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Sensor Things API: DYNAMICS IN FRANCE.

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RÉPUBLIQUE
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Fraternité*



Géosciences pour une terre durable

brgm

SENSOR THINGS API - DYNAMICS IN FRANCE



Sylvain Grellet – BRGM
Mickaël Beaufiles – BRGM
USAGE workshop 2023 – 02 – 01

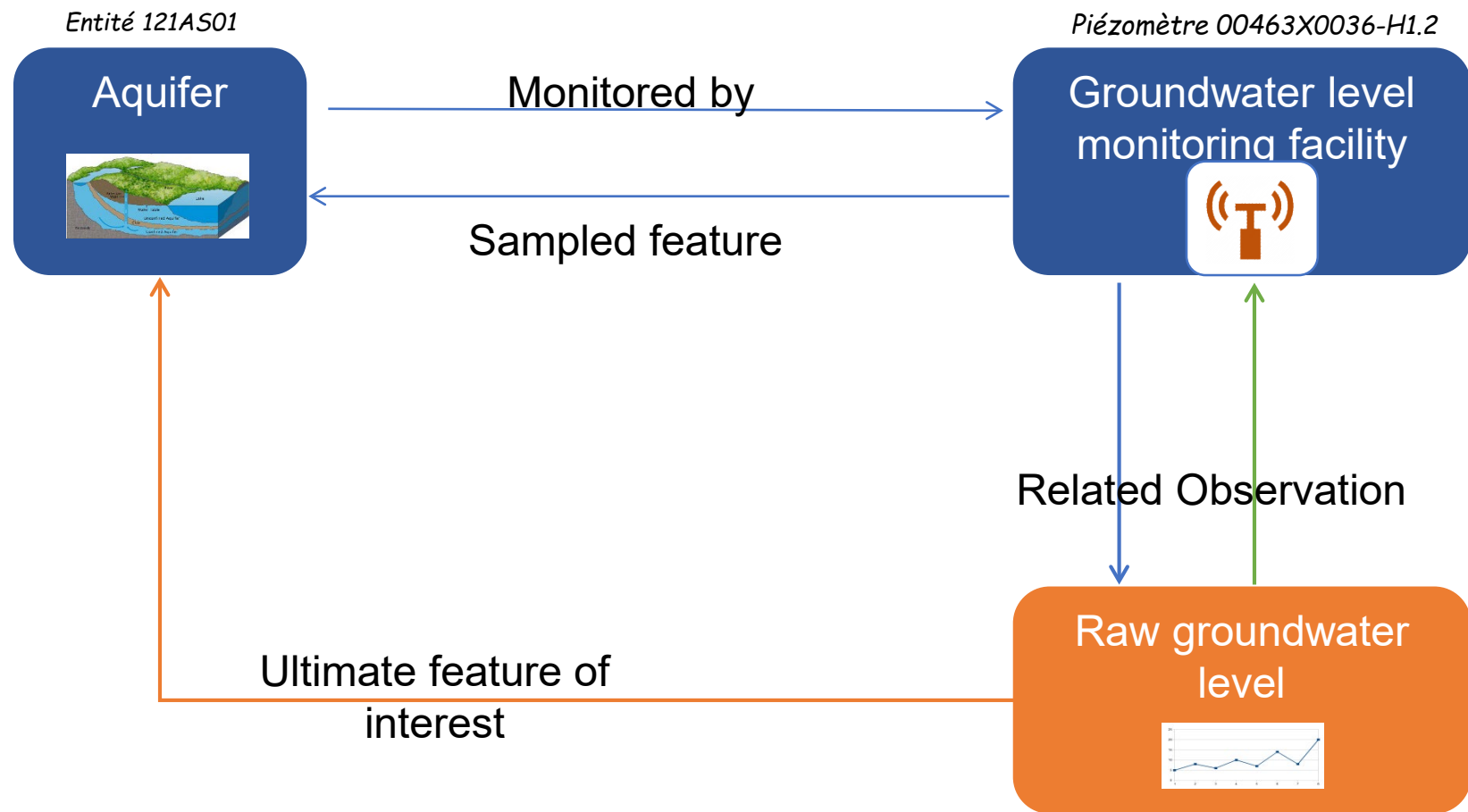


A growing interest: French insight

- 2017 – 2018 : First prototyping activity on BRGM side on national Groundwater level monitoring system
- 2018 – 2019 : French Office of Biodiversity (OFB) – pôle INSIDE : national system on Water Quality (Naïades) and national river gage system (SCHAPI)
- Then, Growing interest from
 - National Institute for Ocean Science : IFREMER
 - National Agronomic institute : INRAE
- And then... Ever growing interest from Research Infrastructures
 - OZCAR : critical zone
 - DataTerra
 - + others (re CIRAD example from Joan Maso in the chat)
 - ⇒ 2022 national research data workshop on SensorThings API
- And also then ... Broadening the domain implementation spectrum through OGC
 - Geotechnical data : OGC Geotech IE
 - Water quality data : OGC Water Quality IE
- + always supporting / funding evolutions in opensource communities

National groundwater monitoring system

French Geologic Survey (BRGM)



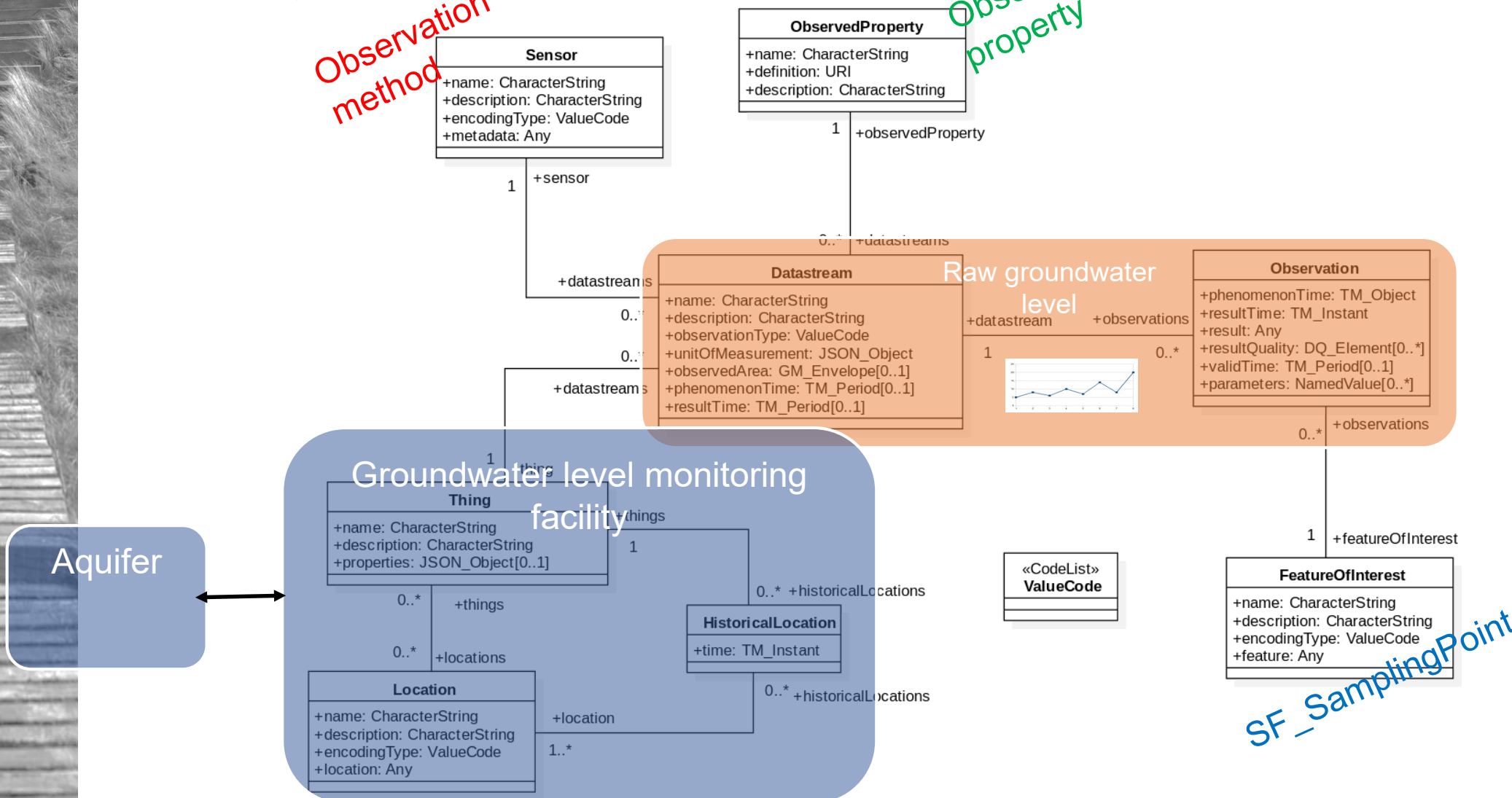
URI

National groundwater monitoring system

French Geologic Survey (BRGM)

Observation method

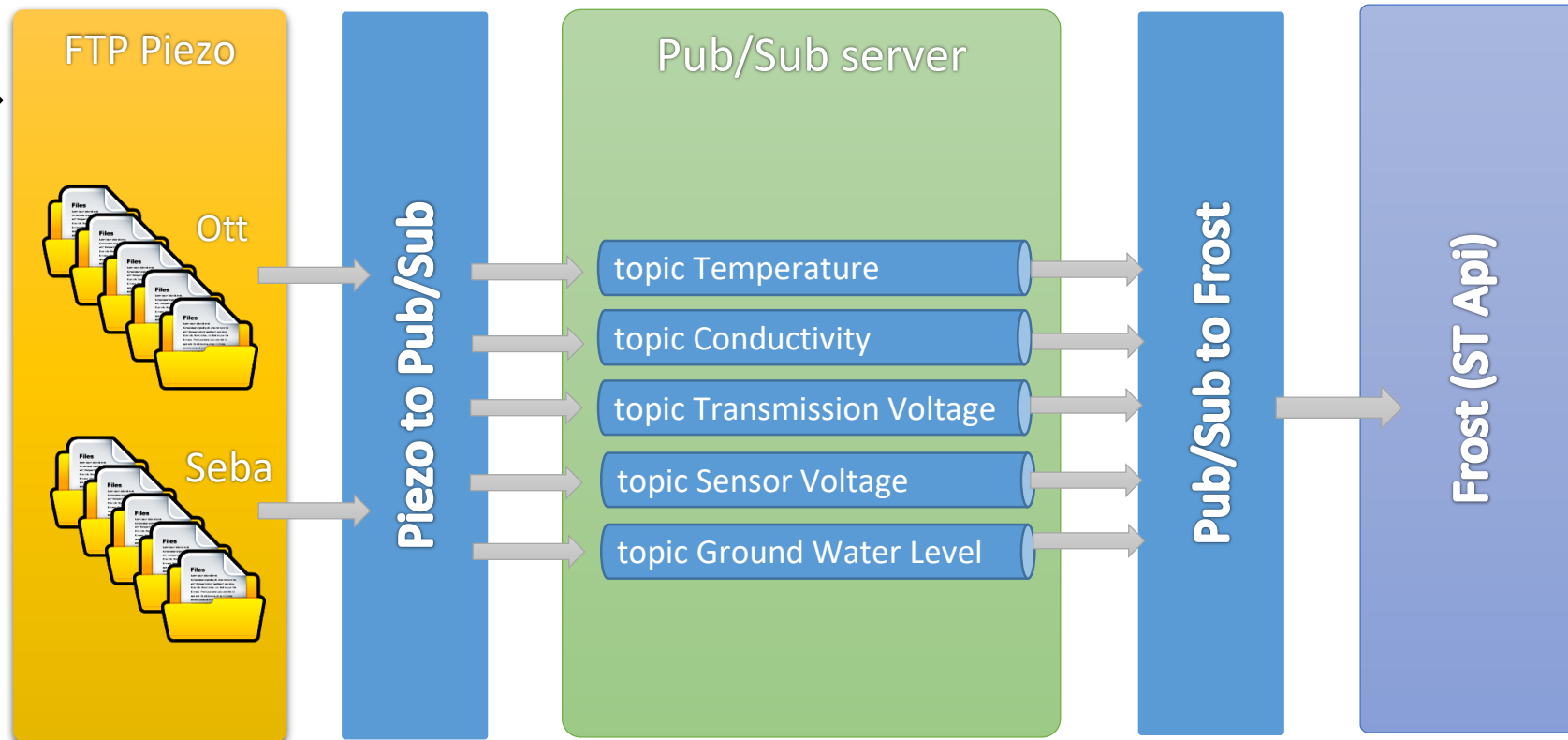
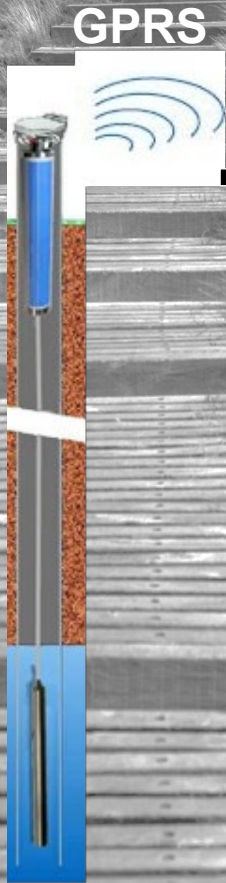
Observed property



National groundwater monitoring system

French Geologic Survey (BRGM)

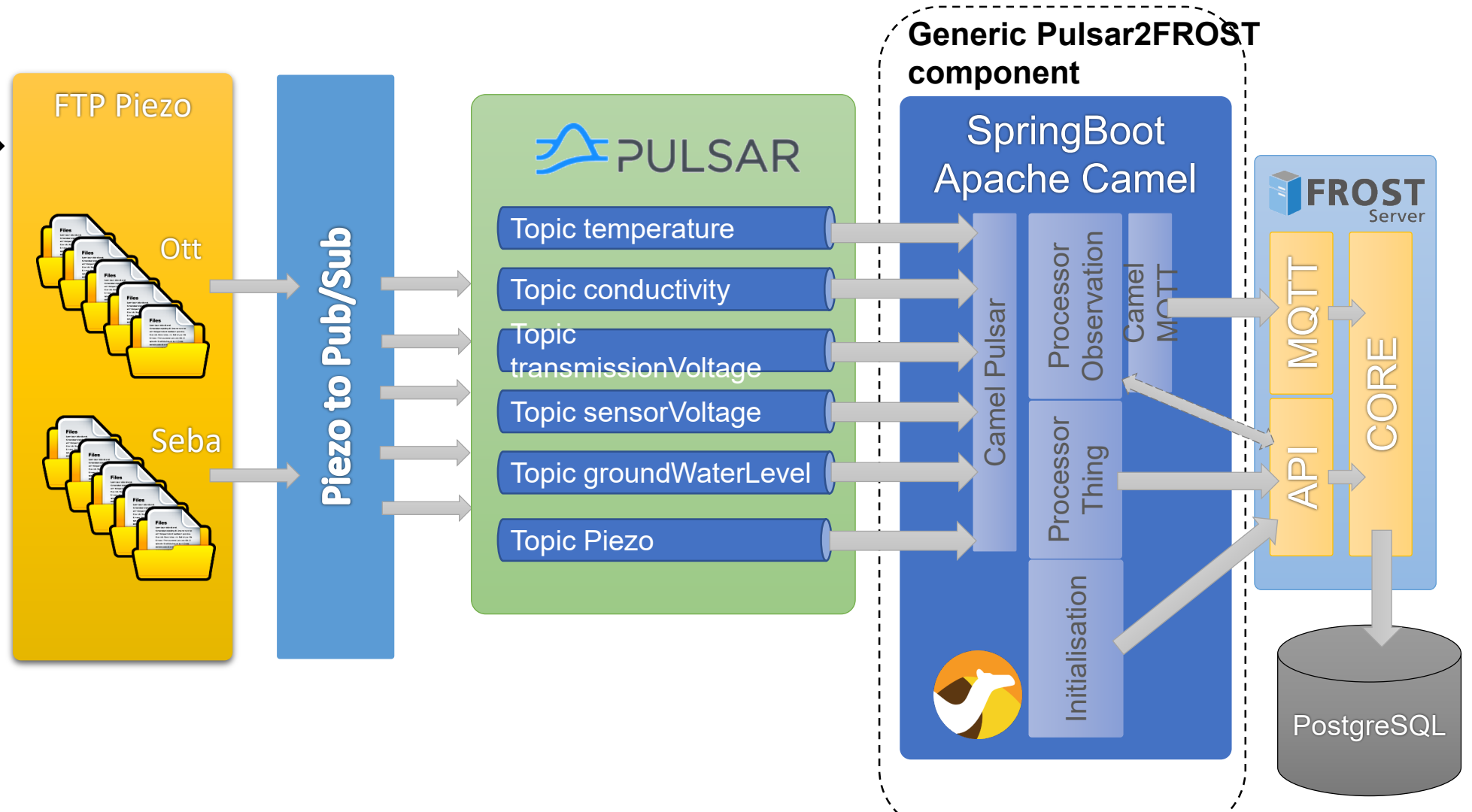
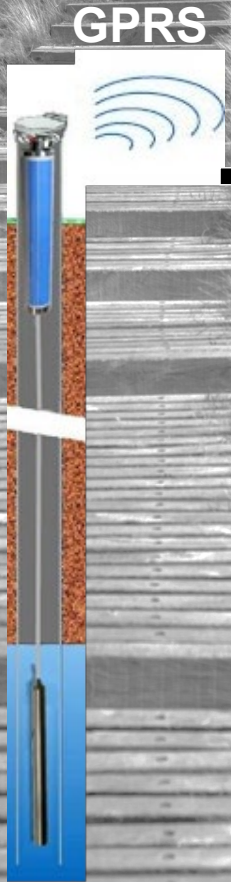
- From field sensors to SensorThings API server



National groundwater monitoring system

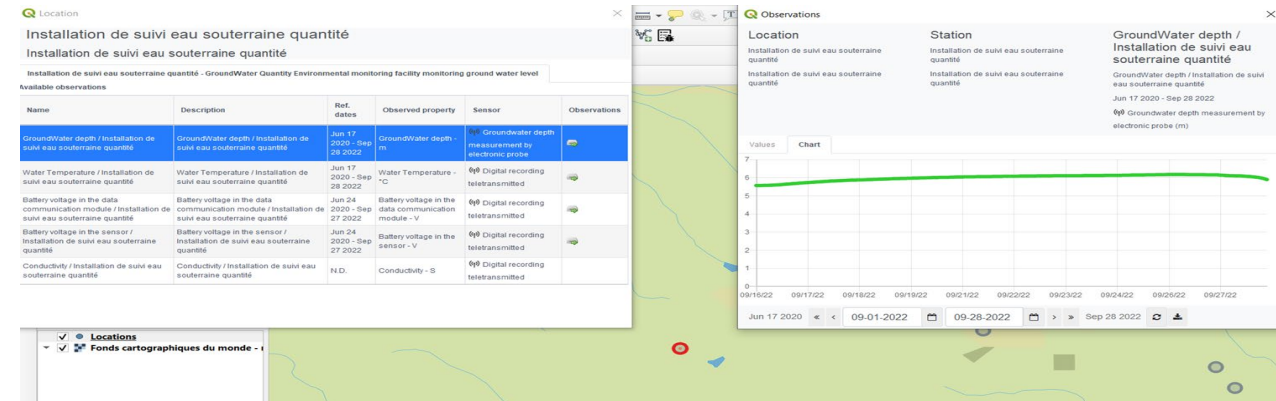
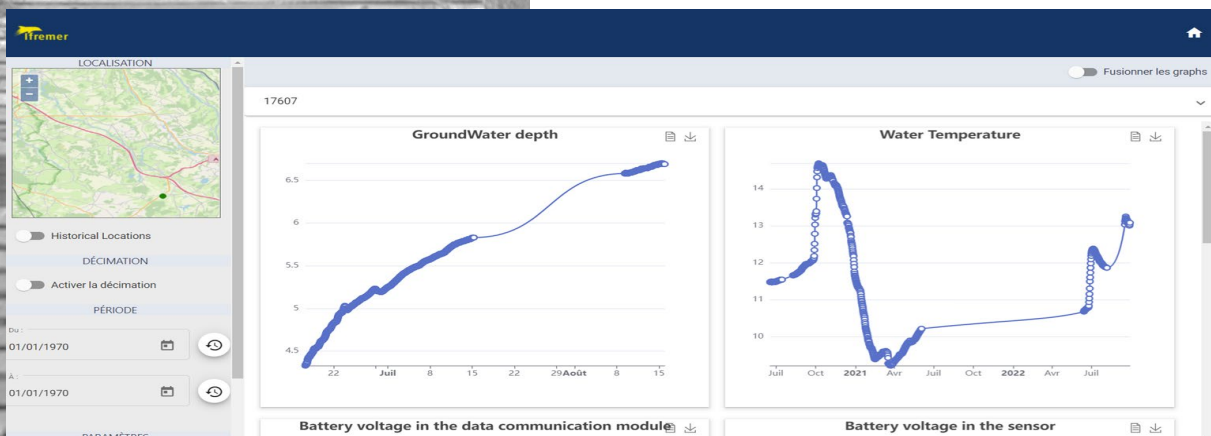
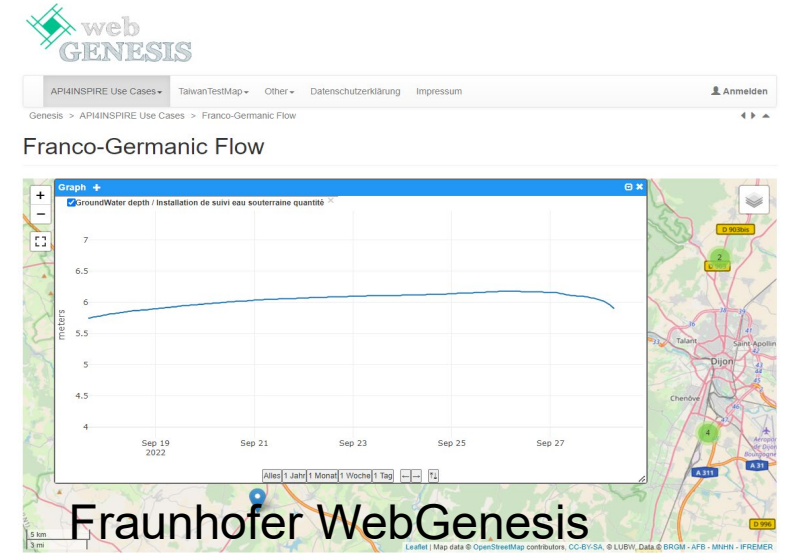
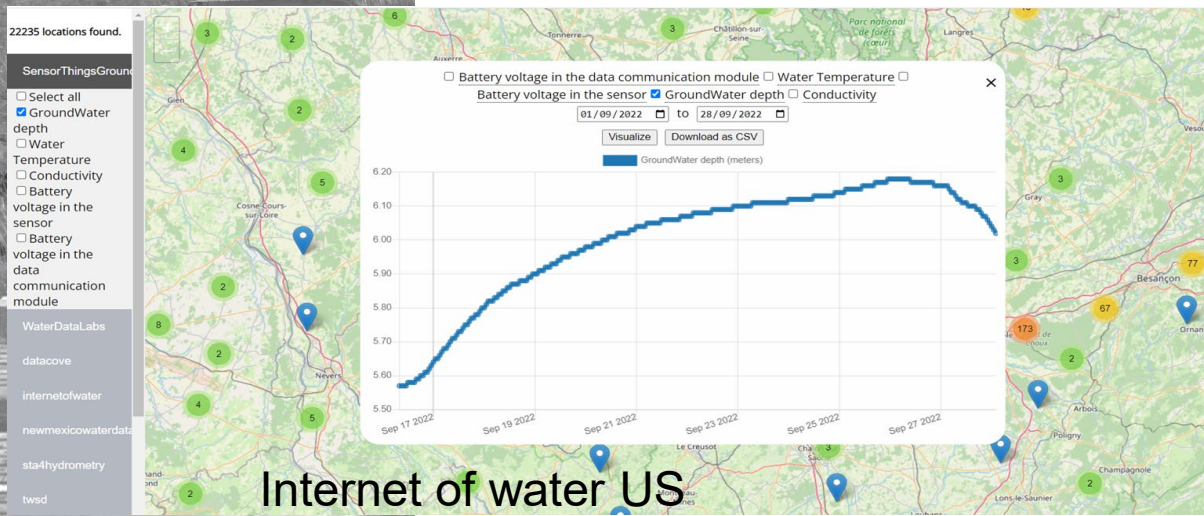
French Geologic Survey (BRGM)

- From field sensors to SensorThings API server using the full RESTful and MQTT capacities of the standard



National groundwater monitoring system

One ground water endpoint (BRGM) various clients

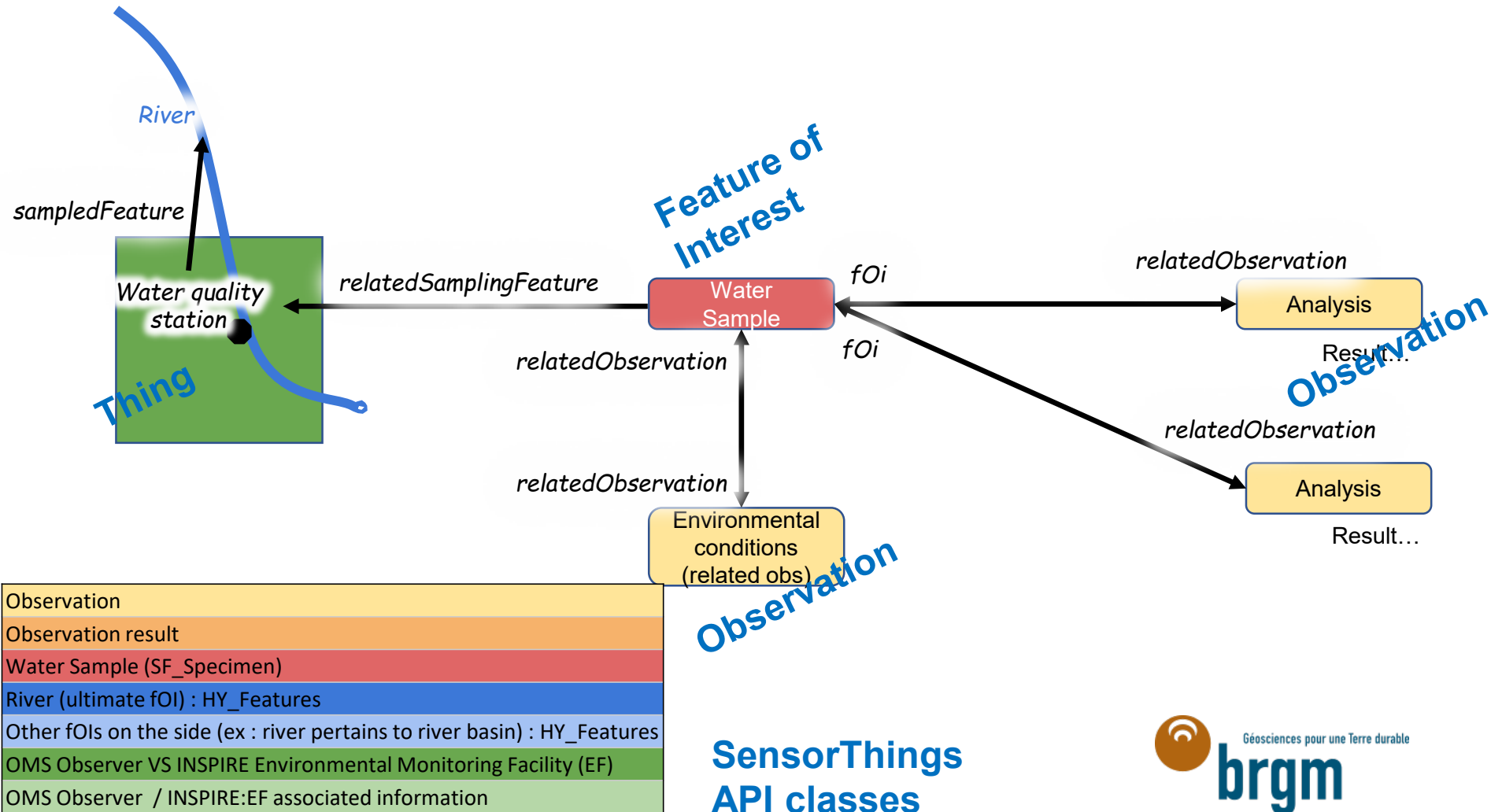




National Water Quality database

French office of Biodiversity (OFB)

- 130M+ observations. <https://www.naiades.eaufrance.fr/>





National Water Quality database

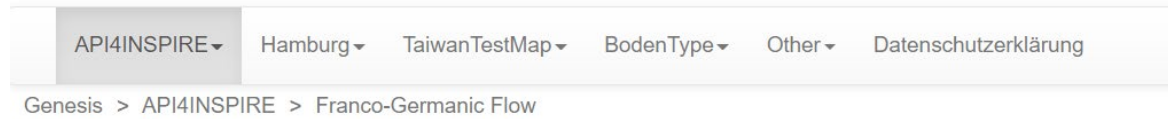
Work context

- [API4INSPIRE](#) project

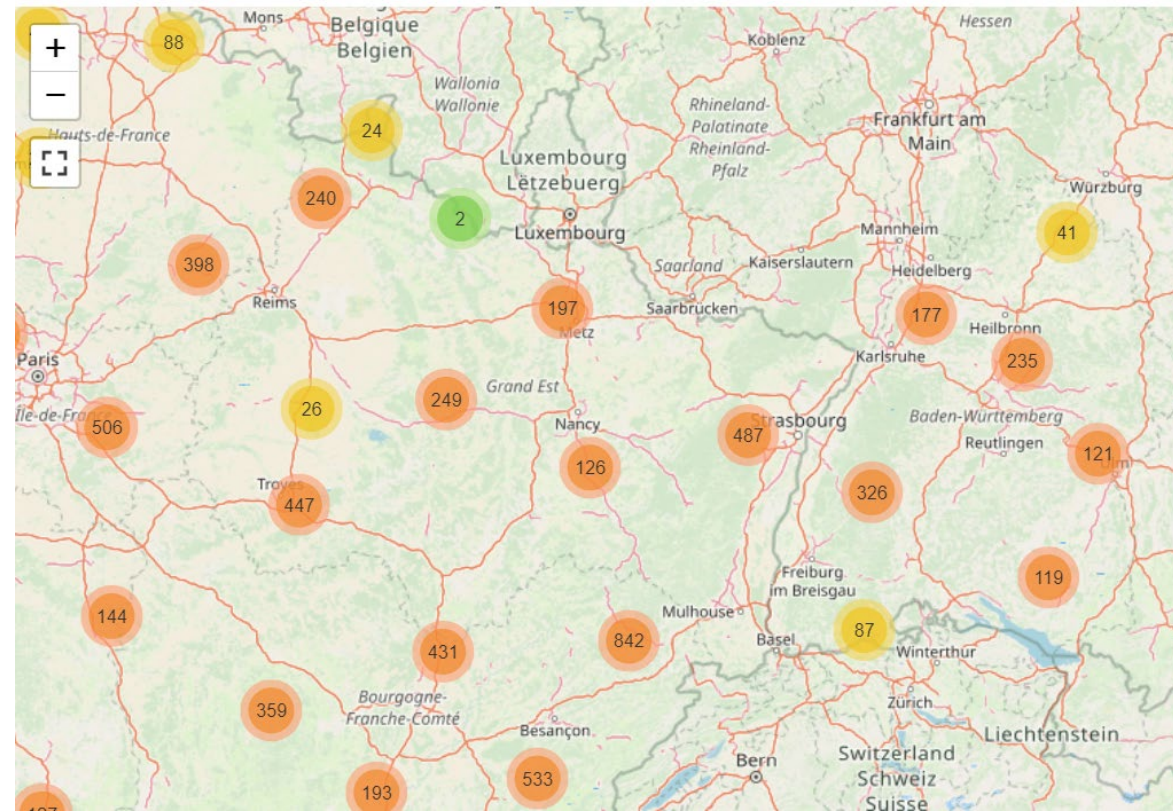


Data

- French Biodiversity Office (OFB),
 - BRGM,
 - Land Baden-Württemberg (LUBV)
- => Several SensorThings API endpoints



Franco-Germanic Flow



National Water Quality database

Cross border data sharing

- Focus on surface water quality stations



National Water Quality database

Cross border data sharing

LE RHIN À DRUSENHEIM

LE RHIN À DRUSENHEIM

- Agents surf. anioniques in Eau brute (mg/L)
- Agents surf. anioniques in Eau brute (mg/L)
- Agents surf. anioniques in Eau brute (mg/L)
- Aluminium in Eau brute ($\mu\text{g}(\text{Al})/\text{L}$)
- Ammonium in Eau brute ($\text{mg}(\text{NH}_4)/\text{L}$)
- Ammonium in Eau brute ($\text{mg}(\text{NH}_4)/\text{L}$)
- Ammonium in Eau brute ($\text{mg}(\text{NH}_4)/\text{L}$)
- Ammonium in Eau brute ($\text{mg}(\text{NH}_4)/\text{L}$)
- Azote Kjeldahl in Eau brute ($\text{mg}(\text{N})/\text{L}$)
- Azote Kjeldahl in Eau brute ($\text{mg}(\text{N})/\text{L}$)
- Bicarbonates in Eau brute ($\text{mg}(\text{HCO}_3)/\text{L}$)
- Bicarbonates in Eau brute ($\text{mg}(\text{HCO}_3)/\text{L}$)
- Calcium in Eau brute ($\text{mg}(\text{Ca})/\text{L}$)
- Calcium in Eau brute ($\text{mg}(\text{Ca})/\text{L}$)
- Calcium in Eau brute ($\text{mg}(\text{Ca})/\text{L}$)
- Carbonates in Eau brute ($\text{mg}(\text{CO}_3)/\text{L}$)
- Carbonates in Eau brute ($\text{mg}(\text{CO}_3)/\text{L}$)
- Carbone Organique in Eau brute ($\text{mg}(\text{C})/\text{L}$)
- Carbone Organique in Phase aqueuse de l'eau (filtrée, centrifugée...) ($\text{mg}(\text{C})/\text{L}$)
- Carbone Organique in Phase aqueuse de l'eau (filtrée, centrifugée...) ($\text{mg}(\text{C})/\text{L}$)
- Chlorophylle a in Eau brute ($\mu\text{g}/\text{L}$)
- Chlorophylle a in Eau brute ($\mu\text{g}/\text{L}$)
- Chlorures in Eau brute ($\text{mg}(\text{Cl})/\text{L}$)
- Chlorures in Eau brute ($\text{mg}(\text{Cl})/\text{L}$)
- Chlorures in Eau brute ($\text{mg}(\text{Cl})/\text{L}$)
- Chlorures in Eau brute ($\text{mg}(\text{Cl})/\text{L}$)

Leaflet | Map data ©

Taxonomies not mapped,
would be the ideal next step

bei Grauelsbaum (XX317.00)

Messtation bei Grauelsbaum (XX317.00) bei Rhein

Monitors:
{properties/gewaesser.Location/name}

All properties:

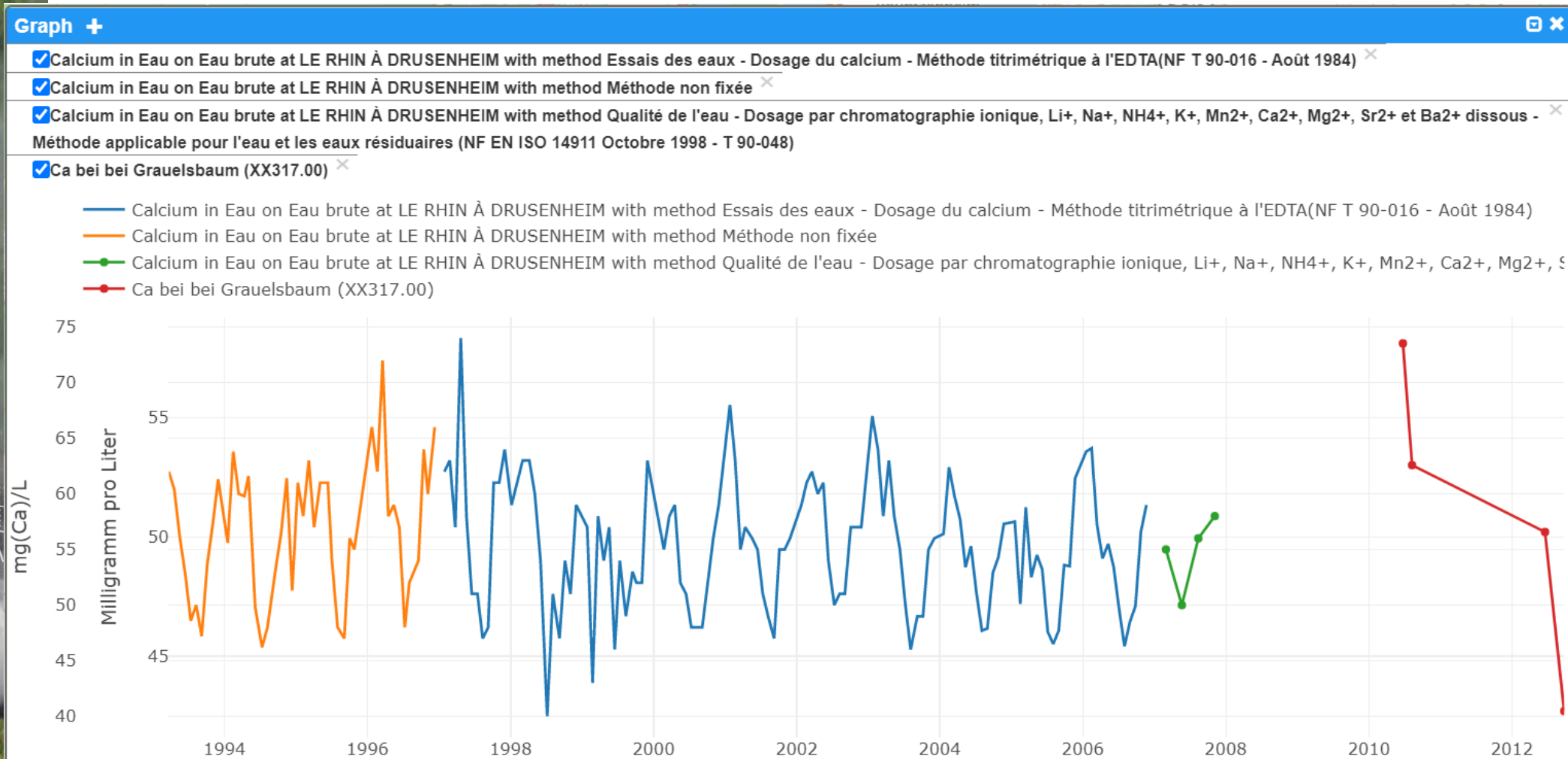
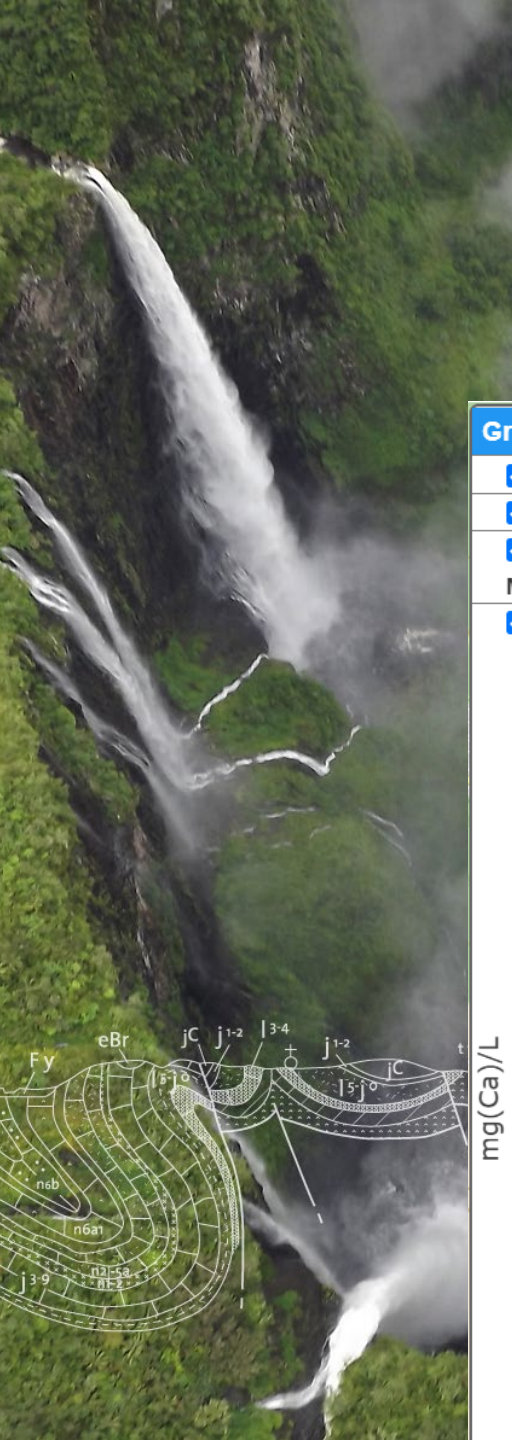
- type:station
- gcode:XX317.00
- xcnflid:5695
- gemeinde:Lichtenau
- flussgebiet:Rhein uh. Kieshafen Lichtenau-Grauelsbaum oh. Yachthafen Greffern
- wasserkoeper:Staugeregelte Rheinstrecke, unterh. Staustufe Strasbourg bis Staustufe Iffezheim
- gemeindeXcnflid:8216028
- flussgebietXcnflid:5847
- wasserkoeperXcnflid:20193351
- gewaesser.Location@iot.id:15739
- gewaesser.Location@iot.navigationLink:https://frost.docker01.ilt-dmz.iosb.fraunhofer.de/v1.1/Locations(15739)

- Ca in Oberflaechengewasser (Stichprobe)
- GH in Oberflaechengewasser (Stichprobe)
- LF in Oberflaechengewasser (Stichprobe)
- Mg in Oberflaechengewasser (Stichprobe)
- O2 in Oberflaechengewasser (Stichprobe)
- O2 SAET in Oberflaechengewasser

Leaflet | Map data ©

National Water Quality database

Cross border data sharing

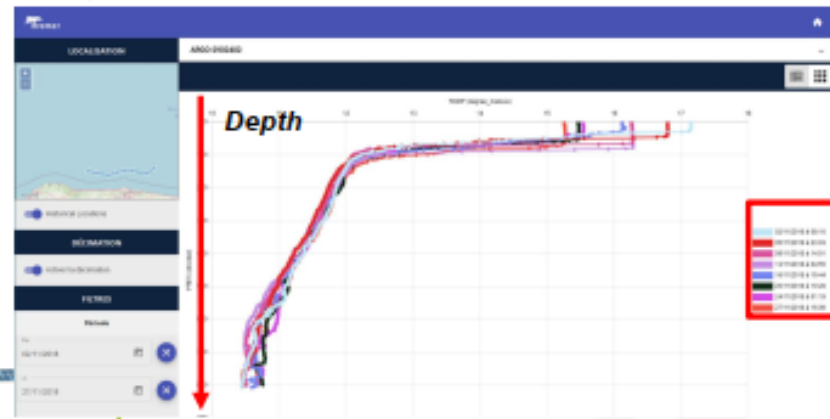


Institute for Ocean Science - IFREMER

Argo network buoys

La modélisation des objets métiers

Les profils (ex : flotteurs Argo) -> un cas particulier, quand le X n'est pas le temps



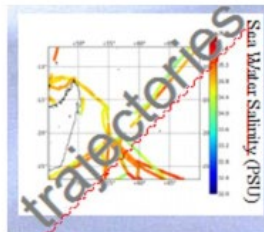
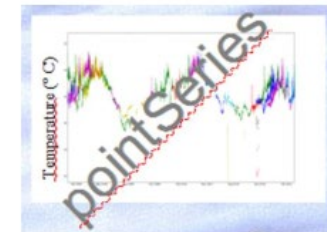
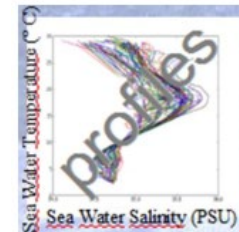
Un seul temps pour n observations selon Z (la profondeur)

7

And pushing it to EU projects

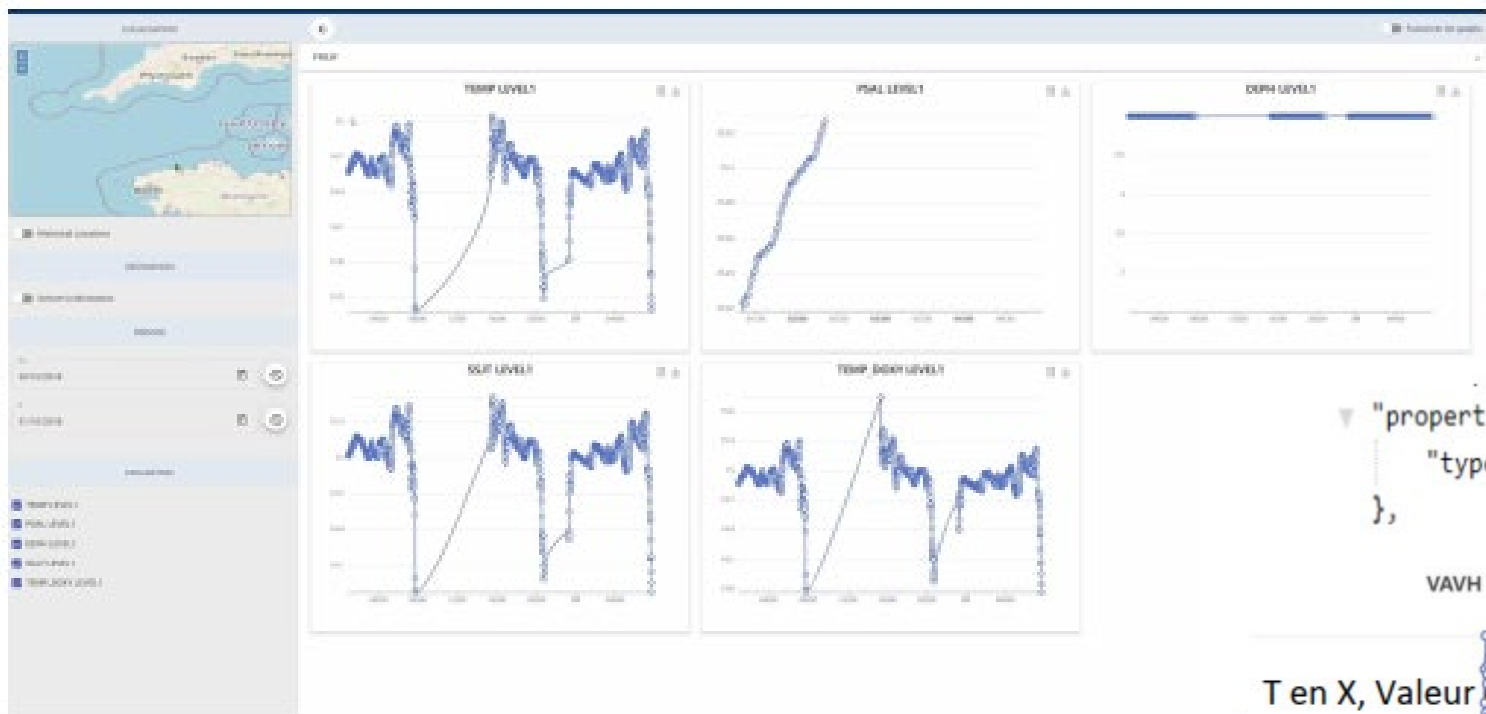
Le contexte métier

- Profiles: CTD, profiling floats (ARGO)
- PointSeries: moorings, including moorings with different vertical levels
- Trajectories: thermo-salinometers, gliders



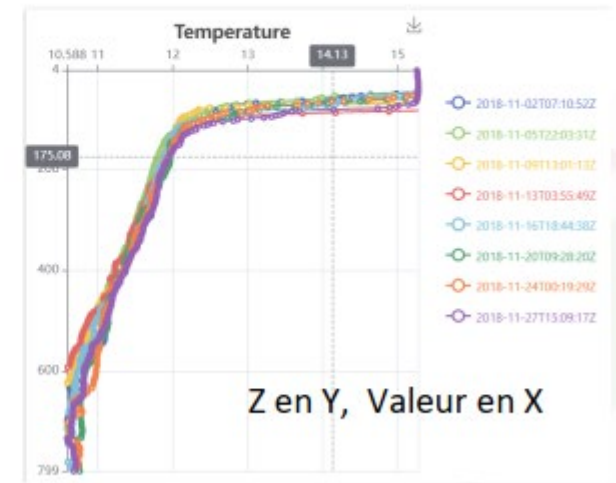
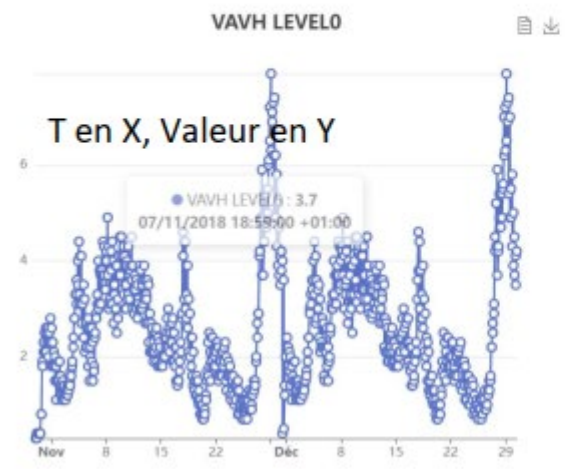
Institute for Ocean Science - IFREMER

Argo network buoys



```
"properties": {  
  "type": "trajectory"  
},
```

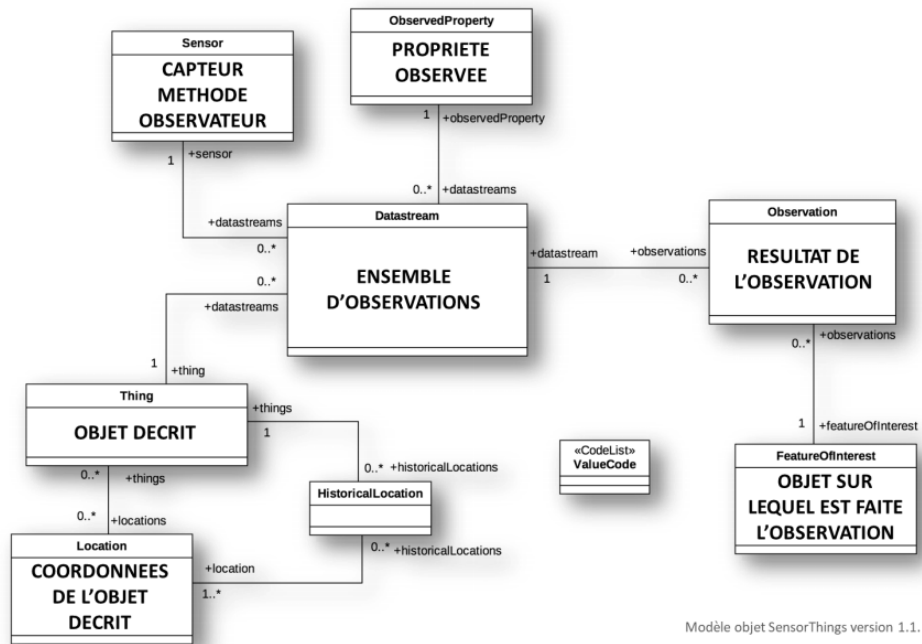
```
properties: {  
  type: "Profile"  
},
```



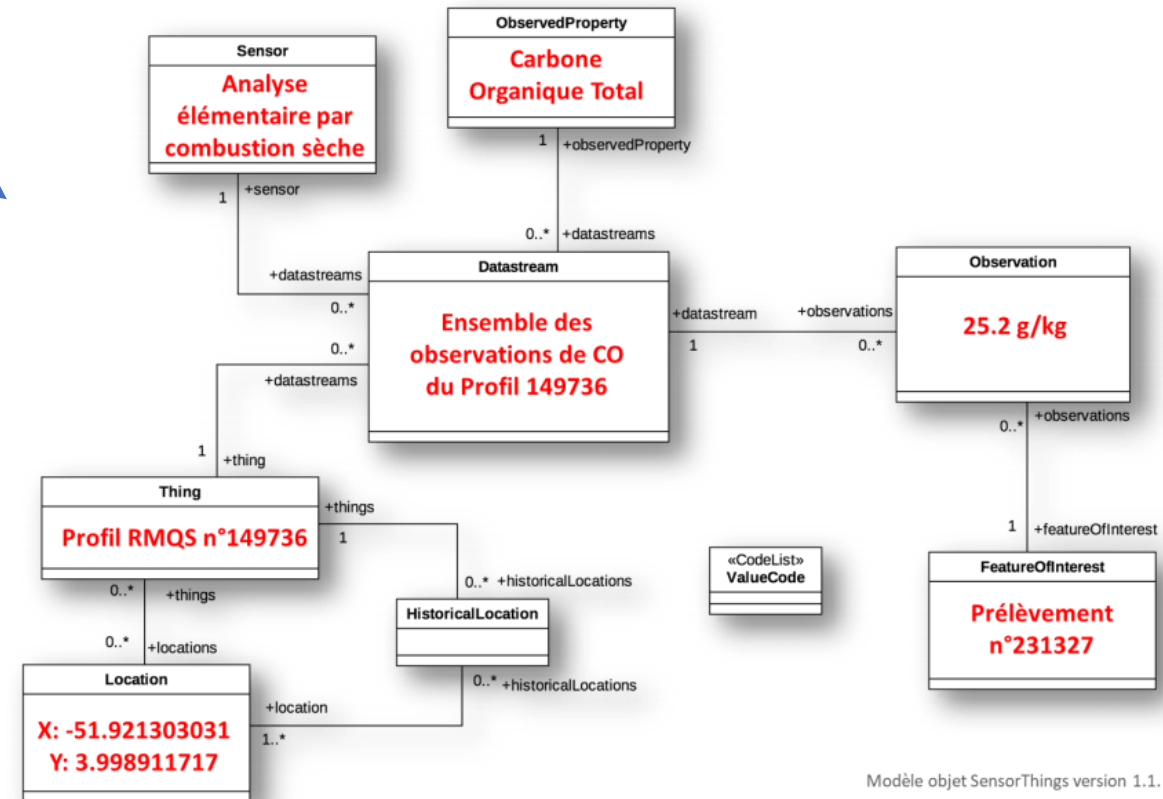
<https://sextant.ifremer.fr/examind/WS/sts/coriolis/v1.1>

Agronomic institute - INRAE

National soil database



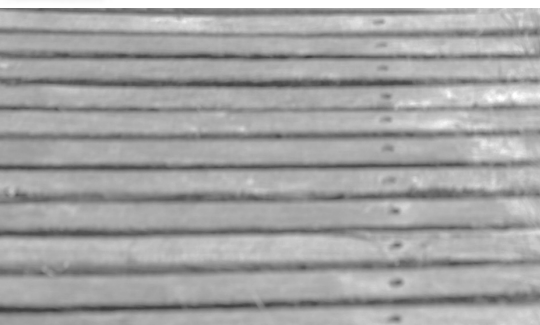
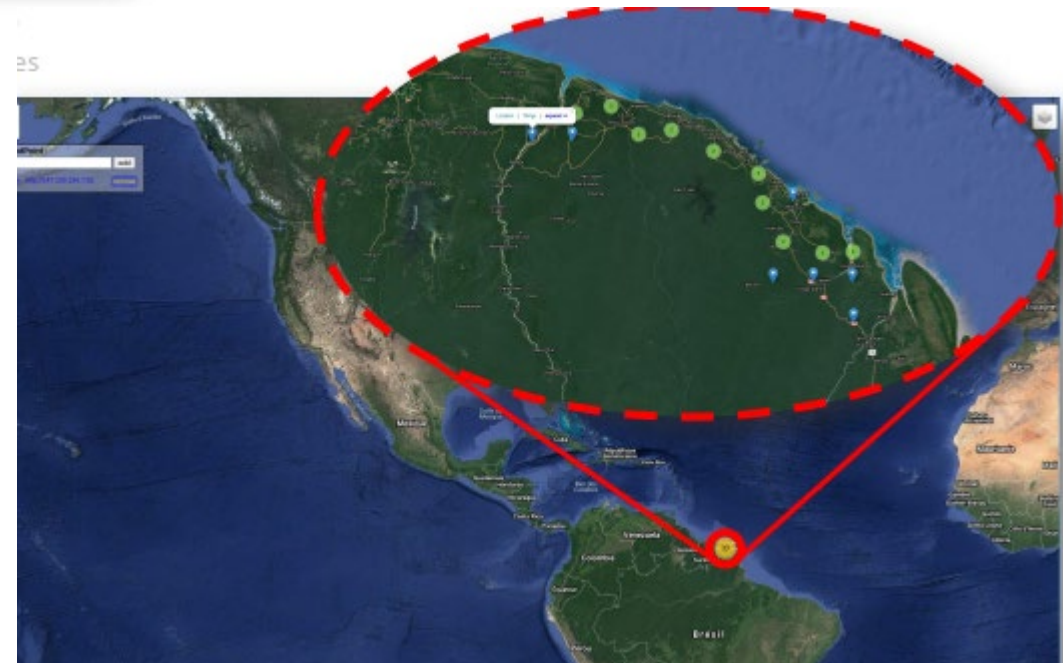
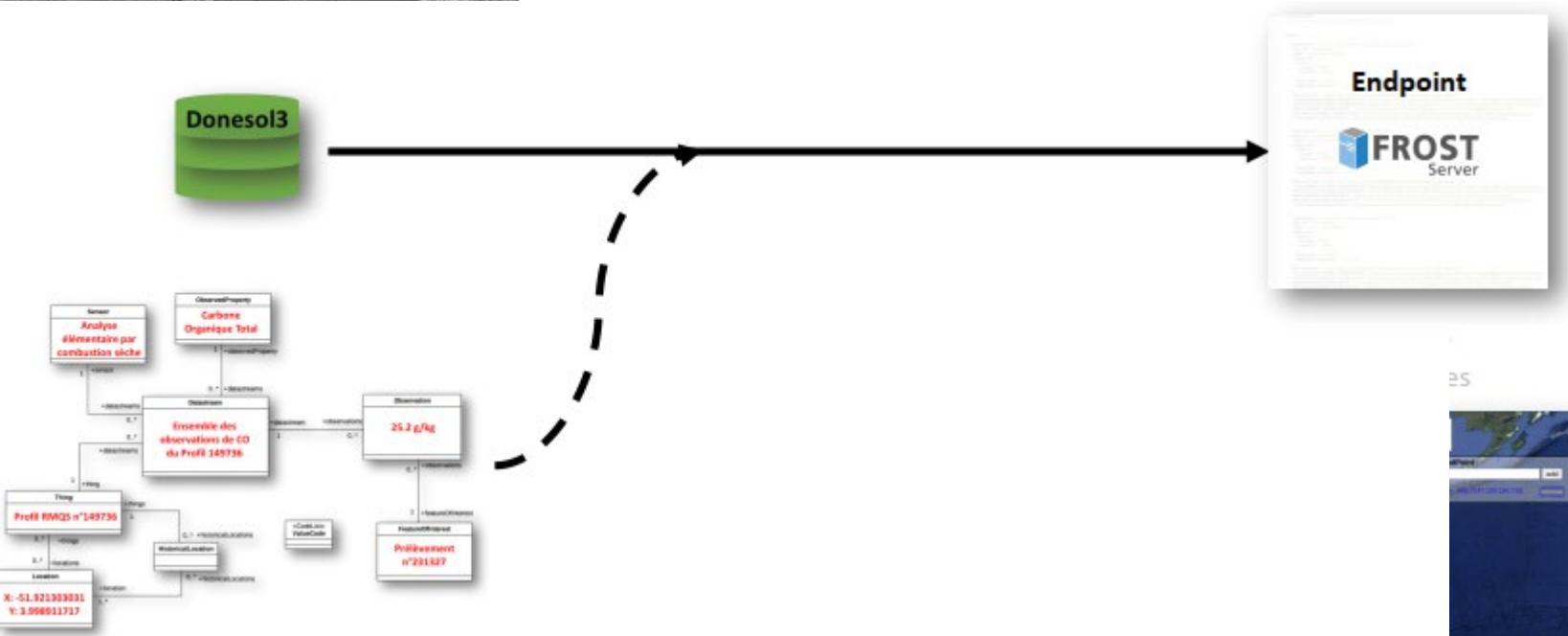
Organic Carbon in a soil sample



Agronomic institute - INRAE

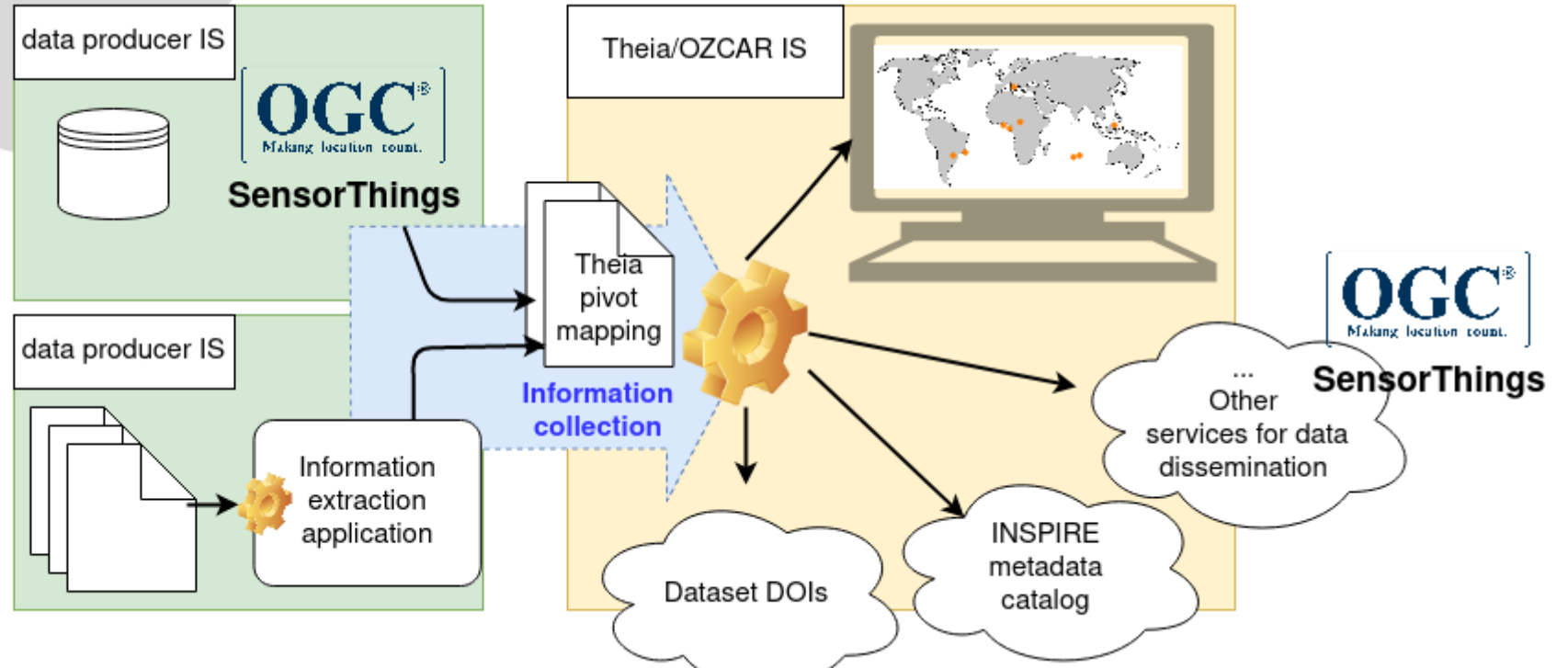
National soil database

- Historical/Legacy national databank mapped to SensorThings API for data sharing



OZCAR-RI

French network of Critical Zone Observatories: Research and Applications



SensorThings API for

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

> OZCAR SensorThings API guidelines (*WorkInProgress*): <https://github.com/theia-ozcar-is/sensorthings-guidelines/>

National research data network workshop

National network on making French research data FAIR

- <https://sist.cnrs.fr/webinaire-sensorthings/>

SIST

Le réseau CNRS des gestionnaires de données d'observation



Accueil Le réseau SIST Séminaires Formations Ressources Actualités

Webinaire SensorThings

Menu

Synthèse de la Journée

Objectifs

Introduction

1ère partie : du standard SOS au standard SensorThings

2nde partie consacrée à des retours d'expériences

Fin de journée et conclusion

Une journée a été organisée en webinaire le jeudi 29 septembre 2022 de 9h30 à 17h00 conjointement par le réseau SIST CNRS et le [Pôle INSIDE](#) (OFB et BRGM), consacrée à la nouvelle application d'échanges de données d'observations **SensorThings API**

« Adopté internationalement dans de nombreux domaines, le standard OGC **SensorThings API** constitue une opportunité incontournable pour stimuler la **diffusion des données environnementales à grande échelle et de façon interopérable dans le cadre de l'internet des objets**. Conçu pour couvrir une multitude de cas d'utilisation, le standard OGC SensorThings API permet une **fourniture légère des données d'observation**, tout en étant conçue pour être « conviviale pour les développeur-ses » »

[<https://www.ogc.org/standards/sensorthings>, <http://pole-inside.brgm-rec.fr/fr/page/api-dobservations>, <https://github.com/INSIDE-information-systems/SensorThingsAPI>]

Les présentations, les vidéos et les liens de démonstration sont disponibles sur le [github du Pôle INSIDE](#).

Synthèse de la Journée

Broadening the domain implementation spectrum

International geotechnical data exchange

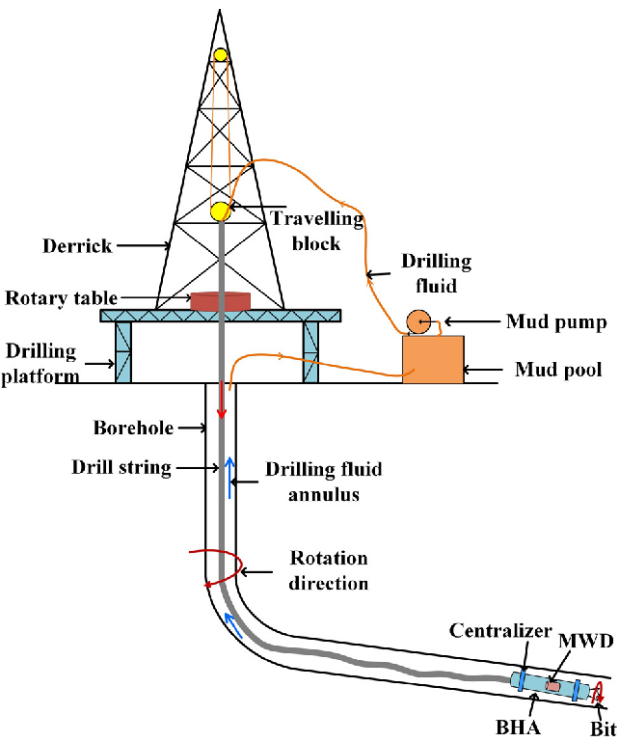
- OGC Geotech IE : <https://github.com/opengeospatial/Geotech/wiki>
 - Co-Lead : BRGM under the OGC Geoscience Domain Working Group umbrella
 - Members : Open Geospatial Consortium, buildingSmart International, AGS, DIGGS
 - Supporting community : ISSMGE TC222, ITA WG22, CGI-IUGS, EGS UGEG, MINnD

Context

- Exposing Geotechnical in-situ measurements thanks to OGC Sensor Things API
- Data: Measurements performed while drilling a borehole (CPT, SPT, Menard Pressuremeter)

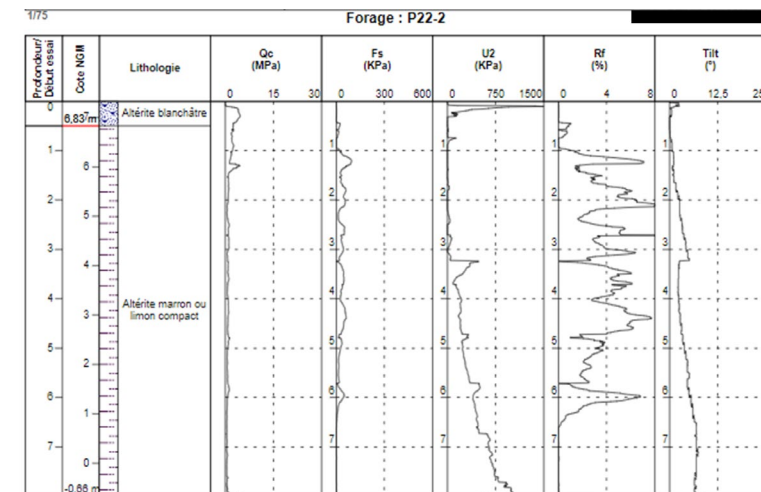
Challenges

- “Z-series” data (tuples of (z, value)).
- Linear referenced coordinates (z is along the borehole trajectory)



A non straight borehole trajectory

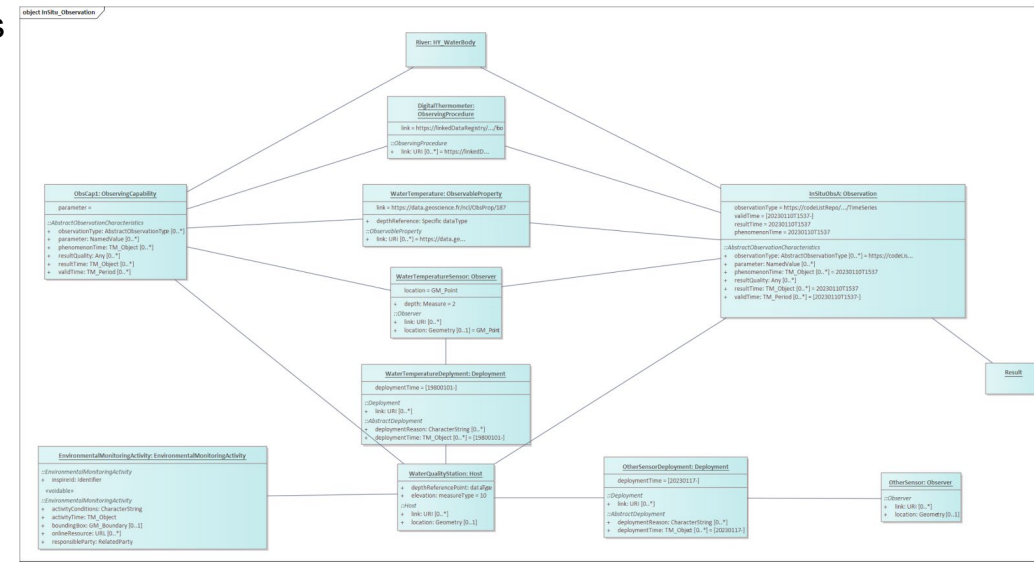
Some geotech measurements results (CPT)



Broadening the domain implementation spectrum



International water quality data exchange

- OGC Water Quality IE : <https://github.com/opengeospatial/WaterQualityIE>
 - Co-Lead : BRGM, Internet of Water under the OGC Hydro Domain Working Group umbrella
 - Members : USGS, US EPA, WMO, UNESCO, BfG, BRGM, OFB - Pôle INSIDE, University of Tartu, Australia & NZ participants
- Context
 - Exposing Water Quality measurements (surface & ground water) across organizations
 - Data : In-situ sensor, one time measurements, sample (and sub-sample) lab analysis, biota observations, lots of controlled vocabularies
 - Back-bone from the OGC baseline
 - Semantics: Observations, Measurements & Samples
 - API : SensorThings API, OGC API - Features



Supporting/Funding evolutions in opensource tools

OGC Geotech IE

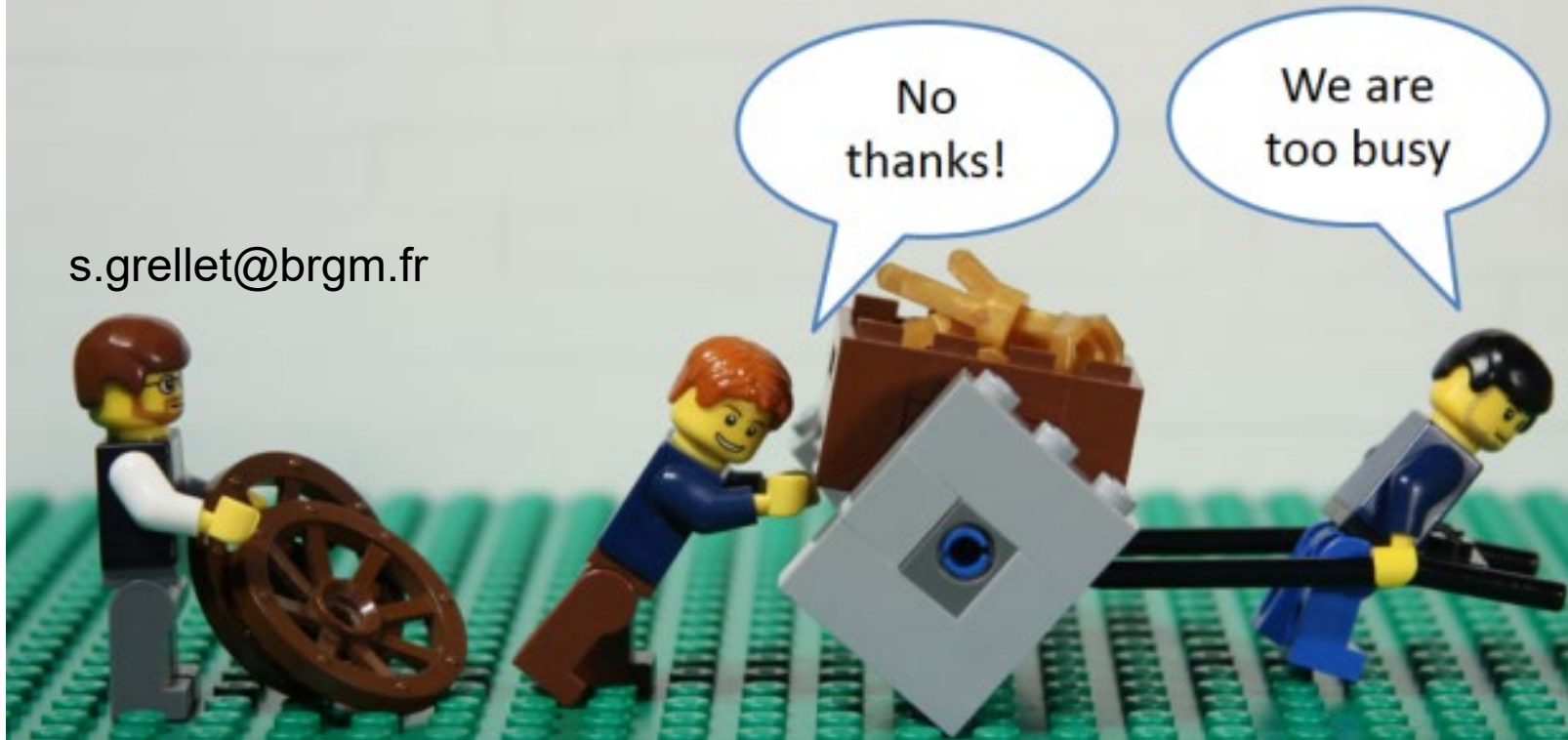
- Server side 
 - FROST implementation of Sensor Things API : Ex : CSV output + findings from Water Quality, Geotech IE
- Client side 
 - Porting to QGIS core the ST API plugin coming from the AIR-BREAK project (<https://plugins.qgis.org/plugins/SensorThingsAPI/>)

Thank you



Are you too busy to improve?

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Håkan Forss @hakanforss <http://hakanforss.wordpress.com>

This illustration is inspired by and in part derived from the work by Scott Simmerman, "The Square Wheels Guy" <http://www.performancemanagementcompany.com/>

Thanks to

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Kathi@DataCove.eu



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M.Beaufils@brgm.fr



Hylke van den Schaaf

hylke.vanderschaaf@iosb.fraunhofer.de

And to the colleagues / partners I grabbed presentation from the ST API workshop in France (EN/French) :

https://github.com/INSIDE-information-systems/SensorThingsAPI/tree/master/presentations/20220929_INSIDE_SIST_SensorThingsAPI_Webinaire