

Implementing SensorThings in the Theia/OZCAR Information System

Charly Coussot (1,2), Véronique Chaffard (2), Mario Adam (3), Sylvain Grellet (4), Hervé Squividant (3)

- 1) OSUG - Observatoire des Sciences de l'Univers, Grenoble, France
- 2) IGE - Institut des Géosciences de l'environnement, Grenoble, France
- 3) SAS - Sol Agro et hydrosystème Spatialisation, Institut Agro, INRAE, Rennes, France
- 4) BRGM - Bureau de Recherches Géologiques et Minières, Orléans, France





French continental surface data
Pole Theia
In situ



21 long term observatories, 21 Information Systems
Heterogeneous data (more than 400 variables)



Common Theia/OZCAR Information System

- Making all in-situ data on continental surfaces visible on a single portal
- Facilitating the discovery, access and reusability of data + interoperability according to international standards and thesauri (interdisciplinary needs)
- A system interoperable with the information systems (IS) under construction:



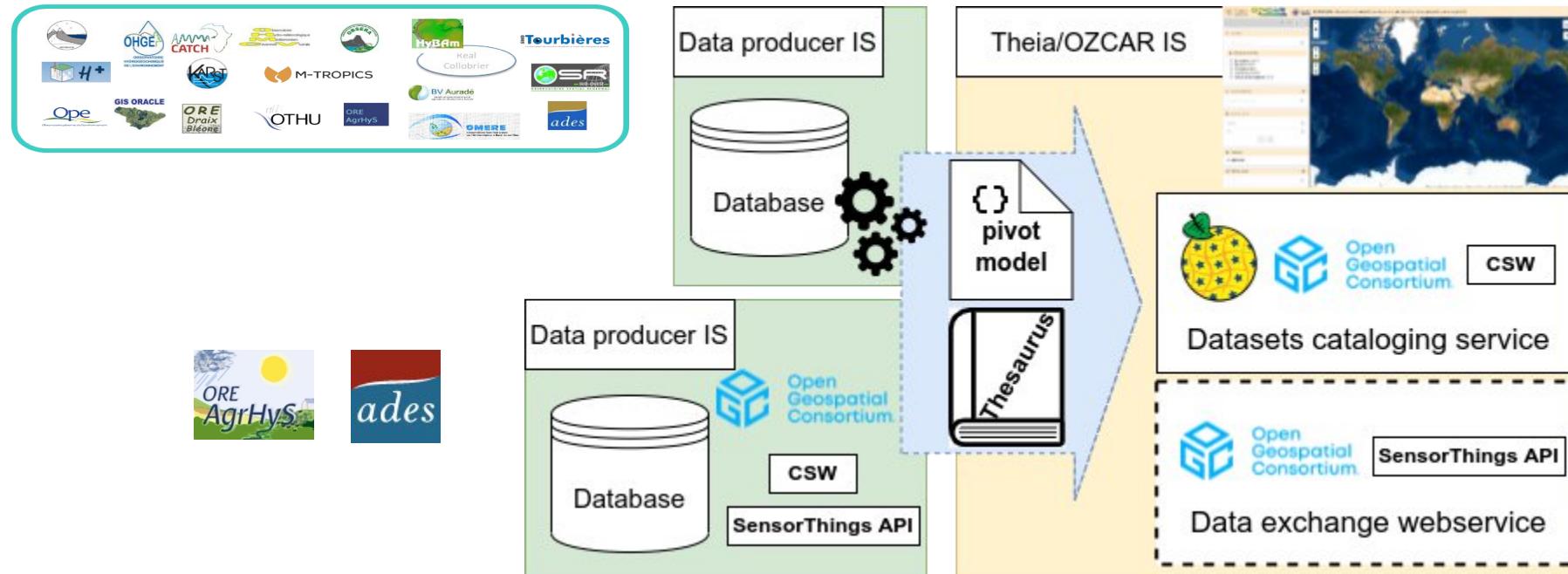
Earth System data IS



Ecosystem & Environment data IS

- A system that facilitates the declaration of data DOIs

Theia/OZCAR IS: data fluxes from observatories to users

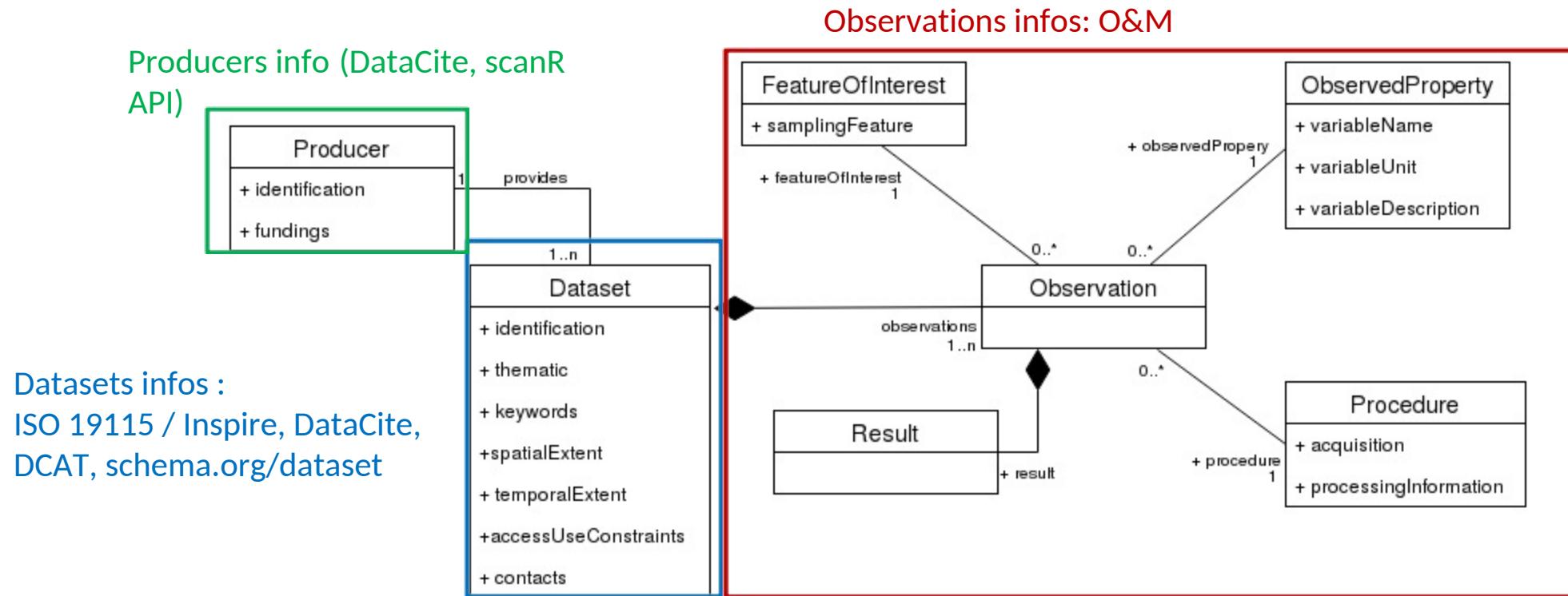


SensorThings API for:

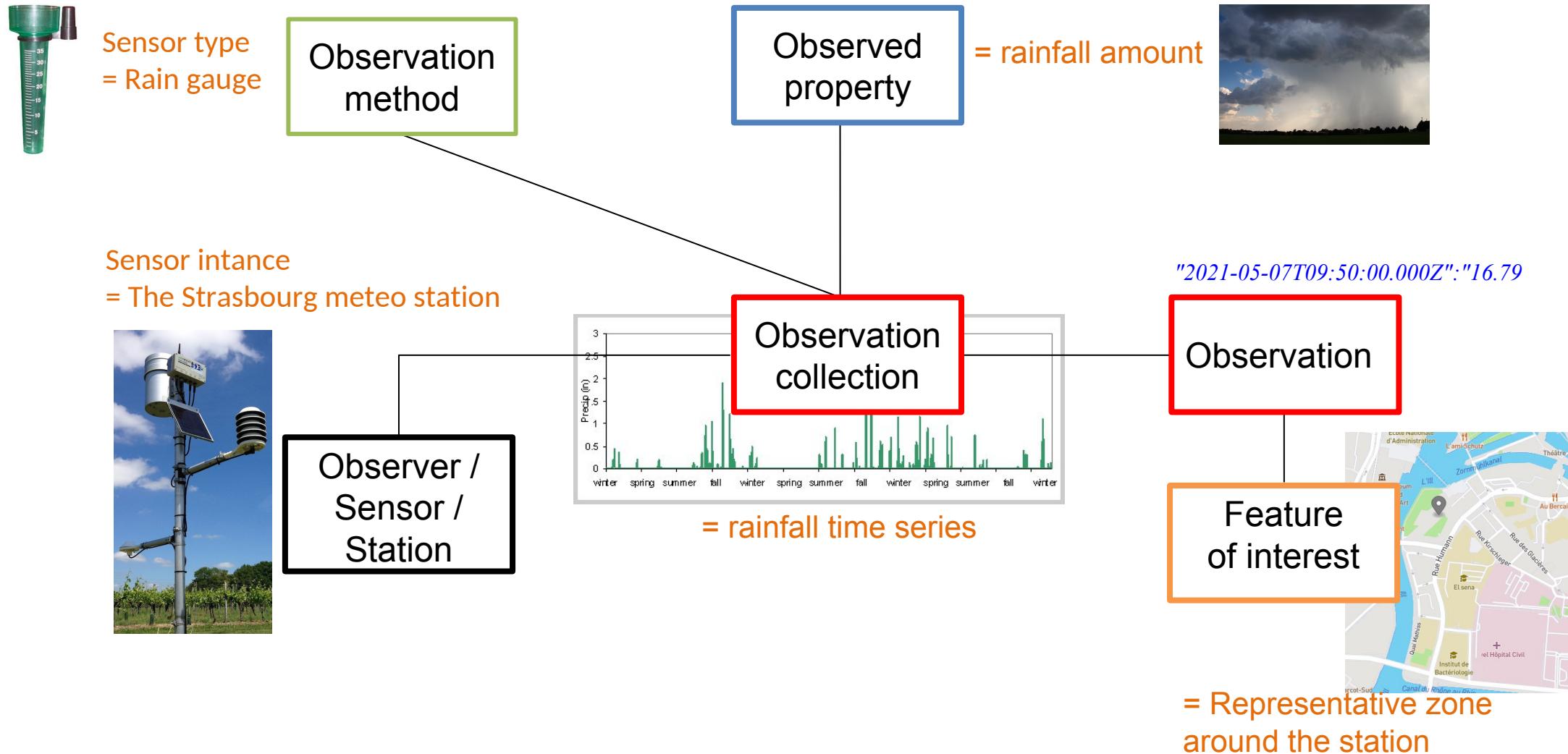
- IN: **data ingestion** in Theia/OZCAR IS for AgrHys and ADES (BRGM) observatories
- OUT: time series **data dissemination**

Theia/OZCAR data model (simplified schema)

- Used for data ingestion : to harmonize data description between producers + to allow to set up standardised data exchange webservices (CSW, SensorThings)
- Based on different standards (ISO 19115, O&M, Datacite)



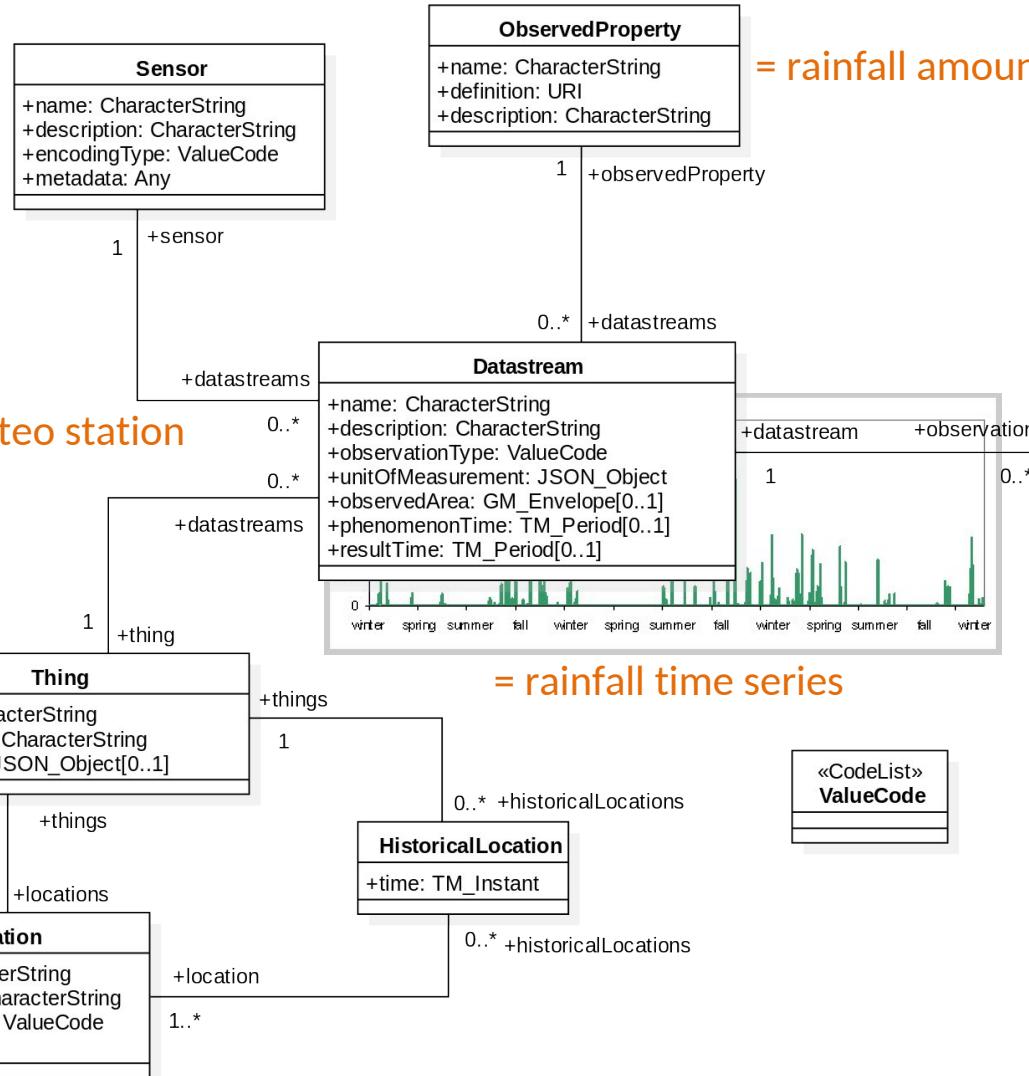
Mapping with SensorThings data model : business objects



Mapping with SensorThings data model : ST objects



Sensor type
= Rain gauge



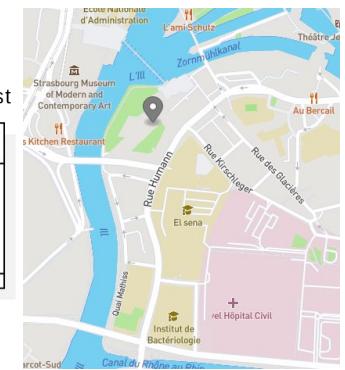
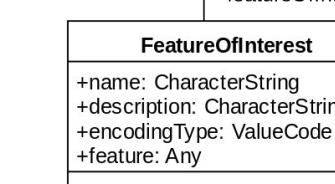
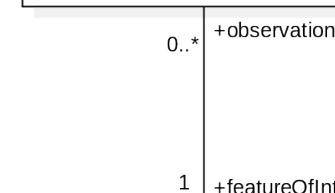
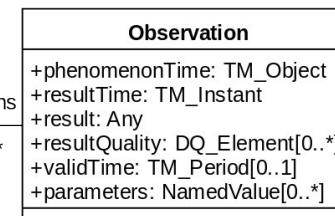
Sensor instance
= The Strasbourg meteo station



= rainfall amount



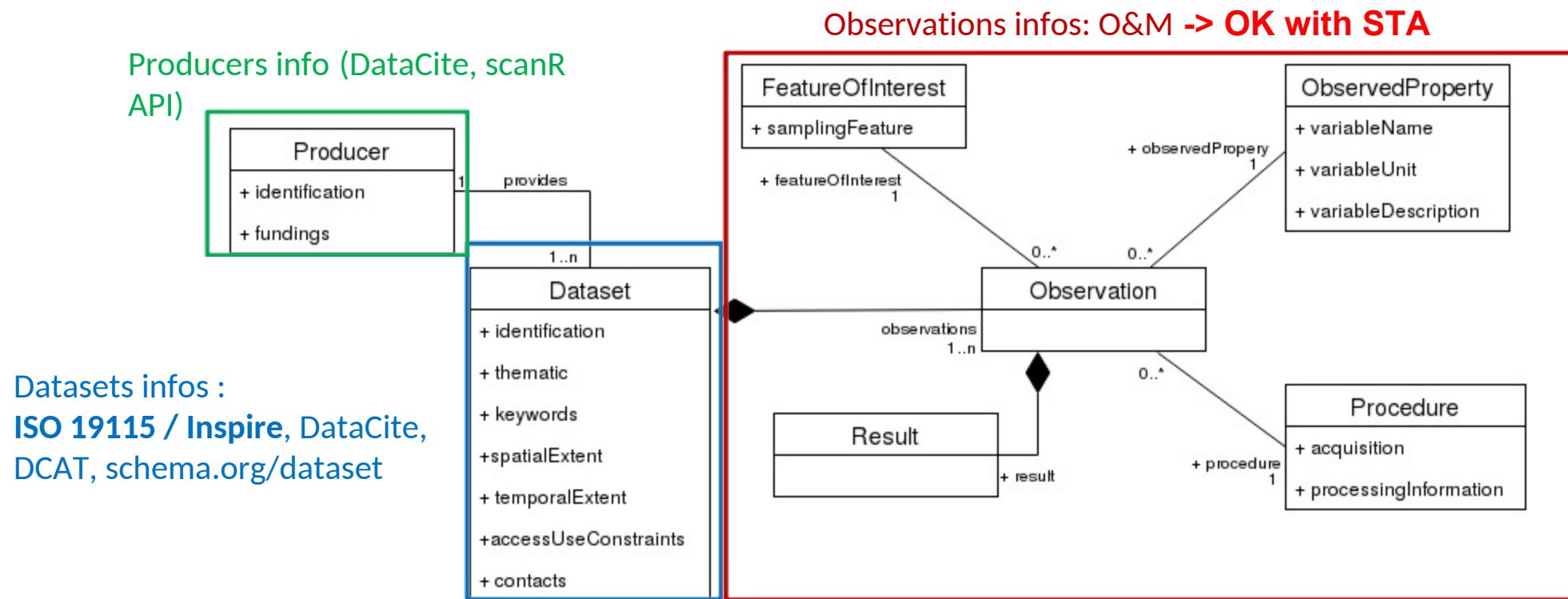
"2021-05-07T09:50:00.000Z": "16.79"



= Representative zone
around the station

Mapping with SensorThings data model : next steps

How to link Dataset object with Observation collections in Theia/OZCAR pivot model using interoperability standards ?



Mapping with SensorThings data model : next steps

[How to link CSW record to STA observations ? \(github issue\)](#)

Requirements: be able to navigate

- 1 - from a CSW catalog service to resources provided by STA endpoint
- 2 - from the STA data to ISO19115 MD_Metadata information describing the dataset that STA data belongs to.

1 - From CSW record to STA

The STA endpoint can be referenced using gmd :CI_OnlineResource

```
<gmd:CI_OnlineResource>
  <gmd:linkage>
    <gmd:URL>https://api.example/agri4cast/v1.0/</gmd:URL>
  </gmd:linkage>
  <gmd:protocol>
    <gmx:Anchor xlink:href="http://www.opengis.net/def/serviceType/ogc/sta">OGC:STA</gmx:Anchor>
  </gmd:protocol>
```

Mapping with SensorThings data model : next steps

2 - from STA to CSW record

2.1 by referencing a unique ST endpoint by dataset

Disavantage :

- No CSW endpoint referenced in the STA
- Difficulty to design cross datasets queries
- Server implementation depends on the organisation of the datasets

2.2 using a user defined property on ST objects (.properties)

- Datastream.properties : need to ensure that all observations of a datastream belong to a unique dataset
- Observation.parameters : how will it impact the performance of the STA service ?

Needs : to describe user defined property object using a JSON schema.

→ Where to reference the schema URL in ST endpoint ?

To learn more about the project:

Braud, I., Chaffard, V., Coussot, C., Galle, S., Juen, P., Alexandre, H., Bailliond, P., Battais, A., Boudevillain, B., Branger, F., Brissebrat, G., Cochonneau, G., Decoupes, R., Desconnets, J.-C., Dubreuil; A., Fabre, J., Gabillard, S., Gérard, M.-F., Grellet, S., Herrmann, A., Laarman, O., Lajeunesse, E., Le Hénaff, G., Lobry, O., Mauclerc, A., Paroissien, J.B., Pierret, M.C., Silvera, N., Squividant, H., 2020. Building the Information System of the French Critical Zone Observatories network: Theia/OZCAR-IS, Hydrological Sciences Journal, special issue “Data: opportunities and barriers”, <https://doi.org/10.1080/02626667.2020.1764568> .

To access the portal, the thesaurus and the project Github

portal : <https://in-situ.theia-land.fr/>

thesaurus : <https://in-situ.theia-land.fr/skosmos/en/>

GitHub :<https://github.com/theia-ozcar-is>

Contacts:

[Isabelle.braud@inrae.fr](mailto:isabelle.braud@inrae.fr)

[Sylvie.galle@ird.fr](mailto:sylvie.galle@ird.fr)

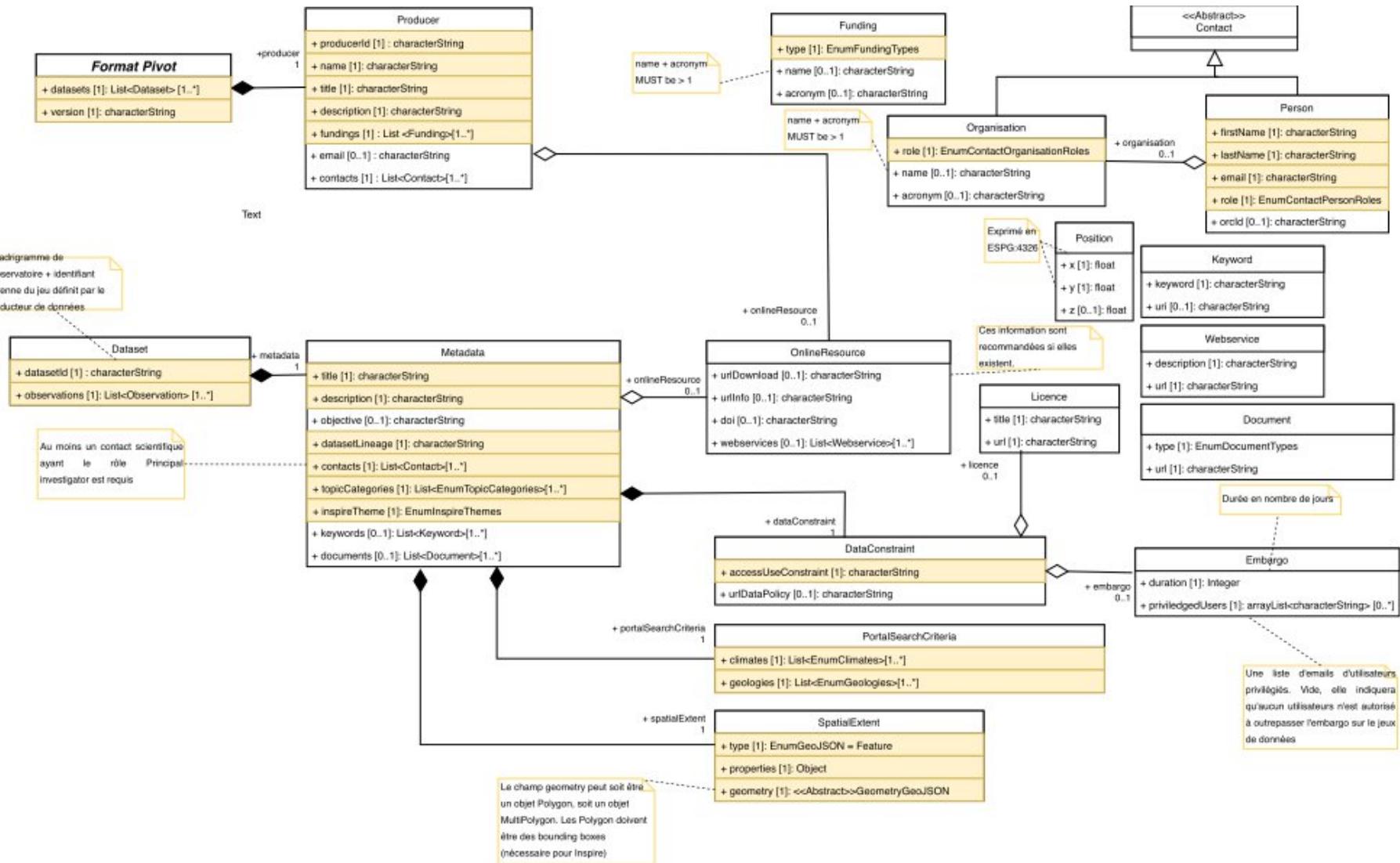
Veronique.chaffard@ird.fr

charly.coussot@ird.fr

Thank you for your attention:
Questions ?

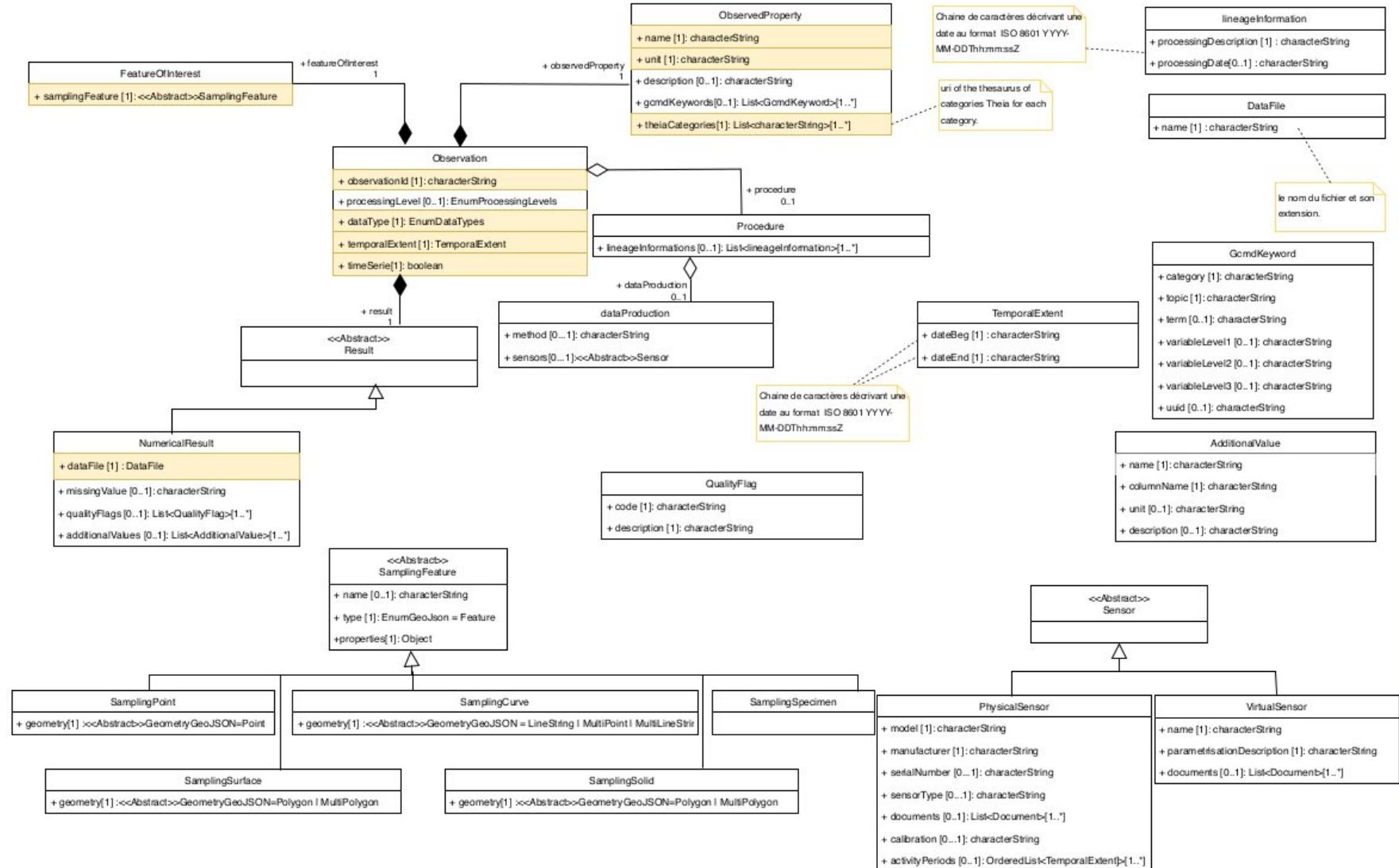


Pivot data model (1/3)



Class diagram

Pivot data model (2/3)



Class diagram

Pivot data model (3/3)

<<Enumeration>>	EnumTopicCategories
+ Boundaries	
+ Biota	
+ Climatology / Meteorology / Atmosphere	
+ Economy	
+ Elevation	
+ Environment	
+ Farming	
+ Geoscientific Information	
+ Health	
+ Imagery / Base Maps / Earth Cover	
+ Inland Waters	
+ Intelligence / Military	
+ Location	
+ Oceans	
+ Planning / Cadastre	
+ Society	
+ Structure	
+ Transportation	
+ Utilities / Communication	

<<Enumeration>>	EnumContactPersonRoles
+ Principal investigator	
+ Project leader	
+ Project member	
+ Data manager	
+ Data collector	

<<Enumeration>>	EnumDocumentTypes
+ Publication	
+ Manual	

<<Enumeration>>	EnumDataTypes
+ Numeric	
+ Vector	
+ Raster	
+ Photo	
+ Video	
+ Text	
+ Audio	
+ Other	

<<Enumeration>>	EnumFundingTypes
+ French research institutes	
+ French universities and schools	
+ Other universities and schools	
+ Other research institutes	
+ Research unit	
+ Federative structure	
+ Research program	
+ Other	

<<Enumeration>>	EnumClimates
+ Oceanic climate	
+ Tropical climate	
+ Mediterranean climate	
+ Mountain climate	
+ Continental climate	
+ Polar climate	
+ Arid climate	
+ Equatorial climate	

<<Enumeration>>	EnumGeologies
+ Volcanic rocks	
+ Plutonic rocks	
+ Metamorphic rocks	
+ Carbonate rocks	
+ Quaternary soils	
+ Other sedimentary rocks	

Class diagram