



ADVANCING  
CRITICAL ZONE  
SCIENCE

FIRST OZCAR - TERENO  
INTERNATIONAL CONFERENCE

STRASBOURG FRANCE

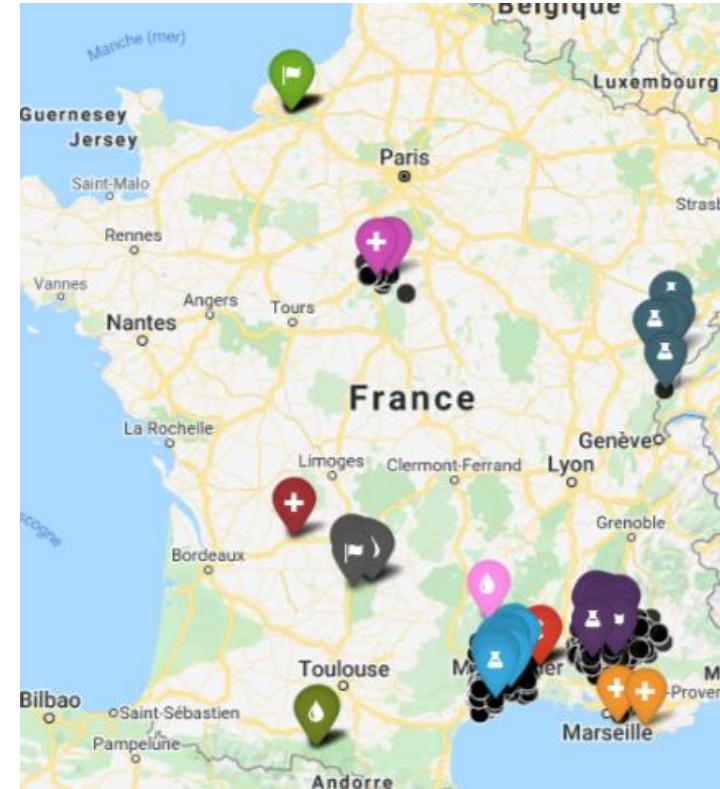
MONDAY OCT. 4 - FRIDAY OCT. 8, 2021

# Manage and distribute data in a french environment observatory: the example of OSU OREME and the KARST observatory network

Juliette FABRE and Olivier LOBRY, OSU OREME, CNRS  
The SNO KARST team

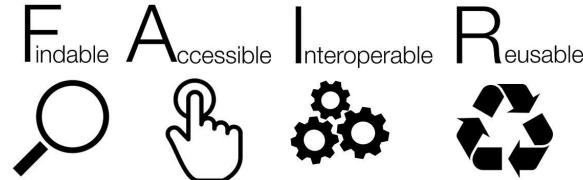
# Context

- OSU OREME: Montpellier Research Observatory of Environment
  - 8 labs, 26 Observation Services
  - Support for long-term observation & data dissemination
  - 1 data portal / infrastructure : [data.oreme.org](http://data.oreme.org) with **shared tools**
  - 2 database engineers
- SNO KARST (OZCAR RI)
  - 9 observatories
  - **multidisciplinary time series on karst**
  - 600 stations & 150 parameters
  - 2016 : OREME in charge of the data



# Needs and constraints

- SNO KARST
  - needs:
    - data **visualisation / download / citation (DOI)**
    - integration of time series from the **french hydrological bank**
  - but: **little time** available for data management 😰



- National requirements : FAIR
- OZCAR RI : **feeding of the data portal => semantic and syntax interoperability**

# Methods

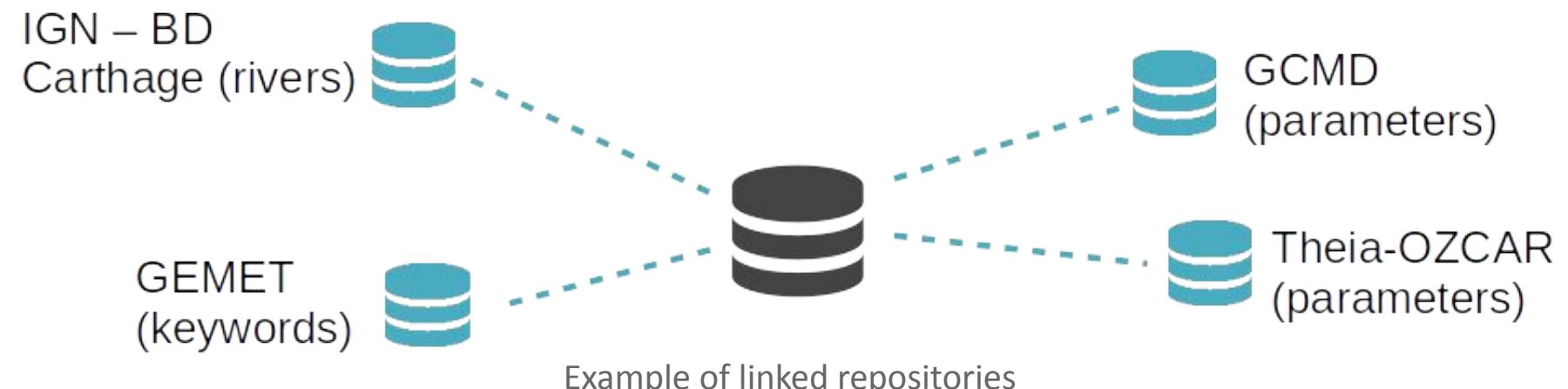
- Project management
  - Small team : 2 engineers + a scientist + project leaders
  - Iterative development process: development, user feedback, dev .. (still in progress !)
  - Interactions with OZCAR data team (18 months)

# Methods

- Database



- Describe data with **detailed metadata**
  - stations, sensors, acquisition methods ..
- Link descriptions to **existing repositories => enrich and link data**
  - see [Data Management Plan](#)
- **Align parameters** with Theia-OZCAR / GCMD thesauri



# Methods

- Database feeding

- 1/ **Metadata** web edition tools - PHP / JS 
- 2/ Generation of Excel/CSV sheet **templates** to submit **data** (FTP server) - PHP / R
- 3/ **Automatic** data integration from the french hydrological bank - Hub'eau API - R

Station

Observatory

Station \*

Parameter

Parameter \*

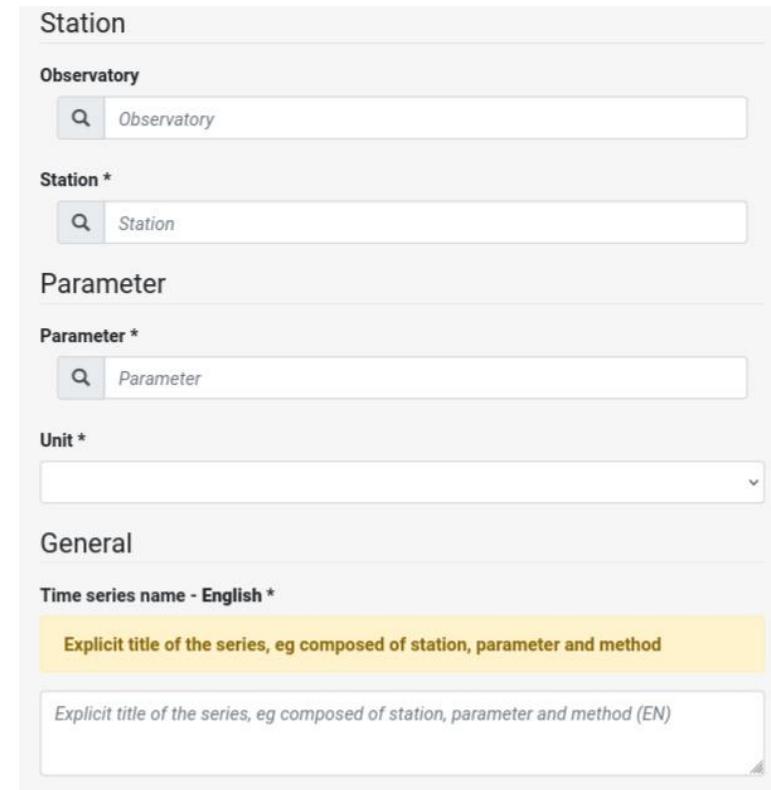
Unit \*

General

Time series name - English \*

Explicit title of the series, eg composed of station, parameter and method

Explicit title of the series, eg composed of station, parameter and method (EN)



Time serie edition form

	A	B	C	D	E	F
1	datetime	storm_event	conductivity	discharge	fluorescence	water_level
2	YYYY-MM-DD hh:mm:ss	true or false (default false)	µS/cm	m3/s	mV	m
3	UTC	empty values authorized	Epenoy site	Epenoy site	Epenoy site	Epenoy site
4			Quality-controlled data	Derived products	Raw data	Quality-controlled data
5			auto	auto	auto	auto
6			epeCTD	epeCTD	epeGGUN	epeCTD
7						
8			2201	2202	2203	2199
9			Conductivity at Epenoy stati	Discharge at Epenoy station	Fluorescence at Epenoy stati	Water level at Epenoy stati
10						

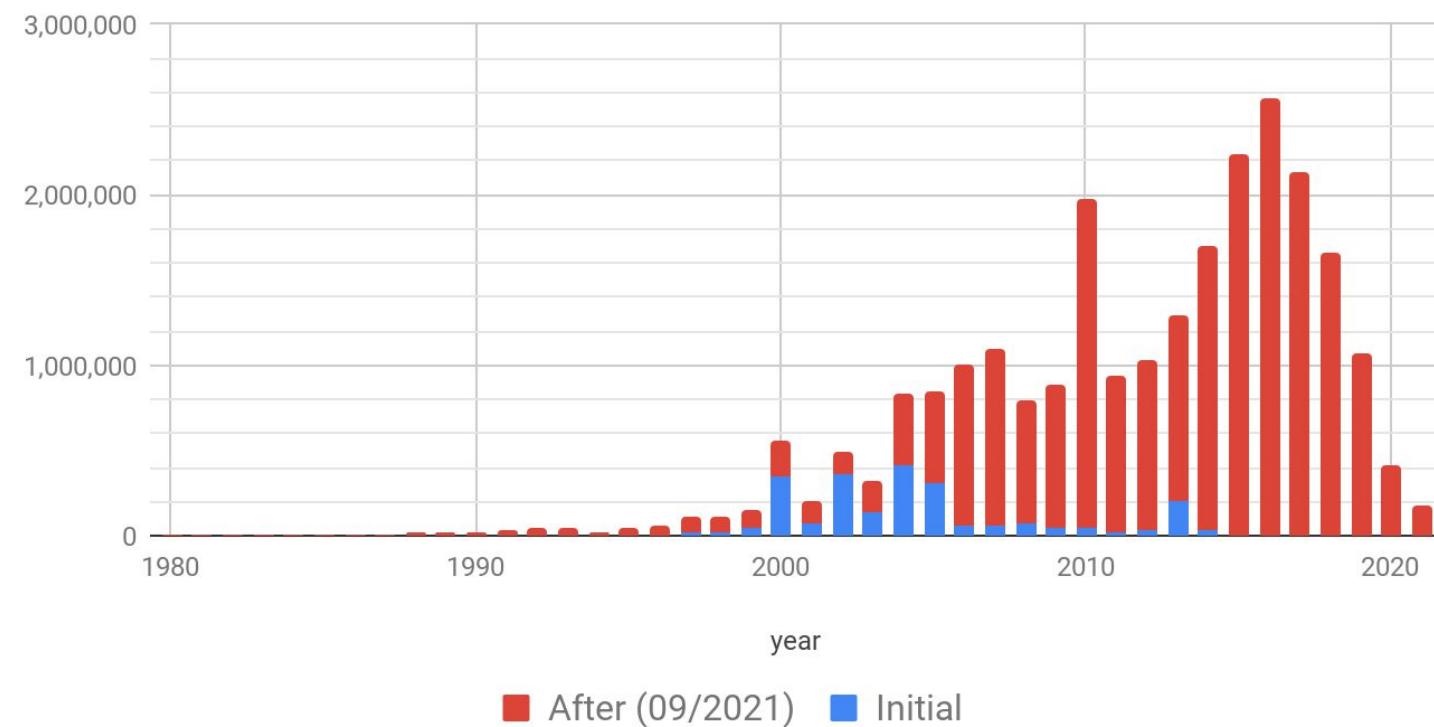
Generated excel / CSV template

# Results

- A living database
  - 600 public time series (> 14 M of data records)
  - Thanks to metadata edition / data feeding tools & motivated scientists!

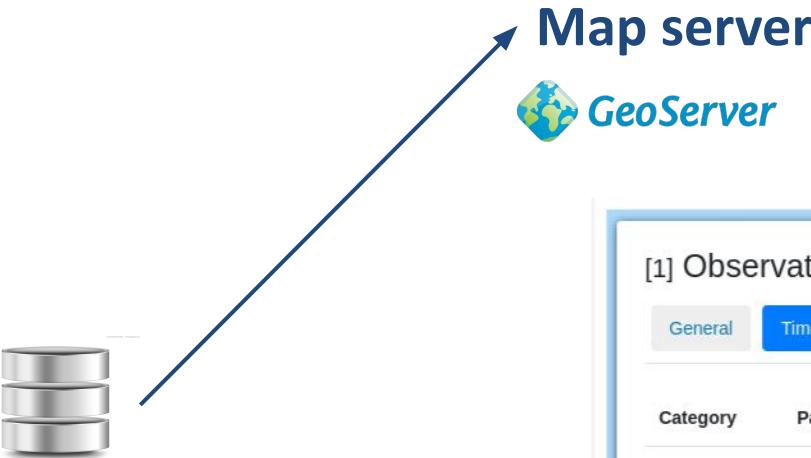


Observations per year (before/after after the database was taken over)



# Results

- Accessible data / metadata



- Standardized map server - WMS / WFS
- Web interactive maps - PHP / leaflet JS

The screenshot shows the "Observatory PORT-MIOU - PORT-MIOU spring" interface. It includes a table of data series and a map of the Cassis area.

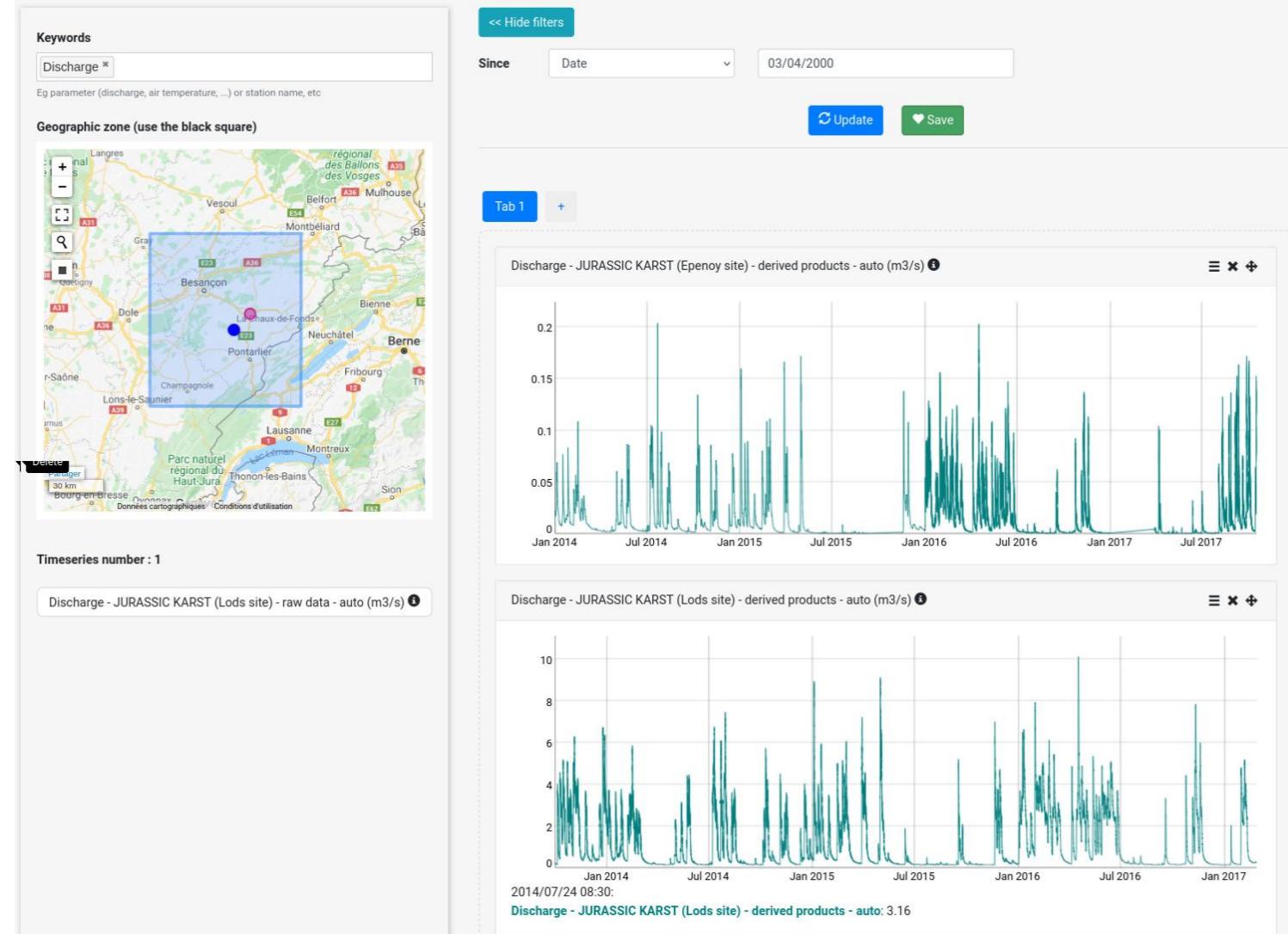
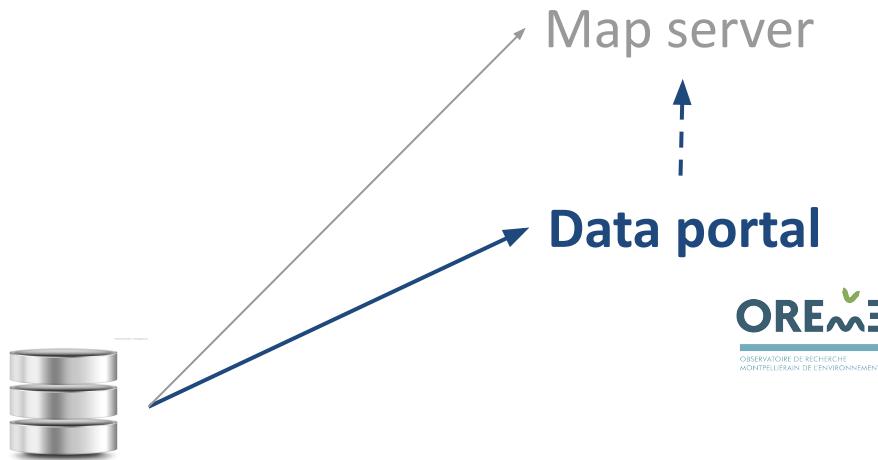
**Table Data:**

Category	Parameter	Unit	Interval	Data level	Type	Dates	Public	?	Statistiques
Chemistry	Fluorescence	mV	15 minutes	Raw data	auto	12-03-2014 - 29-05-2021	<input checked="" type="checkbox"/>		
Chemistry	Fluorescence	mV	15 minutes	Raw data	auto	12-03-2014 - 29-05-2021	<input checked="" type="checkbox"/>		
Chemistry	Fluorescence	mV	15 minutes	Raw data	auto	12-03-2014 - 29-05-2021	<input checked="" type="checkbox"/>		
Chemistry	Turbidity	NTU	15 minutes	Raw data	auto	26-03-2014 - 29-05-2021	<input checked="" type="checkbox"/>		
Climatology-Meteorology-Atmosphere	Atmospheric pressure	cm	5 minutes	Raw data	auto	21-09-2014 - 06-05-2021	<input checked="" type="checkbox"/>		
Hydrology-Hydrogeology	Discharge	m3/s	1 day	Raw data	auto	16-12-2010 -	<input checked="" type="checkbox"/>		

**Map:** The map shows the location of the Observatory PORT-MIOU in Cassis, France. It includes labels for Marseille, La Valentine, La Penne-sur-Huveaune, Gémenos, Cuges-les-Pins, Carnoux-en-Provence, Roquefort-la-Bédoule, Ceyreste, Le Castellet, Saint-Cyr-sur-Mer, Bandol, Sanary-sur-Mer, La Seyne, Six-Fours-les-Plages, and Ollioules. The map also highlights the Parc national des Calanques and the Parc national des Cévennes. A legend on the right side of the map provides information about different map layers and station types.

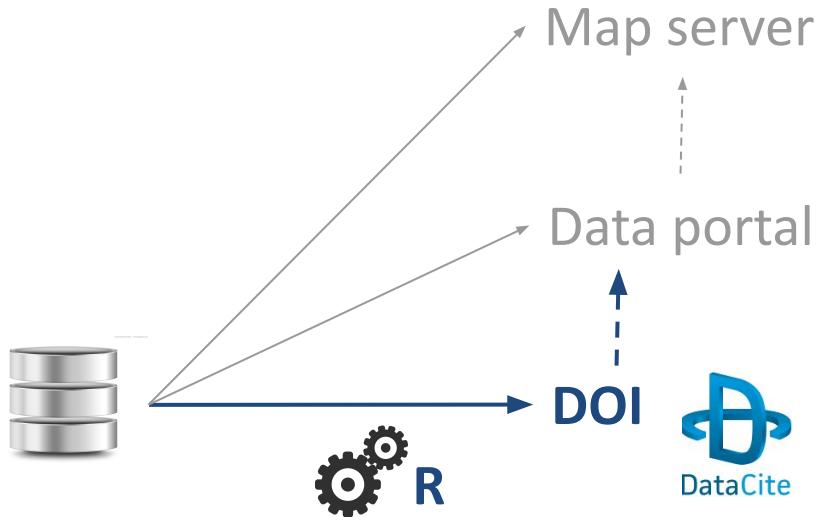
# Results

- Web tools: data search / download / visualisation - PHP / JS



# Results

- 30 DOI on datasets
- dataset = *category of parameters\* watershed*
- Automatic DOI generation - Datacite API - R

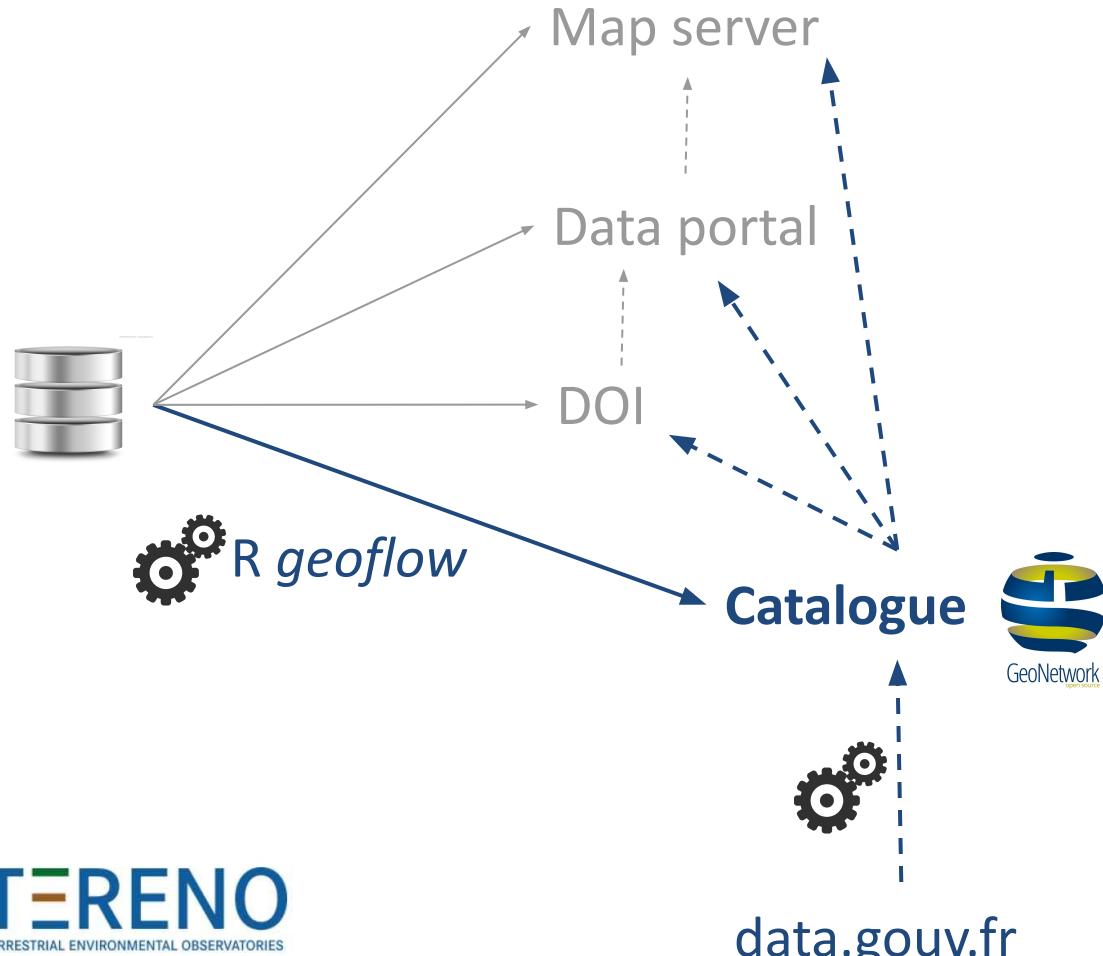


## Citation

SNO KARST (2019). Time series of type hydrology-hydrogeology in L'Isle basin - KARSTS AQUITAINS observatory - KARST observatory network - OZCAR Critical Zone network Research Infrastructure. OSU OREME. (dataset). DOI: <https://doi.org/10.15148/fcf00f41-f22c-47c0-beb4-031255793259>

# Results

- Standardized catalogue - ISO 19139 / CSW
- Automatic feeding - R geoflow



Time series of type chemistry in Fontaine de Vaucluse basin - FONTAINE DE VAUCLUSE observatory - KARST observatory network -OZCAR Critical Zone network Research Infrastructure

Data of type chemistry measured on Fontaine de Vaucluse basin within the framework of the FONTAINE DE VAUCLUSE observatory, that is part of the KARST observatory network. The KARST observatory network aims to strengthen knowledge-sharing and to promote cross-disciplinary research on karst systems, in the framework of the OZCAR Critical Zone network Research Infrastructure. Data consist in 114 time series on 7 station(s).

The measured parameters are: Ammonium (mg/L), Antimony (Sb) ( $\mu\text{g/L}$ ), Arsenic (As) ( $\mu\text{g/L}$ ), Bicarbonate (mg/L), Boron (B) ( $\mu\text{g/L}$ ), Cadmium (Cd) ( $\mu\text{g/L}$ ), Calcium (Ca) - Major ion (mg/L), Chlorine (Cl) (mg/L), Chromium (Cr) ( $\mu\text{g/L}$ ), Conductivity ( $\mu\text{S/cm}$ ), Delta-C-13 (% PDB), Delta-O-18 (% SMOW), Fluorine (F) (mg/L), Iron (Fe) ( $\mu\text{g/L}$ ), Lead (Pb) ( $\mu\text{g/L}$ ), Magnesium (Mg) - Major ion (mg/L), Manganese (Mn) ( $\mu\text{g/L}$ ), Nickel (Ni) ( $\mu\text{g/L}$ ), Nitrate (mg/L), Nitrite (mg/L), pH (units), Potassium (K) - Major ion (mg/L), Silica (SiO<sub>2</sub>) (mg/L), Sodium (Na) - Major ion (mg/L), Sulfate (mg/L), Total organic carbon (TOC) (mg/L), Tritium (TU), Water temperature ( $^{\circ}\text{C}$ ), Zinc (Zn) ( $\mu\text{g/L}$ ). Measurements start on 12-02-1991 and end on 15-02-2021

On going

Download and links

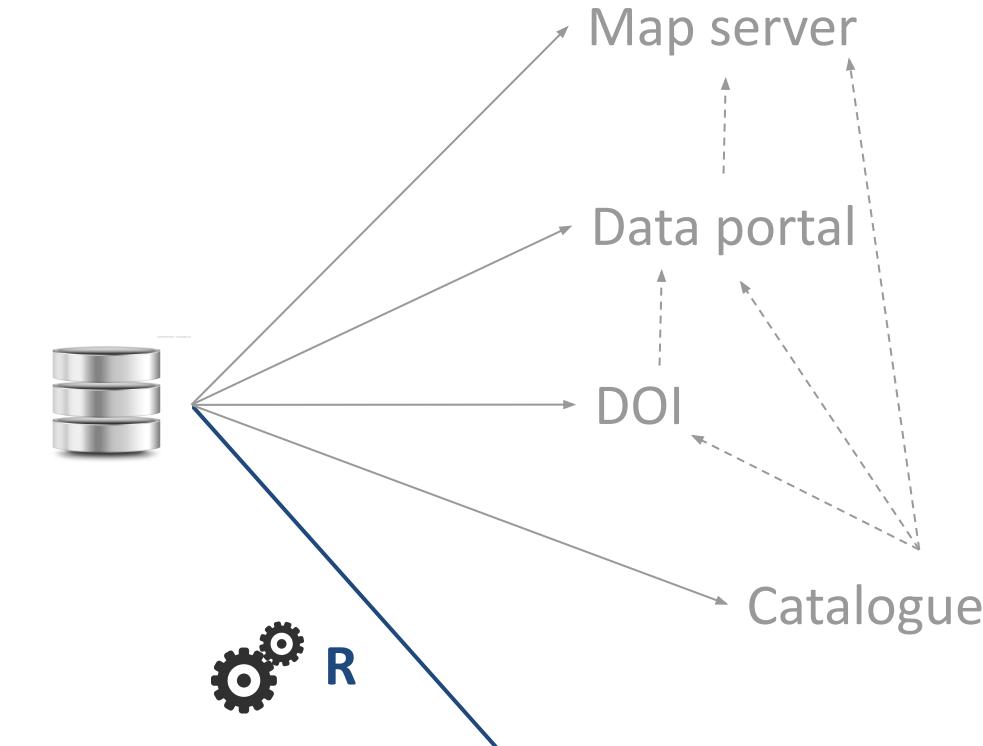
The screenshot shows a dataset page for "snokarst\_station" on a data portal. The page includes:

- Search data on OSU OREME data portal** (with "Open link" button)
- Get associated data with DOI** (with "Open link" button)
- See site information on DEIMS / LTER** (with "Open link" button)
- snokarst\_station** (SNO KARST stations WMS)  
This dataset is published in the view service (WMS) available at <https://sig.oreme.org/geoserver/oreme/wms> with layer name snokarst\_station.
- snokarst\_station** (SNO KARST stations WFS)  
This dataset is published in the download service (WFS) available at <https://sig.oreme.org/geoserver/oreme/wfs> with layer name snokarst\_station.

Below the links, there are sections for **Spatial extent** (a map), **Temporal extent**, **Creation date** (1991-02-12), **Revision date** (2021-07-28), **Period** (Tue Feb 12 1991 00:00:00 GMT+0100 to Mon Feb 15 2021 00:00:00 GMT+0100), **Provided by** (OREME), and **Updated**.

# Results

- Automatic feeding of Theia-OZCAR portal - R

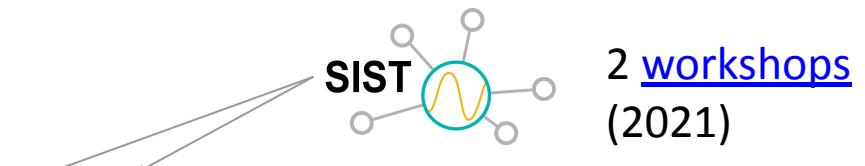


**TERENO**  
TERRESTRIAL ENVIRONMENTAL OBSERVATORIES

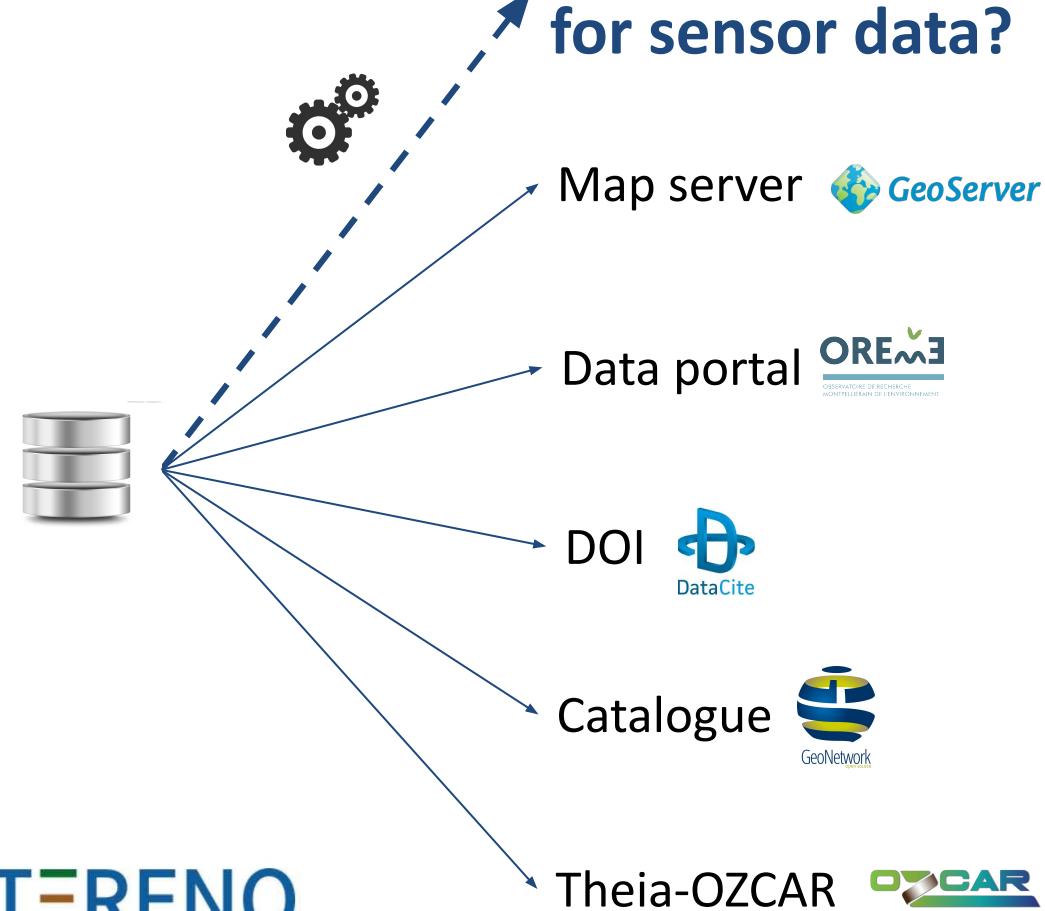
**OZCAR**  
CRITICAL ZONE OBSERVATORIES : RESEARCH AND APPLICATIONS



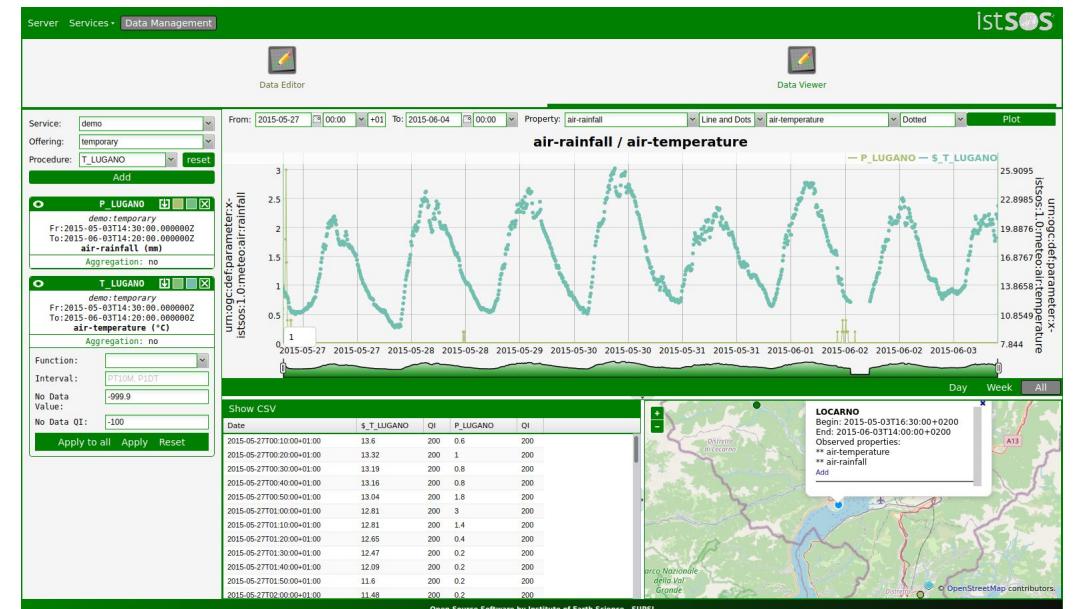
# Perspectives



Standardized flow  
for sensor data?



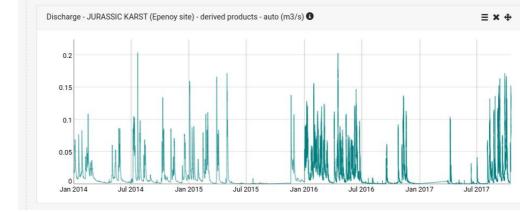
- **SOS: istSOS 52n**
  - clients for data visualisation and query
  - not so easy, takes time, interoperability is not so easy (way to model data)
- **SensorThings:**
  - seminar 2022 (BRGM / OFB / Pole INSIDE / SIST)
- Why? who / what will harvest data?



istSOS web interface for data visualisation

# Conclusions

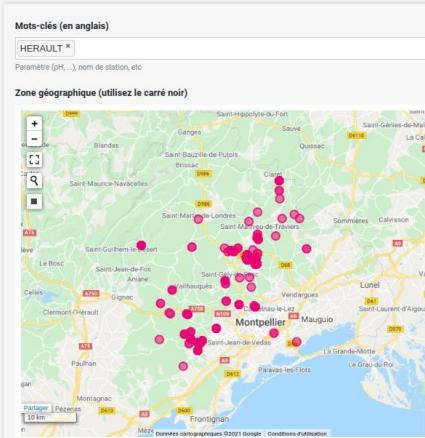
- Building an information system takes years 😎  
=> need **permanent staff** for data team and available **time** for scientific team
- Database feeding is boring 😭 And only scientists can do it!  
=> Develop **tools** with **added values** for scientific team  
=> Use generic methods for **database feeding**
- OSU/Observatories rule! 🏆 **Share methods & tools** across databases!  
=> less work  
=> more interoperability



# Cross-reference data from different observation services

Hérault

Accueil / Bases de données / Créer des graphiques



Puéchabon site  
(TGIR ICOS)



Tits Observation Task  
(Population Ecology)



SNO KARST

