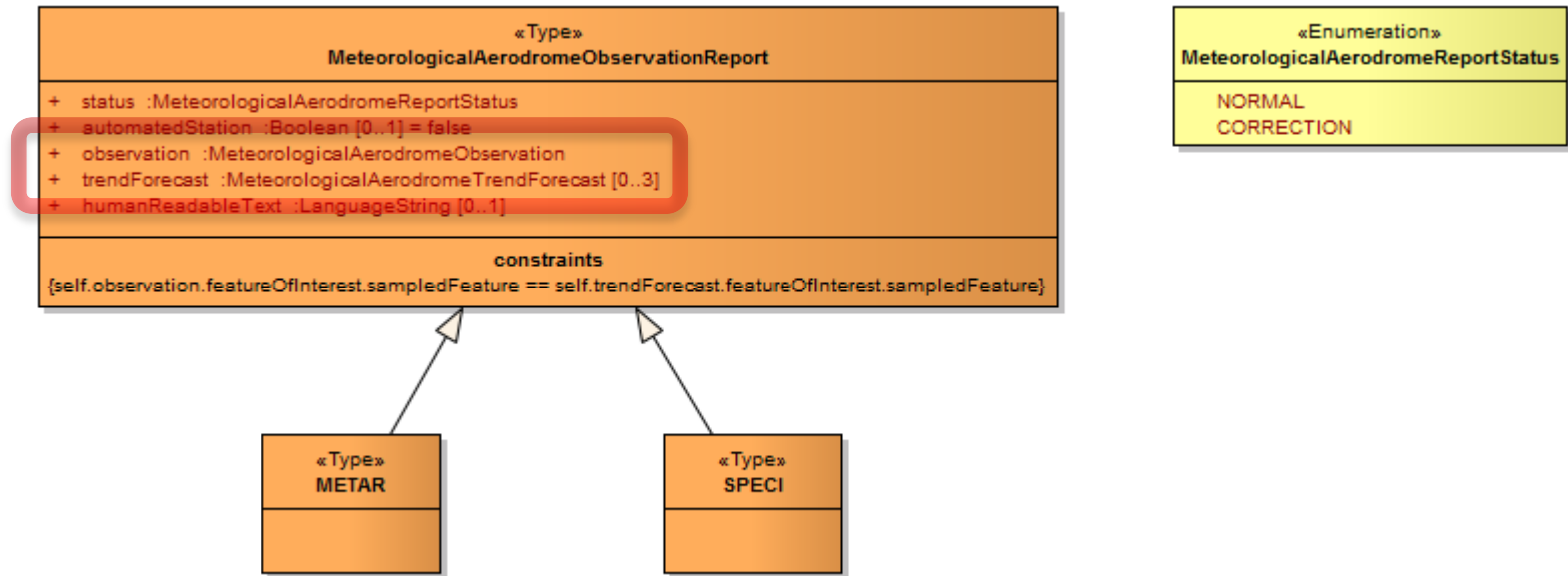


Closer examination of IWXXM relationship to METCE





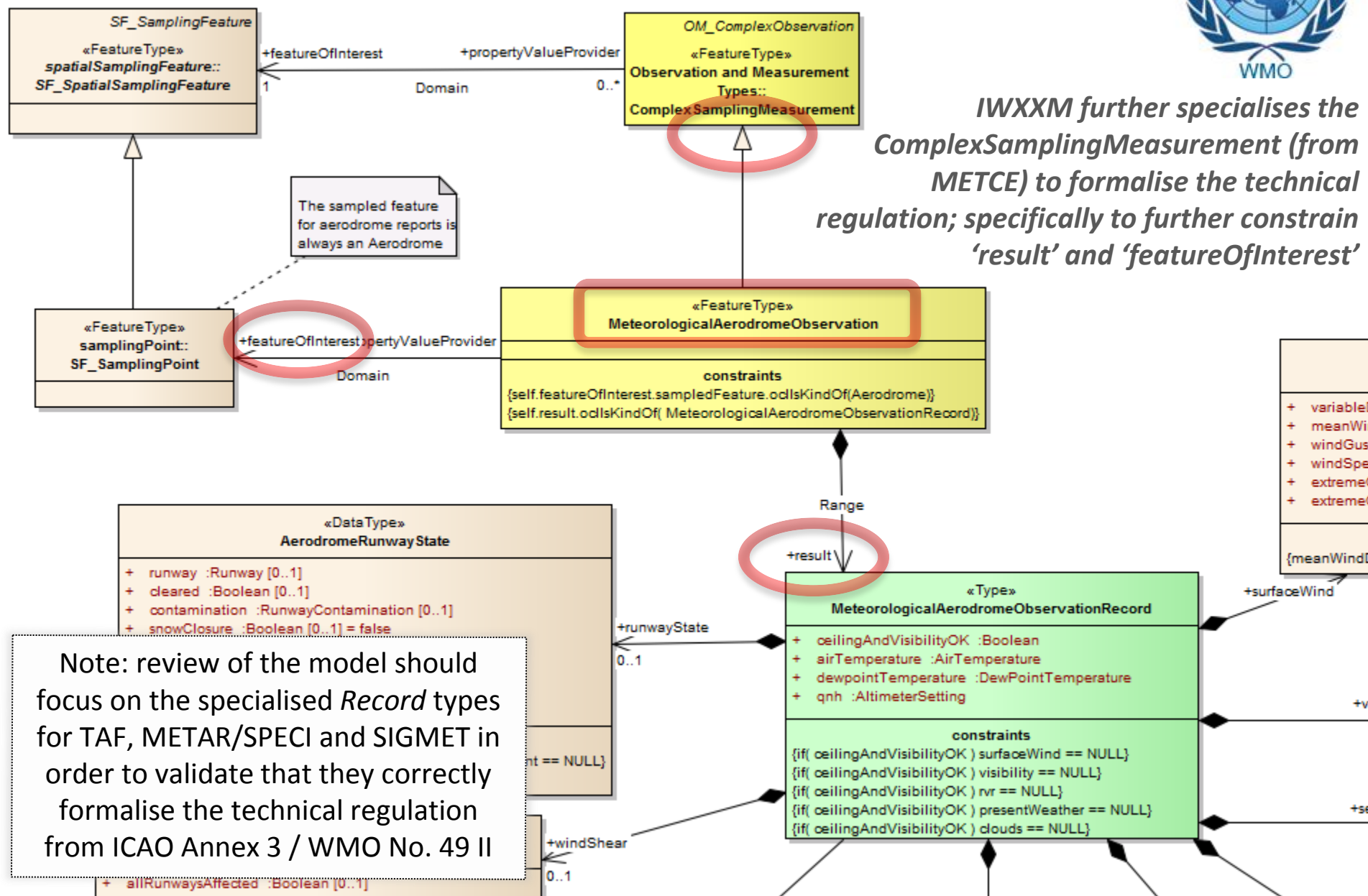
MeteorologicalAerodromeObservationReport



Note: please refer to the [model documentation](#) for more details



MeteorologicalAerodromeObservation



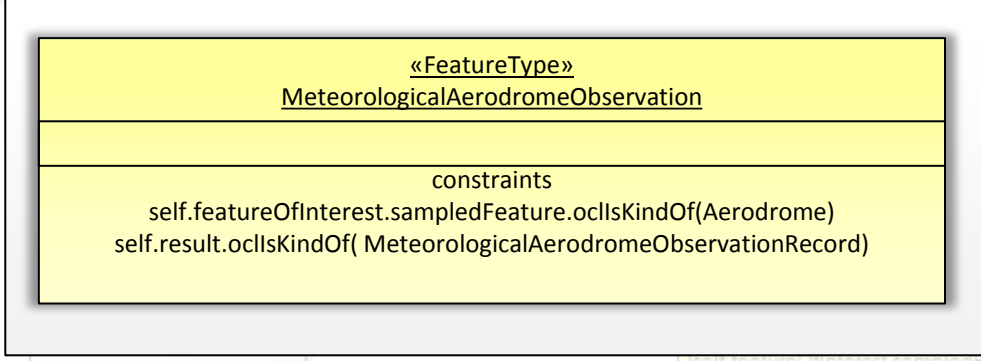
IWXXM further specialises the ComplexSamplingMeasurement (from METCE) to formalise the technical regulation; specifically to further constrain 'result' and 'featureOfInterest'

Note: review of the model should focus on the specialised *Record* types for TAF, METAR/SPECI and SIGMET in order to validate that they correctly formalise the technical regulation from ICAO Annex 3 / WMO No. 49 II



Aside: serialisation OM_Observation sub-types – use of OMXML pattern

IWXXM METAR/SPECI



The GML/XML encoding for sub-types of OM_Observation follows the pattern defined in:

OGC #10-025

‘Observations and measurements v2.0 – XML implementation’



```

<iwxxm:observation>
  <om:OM_Observation gml:id="...">
    <om:type
      xlink:href="http://data.wmo.int/def/observationType/iwxxm/1.0RC1/MeteorologicalAerodromeObservation"
      xlink:title="MeteorologicalAerodromeObservation"/>
    ...
    <om:result>
      <iwxxm:MeteorologicalAerodromeObservationRecord ... />
    </om:result>
  </om:OM_Observation>
</iwxxm:observation>
  
```

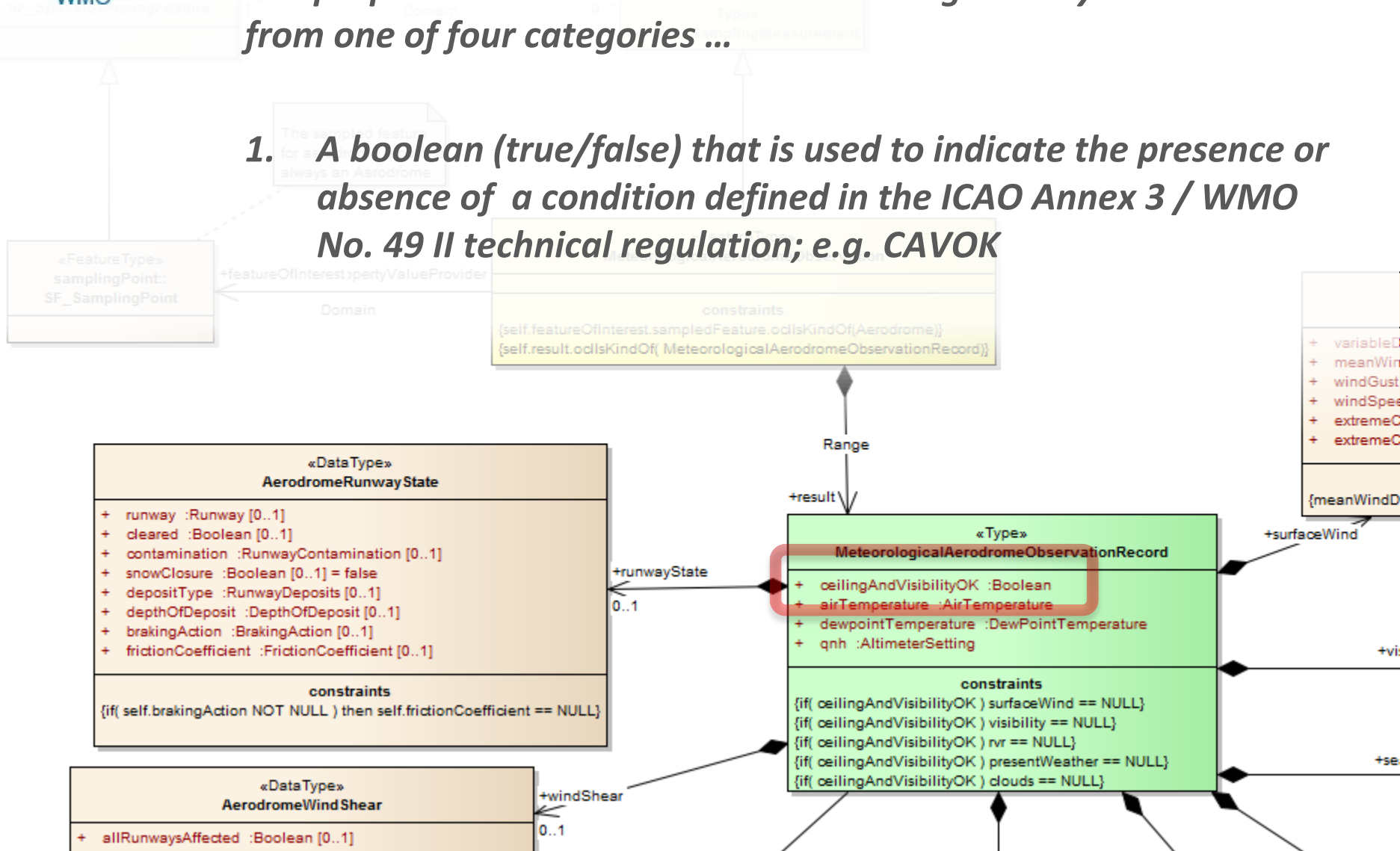




Detailed review of *Record* structure

The properties included within the *Record* generally are drawn from one of four categories ...

1. A boolean (true/false) that is used to indicate the presence or absence of a condition defined in the ICAO Annex 3 / WMO No. 49 II technical regulation; e.g. CAVOK





IWXXM METAR/SPECI

Aside: serialisation of properties as XML attributes – GML encoding extension

The properties included within the Record generally are drawn from one of four categories:

To improve readability of the resulting XML we have introduced an encoding extension to support serialisation as XML attributes.

Both class and property within the model are amended with tagged value ...

«Type» MeteorologicalAerodromeObservationRecord
+ ceilingAndVisibilityOK : Boolean [tagged values: allowXMLAttribute = "true"] + airTemperature : AirTemperature + dewpointTemperature : DewPointTemperature + qnh : AltimeterSetting
tagged values: acceptXMLAttribute = "true"

```
<complexType name="MeteorologicalAerodromeObservationRecordType">
  <complexContent>
    <extension base="gml:AbstractGMLType">
      <sequence> ... </sequence>
      <attribute name="ceilingAndVisibilityOK" type="boolean" use="required"/>
    </extension>
  </complexContent>
</complexType>
```



```
<iwxm:MeteorologicalAerodromeObservationRecord ceilingAndVisibilityOK="false" gml:id="...">
```

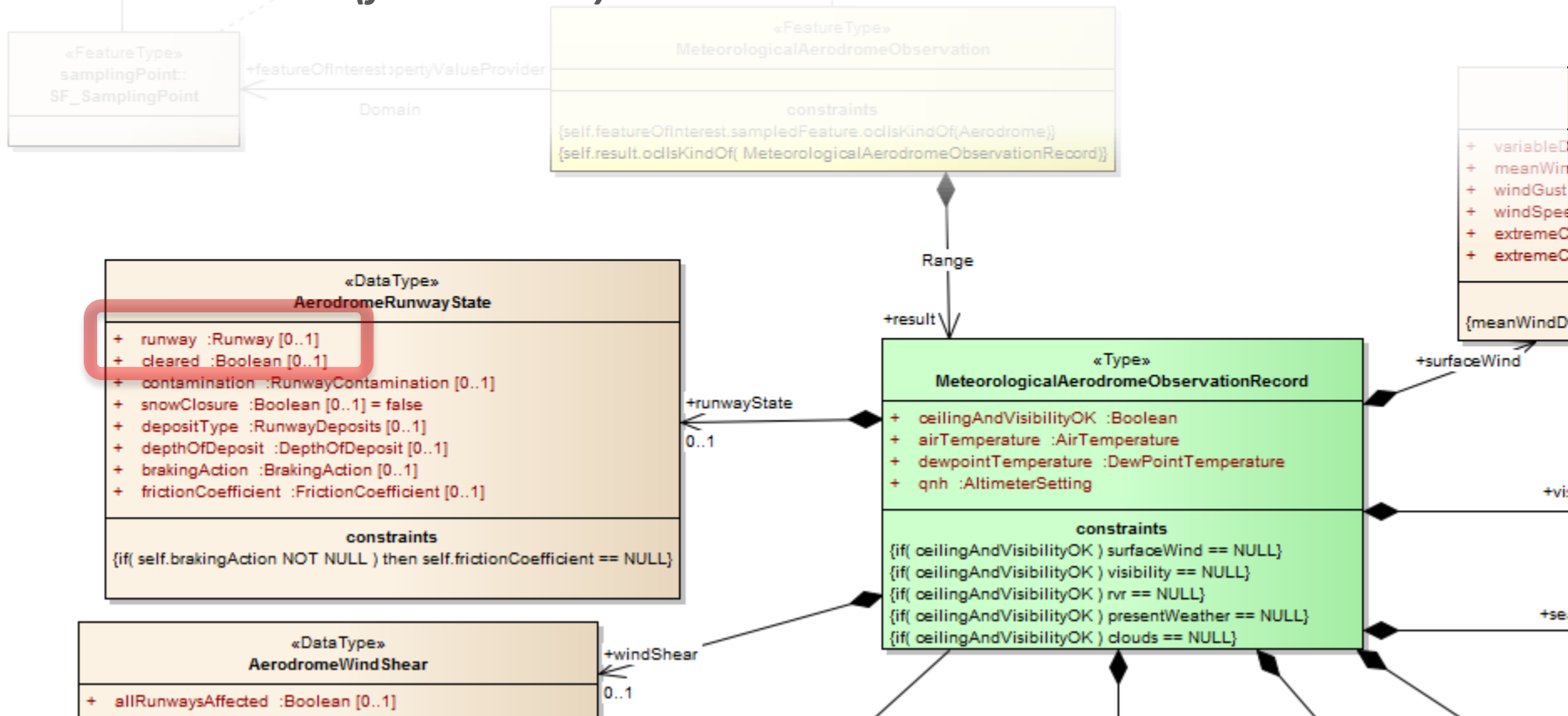




Detailed review of *Record* structure

The properties included within the Record generally are drawn from one of four categories ...

2. An identifiable entity; e.g. 'runway' (from SAF) or 'volcano' (from METCE)

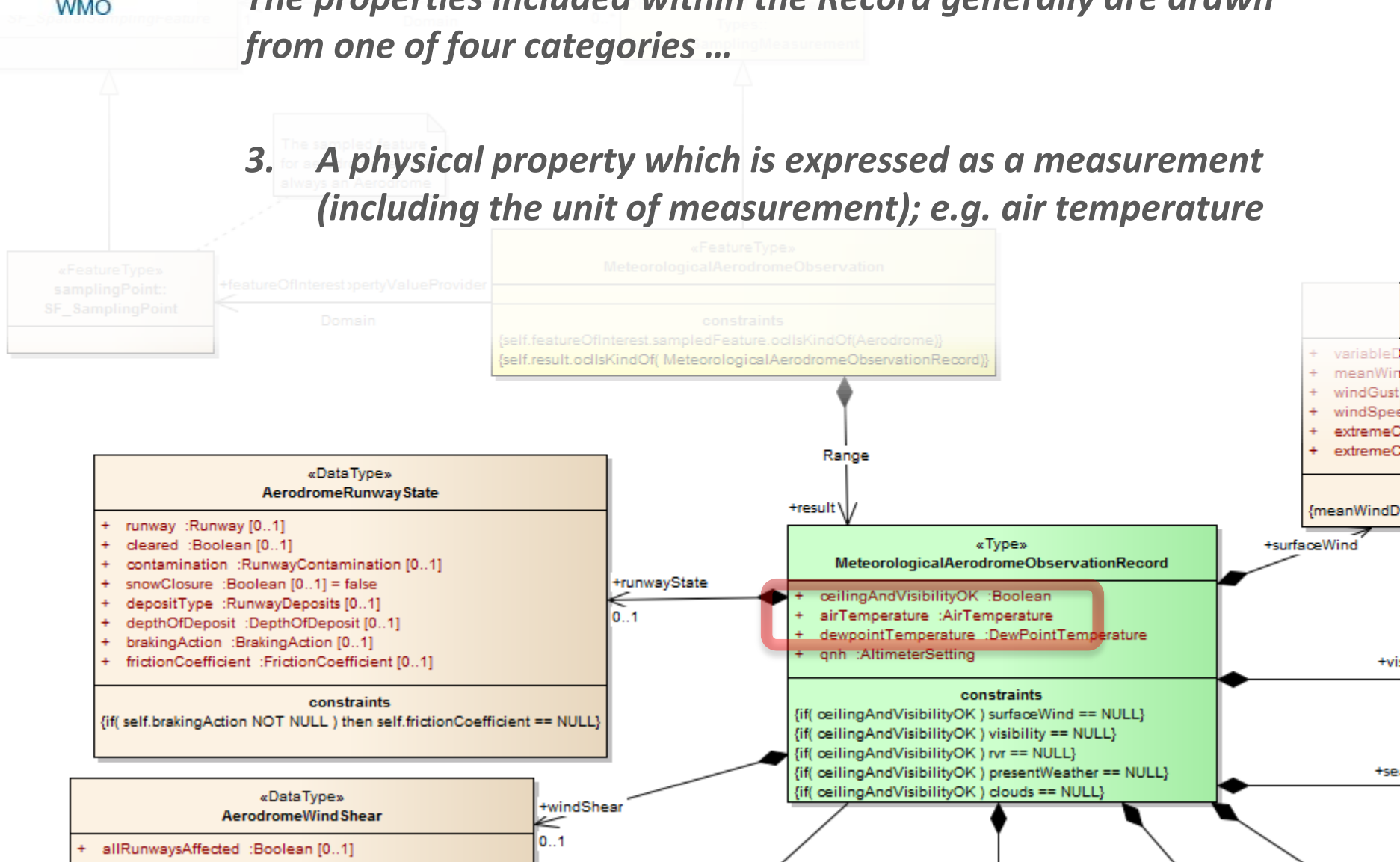




Detailed review of *Record* structure

The properties included within the *Record* generally are drawn from one of four categories ...

3. A physical property which is expressed as a measurement (including the unit of measurement); e.g. air temperature

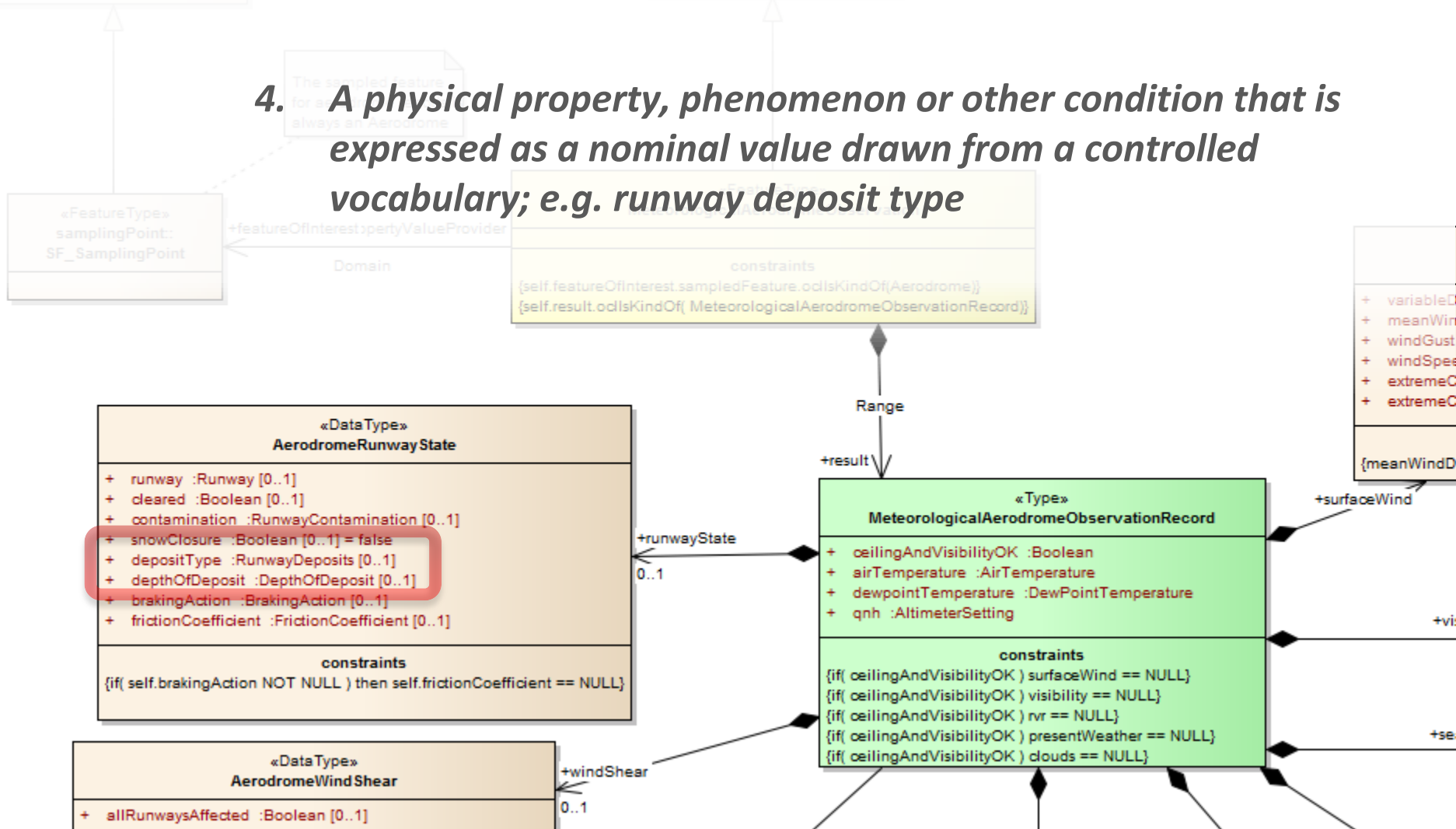




Detailed review of *Record* structure

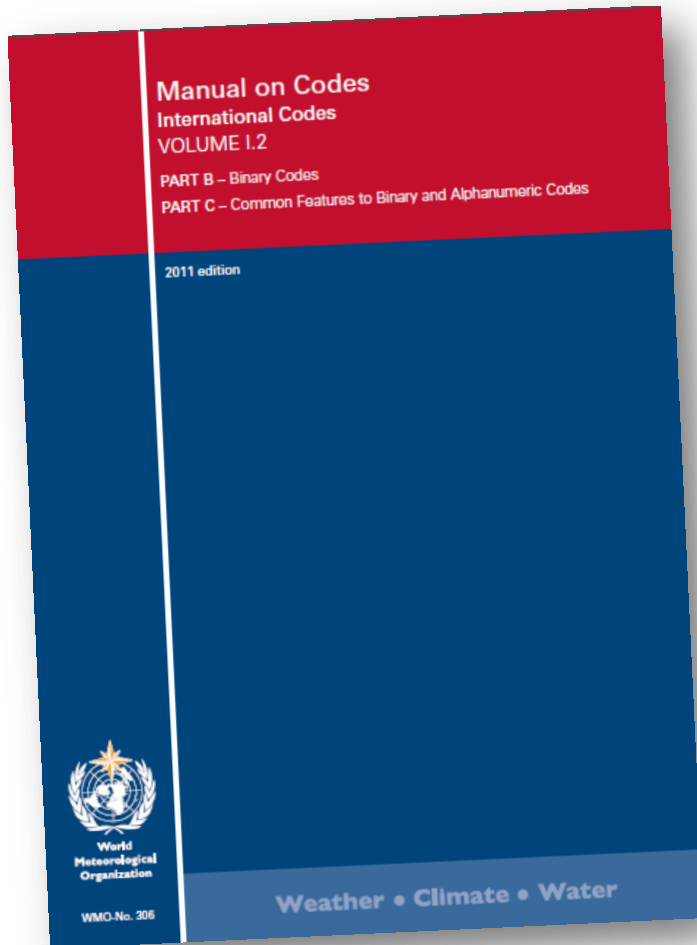
The properties included within the *Record* generally are drawn from one of four categories ...

4. A physical property, phenomenon or other condition that is expressed as a nominal value drawn from a controlled vocabulary; e.g. runway deposit type





Provision of a re-usable palette of physical property classes



WMO already maintains a vast array of property definitions and code-tables in support of the WMO Table-Driven Code Forms (e.g. GRIB and BUFR)

WMO seeks to re-use these existing definitions & code-tables to:

- 1. ensure that the TDCF data-formats are harmonised with this 'model-driven' approach*
- 2. mitigate increases in maintenance effort from maintaining additional data-exchange standards*
- 3. ensure that consistent semantics are employed in Application Schema describing meteorological phenomena.*



Met-basic: meteorological basic types



Geographic Information / Geomatics

Met-basic provides:

- *a palette of quantity value classes specialising Measure (from ISO 19103), or subclasses thereof, for meteorological, hydrological and oceanographic physical properties; and*
- *a palette of «CodeList» classes for expressing nominal values of meteorological, hydrological and oceanographic physical properties.*

These classes describing meteorological, hydrologic and oceanographic quantity values and nominal property values are derived from the WMO code-tables and governed by WMO.

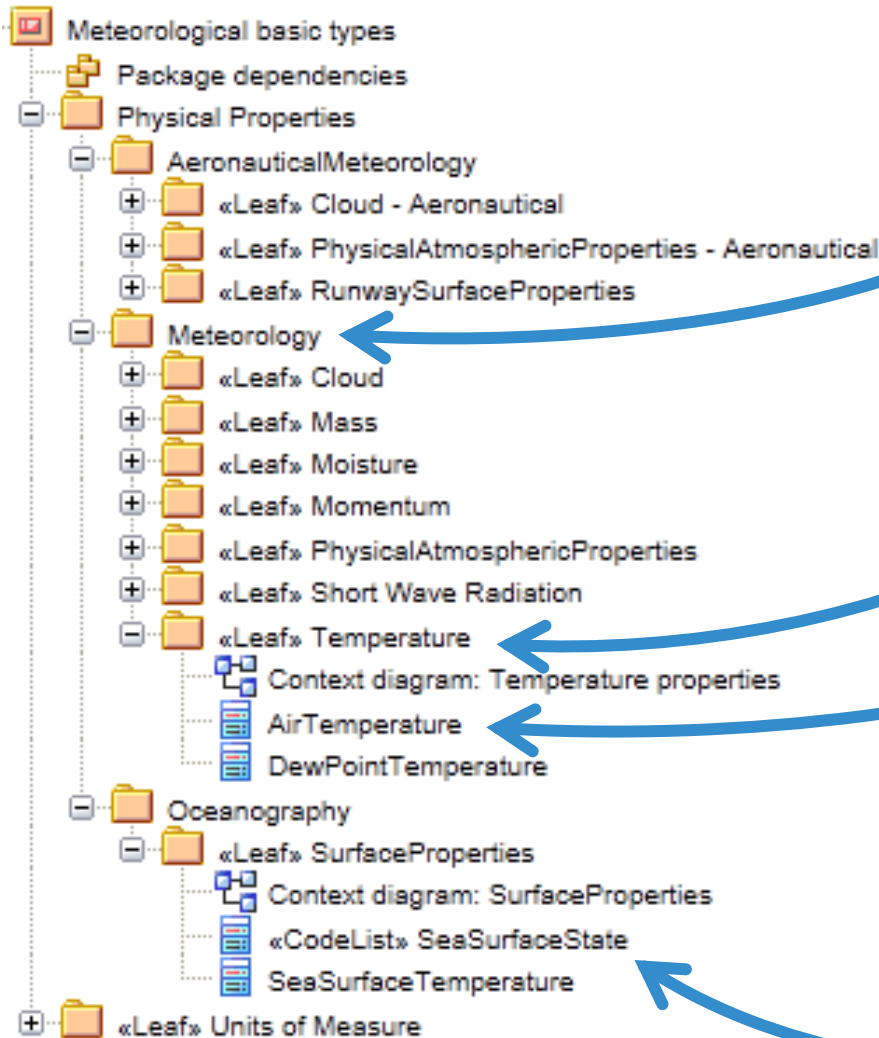
Currently, Met-basic_ONLY_ includes properties required to support International Air Navigation. In future iterations, it is expected that all terms from WMO TDCF will be included.



Met-basic package organisation

The physical properties defined in Met-basic are organised according to the scheme used in WMO FM-92 (GRIB):

discipline | category | parameter



Note: model documentation provides a brief description of each property and identifies the source code-table from the WMO No. 306 Manual on Codes

Met-basic includes an additional “Aeronautical Meteorology” discipline and properties drawn from BUFR (usually relating to code-lists) that have no equivalent in GRIB2 (e.g. sea surface state; BUFR 0 22 061)



Aside: specialisation of Measure (from ISO 19103) – GML encoding extension

The physical properties defined in Met-basic are organised according to the scheme used in WMO FM-92 (GRIB):

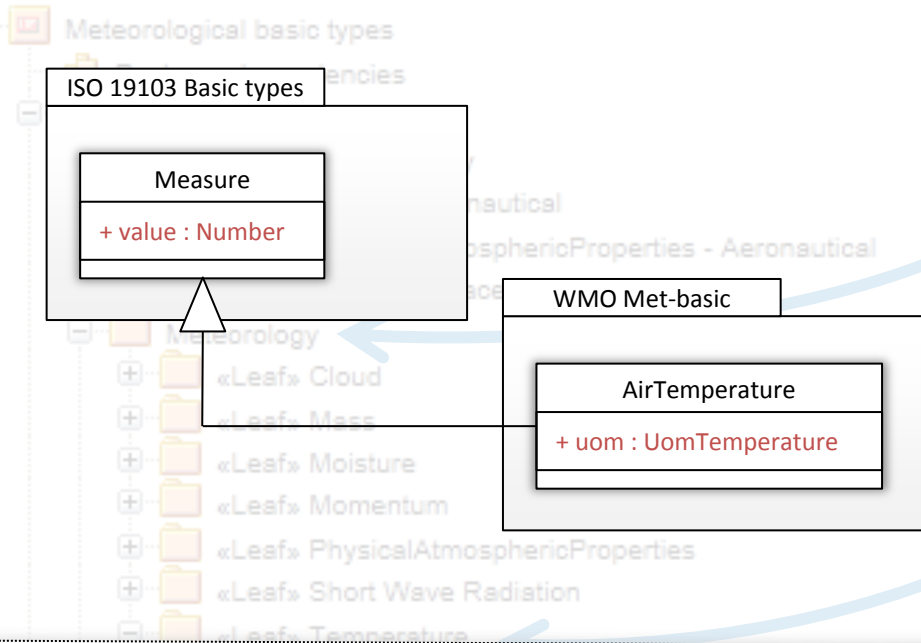
discipline / category / parameter

Quantity-value classes from WMO Met-basic specialise Measure (or sub-types thereof) from ISO 19103.

However, the rules for Application Schema prohibit specialisation of classes from ISO 19103.

Therefore WMO Met-basic is an EXTENSION to standard GML; it is NOT specified as an Application Schema itself.

et-basic includes additional "Aeronautical Meteorology" discipline and properties drawn from BUFR (usually relating code-lists) that have no equivalent in GRIB2 (e.g. sea surface state; BUFR 0 22 061)



```

<complexType name="AirTemperatureType">
  <simpleContent>
    <extension base="gml:MeasureType"/>
  </simpleContent>
</complexType>
  
```





Aside: specialisation of Measure (from ISO 19103) – usage in Application Schema and GML documents

IWXXM METAR/SPECI

«Type»
MeteorologicalAerodromeObservationRecord
+ ceilingAndVisibilityOK : Boolean
+ airTemperature : AirTemperature
+ dewpointTemperature : DewPointTemperature
+ qnh : AltimeterSetting

Within ApplicationSchema referencing meteorological physical properties, use Types from Met-basic in the same way as Measure (and sub-types thereof) from ISO 19103.

```
<complexType name="MeteorologicalAerodromeObservationRecordType">
  <complexContent>
    <extension base="gml:AbstractGMLType">
      <sequence>
        <element name="airTemperature" type="met-basic:AirTemperatureType"/>
        ...
      </sequence>
      <attribute ... />
    </extension>
  </complexContent>
</complexType>
```



```
<iwxxm:airTemperature uom="http://opengis.net/def/uom/UCUM/0/Cel">
  27
</iwxxm:airTemperature>
```



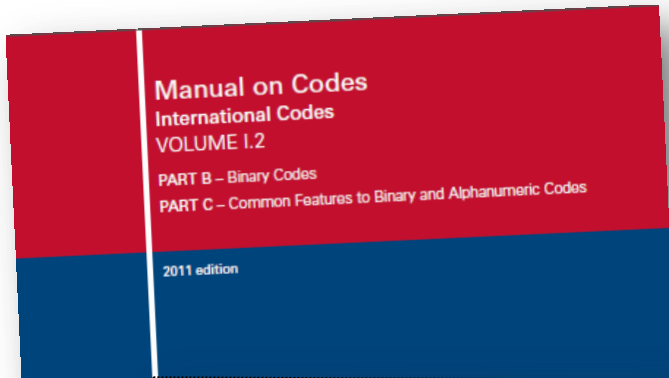


WMO code-tables published as web-accessible resources

To complement the WMO model, terms from WMO Code-tables are in the process of being published as web-accessible resources.

It is anticipated that these web-accessible resources will be available for RC2.

Each code-table and each term will be assigned HTTP URIs which resolve to useful information about those entities; e.g. human-readable web-pages or machine-readable content.



0 20 086

Runway deposits

<http://data.wmo.int/def/bufr4/codeflag/0-20-086>

Operational

Note: at a minimum, a code-list resource will define the members of the code-list

Code figure		
0	Clear and dry	
1	Damp	
2	Wet with water patches	
3	Rime and frost covered (depth normally less than 1 mm)	
4	Dry snow	
5	Wet snow	
6	Slush	
7		
8		
9		
10-14	Reserved	Operational
15	Missing or not reported (e.g. due to runway clearance in progress)	Operational

<http://data.wmo.int/def/bufr4/codeflag/0-20-086/6>

Operational

Operational

Operational



Binding «CodeList» classes to controlled vocabularies

A «CodeList» class is used to indicate that permissible values for a property or attribute are taken from a specific controlled vocabulary governed externally to the model.

Each «CodeList» carries two additional tagged values:

- ***vocabulary***: used to refer to the authoritative list of terms using an HTTP URI. This authoritative list may be implemented as a GML dictionary, SKOS concept scheme etc.
- ***extensibility***: indicates the governance regime applied to evaluation of terms used as values of the <CodeList> class; "none", "narrower" or "any". Basically, "none" implies *ONLY* terms from the specified code list are permitted, "narrower" implies you can use terms with more refined definitions (e.g. narrower semantics), and "any" implies that anything goes and the specified code list is simply a recommendation!

Once published as web-accessible resources, the WMO code-tables can be specified as the controlled vocabulary for «CodeList» classes.

Crucially, note that in line with best practice, «CodeList» resources are managed externally to the model; in this case using existing WMO governance processes.

WMO Met-basic

«CodeList»
RunwayDeposits

tagged values:

vocabulary = "http://data.wmo.int/def/bufr4/codeflag/0-20-086"
extensibility = "none"



Aside: additional tagged values for «CodeList» classes – GML encoding extension

```
<complexType name="RunwayDepositsType">
```

```
<annotation>
```

```
<appinfo>
```

```
<vocabulary> http://data.wmo.int/def/bufr4/codeflag/0-20-086 </vocabulary>
```

```
<extensibility> none </extensibility>
```

```
</appinfo>
```

```
<documentation>
```

Type of deposit on runway. See WMO No. 306: - WMO Code table 0919; and - BUFR Code table 0 20 086

```
</documentation>
```

```
</annotation>
```

```
<complexContent>
```

```
<extension base="gml:ReferenceType"/>
```

```
</complexContent>
```

```
</complexType>
```



Serialisation of «CodeList» classes follows practice from GML 3.3; gml:ReferenceType is used as extension base. Tagged values are included in schema documentation for developer reference.

WMO Met-basic

«CodeList»
RunwayDeposits

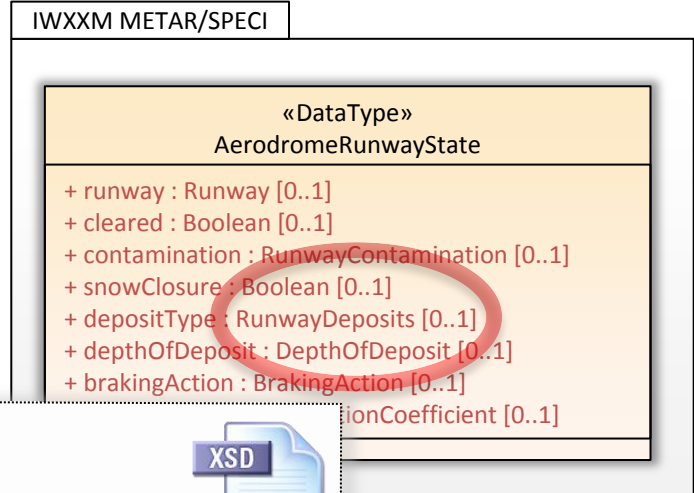
tagged values:

vocabulary = "http://data.wmo.int/def/bufr4/codeflag/0-20-086"
extensibility = "none"



Aside: additional tagged values for «CodeList» classes – usage in Application Schema and GML documents

Within ApplicationSchema referencing meteorological code-tables, use Types from Met-basic. GML documents use XLINK to refer to the terms from the necessary code-table.



```
<complexType name="AerodromeRunwayStateType">
  <sequence>
    ...
    <element name="depositType" type="met-basic:RunwayDepositsType">
      <annotation>
        <documentation>
          The type of runway deposit, such as damp conditions, wet snow, or ice. WMO 306: Table 0919
        </documentation>
      </annotation>
    </element>
    ...
  </sequence>
</complexType>

<iwxxm:depositType
  xlink:href="http://data.wmo.int/def/bufr4/codeflag/0-20-086/1" xlink:title="Damp"/>
```





Validation of code entries within data products

IWXXM Validation Services



***TAF
METAR/SPECI
SIGMET***



Given that each WMO code-table required to support international air navigation services will be published as web-accessible resources, it is anticipated that IWXXM will include the facility to validate that a term given in a data product (e.g. a GML instance of TAF, METAR or SIGMET) IS a member of the appropriate code-list as defined in the conceptual model.



Aside: implementation of constraints as schematron – embedded in XSD documents; *extension to FullMoon*

```
<element name="AerodromeHorizontalVisibility"
  substitutionGroup="gml:AbstractObject" type="iwxxm:AerodromeHorizontalVisibilityType">
  <annotation>
    <documentation> An aggregation of horizontal visibility conditions typically reported together at an aerodrome,
    including the prevailing visibility and minimum visibility. </documentation>
    <appinfo>
      <sch:pattern xmlns:sch="http://purl.oclc.org/dsdl/schematron"
        name="AerodromeHorizontalVisibility1">
        <sch:rule context="//iwxxm:AerodromeHorizontalVisibility">
          <sch:assert
            test="(if( exists(iwxxm:minimumVisibility) ) then exists(iwxxm:minimumVisibilityDirection) else true())">
            AerodromeHorizontalVisibility: Minimum visibility and the direction must be reported together
          </sch:assert>
        </sch:rule>
      </sch:pattern>
    </appinfo>
  </annotation>
</element>
```



IWXXM METAR/SPECI

«DataType»

AerodromeHorizontalVisibility

+ prevailingVisibility : PrevailingVisibility
+ minimumVisibility: VisibilityAero[0..1]
+ minimumVisibilityDirection : Angle [0..1]

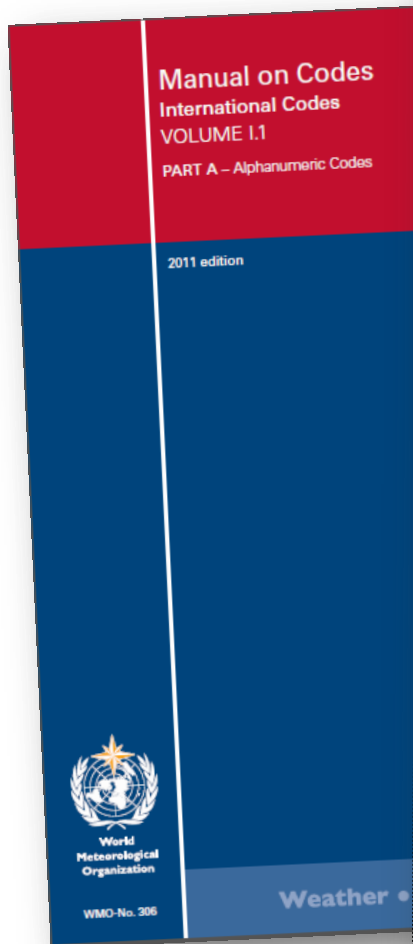
constraints

if(self.minimumVisibility NOT NULL)
minimumVisibilityDirection NOT NULL



WMO No. 306 Vol I.1 Code-table 4678 Significant Weather

Code-table 4678 is organised into 5-categories from which terms can be combined to form appropriate significant weather codes (e.g. +DZSNRA 'Heavy' 'Drizzle', 'Snow' and 'Rain') where meteorologically valid.



4678

w'w' Significant present and forecast weather

QUALIFIER		WEATHER PHENOMENA		
INTENSITY OR PROXIMITY	DESCRIPTOR	PRECIPITATION	OBSCURATION	OTHER
1	2	3	4	5
- Light	MI Shallow	DZ Drizzle	BR Mist	PO Dust/sand whirls (dust devils)
Moderate (no qualifier)	BC Patches	RA Rain	FG Fog	SQ Squalls
+ Heavy (well developed in the case of dust/sand whirls (dust devils) and funnel clouds)	PR Partial (covering part of the aerodrome)	SN Snow	FU Smoke	FC Funnel cloud(s) (tornado or water-spout)
	DR Low drifting	SG Snow grains	VA Volcanic ash	SS Sandstorm
	BL Blowing	IC Ice crystals (diamond dust)	DU Widespread dust	DS Duststorm
VC In the vicinity	SH Shower(s)	PL Ice pellets	SA Sand	
	TS Thunderstorm	GR Hail	HZ Haze	
	FZ Freezing (supercooled)	GS Small hail and/or snow pellets		
		UP Unknown precipitation		

The w'w' groups shall be constructed by considering columns 1 to 5 in the table above in sequence, that is, intensity, followed by description, followed by weather phenomena. An example could be: +SHRA (heavy shower(s) of rain).

Excerpt from WMO No. 306 Vol I.1



WMO No. 306 Vol I.1 Code-table 4678 Significant Weather

Assessment of significant weather codes to determine their validity is complex. As a result, the GML/XML implementation of METAR/SPECI and TAF will use a register of predefined codes for significant weather. Validation of significant weather codes can then be simply achieved by checking whether the term appears on within the register.

The register containing the complete set of valid terms derived from code-table 4678 shall be published by WMO as a web accessible resource. The URI of this register shall be:

<http://data.wmo.int/def/306/4678>

Each of the valid significant weather codes will also be assigned an HTTP URI within the namespace of the register using familiar codes for the significant weather terms; e.g.

(light) 'drizzle': <http://data.wmo.int/def/306/4678/-DZ>

(moderate) 'drizzle': <http://data.wmo.int/def/306/4678/DZ>

(heavy) 'drizzle': <http://data.wmo.int/def/306/4678/+DZ>

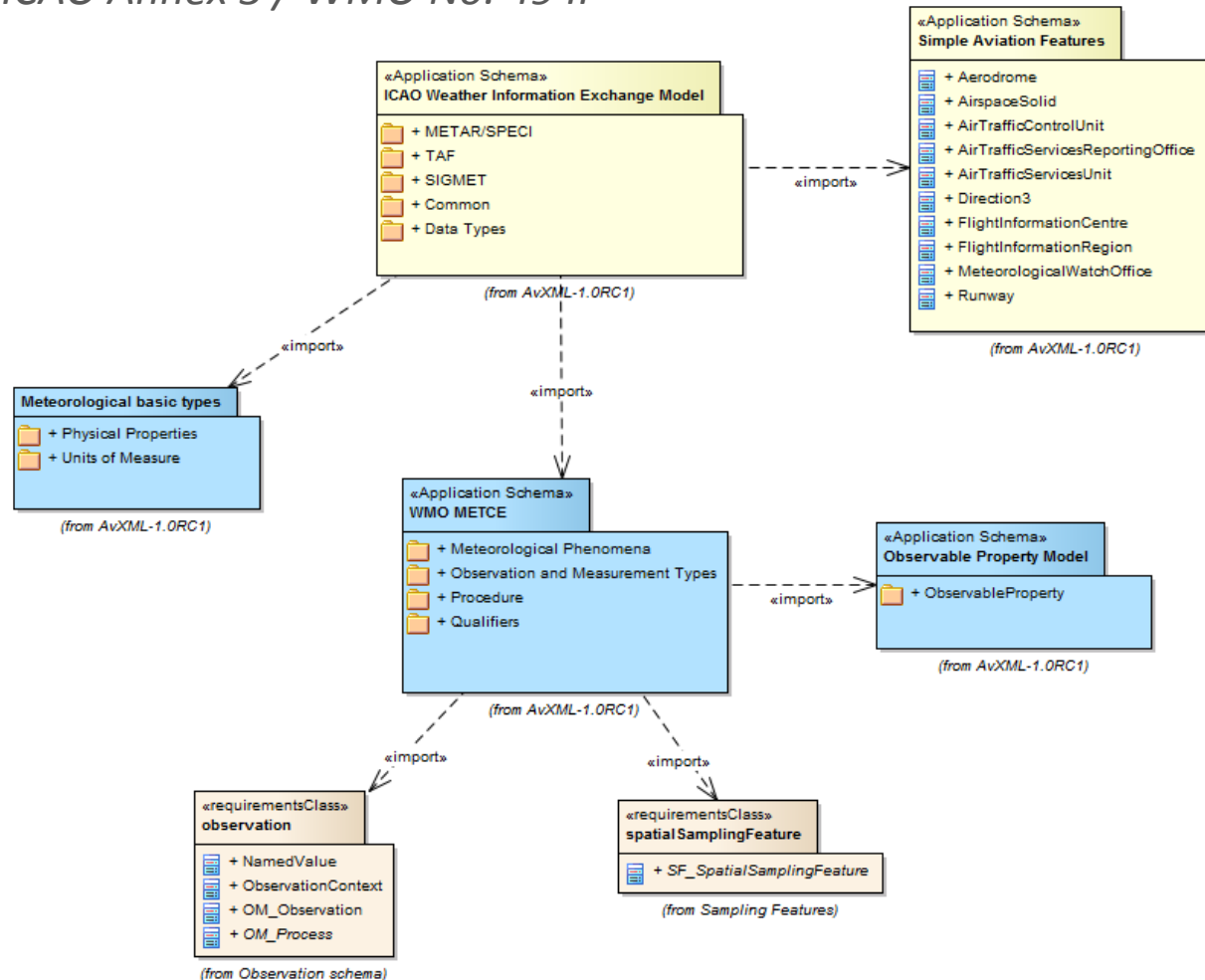
(moderate) 'showers' 'in vicinity': <http://data.wmo.int/def/306/4678/VCSH>

PLEASE [HELP DETERMINE THE COMPLETE SET OF VALID COMBINATIONS](#)



AvXML 1.0RC1 model overview

Please use the [HTML documentation](#), [EA Project file](#) or [XML export](#) to browse the remaining aspects of the model – paying particular attention to how the components from IWXXM implement the technical regulation from ICAO Annex 3 / WMO No. 49 II





Worked example 1: XML encoded simple METAR

METAR FOR KARLOVY VARY AIRPORT, MIDDAY 25-JULY-2007




Worked example 2: XML encoded VA SIGMET

*VA SIGMET FOR SHANWICK OCEANIC FLIGHT INFORMATION
REGION, 16:00Z 25-MONTH-YEAR*



AvXML 1.0 standard development schedule



- [1st Feb 2013] *1.0RC1 review closes* 
- [1-8 Feb 2013] *1.0RC1 feedback clarification*
- [Feb-Mar 2013] *Amendments incorporated for 1.0RC2*
- [Mar 2013] *1.0RC2 published for review*

Note that further information and training sessions are planned for the '4th Workshop on the use of GIS in meteorology' to be hosted at ECMWF, Reading, UK in early March 2013

- [July 2013] *AvXML 1.0 published*



Any questions?

AvXML 1.0RC1 release page:

<http://www.wmo.int/pages/prog/www/WIS/wiswiki/tiki-index.php?page=METCE-1.0RC1>

Please provide your AvXML 1.0RC1 feedback and comments to the [CBS-TT-AvXML Google Group](#)

comments on AvXML 1.0RC1 should be submitted to the Google group using a subject line beginning with the text “[1.0RC1-feedback]”





Thank you

READ request for '0-20-086':



```
GET /def/bufr4/codeflag/0-20-086 HTTP/1.1
Host: data.wmo.int
Accept: application/ld+json,application/json
Accept-Language: en-gb
```

```
HTTP/1.1 200 OK
Date: Sat, 24-Nov-2012 21:18:41 GMT
Last-Modified: Sat, 24-Nov-2012 20:47:03 GMT
Content-type: application/ld+json
```

```
{
  "@context": {
    "reg": "http://purl.org/linked-data/registry#",
    "rdfs": "http://www.w3.org/2000/01/rdf-schema#",
    "owl": "http://www.w3.org/2002/07/owl",
    "dct": "http://purl.org/dc/terms/",
    "skos": "http://www.w3.org/2004/02/skos/core#"
  },
  "@graph": [
    {
      "@id": "http://data.wmo.int/def/bufr4/codeflag/0-20-086",
      "@type": [
        "reg:Register",
        "skos:ConceptScheme"
      ],
      "rdfs:label": {
        "@value": "Runway deposits (Scheme)",
        "@language": "en"
      },
      "dct:description": {
        "@value": "BUFR Code-table 0-20-086: Runway deposits.",
        "@language": "en"
      },
      "reg:inverseMembershipPredicate": "skos:inScheme",
      "reg:containedItemClass": "http://data.wmo.int/def/bufr4/b/20/086",

```

READ request for item #6 within '0-20-086':



```
GET /def/bufr4/g/0-20-086/6 HTTP/1.1
Host: data.wmo.int
Accept: application/ld+json,application/json
Accept-Language: en-gb
```

```
HTTP/1.1 200 OK
Date: Sat, 24-Nov-2012 22:37:59 GMT
Last-Modified: Sat, 24-Nov-2012 22:26:09 GMT
Content-type: application/ld+json
```

```
{
  "@context": {
    "reg": "http://purl.org/linked-data/registry#",
    "rdfs": "http://www.w3.org/2000/01/rdf-schema#",
    "owl": "http://www.w3.org/2002/07/owl",
    "dct": "http://purl.org/dc/terms/",
    "skos": "http://www.w3.org/2004/02/skos/core#",
    "wmo": "http://data.wmo.int/def/bufr4/core#",
    "xsd": "http://www.w3.org/2001/XMLSchema#"
  },
  "@id": "http://data.wmo.int/def/bufr4/codeflag/0-20-086/6",
  "@type": "http://data.wmo.int/def/bufr4/b/20/086",
  "skos:prefLabel": {
    "@value": "Slush",
    "@language": "en"
  },
  "skos:definition": {
    "@value": "Snow or ice on the ground that has been reduced to a soft watery mix",
    "@language": "en"
  },
  "skos:topConceptOf": "http://data.wmo.int/def/bufr4/codeflag/0-20-086",
  "skos:inScheme": "http://data.wmo.int/def/bufr4/codeflag/0-20-086"
}
```

