

Implementing SensorThings in the Theia/OZCAR Information System

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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

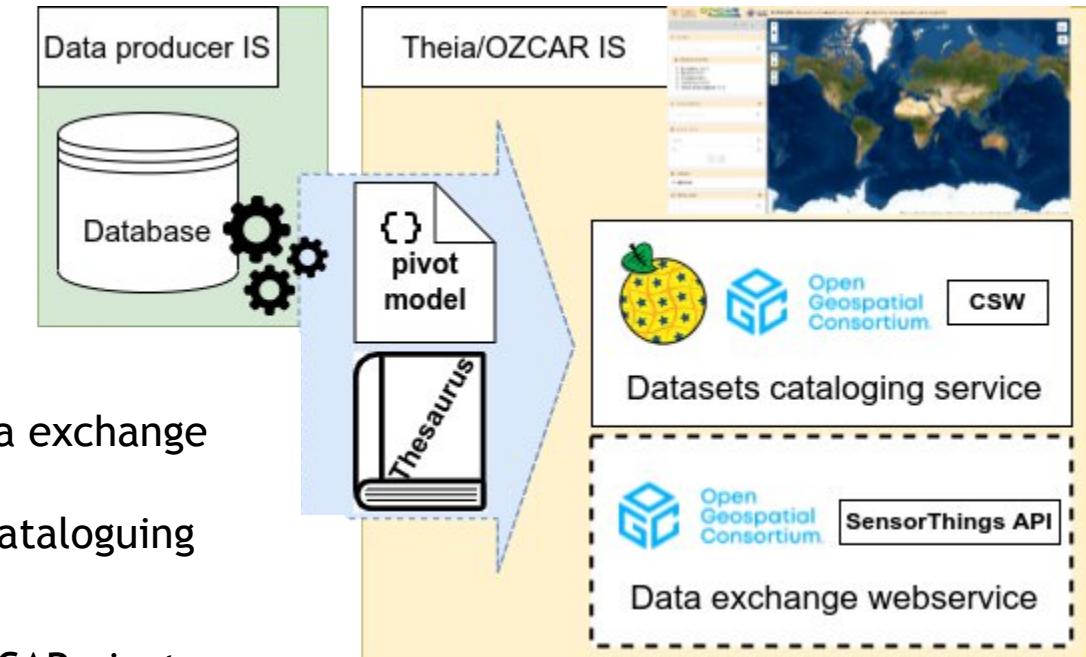
- A system that facilitates the declaration of data DOIs

Theia/OZCAR IS: data fluxes from observatories to users



Data producer IS:

- no standardised data exchange webservice
 - only some dataset cataloguing webservices
- > defining a Theia/OZCAR pivot data model



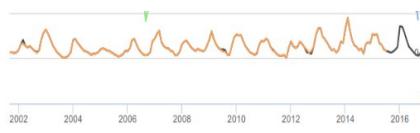
Theia/OZCAR IS: data fluxes from observatories to users



Agro-hydrosystem observatory



- surface water
- ground water
- meteo & flux
- soil moisture
- water quality
- land use



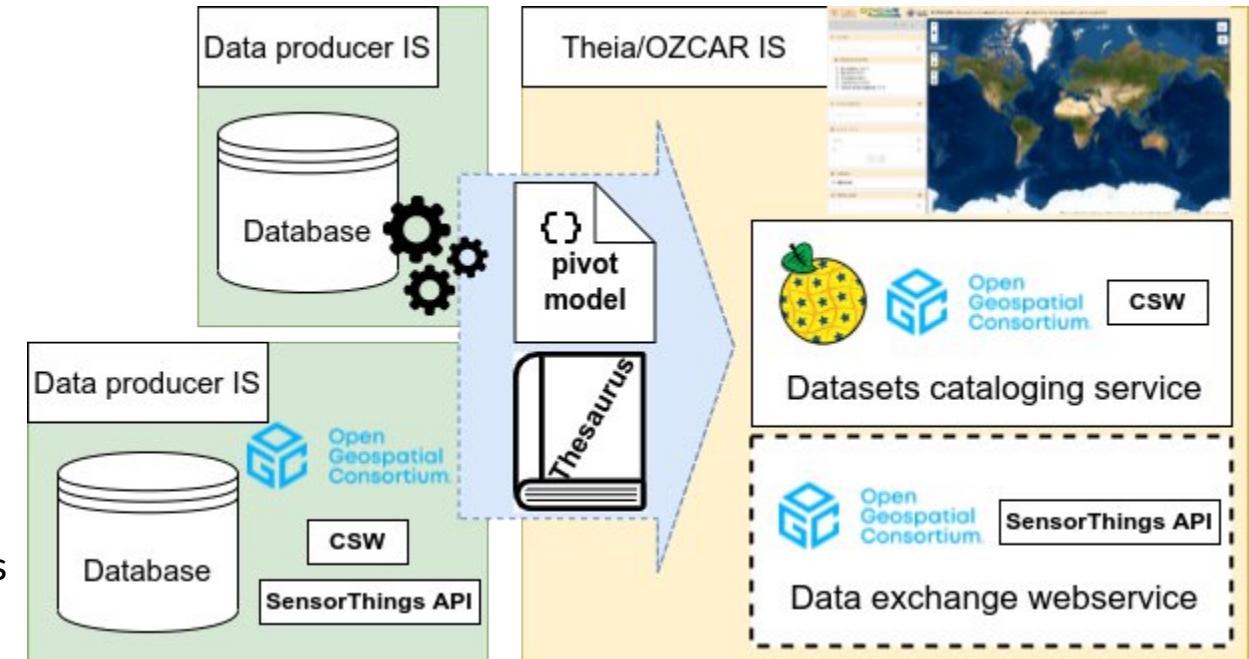
Groundwater quality & level



> 77 000 qualitometers



> 4900 piezometers

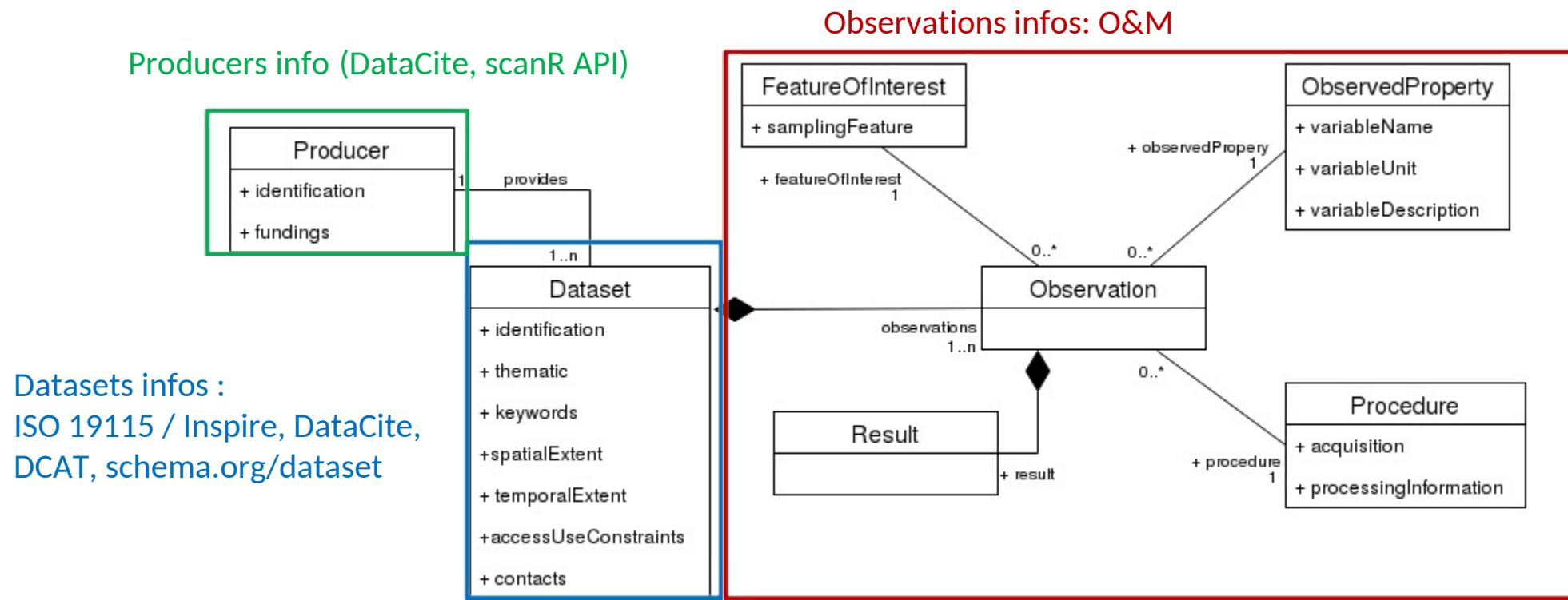


SensorThings API for:

- 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
- Objectives: 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



Sensor type
= Rain gauge

Observation
method

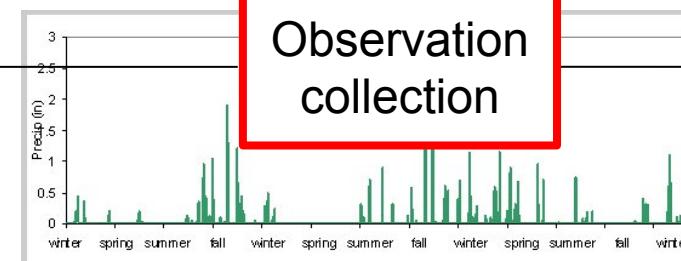
Sensor instance
= The Strasbourg meteo station



Observer /
Sensor /
Station

Observed
property

= rainfall amount



Observation
collection

= rainfall time series

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

Observation

Feature
of interest

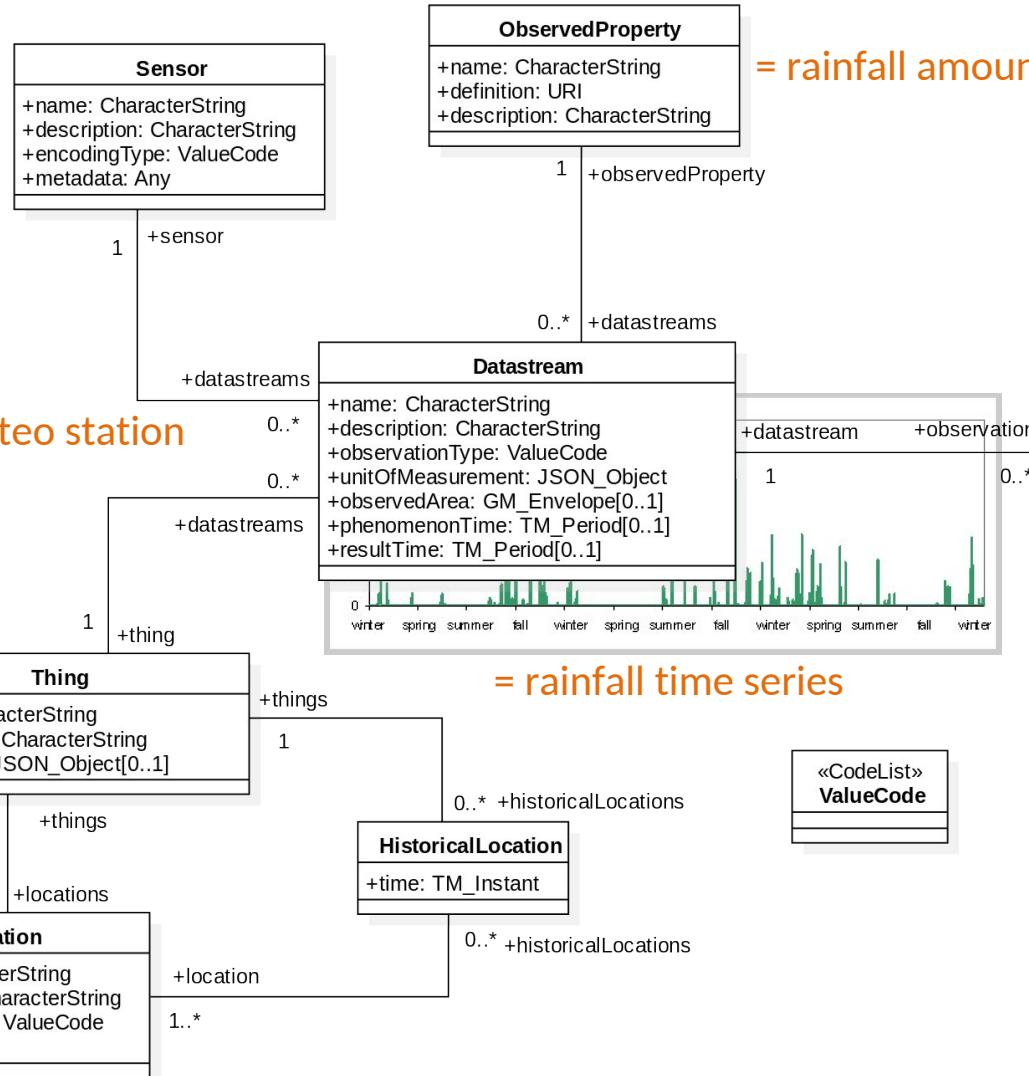


= Representative zone
around the station

Mapping with SensorThings data model : ST objects



Sensor type
= Rain gauge

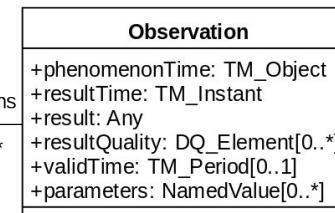


Sensor instance
= The Strasbourg meteo station



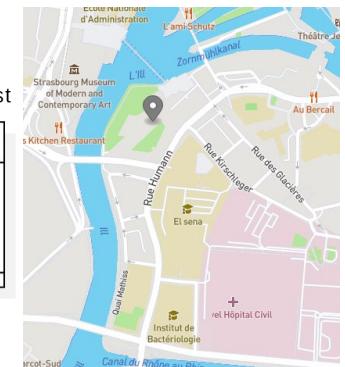
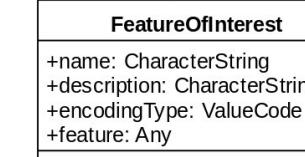
= rainfall amount

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



0..* +observations

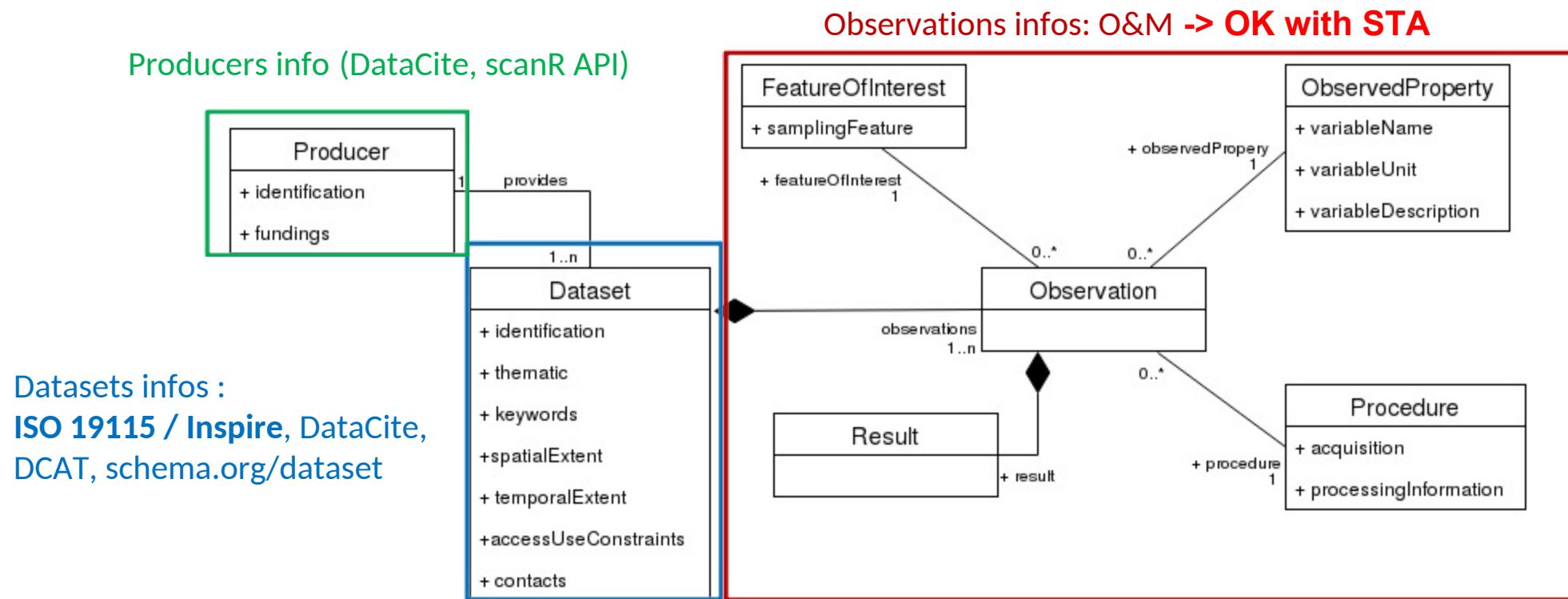
1 +featureOfInterest



= 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>

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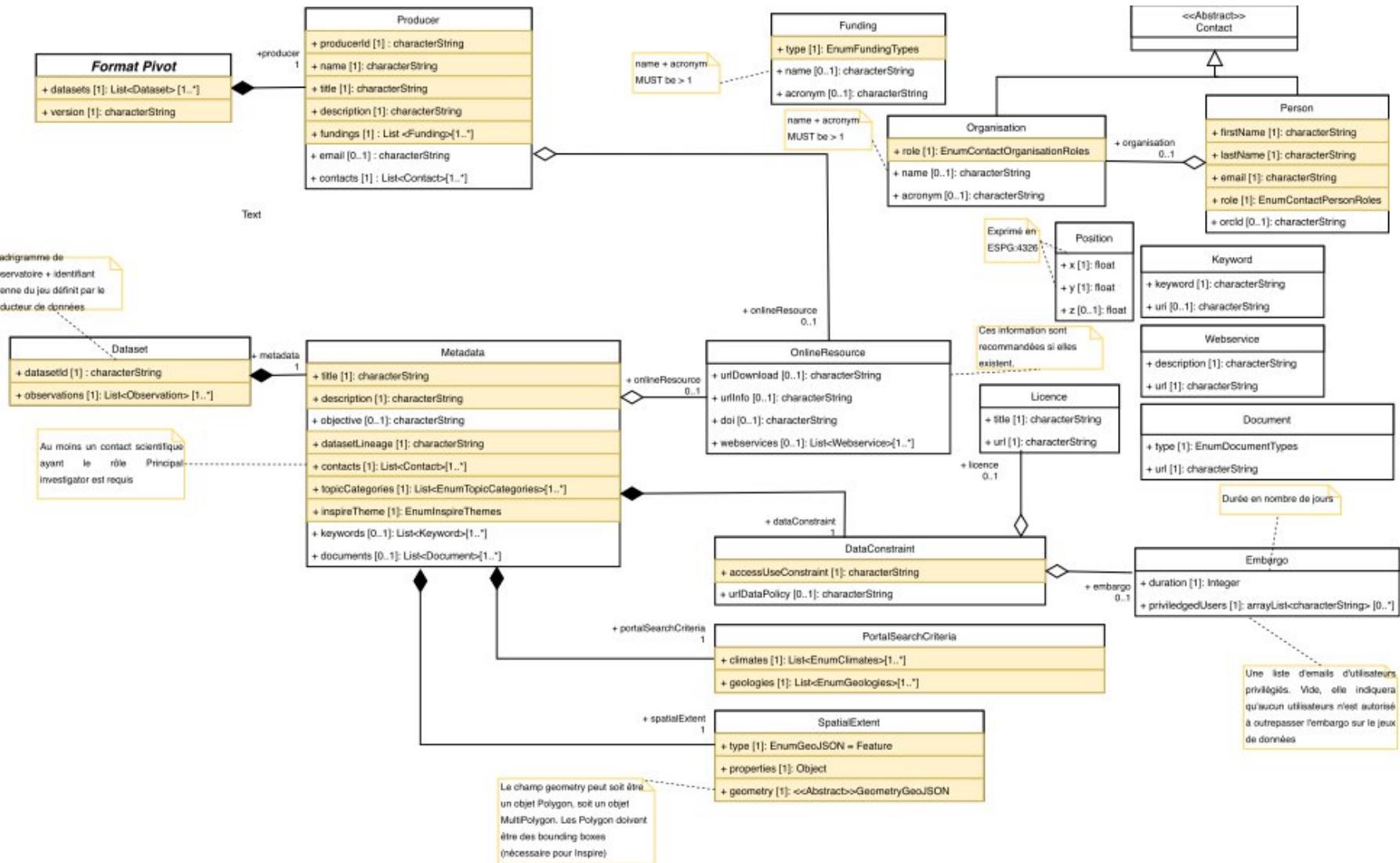
Veronique.chaffard@ird.fr

charly.coussot@ird.fr

Thank you for your attention:
Questions ?

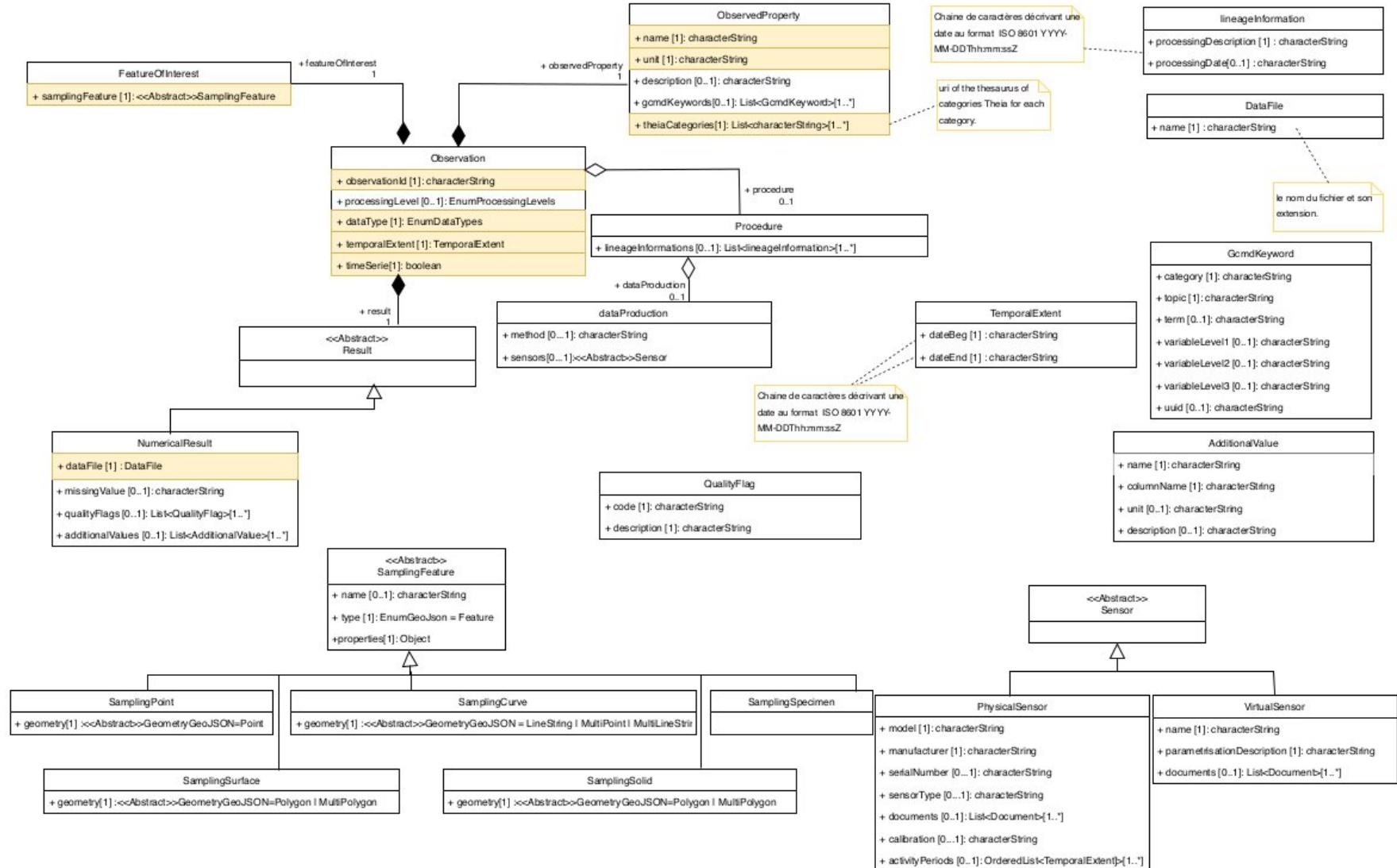


Pivot data model (1/3)



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