SO FAIR - A generic tool for publishing observation data within an ecosystem of interoperable services

Hervé Squividant, Mario Adam, Mikael Faucheux, Ophélie Fovet, Christophe Geneste, Tom Loree, Thierry Morvan, Laurent Ruiz, Zahra Thomas

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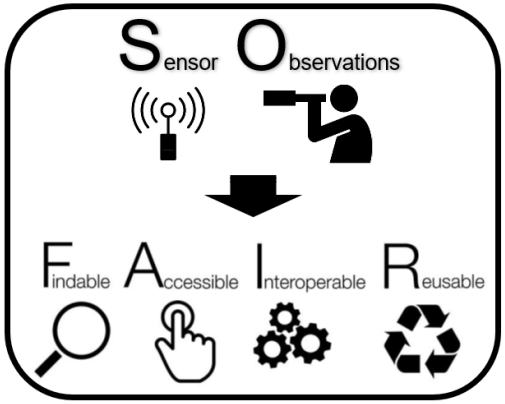

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Context

- Maturity of FAIrisation of geographic data
  - 2000: OGC W*S standards
  - 2007: INSPIRE directive
  - 2009 : SDI
  - 2010 →... : Platforms + communities + ...
  - … birth of the spatial open data ecosytem

- Late start for the "liberation" of temporal data
  - 2006: Standard SOS "orphaned by its WMS
  - 2015: New OGC SensorThings standard
  - 2016: FROST Server
  - 2021 : SensorThings as input of Theia/OZCAR IS

- Complexity of configuring a temporal open data service

- Compartmentalization between FAIR services for "geographic" AND "temporal" data

Question

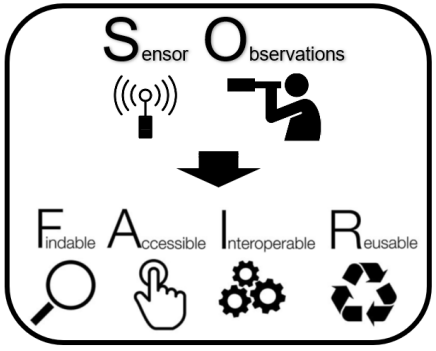
How to **publish** temporal datas **simply** and **integrate** them into an ecosystem of pre-existing services ?

Our answer

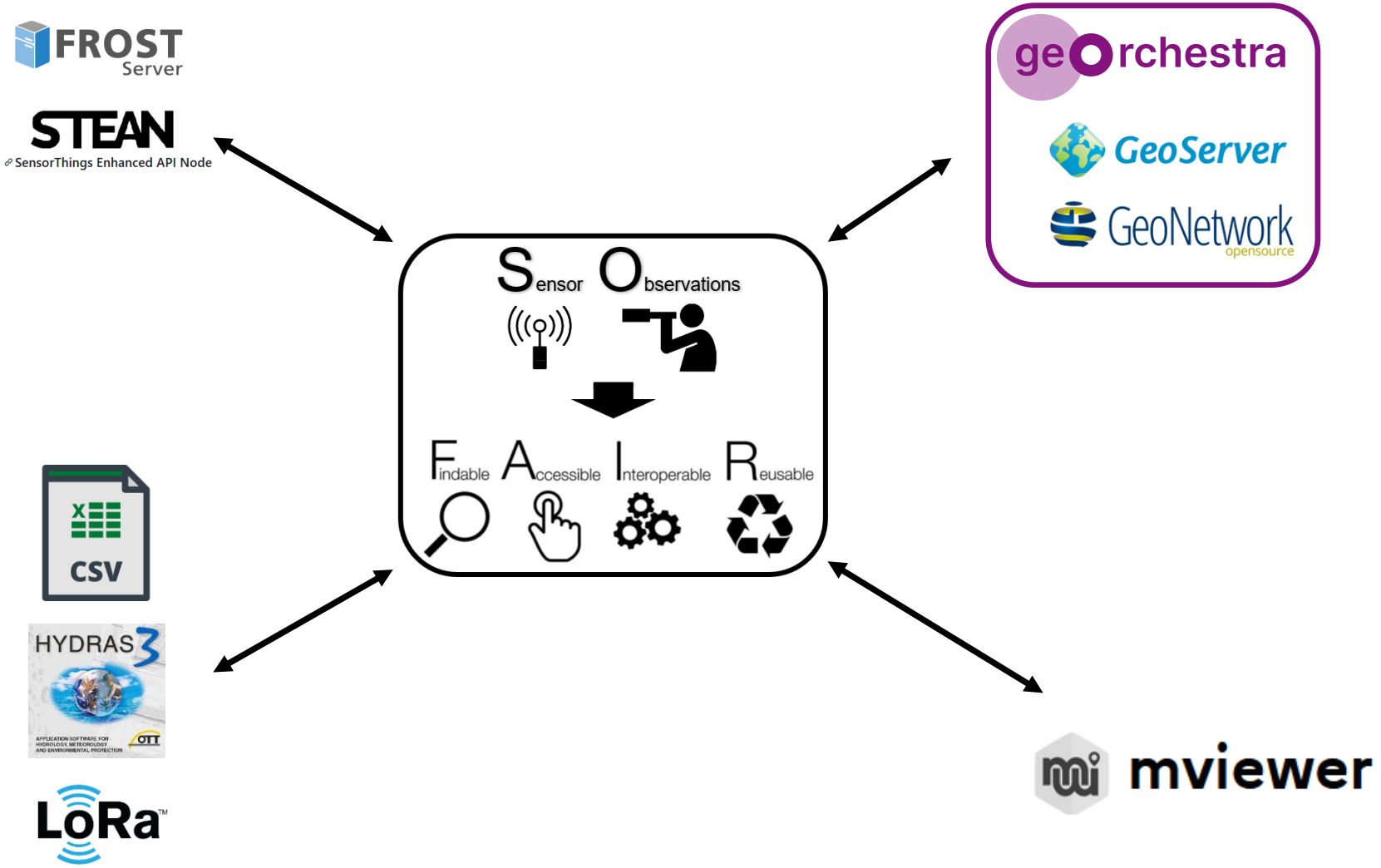
By initiating an internal working group with a mix of different skill profiles : metrologist, scientist, FAIR data scientist, API developer, service deployer / infrastructure manager, …

To work together to define a methodological, technical and human chain for routing data from the sensor to the ecosystem of FAIR data services based on subsidiarity as we made before with INSPIRE SDI and geographical data sharing.

The project SO FAIR -> Sensor Observations to FAIR data



SO FAIR middleware service



The SO FAIR project

1 Creating a SensorThings service
→ api.geosas.fr/<MyInstance>/v1.0

2 Configuring a SensorThings service
- Things
- Sensors
- ObservedProperties
- Thesaurii
- …

3 Feeding datas to service
- Automatic : Lora, …
- Semi-automatic : Outputs from proprietary software
- Manual : upload CSV
- …

4 Connection to the service ecosystem
- Automated generation of INSPIRE metadata and OGC layers in SDI
- Dataverse Metadata

5 Automated generation of web-based tools for viewing and downloading time series, with or without spatial inputs.

SO FAIR API service
https://geosas.fr/sofair-dev/api

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SO FAIR API Service

- New standard

- A python implementation of the OGC API

pygeoapi

- deployed in a beta version

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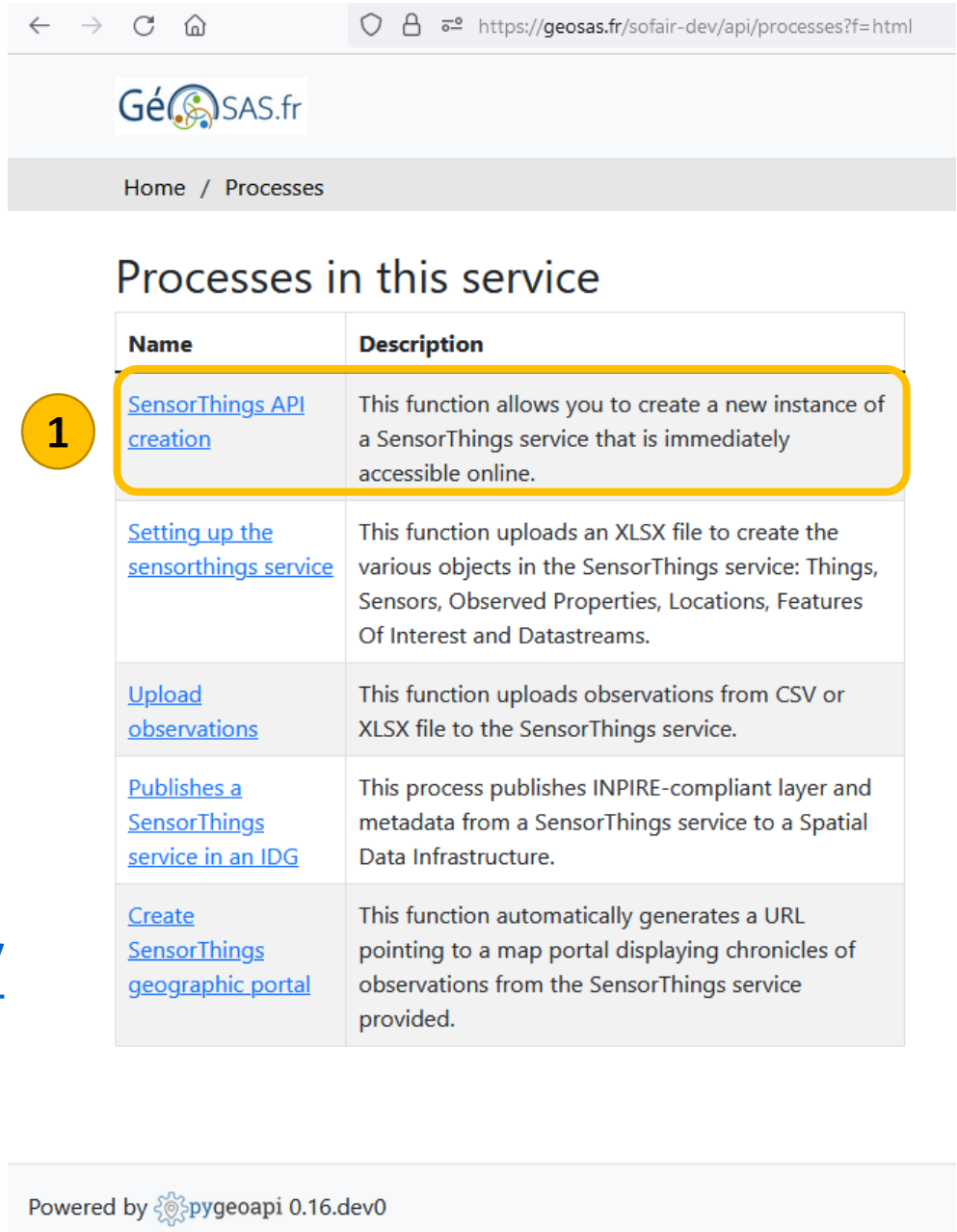
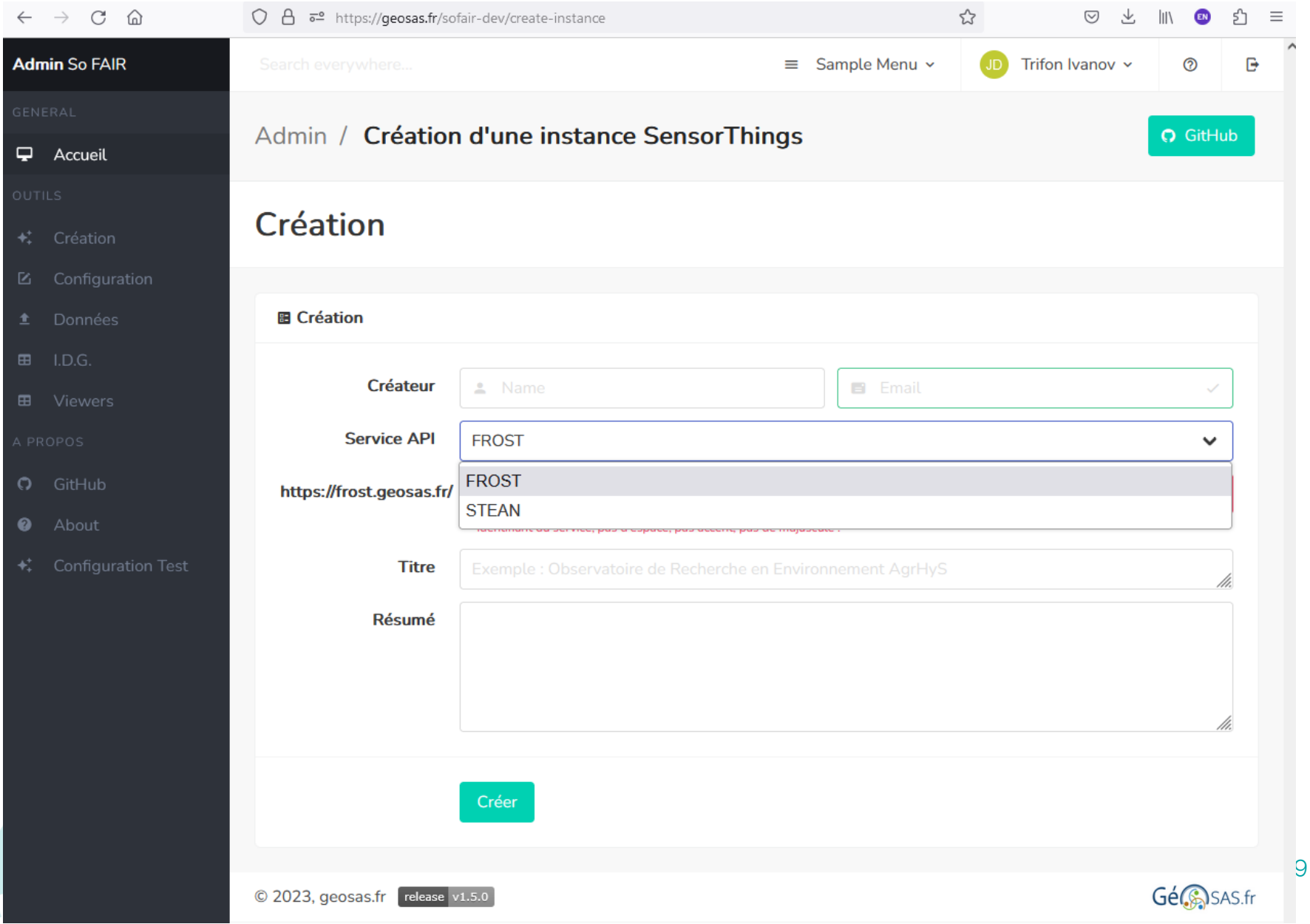


SO FAIR API Service



SO FAIR API Service

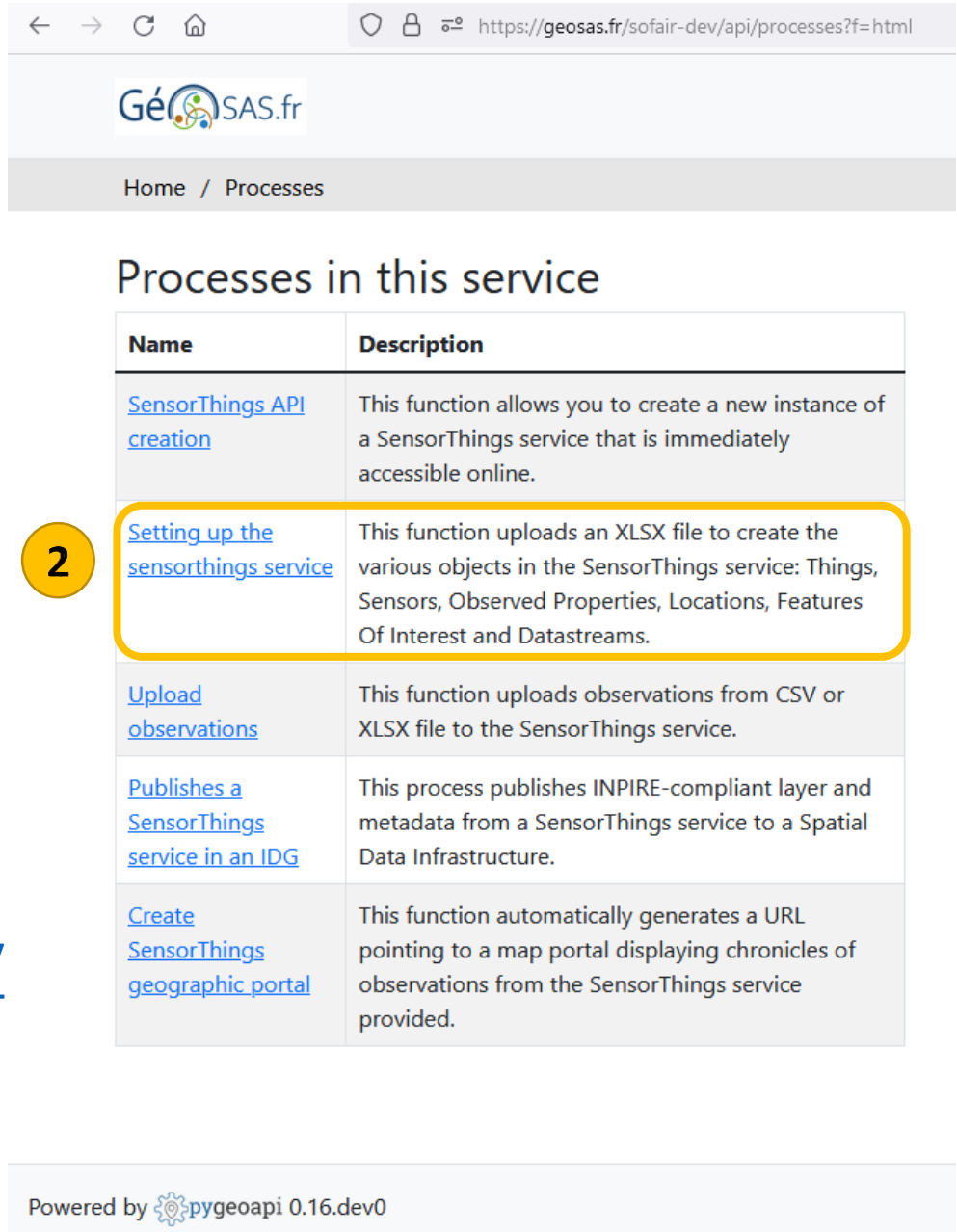
- Un nouveau standard

- Une implémentation de l'API OGC en python

pygeoapi

- Déployée en mode béta

https://geosas.fr/sofair-dev/api/



2

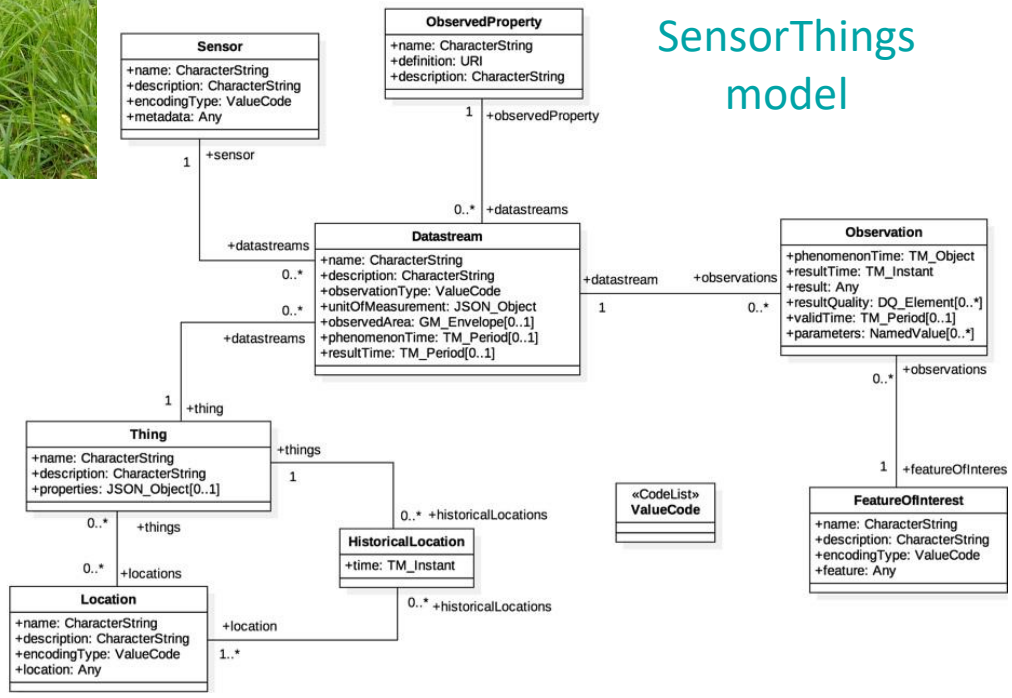
From environmental observatory to SensorThings Model

Reality in the field

How ?

Information system

SensorThings model



Iterative teamwork

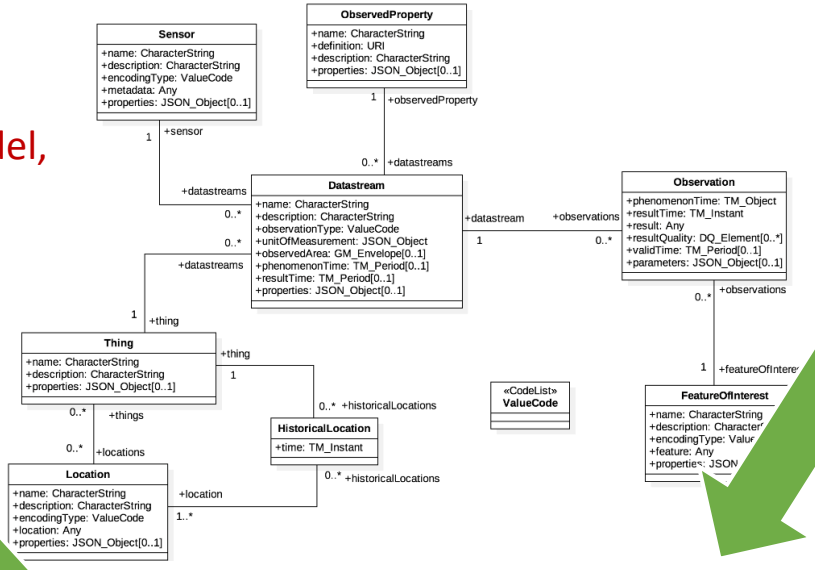
Scientists

- Need to understand the model,
- Involvement in the choice of concepts and thesaurus definitions.

Metrologist, sensor installer

- Need to understand the model,
- Knowledge of observatory site, sensors, oberved properties and data path.

Sensorthings model



FAIR data scientist

- Good knowledge of the model, services & tools,
- Facilitating role to extract knowledge from the scientist and the metrologist.

Example Of AgrHyS Observatory in Britanny

aghrys_sensorthings_v5.xlsx - Excel

Fichier de configuration

	A	B	C	D	E	F
1	**name**	**observationType**	**description**	**unitOfMeasurement.name**	**unitOfMeasurement.symbol**	**unitOfMeasurement.definition**
2	**E30_niveau_eau_102**	http://www.opengis.net/def/observationType/OGC-OM/2.0/OM_Measurement	Niveau du cours d'eau de l'exutoire du bassin versant du Puits. Fréquence d'acquisition: 6 minutes.	meter	m	https://www.bipm.org/en/si-base-units/metre
3	**E30_temperature_201**	http://www.opengis.net/def/observationType/OGC-OM/2.0/OM_Measurement	Température du cours d'eau à l'exutoire du bassin versant du Puits. Fréquence d'acquisition: 10 minutes.	degree Celsius	°C	http://unitsofmeasure.org/ucum.html#para-30
4	**E30_niveau_eau_X102**	http://www.opengis.net/def/observationType/OGC-OM/2.0/OM_Measurement	Niveau du cours d'eau de l'exutoire du bassin versant du Puits. Fréquence d'acquisition: 6 minutes.	meter	m	https://www.bipm.org/en/si-base-units/metre
5	**E30_temperature_X222**	http://www.opengis.net/def/observationType/OGC-OM/2.0/OM_Measurement	Température du cours d'eau à l'exutoire du bassin versant du Puits. Fréquence d'acquisition: 10 minutes.	degree Celsius	°C	http://unitsofmeasure.org/ucum.html#para-30
6	**E30_conductivite_224**	http://www.opengis.net/def/observationType/OGC-OM/2.0/OM_Measurement	Conductivité électrique mesure à l'exutoire du bassin versant du Puits. Fréquence d'acquisition: 10 minutes.	siemens/meter	µS/m	https://fr.wikipedia.org/wiki/Conductivit%C3%A9_%C3%A9lectrique
7	**E30_temperature_X211**	http://www.opengis.net/def/observationType/OGC-OM/2.0/OM_Measurement	Température de la zone hyporhéique à l'exutoire du bassin versant du Puits. Fréquence d'acquisition: 10 minutes.	degree Celsius	°C	http://unitsofmeasure.org/ucum.html#para-32
8	**E30_niveau_eau_116**	http://www.opengis.net/def/observationType/OGC-OM/2.0/OM_Measurement	Niveau du cours d'eau de l'exutoire du bassin versant du Puits. Fréquence d'acquisition : 1 heure	meter	m	https://www.bipm.org/en/si-base-units/metre
9						
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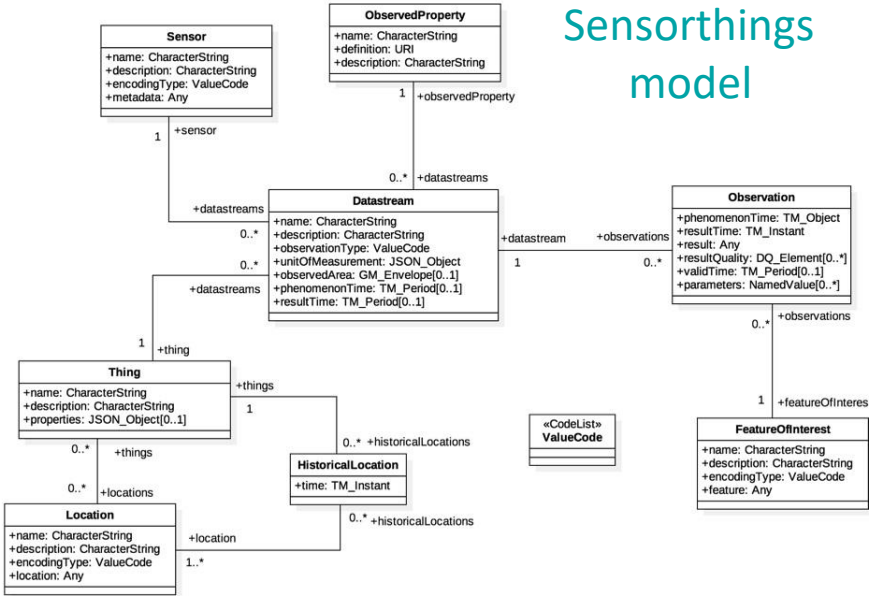
23						
24	**Exutoire_oxygene_dissous_0368**	http://www.opengis.net/def/observationTyp... GC-OM/2.0/OM_Measurement				
25	**Exutoire_temperature_X222**	http://www.opengis.net/def/observationType/OGC-OM/2.0/OM_Measurement	Température du cours à l'exutoire du bassin versant d... Fréquence d'acquisition: 10 minutes.			
26	**Exutoire_conductivite_X0244**	http://www.opengis.net/def/observationType/OGC-OM/2.0/OM_Measurement	Conductivité électrique mesure à l'exutoire du bassin Kervidy. Fréquence d'acquisition: 10 minutes.			

Lisez-moi | 1_datastream | 2_observedProperty | 3_sensor | 4_thing | 5_location | 6_featureOfInterest

Sensorthings model



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- New standard

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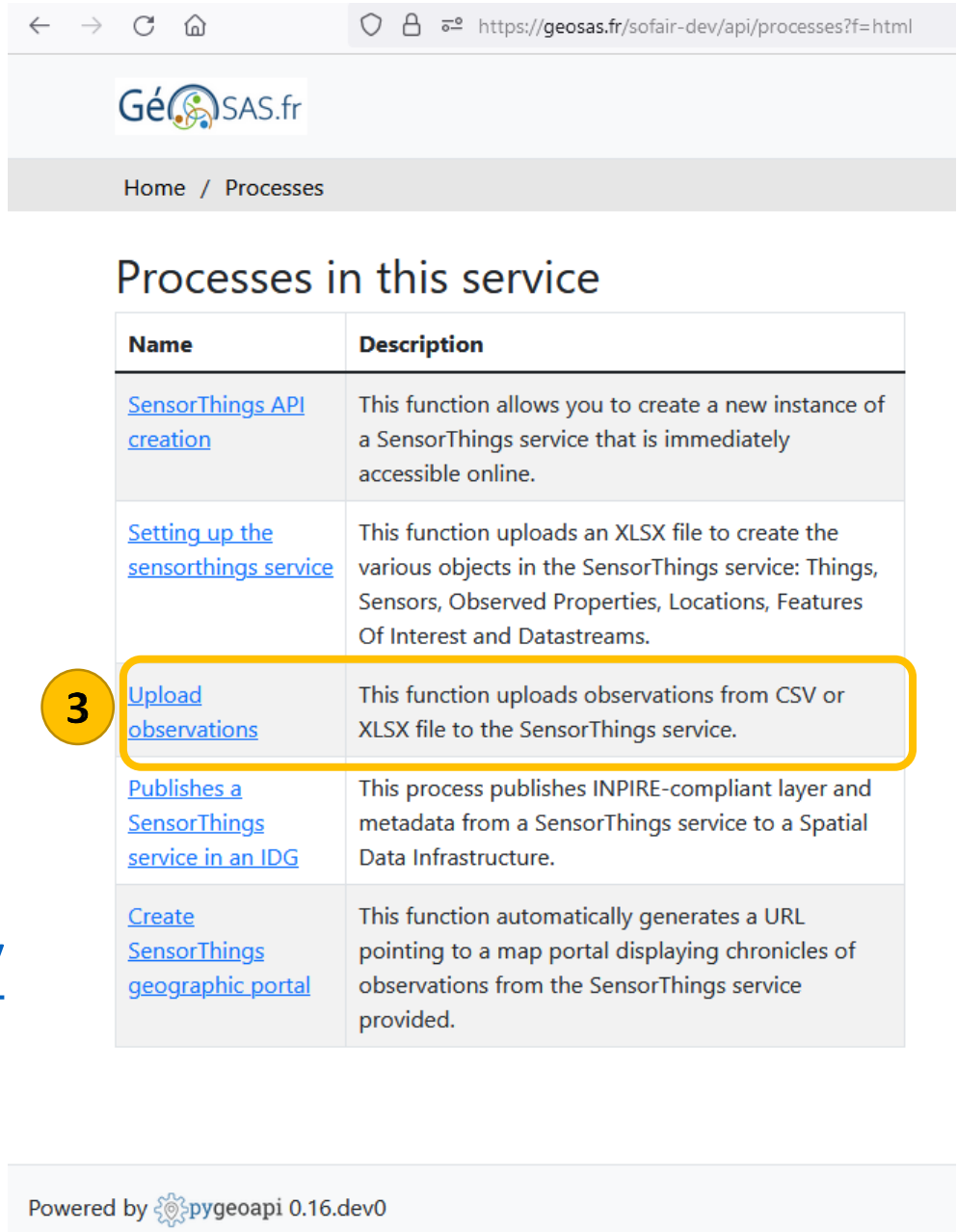
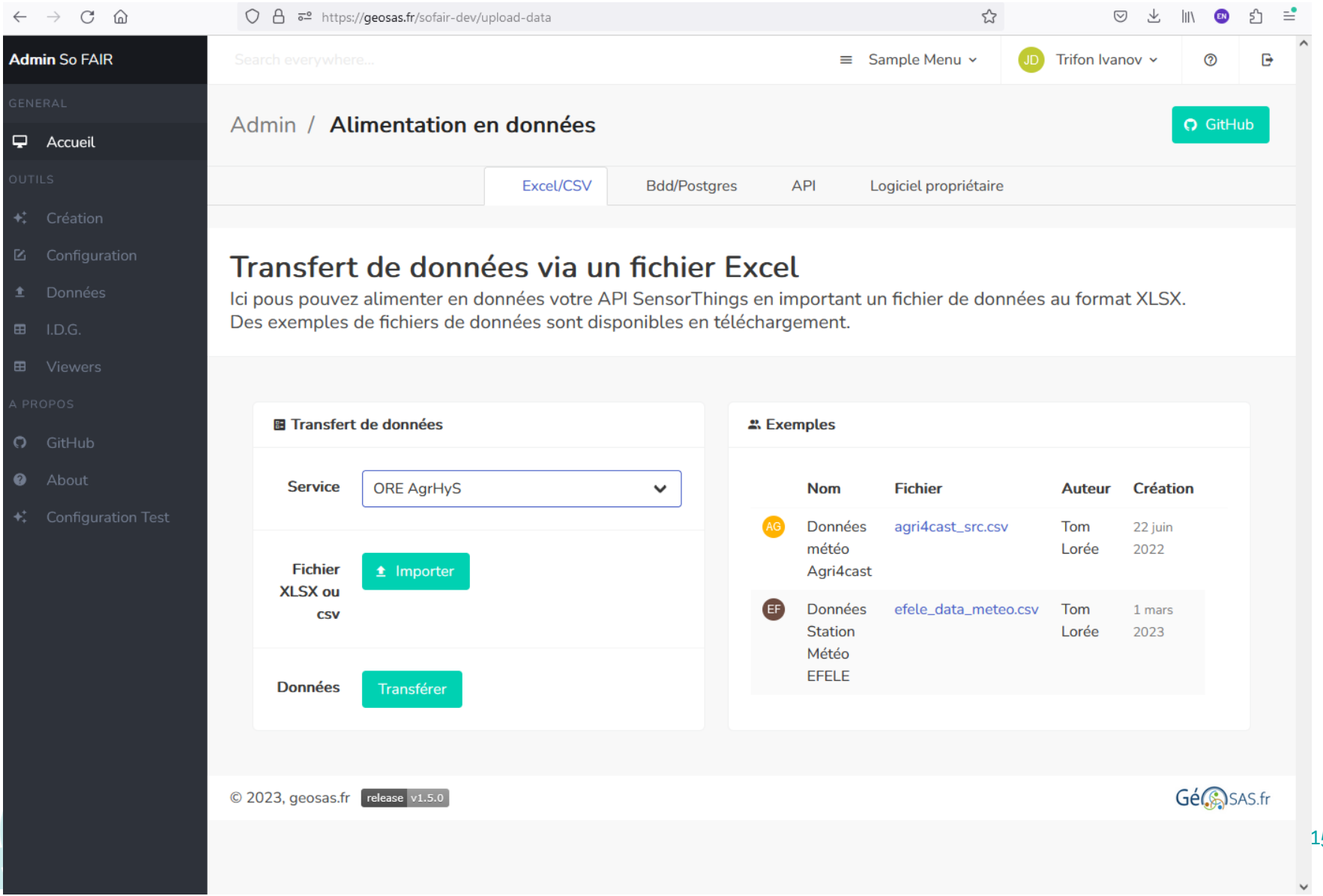


Upload observations in SensorThings API



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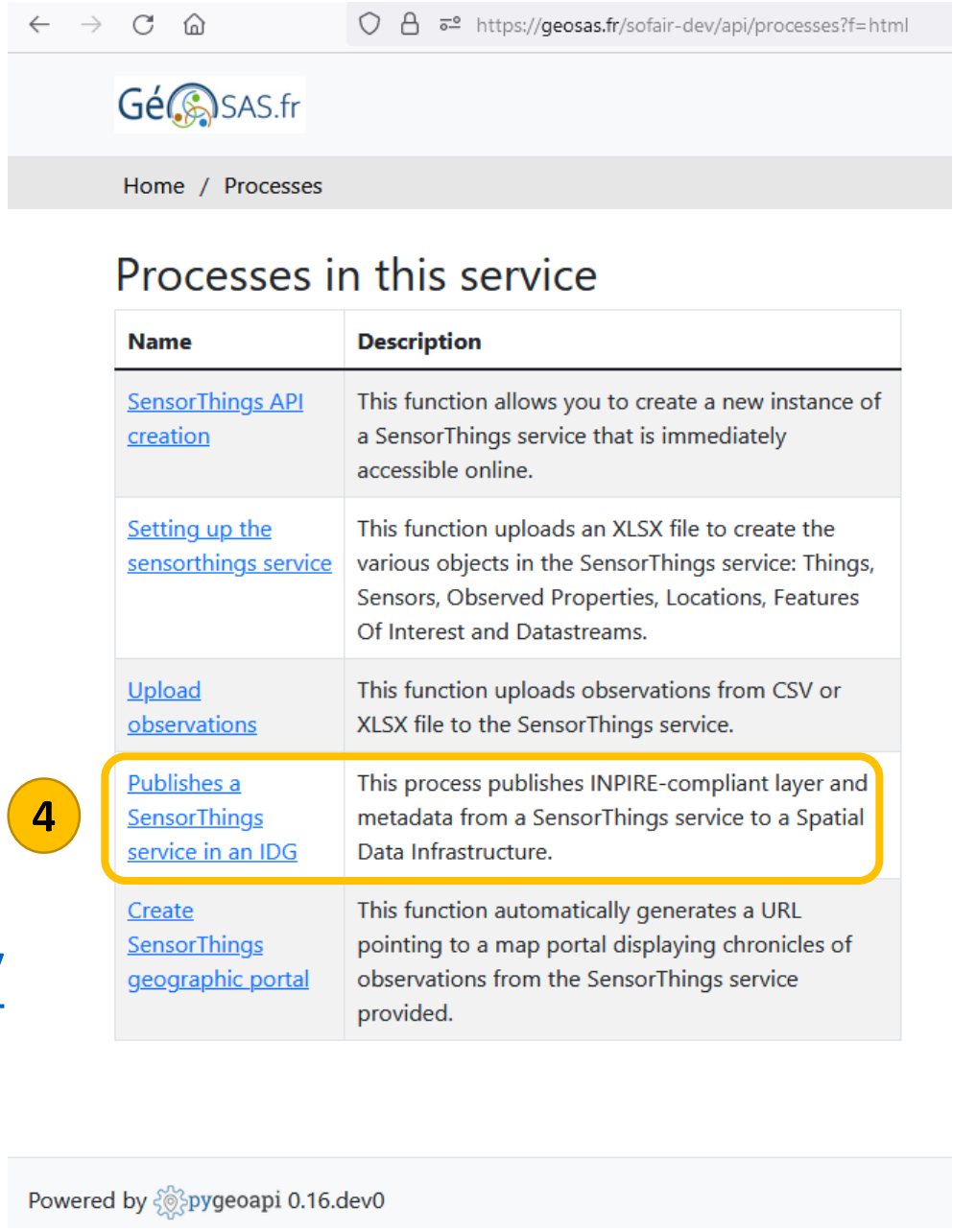
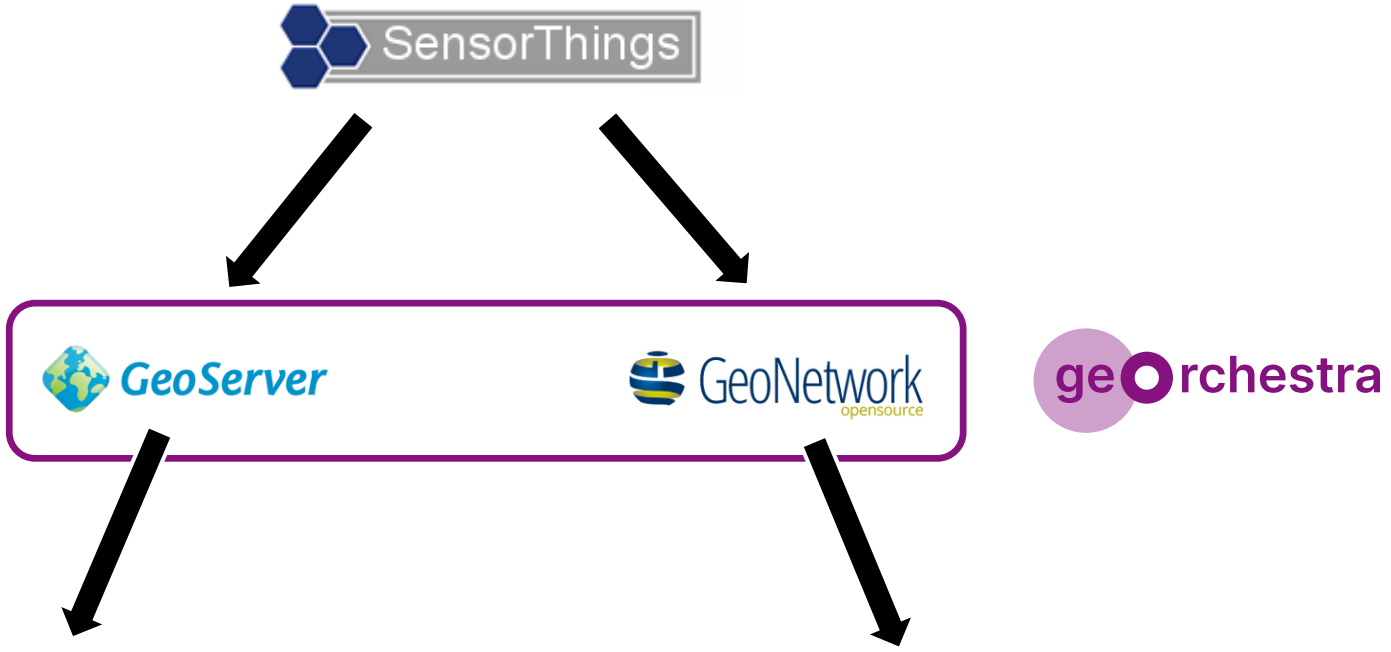


Creating Métadata and layers in SDI



- View/download/request by OGC W*S
- Solves the problem of large number of Things or Features

- Increase SensorThings API visibility in the INSPIRE platform ecosystem via multiple harvesting mechanisms
- Openness to other standard, other catalog?

SO FAIR API service

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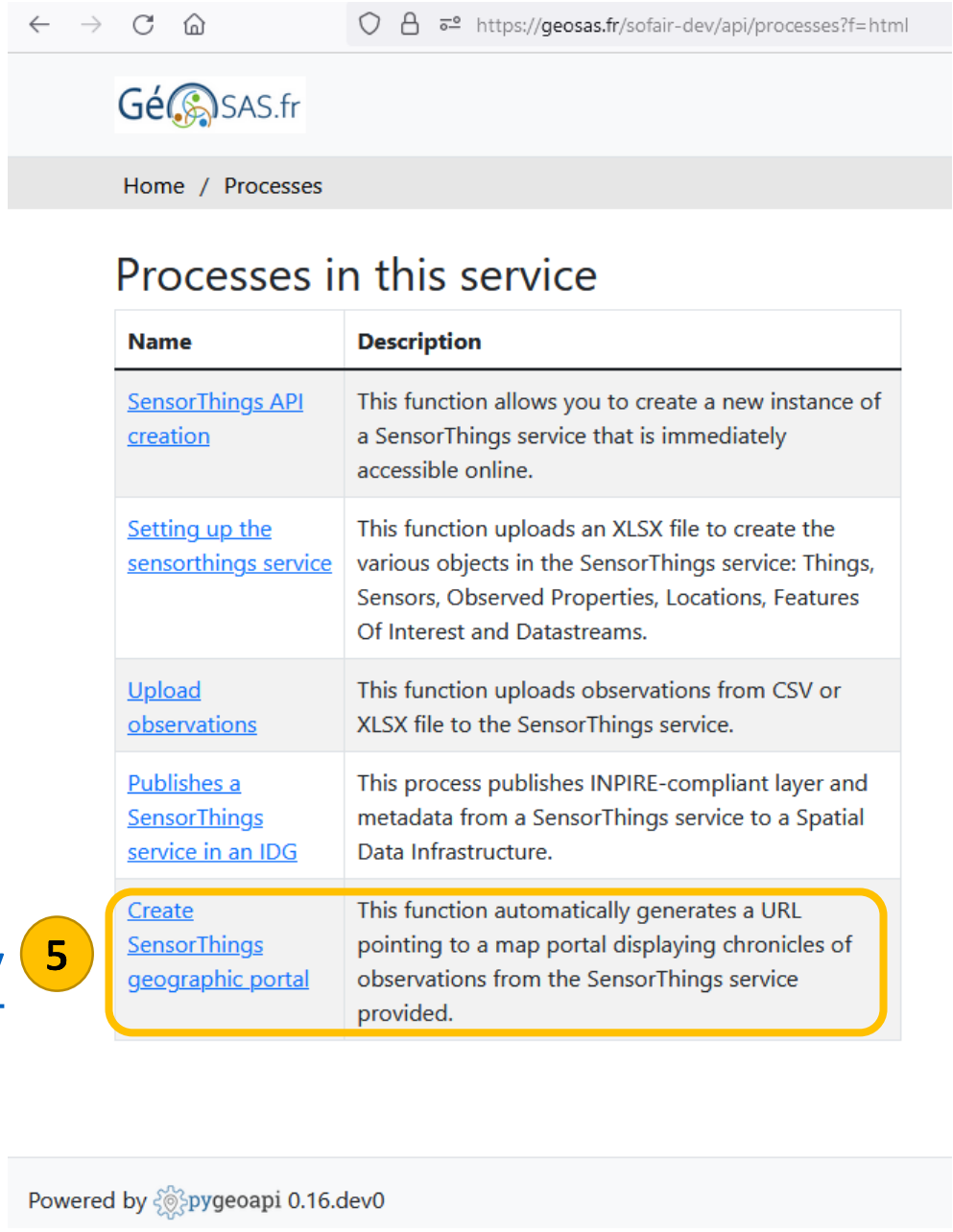
5



Dynamic creation of a cartographic web portal

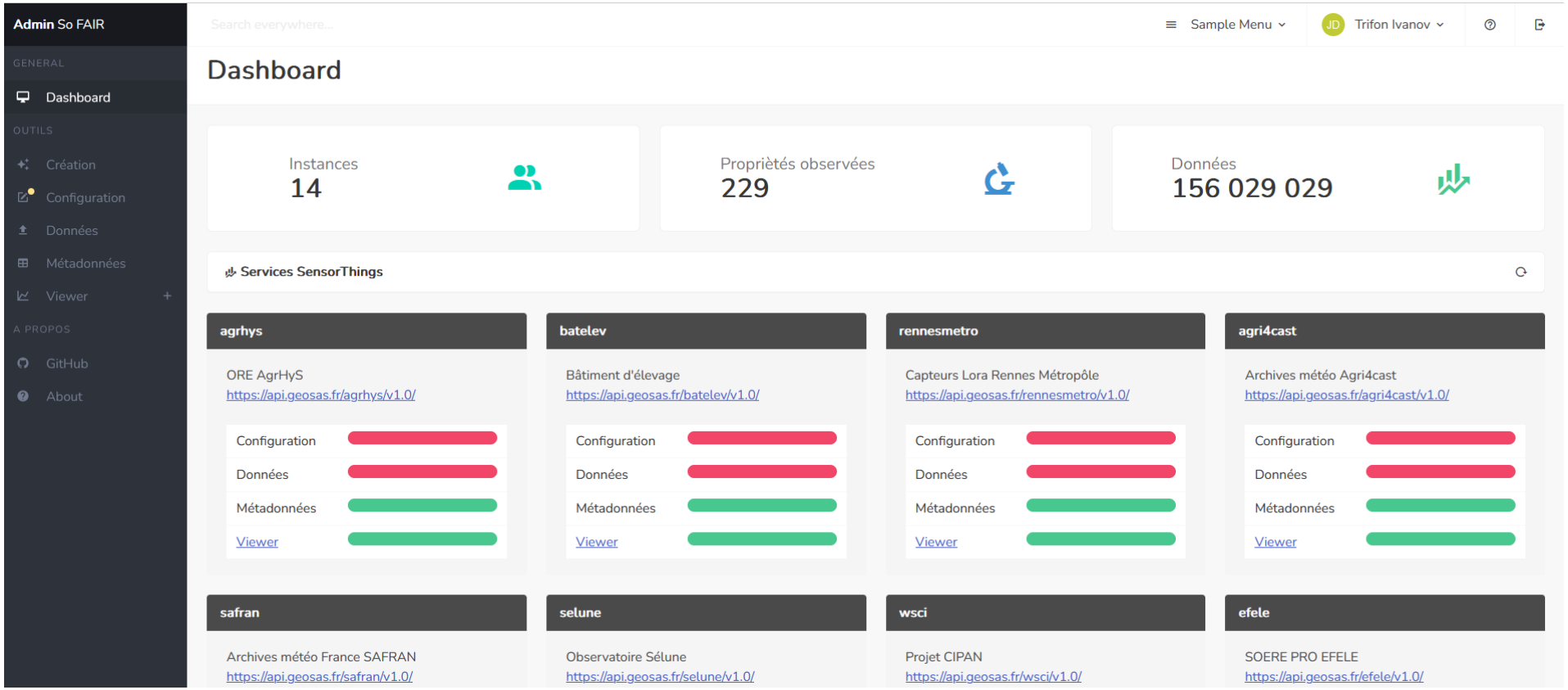
- Automatic URL generation

e.g. : https://geosas.fr/mviewer-dev/?config=/apps/efele/config2.xm

- co-visualization of spatial data / temporal data

SO FAIR Portal

- Dashboard of deployed ST services



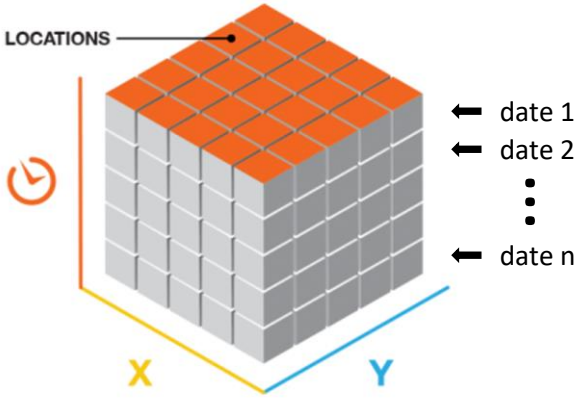
- Simple access to API functions
- Embedded in the API URL : https://geosas.fr/sofair-dev/

Prospects

SO FAIR, missing link Spatial and temporal data Infrastructures - S&TDI ?

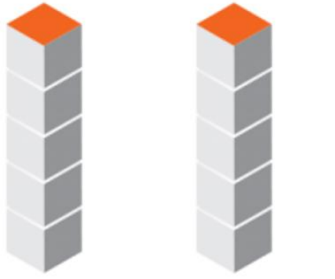
→ able to publish spatio-temporal data in a variety of complementary representations :

- using time series of georeferenced raster or vector layers



WMS

- Using time series associated with each geographical object



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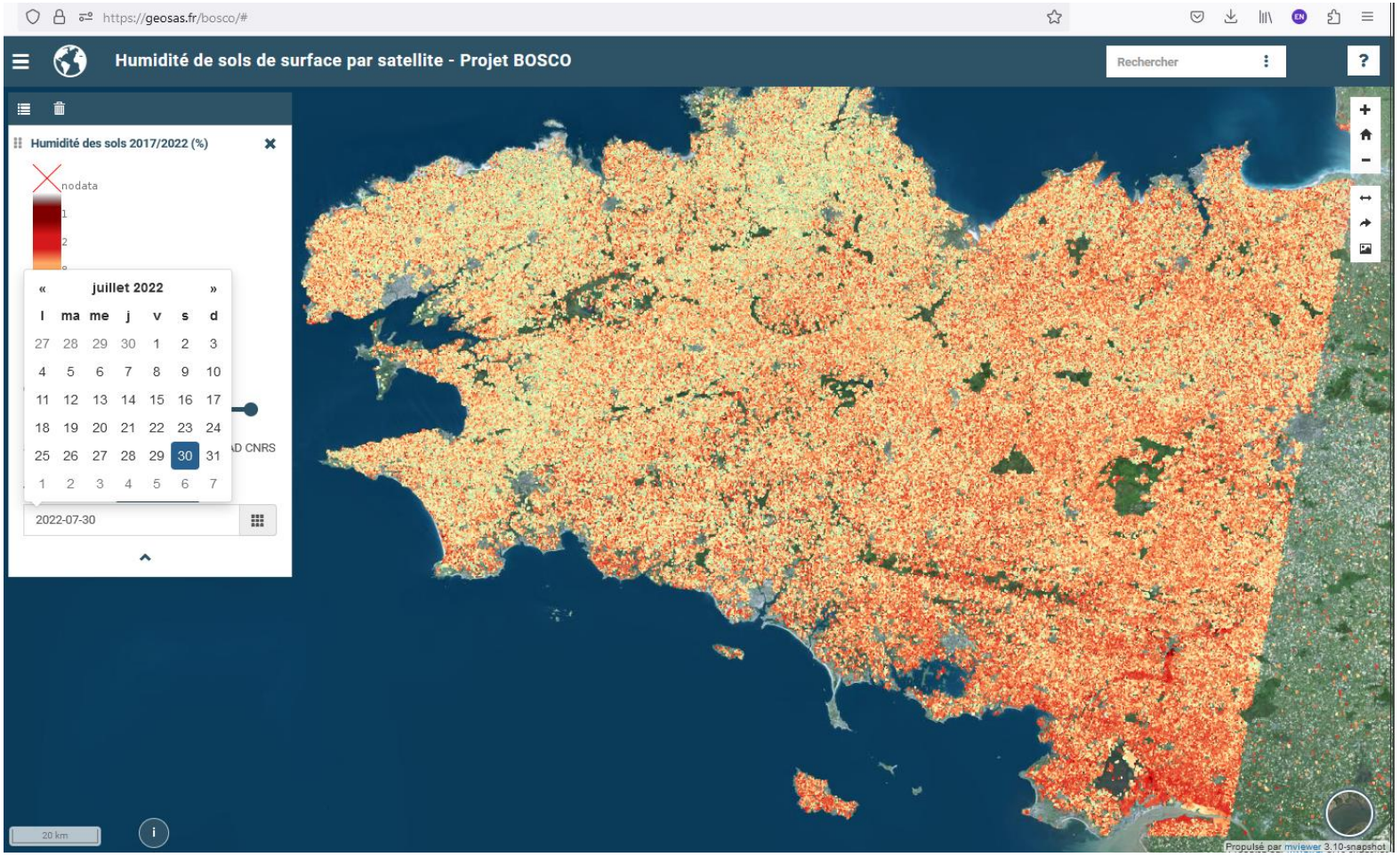
SensorThings

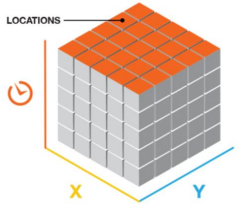
Parcelle 1 Parcelle 2 Parcelle n

Prospects : BOSCO project example

- Time series of raster images representing soil surface moisture at 10 m resolution



Request by OGC WMS/WCS



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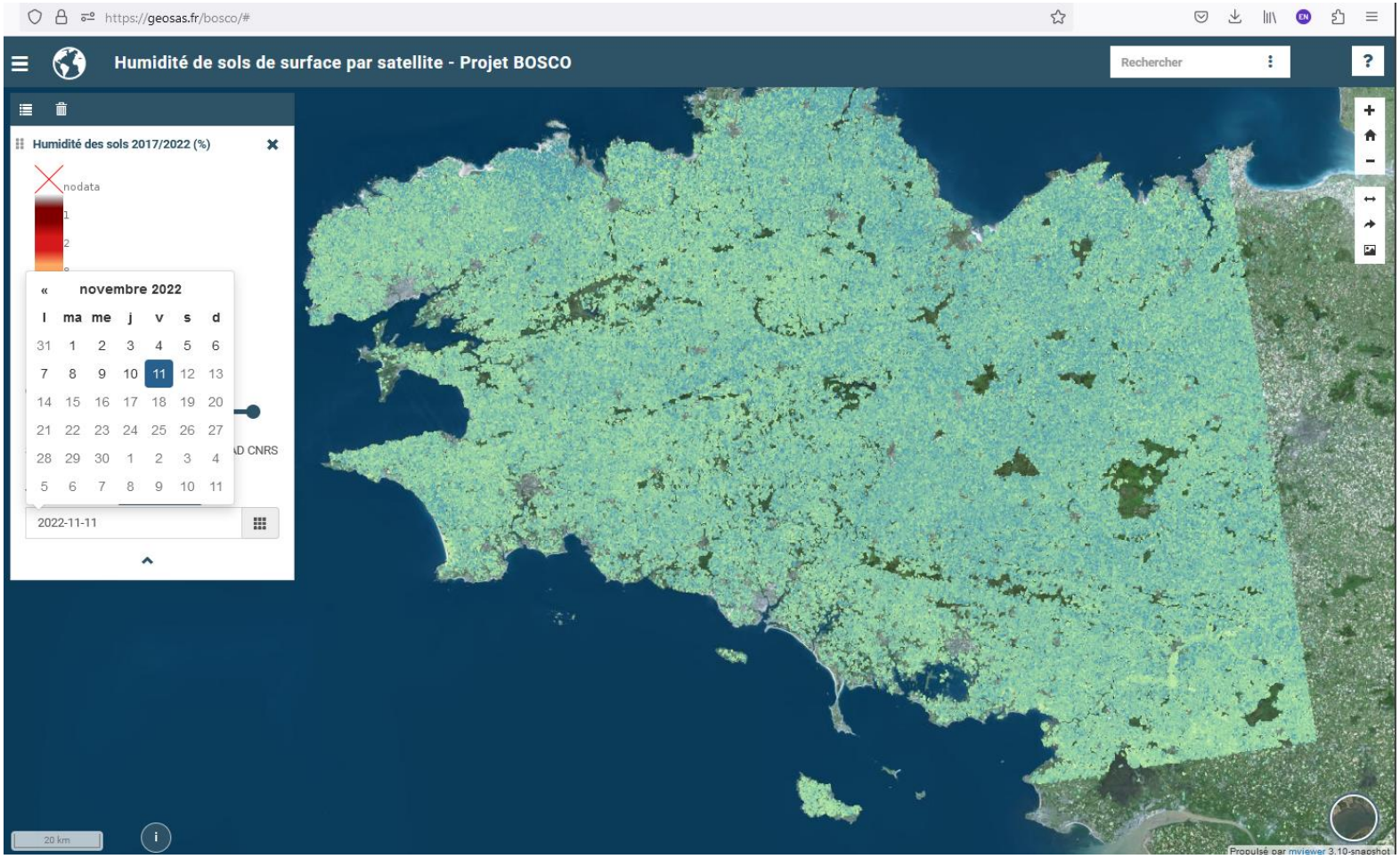

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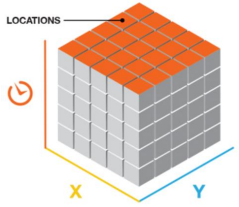

Prospects : BOSCO project example

- Time series representing soil surface moisture on each crop plot

Request by OGC SensorThings API

Thank you / Questions ?

Git SO FAIR project : ***https://github.com/geosas/sofair***

Git STEAN : ***https://github.com/Mario-35/STEAN***

Our research unit SDI GéoSAS : ***https://geosas.fr***