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## **Interoperability / FAIR Data : building on Standards and Best Practices to achieve it**

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Géosciences pour une terre durable

**brgm**

# SETTING THE SCENE




Sylvain Grellet – BRGM  
ENSG – mastère GDM – 2023-01-20





# Why do we need interoperability -> hydrology example

- Let's go there : [https://external.ogc.org/twiki\\_public/HydrologyDWG/DarmstadtTc2009](https://external.ogc.org/twiki_public/HydrologyDWG/DarmstadtTc2009)
- 2009\_Sept\_Darmstadt\_HarmonisationObservations\_PeterT.ppt




www.csiro.au

## Harmonisation of water observations data standards

Water for a Healthy Country

**Pete Taylor**  
29<sup>th</sup> September  
OGC TC – Darmstadt 2009

National Research  
**FLAGSHIPS**



CSIRO



# Why do we need interoperability -> hydrology example



## The need for standards

- Sharing of hydrological data is somewhat ad-hoc, based largely on CSV files and FTP
- Leads to very inefficient (or non-existent) transfer and sharing of data
- Sharing requires a lot of transformation effort on the behalf of the data requestor
  - Parse different file formats
  - Understand the concepts
  - Metadata is often limited or non-existent, requiring follow up conversations

# Why do we need interoperability -> hydrology example

Hydro Jack  
Need flow data!  
Hmm maybe Don can help...

\*RING RING\*

Hi Don, I need some  
\*RING RING\* upper Derwent flow  
readings for my  
geochemical model.  
Where is the site  
located?

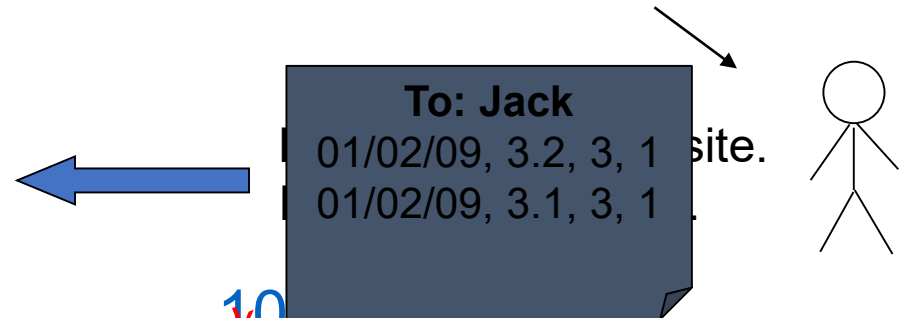
Coordinates?

What reference  
system??

Ok. What sensor is  
used?

Oh...how accurate is  
that?

DON?



*How often have you been Hydro Jack (or Don) ?*

Oh, it's at laughing jack bridge.

Ummm. (papers shuffle)  
147.123 -41.588

I think it's GDA94

It's calculated from the stream  
gauge reading using a rating  
curve..

Umm.....

\*CLICK\*



# Why do we need interoperability -> geoscience example



**REGISTRES & VOCABULAIRES**  
LA QUALITÉ ET L'INTEROPÉRABILITÉ DES DONNÉES PAR  
LA SÉMANTIQUE  
HÉLÈNE BRESSAN

15/06/2020

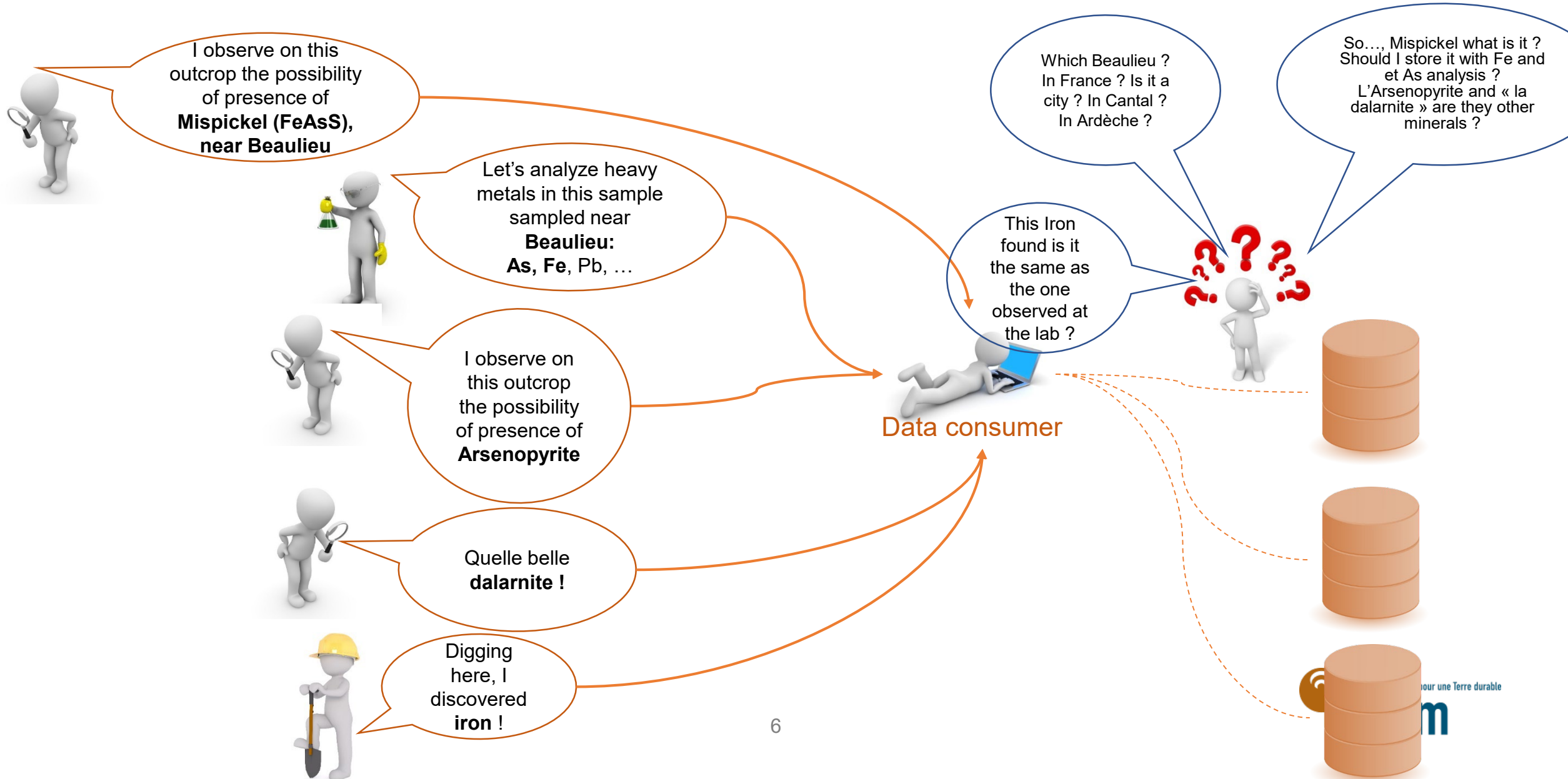


Trad : *Linked data registries and vocabulaires*

*Data quality & interoperability thanks to semantics*

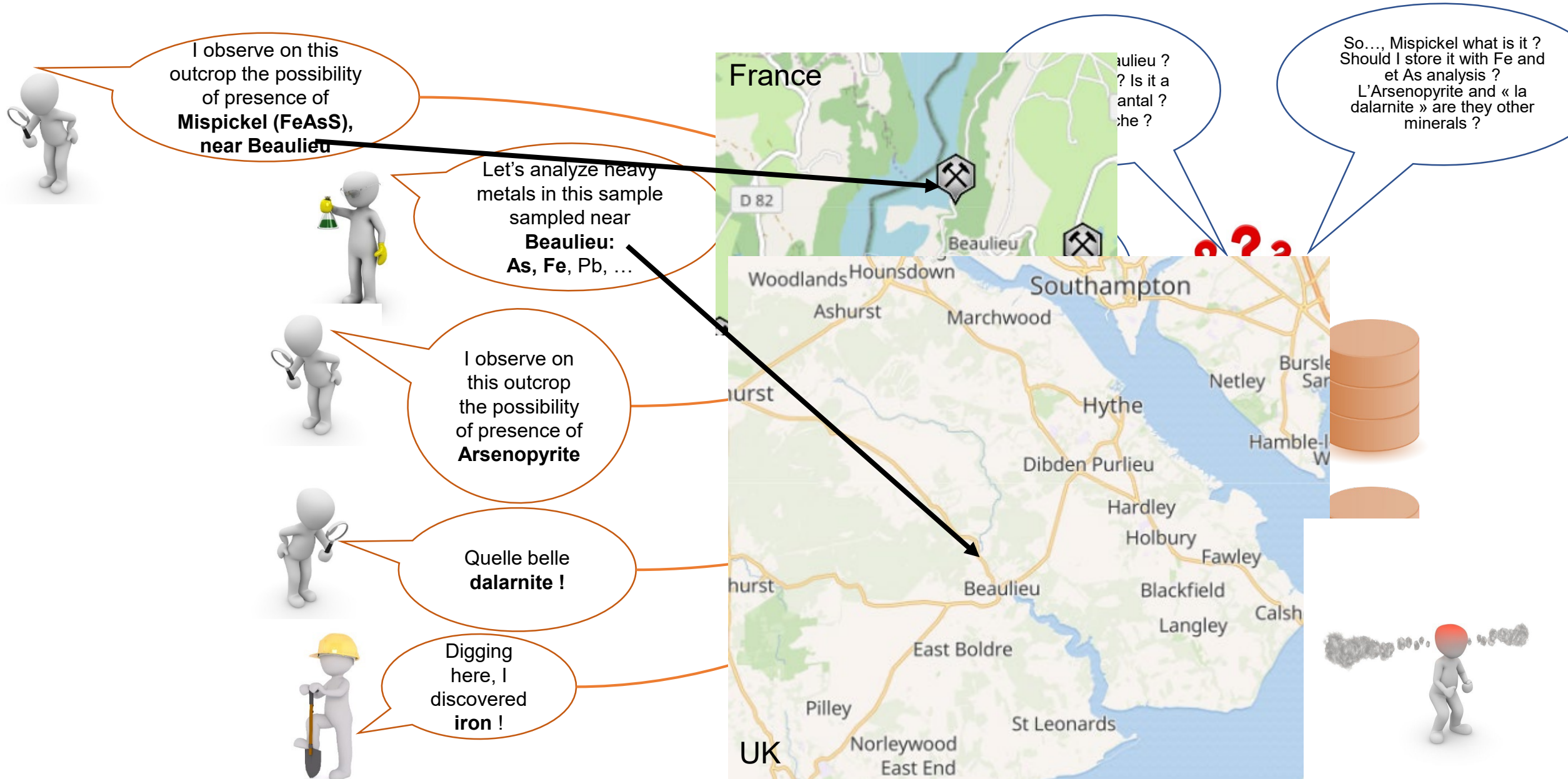


# Why do we need interoperability -> geoscience example





# Why do we need interoperability -> geoscience example





# Why do we need interoperability

observe on this outcrop the possibility of presence of **Mispickel (FeAsS)**, near **Beaulieu**

Let's analyze heavy metals in this sample sampled near **Beaulieu**.  
**As, Fe, Pb**

I observe on this outcrop the possibility of presence of **Arsenopyrite**

Quelle belle **dalarnite !**

Digging here, discovered **iron !**

I observe on this outcrop the possibility of presence of <https://data.geoscience.fr/ncl/Minls/22> (**FeAsS**), near <http://id.insee.fr/geo/commune/15020>

Let's analyze heavy metals in this sample sampled on <https://environment.data.gov.uk/catchment-planning/WaterBody/GB520704201400>, then, <https://data.geoscience.fr/ncl/ObjParSubs/3183>, <https://data.geoscience.fr/ncl/ObjParSubs/3177>, Pb, ...

I observe on this outcrop the possibility of presence of <https://data.geoscience.fr/ncl/Minls/22>

Quelle belle <https://data.geoscience.fr/ncl/Minls/22> !

I discovered <https://data.geoscience.fr/ncl/AnthroMat/62>

Location

Observations and measures

Minerals

Share semantics to describe and exchange data

Chemical composition

8 Iron made Object





# do we need interoperability -> geo

I observe on this outcrop the possibility of presence of <https://data.geoscience.fr/ncl/Minls/22> (FeAsS), near <http://id.insee.fr/geo/commune/15020>

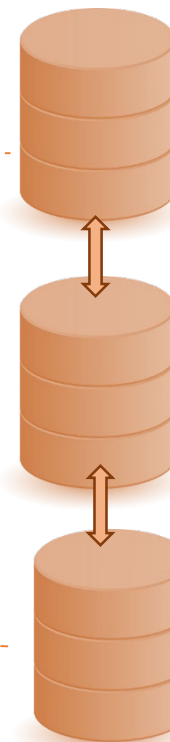
Let's analyze heavy metals in this sample sampled on <https://environment.data.gov.uk/catchment-planning/WaterBody/GB520704201400>, then, <https://data.geoscience.fr/ncl/ObjParSubs/3183>, <https://data.geoscience.fr/ncl/ObjParSubs/3177>, Pb, ...

I observe on this outcrop the possibility of presence of <https://data.geoscience.fr/ncl/Minls/22>

Quelle belle <https://data.geoscience.fr/ncl/Minls/22> !

I discovered <https://data.geoscience.fr/ncl/AnthroMat/62>

Interoperable data



No more siloed data

Share semantics to describe and exchange data



# Why do we need interoperability -> space example

- Lead to the creation of OGC SWE – Sensor Web Enablement standards

## Sensor Metadata!

Wired Nov. 10, 1999: Metric Math Mistake Muffed Mars Meteorology Mission

LISA GROSSMAN 11-10-99 07:00 AM

### NOV. 10, 1999: METRIC MATH MISTAKE MUFFED MARS METEOROLOGY MISSION



BBC ONLINE NETWORK      HOMEPAGE | SITEMAP | SCHEDULES | BBC INFORMATION | BBC EDUCATION | BBC WORLD SERVICE

**BBC NEWS**

News in Audio    News in Video    Newyddion    Новости    Noticias    أخبار    国际新闻    粵語廣播

Thursday, September 30, 1999 Published at 18:53 GMT 19:53 UK

## Sci/Tech

### Confusion leads to Mars failure



The Mars Climate Orbiter: Now in pieces on the planet's surface

The Mars Climate Orbiter Spacecraft was lost because one Nasa team used imperial units while another used metric units for a key spacecraft operation.

**Sci/Tech Contents**

#### Relevant Stories

- 24 Sep 99 | Sci/Tech [Scientist fights Mars setback](#)
- 23 Sep 99 | Sci/Tech [Mars probe feared destroyed](#)
- 23 Sep 99 | Sci/Tech [What the loss of Mars Climate Orbiter means](#)
- 17 Jul 99 | Sci/Tech [Astronauts call for Mars mission](#)

**Internet Links**

[Mars Climate Orbiter](#)

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[Talking Point](#)  
[In Depth](#)  
[On Air](#)  
[Archive](#)

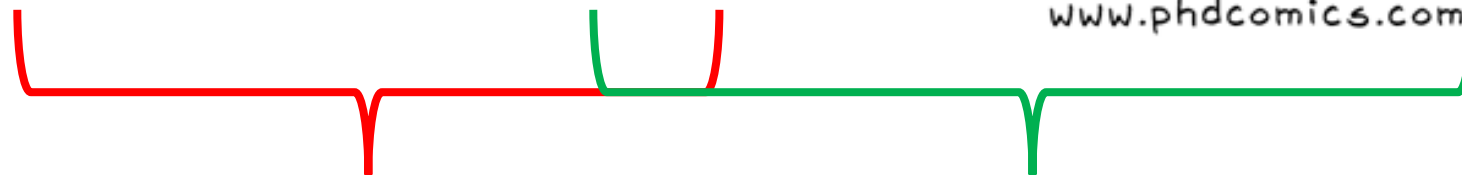
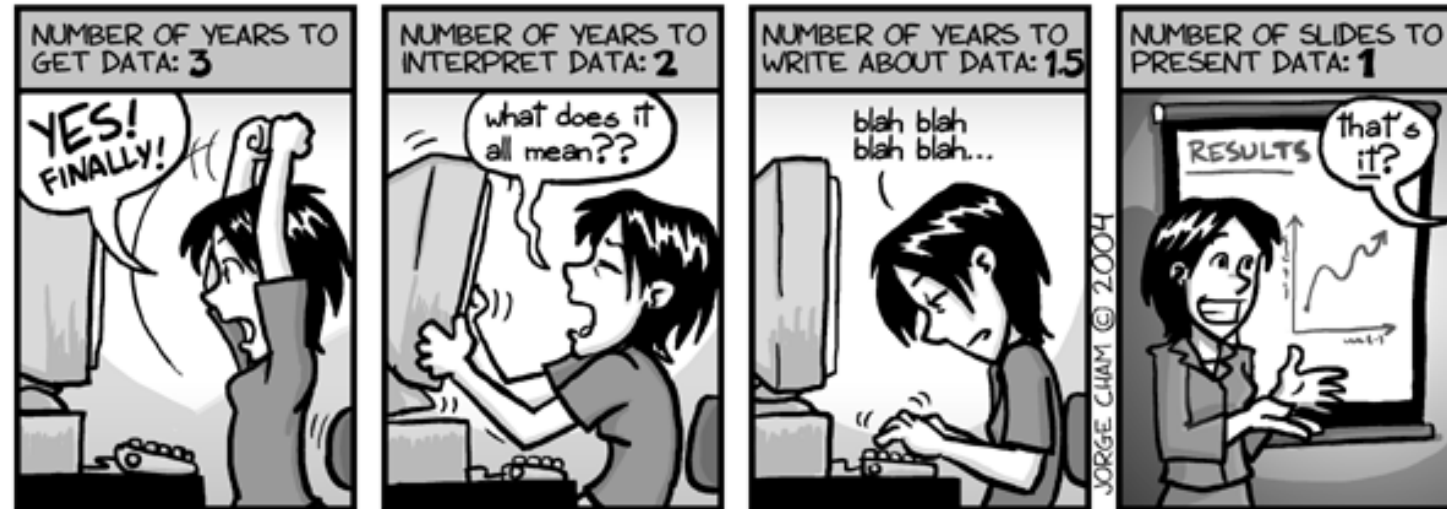
[Feedback](#)  
[Low Graphics](#)  
[Help](#)



# Why do we need interoperability -> Research example



## DATA: BY THE NUMBERS



Interoperability / FAIR data

for our domain colleagues do to their real work

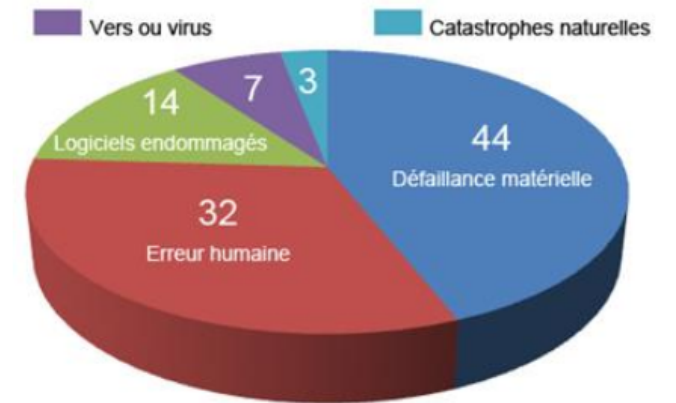
# Why do we need interoperability -> Research example

20 years after publication, 80% of scientific data is lost

## — III. Données de la recherche : pourquoi les gérer ?

20 ans après publication, 80 % des données scientifiques sont perdues...

- Pour les auteurs
- Pour les équipes, organismes, institutions
- Pour la recherche mondiale
- **Causes :**
  - Destruction des supports
  - Problème de version, obsolescence matérielle ou logicielle
  - Lieu de stockage indéfini
- **Conséquences :**
  - Perte de temps, d'argent (fonds publics...)
  - Pas de vérification des résultats possible
  - Pas de comparaison des résultats dans le temps ou l'espace
  - Pas de réutilisations (différentes)







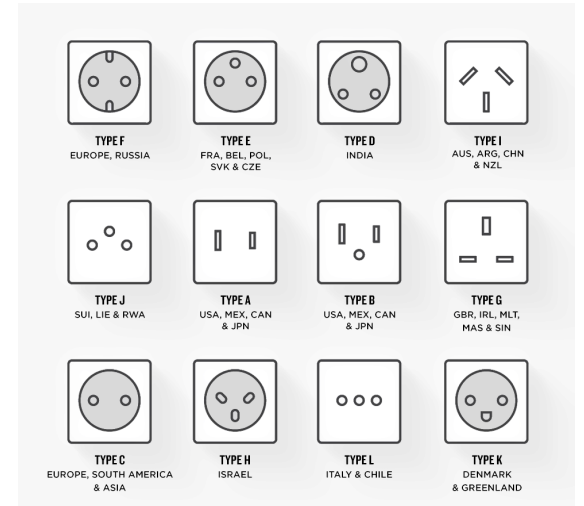
# Why do we need interoperability

It's everywhere in our daily life

- Simple thing done everyday



Simple because normalized, we can easily plug our kettle at home or at the office



Adaptators exist when need be

- Shared driving signs\*



With local specificities



\* let's not discuss who is driving on the good(right) side of the road please ☺

# Dream goal

Let's see what we could do if everyone played the interoperability game

- QGIS

EnvironmentalMonitoringFacility (representativePoint) - Attributs d'entités

fid <http://ressource.brgm-rec.fr/data/Piezometre/06512X0037/STREMY.2>

Element	Value
gml:TimePeriod	
@gml:id	ObservingCapability.TimePeriod.14636
gml:beginPosition	1977-10-06T13:00:00Z
gml:endPosition	2018-03-30T02:00:00Z
ef:processType	
@xlink:href	<a href="http://inspire.ec.europa.eu/codelist/ProcessType/Value/process/">http://inspire.ec.europa.eu/codelist/ProcessType/Value/process/</a>
@xlink:title	Process
ef:resultature	
@xlink:href	<a href="http://inspire.ec.europa.eu/codelist/Resultature/Value/primary/">http://inspire.ec.europa.eu/codelist/Resultature/Value/primary/</a>
@xlink:title	primary
ef:procedure	
@xlink:href	<a href="http://ressource.brgm-rec.fr/data/EntiteHydroGeol/507AC00">http://ressource.brgm-rec.fr/data/EntiteHydroGeol/507AC00</a>
@xlink:title	Entite hydrogeologique 507AC00
ef:observedProperty	
@xlink:href	<a href="http://ressource.brgm-rec.fr/data/somePath">http://ressource.brgm-rec.fr/data/somePath</a>
@xlink:title	GroundWater.Level
ef:broader	
ef:supersedes	
ef:supersededBy	
ef:reportedTo	
@nilReason	<a href="http://inspire.ec.europa.eu/codelist/VoidReason/Value/Unpopulated">http://inspire.ec.europa.eu/codelist/VoidReason/Value/Unpopulated</a>
@xsi:nil	true
ef:hasObservation	
@xlink:href	<a href="http://ressource.brgm-rec.fr/obs/RawOfferingPiezo/06512X0037/STREMY.2&amp;responseFormat=http://www.opengis.net/waterml/2.0&amp;temporalFilter=om%3AphenomenonTime%2Clatest">http://ressource.brgm-rec.fr/obs/RawOfferingPiezo/06512X0037/STREMY.2&amp;responseFormat=http://www.opengis.net/waterml/2.0&amp;temporalFilter=om%3AphenomenonTime%2Clatest</a>
@xlink:title	Latest value (WaterML 2.0 format): Raw groundwater level measurement from piezometer 06512X0037/STREMY.2
ef:hasObservation	
@xlink:href	<a href="http://ressource.brgm-rec.fr/obs/RawOfferingPiezo/06512X0037/STREMY.2&amp;responseFormat=application/json&amp;temporalFilter=om%3AphenomenonTime%2Clatest">http://ressource.brgm-rec.fr/obs/RawOfferingPiezo/06512X0037/STREMY.2&amp;responseFormat=application/json&amp;temporalFilter=om%3AphenomenonTime%2Clatest</a>
@xlink:title	Latest value (JSON format): Raw groundwater level measurement from piezometer 06512X0037/STREMY.2
ef:hasObservedProperty	
@xlink:href	<a href="http://ressource.brgm-rec.fr/obs/RawOfferingPiezo/06512X0037/STREMY.2&amp;responseFormat=http://www.opengis.net/waterml/2.0">http://ressource.brgm-rec.fr/obs/RawOfferingPiezo/06512X0037/STREMY.2&amp;responseFormat=http://www.opengis.net/waterml/2.0</a>
@xlink:title	Latest value (WaterML 2.0 format): Raw groundwater level measurement from piezometer 06512X0037/STREMY.2
ef:hasObservedProperty	
@xlink:href	<a href="http://ressource.brgm-rec.fr/obs/RawOfferingPiezo/06512X0037/STREMY.2&amp;MergeObservationsIntoDataArray=true">http://ressource.brgm-rec.fr/obs/RawOfferingPiezo/06512X0037/STREMY.2&amp;MergeObservationsIntoDataArray=true</a>
@xlink:title	Latest value (JSON format): Raw groundwater level measurement from piezometer 06512X0037/STREMY.2
ef:involvedIn	
ef:representativePoint	
gml:Point	
@srsDimension	

XML

Dereferencing related raw ground water level timeseries URI

See :

[https://github.com/BRGM/gml\\_application\\_schema\\_toolbox/tree/master/docs/presentations/2018\\_INSPIRE\\_conference](https://github.com/BRGM/gml_application_schema_toolbox/tree/master/docs/presentations/2018_INSPIRE_conference)



# Dream goal

Let's see what we could do if everyone played the interoperability game

- Linked data aware web client

The screenshot displays a web client interface for a linked data aware application. At the top, there is a search bar with the text "Enter BRGM linked data resource URI here..." and a "OR" button. Below the search bar is a text area containing a JSON-LD snippet for a water body resource:

```
{
  "@id": "https://opengeospatial.github.io/ELFIE/FR/HY-WaterBody/sgwiE6-009-",
  "@type": "HY_WaterBody",
  "name": "La Somme Canalisée",
  "gsp:hasGeometry": {
    "@type": "gsp:Geometry",
    "gsp:asWKT": "MULTILINESTRING((3 13347982042203 49 7409931557826 3 133170628680 49 7409863061587 3 13214210011018 49 7410646964317 3 1252874658722 49 7415840788399 3 1246553611381 49 74163055031 3 12161265730084 49 741860943894)(3 12161265730084 49 741860943894 3 12122729092244 49 741890079681)(3 06976861191596 49 7425710354124 3 06893673695938 49 7425708998422)(3 15918689153231 49 7427682536191 3 1586460279536 49 7422442393435 3 15275264729884 49 7419408914488 3 14587342803432 49 7415872285919 3 13899429797443 49 7412304817264 3 13556933117711 49 7410537433805 3 13490236704776 49 7410194423897 3 13347982042203 49 7409931557826)(3 12122729092244 49 741890079681 3 11843407483668 49 7421012769724 3 1115791627624
```

Below the text area, there are several checkboxes and labels for selecting data types or ontologies, including "http://opengeospatial.github.io/ELFIE/FR/HY-WaterBody/sgwiE6-009-", "http://opengeospatial.github.io/ELFIE/FR/GW-HydrogeoUnit/sgwiV121AT", and "http://www.opengis.net/geojson/Geometry".

The main content area is split into two parts. On the left is a map of Belgium showing a red-shaded area representing a river network. On the right is a linked data graph showing relationships between resources. The graph includes nodes for "La Somme Canalisée", "Rivière d'Hallue", "Crue du Séno-Turonien en Artois-Picardie", and "https://opengeospatial.github.io/ELFIE/FR/HY-WaterBody/sgwiE390552". Relationships are labeled "hydlowstreamWaterBody" and "related".

A text box at the bottom of the map area reads "River network traversed to its mouth".

[https://opengeospatial.github.io/ELFIE/demo/surface\\_groundwater\\_network\\_interaction](https://opengeospatial.github.io/ELFIE/demo/surface_groundwater_network_interaction)

# Interoperability

## Benefits

- 2 folds aspects
  - Either we have legal constraints (Re INSPIRE and FAIR presentation)
  - But when no constraints exist, how to set up a Data Sharing culture?
  
- Creating the necessary organizational context to opening / sharing data is already quite an endeavor
  - So, when this point is reached, the technical aspects should be straightforward.



# Interoperability

## Context

- More and more external pressure on organisations
  - Climate change
  - Health crisis
  - Reduced (public) fundings

=> Organizations cannot afford to reinvent their own wheel locally when it comes down to sharing data
  
- Even more when we have 90% of the solutions at hand
  - Experience shows that it's not a matter of IT issues (those can always be fixed)
  - It's a matter of organizing communities & changing behaviours

=> Let's explore how to do so

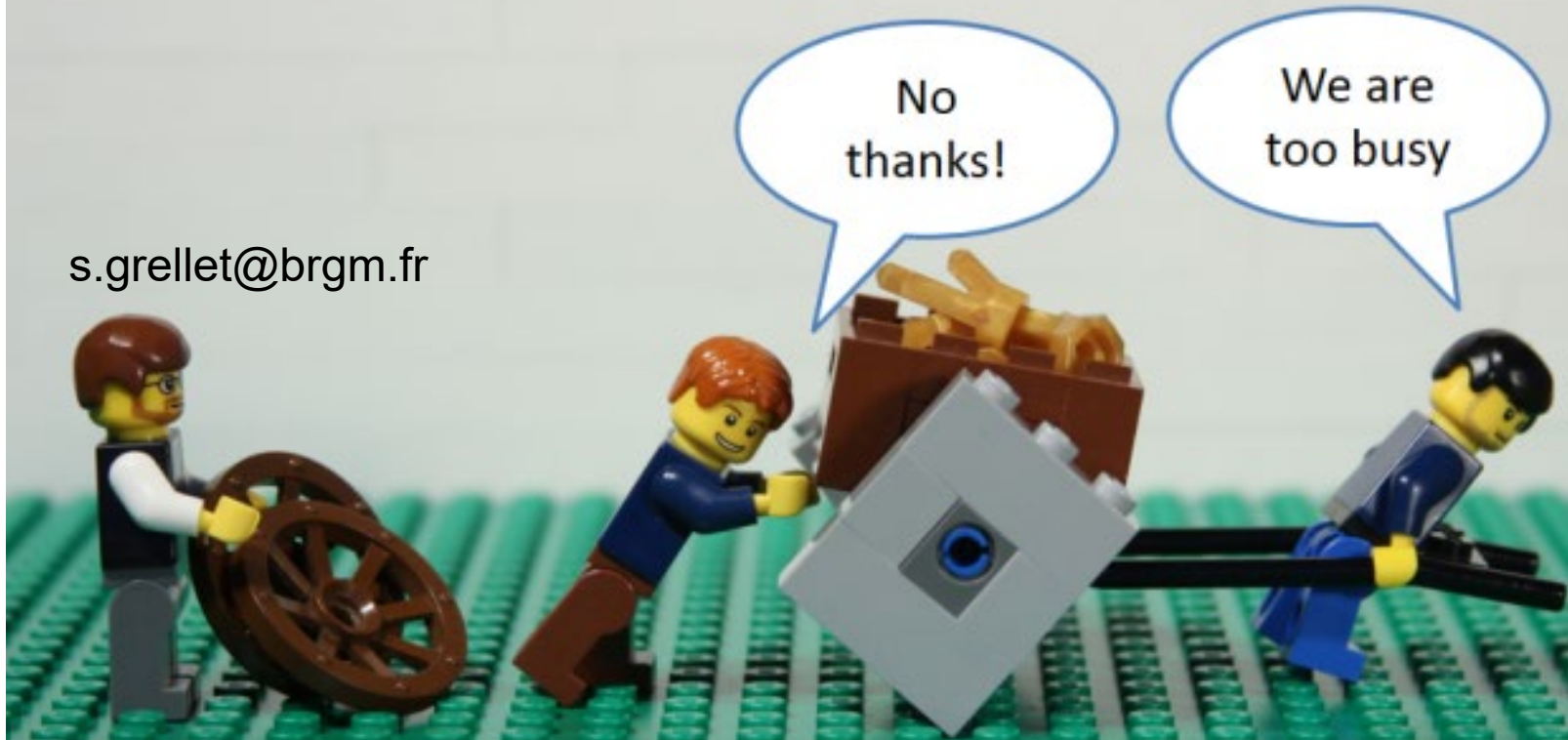
With local specificities

Thank you



Are you too busy to improve?

s.grellet@brgm.fr



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/>





# Thanks to

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