

Water Quality is Known

Silvano Pecora, Vice-President of the WMO Infrastructure Commission

WEATHER CLIMATE WATER

WMO LONG-TERM AMBITIONS LONG-TERM FOR THE OPERATIONAL HYDROLOGICAL COMMUNITY

The Congress approved eight long-term ambitions that should guide the development of WMO activities relevant to water:

1. No one is surprised by a flood;
2. Everyone is prepared for drought;
3. Hydro-climate and meteorological data support the food security agenda;
4. High-quality data supports science;
5. Science provides a sound basis for operational hydrology;
6. We have a thorough knowledge of the water resources of our world;
7. Sustainable development is supported by information covering the full hydrological cycle;
8. **Water quality is known.**

International Standardization for Water Data

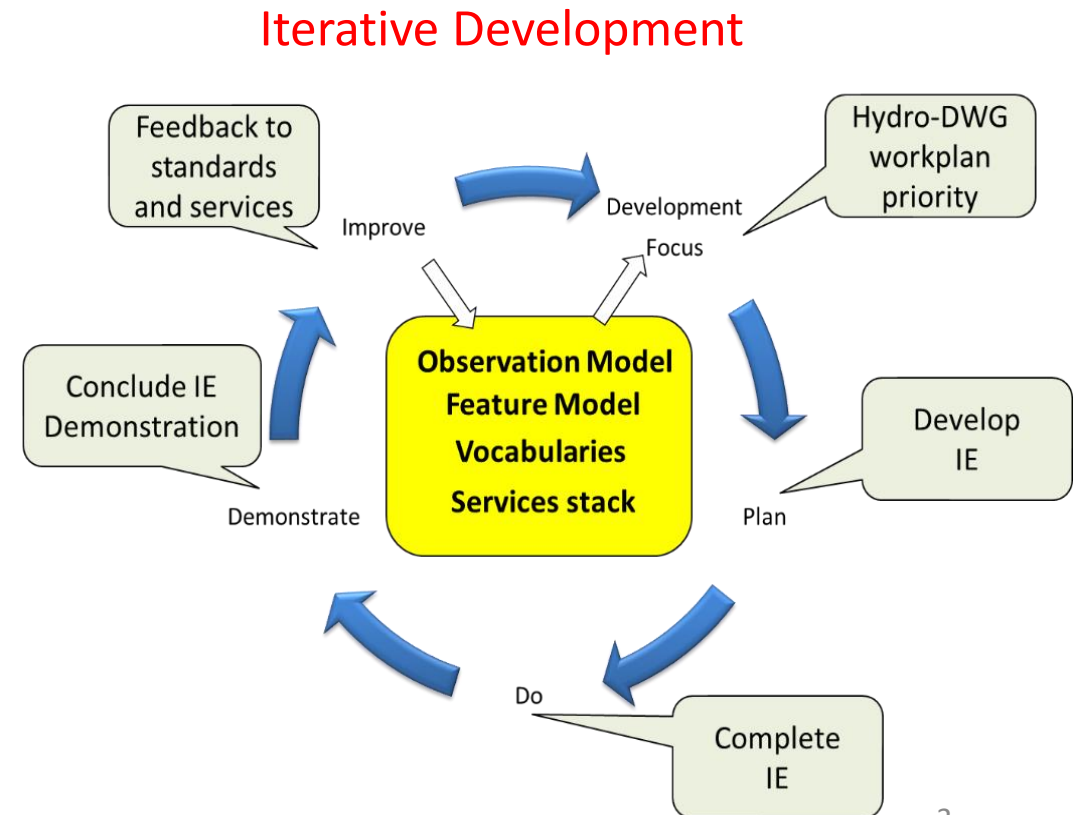
OGC-WMO Hydrology Domain Working Group

- standards for water data: **WaterML 2.0 suite**
- organizing Interoperability Experiments (IEs) focused on different sub-domains of water

Chairs:

- Tony Boston (Australia)
- Silvano Pecora (Italy)
- David Blodgett (USA)

http://external.opengis.org/twiki_public/bin/view/HydrologyDWG/WebHome



WaterML2.0 standards



Part 1 -
Timeseries



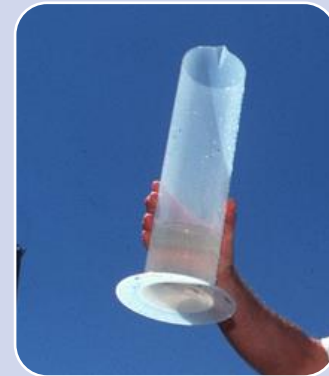
Part 2 –
Ratings,
Gaugings and
Sections



Part 3 –
Surface
water
features



Part 4 –
Groundwater

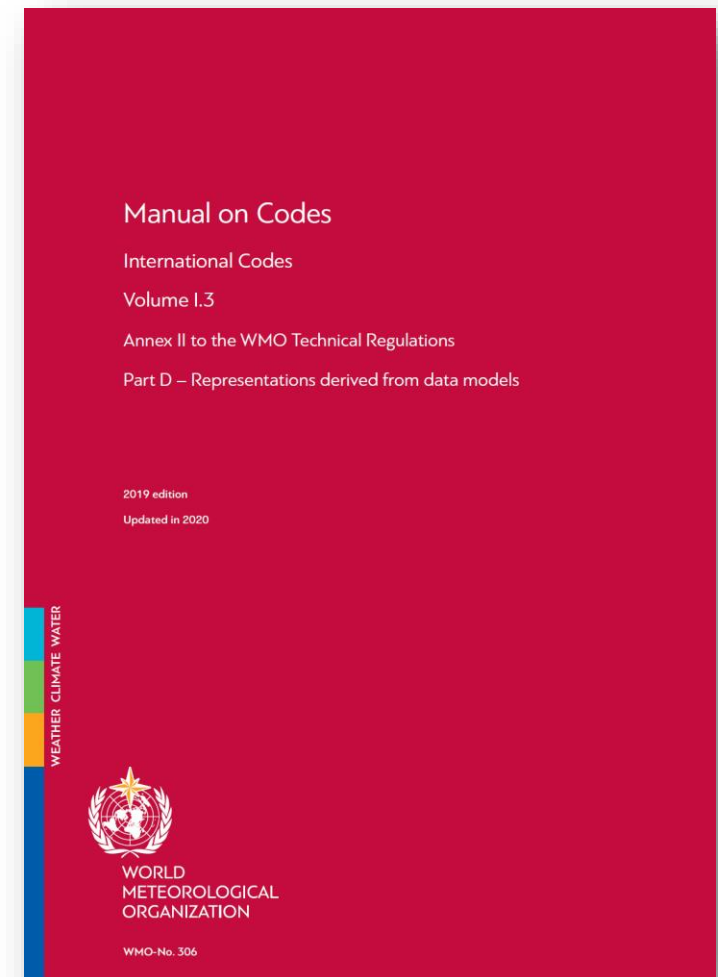


Part 5 –
Water quality

ADOPTIONS by OGC and WMO

- **OGC** adopted WaterML2 Part1 – Timeseries in February 2014, WaterML2 Part2 - Ratings, Gaugings and Sections in February 2016, the conceptual model WaterML2 Part3 - Surface Hydrology Features in January 2018, WaterML2 Part 4 - GroundWaterML2 in March 2017
- **WMO** formally adopted WaterML2 Part 1, 2 & 4 standards

https://library.wmo.int/?lvl=notice_display&id=19508#.YAakp-hKjSI



WATERML-WQ – AN INFORMATION MODEL AND DATA TRANSFER FORMAT FOR WATER QUALITY DATA

B.A. SIMONS & S.J.D. COX

Environmental Information Systems, CSIRO, Highett, Australia

The OGC Observations and Measurements (O&M) standard provides a domain neutral information model and XML schema for observation metadata. WaterML 2.0 – Part 1 (WaterML) specializes O&M for application to water monitoring time-series, by defining some specific data types and rules for the observation result. In WaterML-WQ we further constrain both WaterML and O&M for application to water quality observations by specifying that:

- (a) the observation feature of interest shall be relevant to the water domain, and
- (b) the observed property shall be taken from a vocabulary designated by a water or environmental monitoring agency.

Both constraints require these two properties to appear in a data instance as a reference to an external resource, denoted by a URI. For WaterML-WQ the constraint is expressed in terms of a fixed URI pattern. This requires that valid observable-property vocabularies and features of interest must be registered.

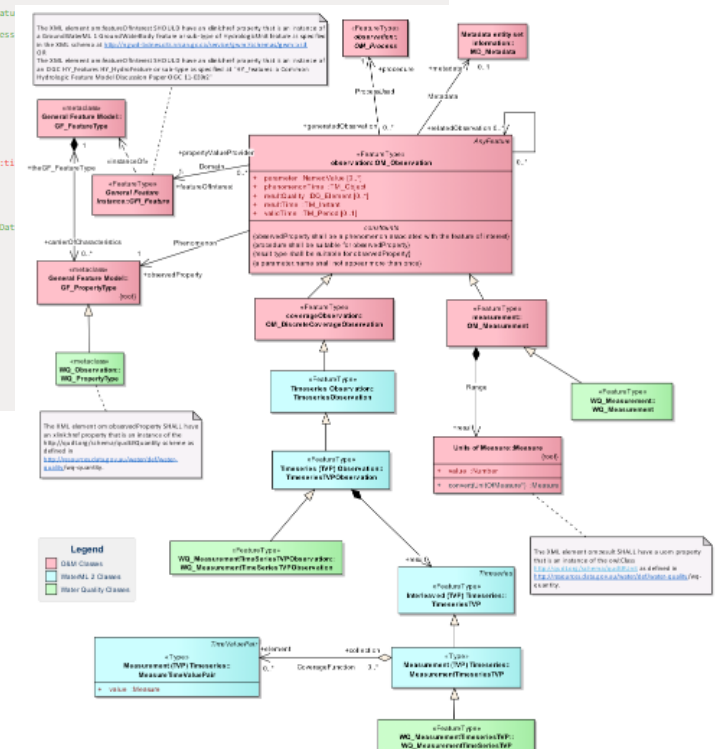
Following the standard OGC methodology, WaterML-WQ has been specified as a set of requirements and conformance tests and classes, and the information model specified in UML. In WaterML-WQ no new feature-properties are introduced, as all specializations are constraints on existing properties. Therefore, the XML implementation of WaterML-WQ is specified as rules applied to the O&M and WaterML XML implementations, expressed using Schematron.

WIGOS, WHOS, WIS and WQ



```

<wml:collection
xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
xmlns:gml="http://www.opengis.net/gml/3.2"
xmlns:xi="http://www.w3.org/1999/xlink"
xmlns:wml2="http://www.opengis.net/waterml/2.0"
xmlns:swe="http://www.opengis.net/swe/2.0"
xmlns:om="http://www.opengis.net/om/2.0"
xmlns:sam="http://www.opengis.net/sampling/2.0"
xmlns:sams="http://www.opengis.net/samplingSpatial/2.0"
xmlns:gco="http://www.isotc211.org/2005/gco"
xmlns:gmd="http://www.isotc211.org/2005/gmd"
xsi:schemaLocation="http://www.opengis.net/waterml/2.0 http://schemas.opengis.net/waterml/2.0/waterml2.xsd"
gml:id="xsd-collection-example">
  <gml:description>Example collection for XML encoding http://www.opengis.net/spec/waterml/2.0/req/xsd-collection. time series observation of water temperature.</gml:description>
  <wml:metadata>
    <wml:DocumentMetadata gml:id="document-metadata.1">
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      <wml:generationSystemManual/>
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      <wml:profile xlink:href="http://www.opengis.net/spec/waterml/1.0/conf/typ-measurement"/>
      <wml:profile xlink:href="http://www.opengis.net/spec/waterml/1.0/conf/typ-observation"/>
      <wml:profile xlink:href="http://www.opengis.net/spec/waterml/2.0/conf/xsd-featu">
      <wml:profile xlink:href="http://www.opengis.net/spec/waterml/2.0/conf/xsd-observation-process">
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  </wml:metadata>
  <wml:temporalExtent>
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  </wml:temporalExtent>
  <wml:samplingContextMember>
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      </gml:pos>
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      </gml:point>
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          <wml:zoneAbbreviation>AEDT</wml:zoneAbbreviation>
        </wml:timeZone>
      </wml:timeZone>
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  <wml:observationMember>
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      <gml:identifier codeSpace="http://www.example.com/observations">EX.OB.8.1</gml:identifier>
      <com:metadata>
        <wml:OB_SensorMetadata>
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    </com:OB_Observation>
  </wml:observationMember>
  </wml:collection>
  
```



DEFINING A WQ ROADMAP AT WMO



**Interoperability
Experiment**



Standardization



WQ DATA SHARING



Workshop Series on Water Quality Monitoring – Opening Workshop



Thank you!

WEATHER CLIMATE WATER

