An extensible model for describing real world properties in observational contexts.

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Introduction

Many, if not all, scientific domains have controlled vocabularies for the ***real-world properties*** that they observe or model. We can refer generically to these terms as *Observable Properties*.

- "**Observable Properties**" may be:
  - **physical** property (such as temperature, length, etc.)
  - a **classification** (such as species)
  - **frequency** or **count**
  - **existence** indication

- **Governance** and **format** of vocabularies **varies** between communities
- Harmonisation often not desirable.
- Need for **reference** and **reuse** within **common metadata frameworks**
- Need for **composition** and **constraints**
- *We propose a mechanism for applying constraints to observable properties in **particular data instances**, **complementing** existing community vocabs such as SWEET ontology, or CF standard names.*

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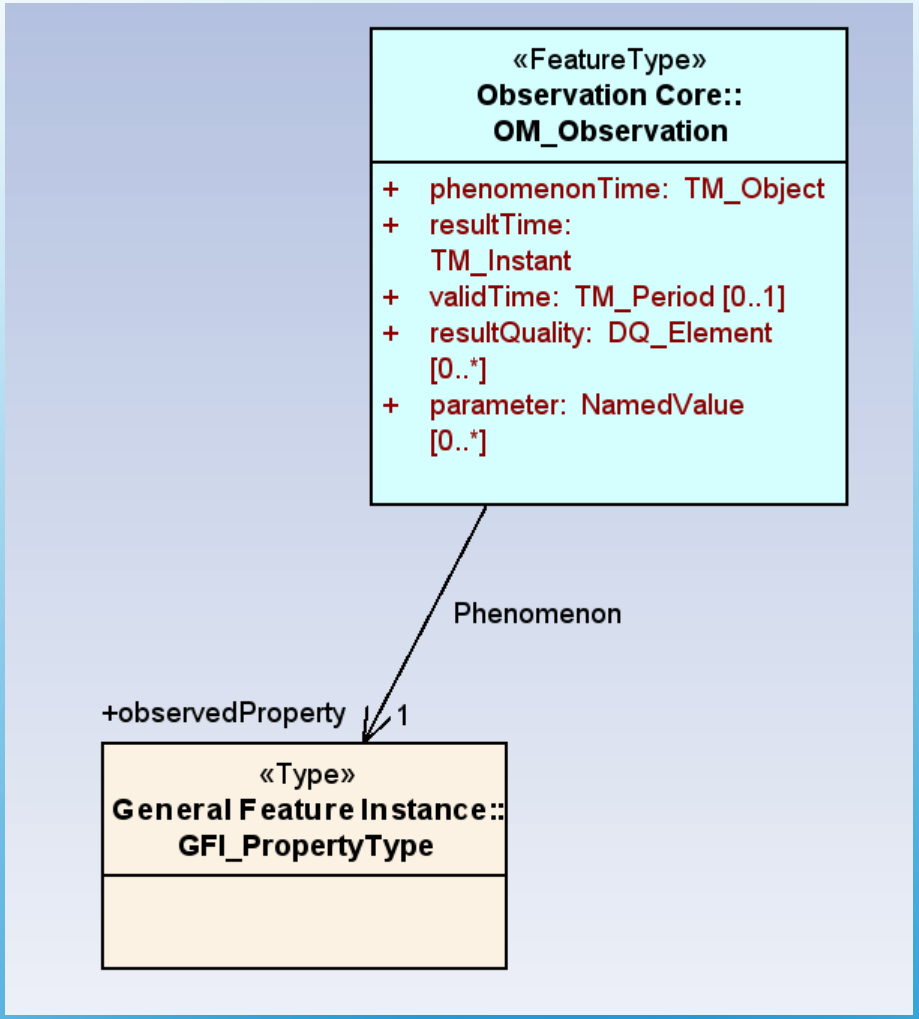
Evolution of ObservableProperty model.

- Original OGC 'Phenomenon' model developed in early versions of O&M/SWE Common
- Based on GML:Dictionary
- This iteration reviews some of the key concepts.
- Removes dependency on GML, making it more generic
- Provides conceptual model, which could be implemented using different mechanisms
- Exploring xml-schema implementation in separate namespace.

ISO 19156 Observations and Measurements: observedProperty



An **observation** is an act that results in the **estimation** of the **value** of a **feature property**.

Examples might include:

Temperature
Precipitation
Radiance
Species
Mass

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Mismatch between 'static' vocabularies and data instances.

Controlled Vocabulary

Temperature
Precipitation
Radiance
Etc...

Contains reuseable terms that can be catalogued and governed in a scaleable way.

Data Instance

Temperature at 2m above ground level.

Precipitation where type = “snow”

Radiance where wavelength = 1000 to 2000 nm

Instance data is specific to particular observing strategies – not always scalable to catalogue all terms individually.

Mismatch between 'static' vocabularies and data instances.

Controlled Vocabulary

Temperature
Precipitation
Radiance
Etc...

Contains reuseable terms that can be catalogued and governed in a scaleable way.

Data Instance

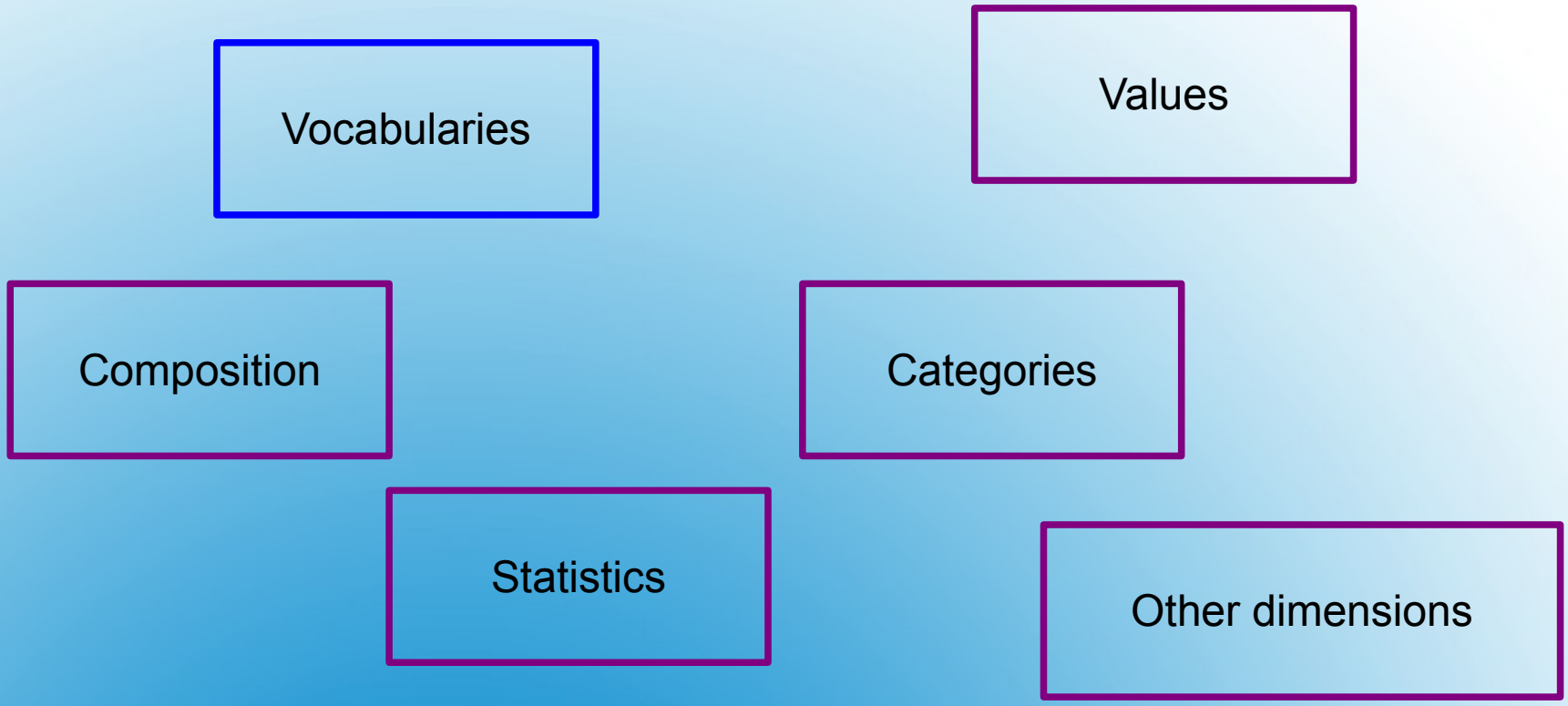
Temperature at 3m above ground level.

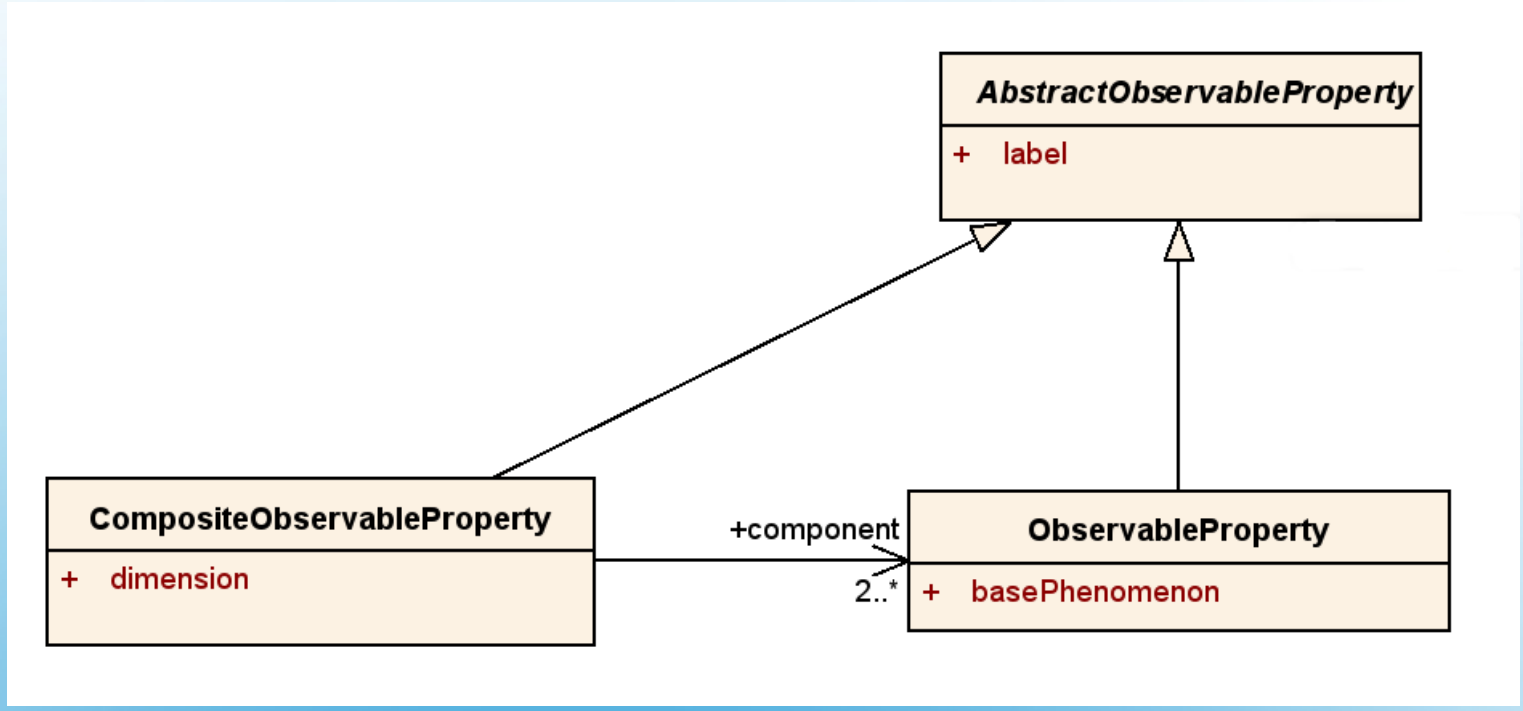
Precipitation where type = "rain"

Radiance where wavelength = 1050 to 2050 nm

Instance data is specific to particular observing strategies – not always scalable to catalogue all terms individually.

Need to construct 'Observed Properties' in terms of vocabulary definitions *and other factors*.





Simple & Composite Definitions

```
302035          (Basic synoptic "instantaneous" data)
        302032  Temperature and humidity data
        302033  Visibility data
        302034  Precipitation past 24 hours
        007032  Height of sensor above local ground (set to missing to cancel the previous value)
        302004  Cloud data
        101000  Delayed replication
        031001  Delayed descriptor replication factor
        302005  Individual cloud layer or mass
```

BUFR (Meteorology) Composite Example

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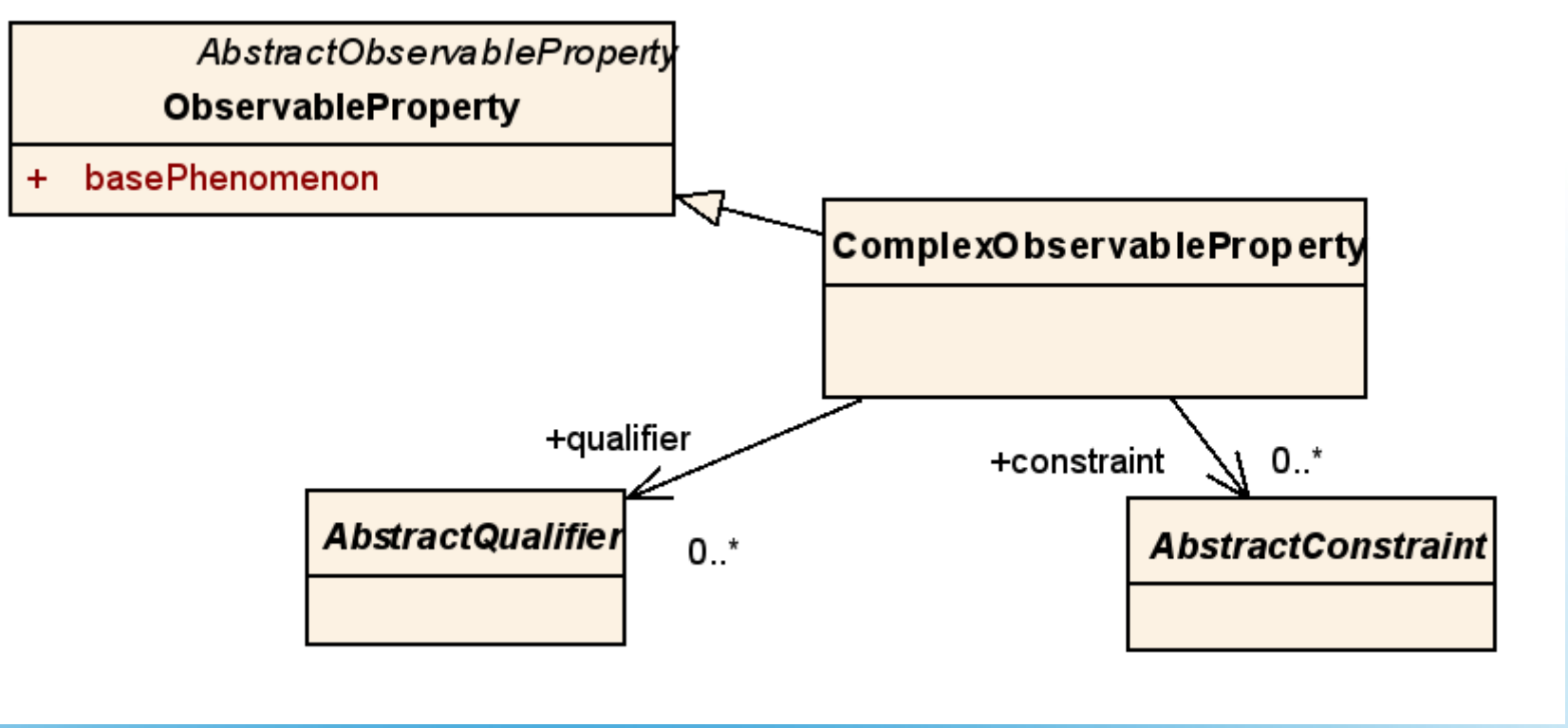
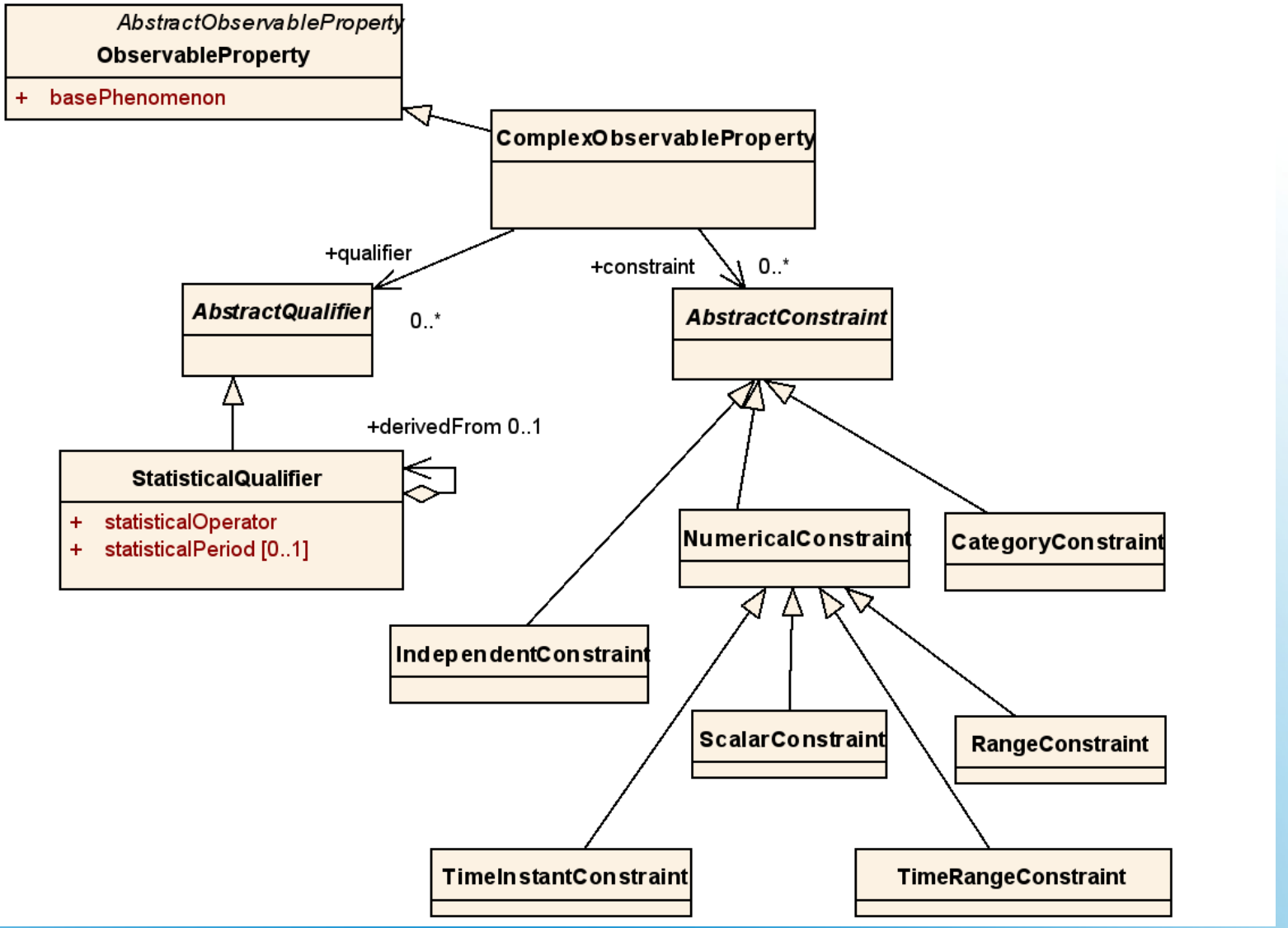


Complex Observable Properties



Types of Constraint

Types of Qualifier

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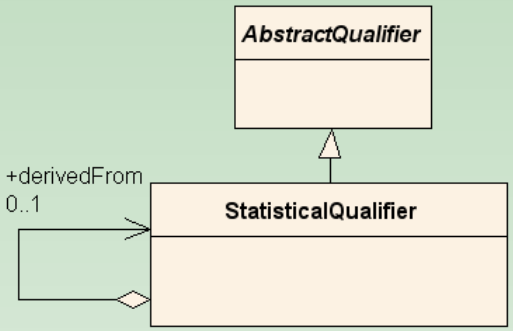
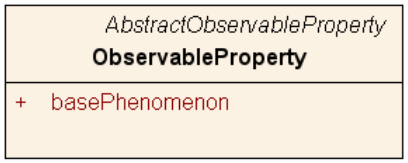
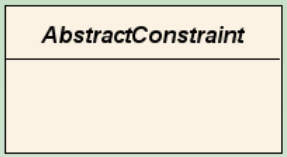
Illustrative examples

.	Statistical Qualifiers	Base Phenomenon	Constraints
			
Maximum Daily Temperature:	**MAX over DAY**	**TEMPERATURE**	
Hourly accumulated snowfall:	**SUM over HOUR**	**PRECIPITATION**	**PRECIPITATIONTYPE = SNOW**
Near-infrared radiation:		**RADIANCE**	**WAVELENGTH= range(700 nm, 1400 nm)**
Monthly Mean Maximum Temperatures	**MEAN over MONTHS derivedFrom MAX over DAYS**	**TEMPERATURE**	
Probability Temperature Exceeeds 30 degrees C	**PROBABILITY**	**TEMPERATURE**	**TEMPERATURE > 30C**

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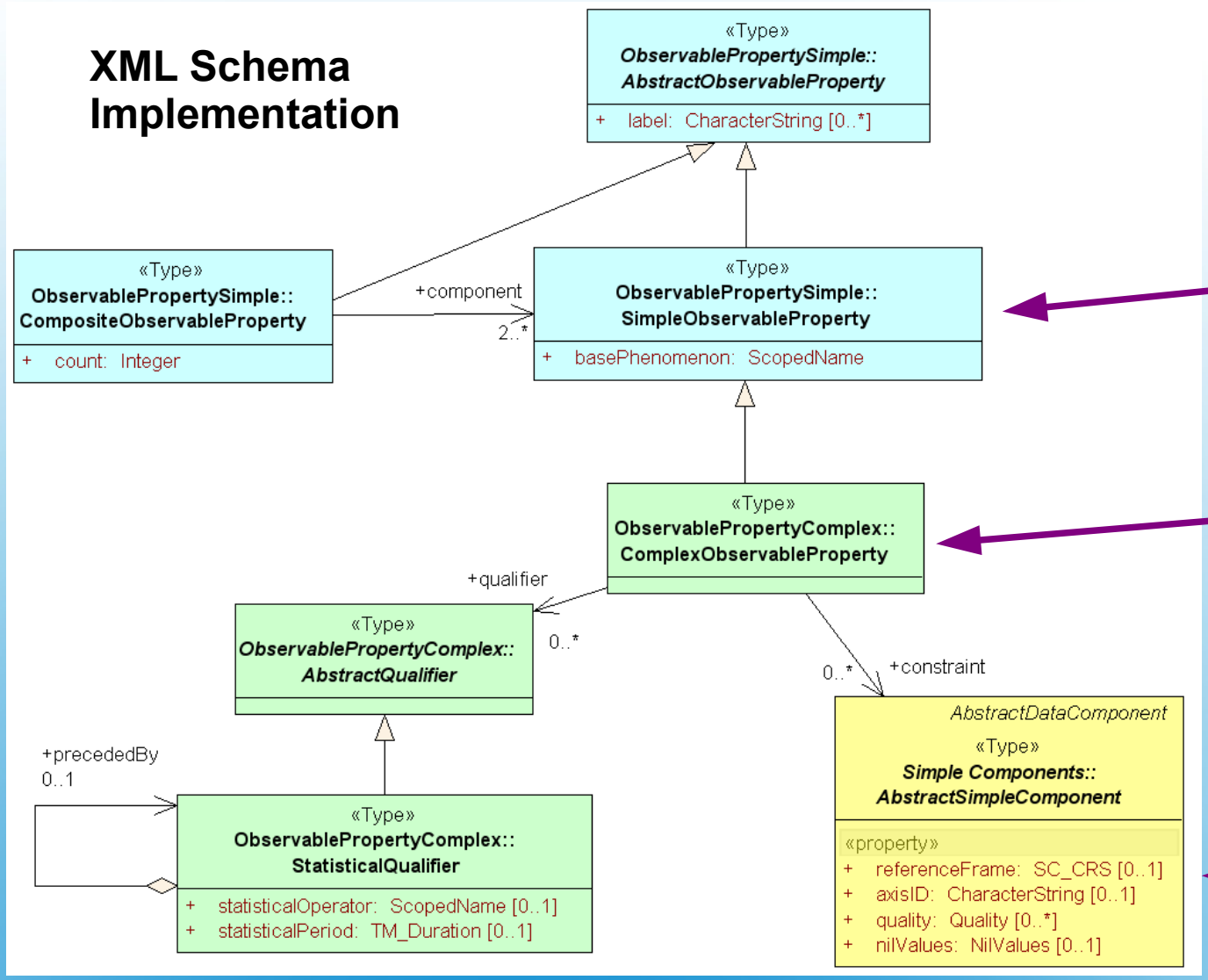
XML Schema Implementation



opSimple.xsd

imports

opComplex.xsd

imports

SWE Common
simple_components.xsd

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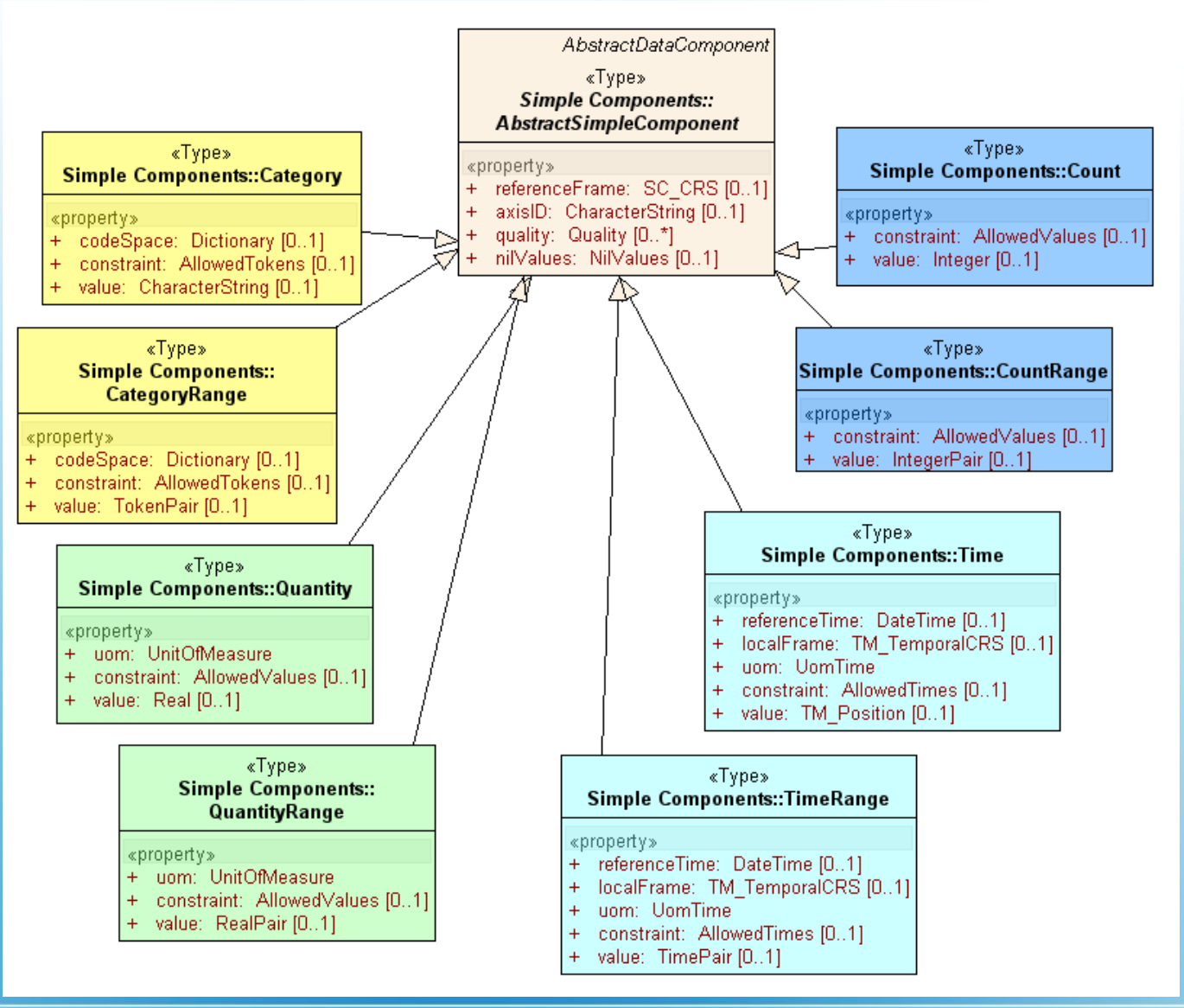

SWE Common

(OGC Standard)

SimpleComponents can be used to express Constraints

Related Work: CF (Climate & Forecast) Common Concepts.

Common Concept: {gfdl.noaa.gov}high_cloud
Defined as:

```
dimensions:
    hgt=1;
variables:
    float x(unconstrained);
        x:standard_name:"cloud_area_fraction" ;
        x:units="1";
        x:coordinates="height + unconstrained";
        x:common_concept:"{gfdl.noaa.gov}high_cloud;tbd";
    float height (unconstrained);
        height:units="m";
        height:valid_min=7000.;
        height:valid_max=14000.;
```

Similar requirement to express definitions in terms of base and 'constraints'

ObservableProperty model provides possible mechanism for management of common concepts in XML based vocabulary services

https://cf-pcmdi.llnl.gov/trac/ticket/24

Next Steps:

- Refine model within OGC SWE Common WG
- Complete XML Schema implementation
- Discuss and review within OGC MetOcean DWG

Feedback, contributions welcome!
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UML, Schemas:
http://proj.badc.rl.ac.uk/csml/browser/observableproperty

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