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## Implementing INSPIRE: the BRGM road trip

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# Implementing INSPIRE: the BRGM road trip

*Mickaël Beaufils, Sylvain Grellet*

**INSPIRE Conference**

Strasbourg, Wednesday September 6th, 2017



# BRGM in one slide



- > French Geological Survey
- > 1000 people in 5 main départements: water, georessources, natural risks assessment, laboratories & IT
- > An active contributor for interoperability in the geosciences

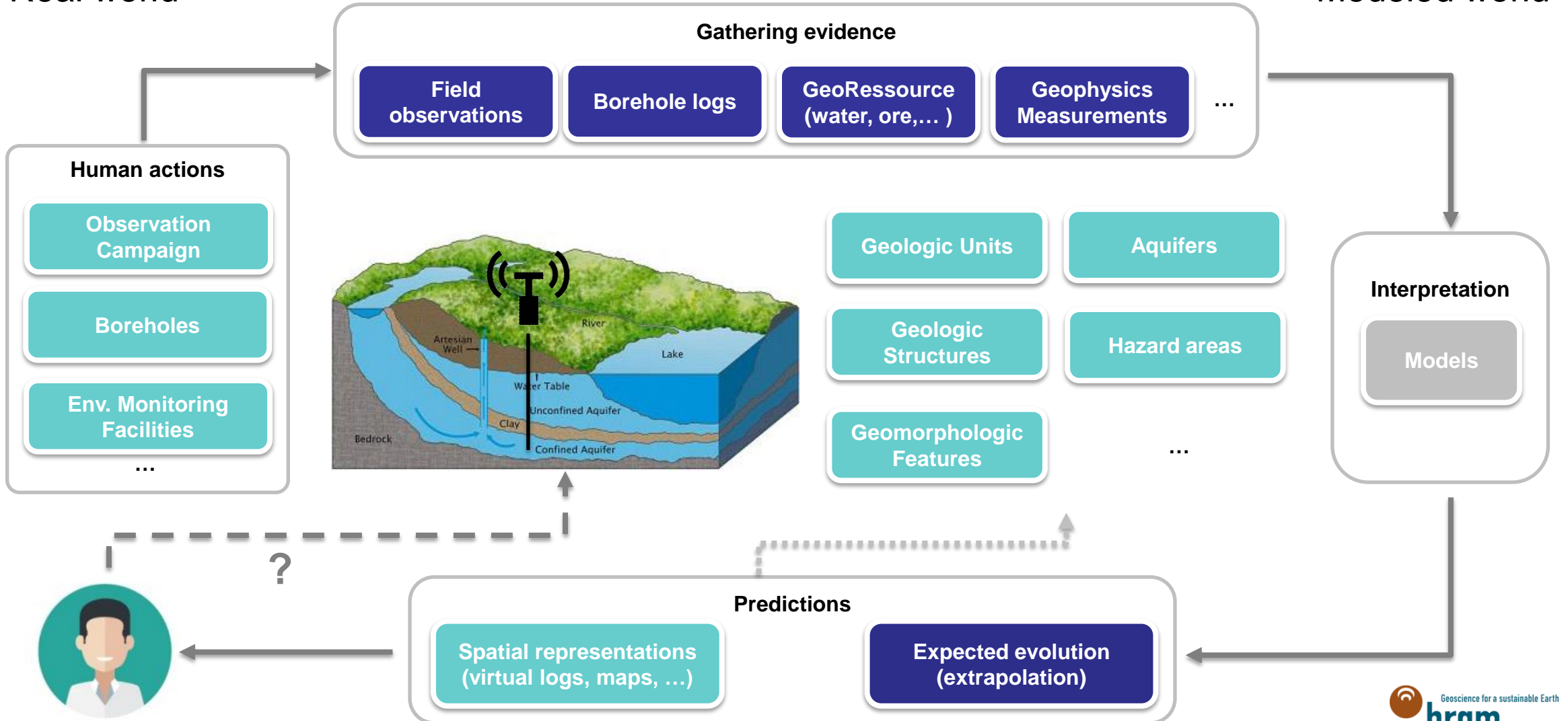


# Main use case: understanding the subsurface

Legend:   Features   Observations

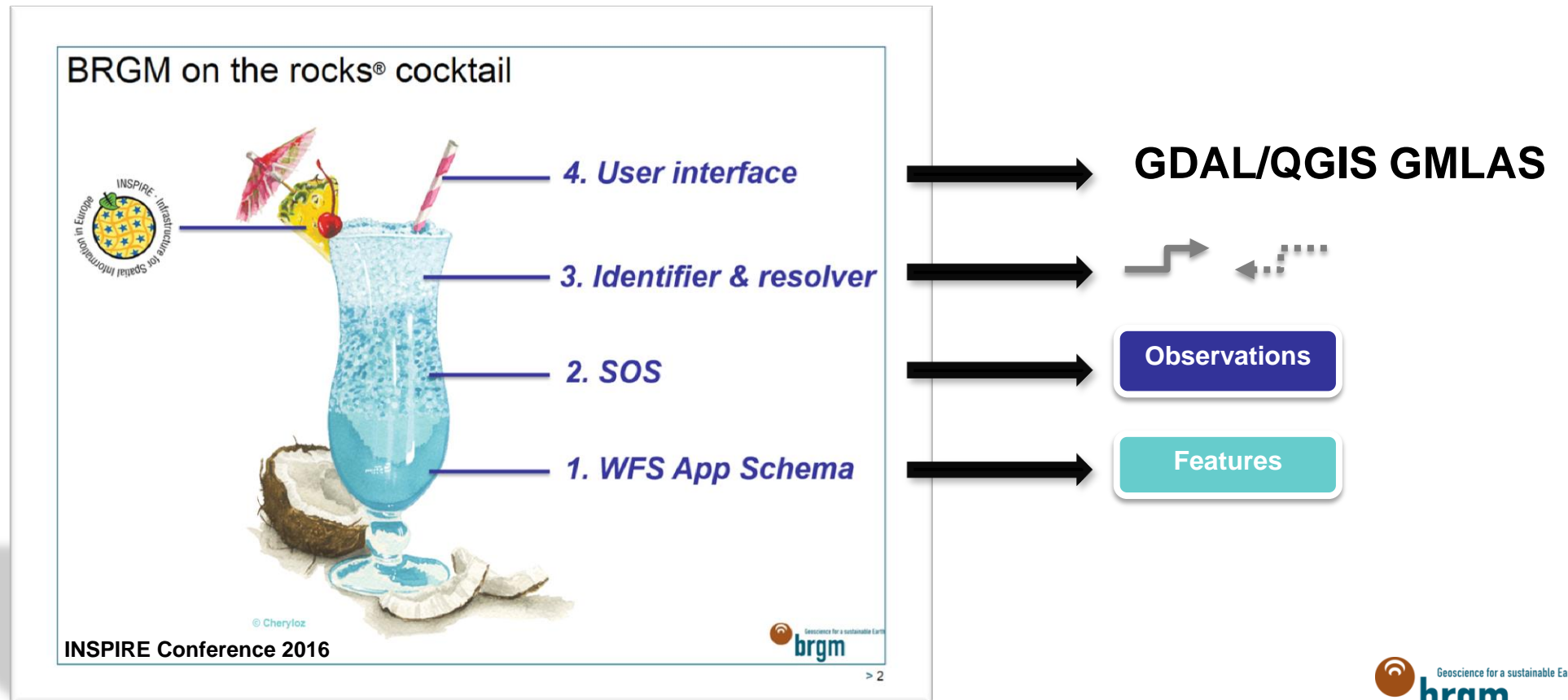
Real world

Modeled world



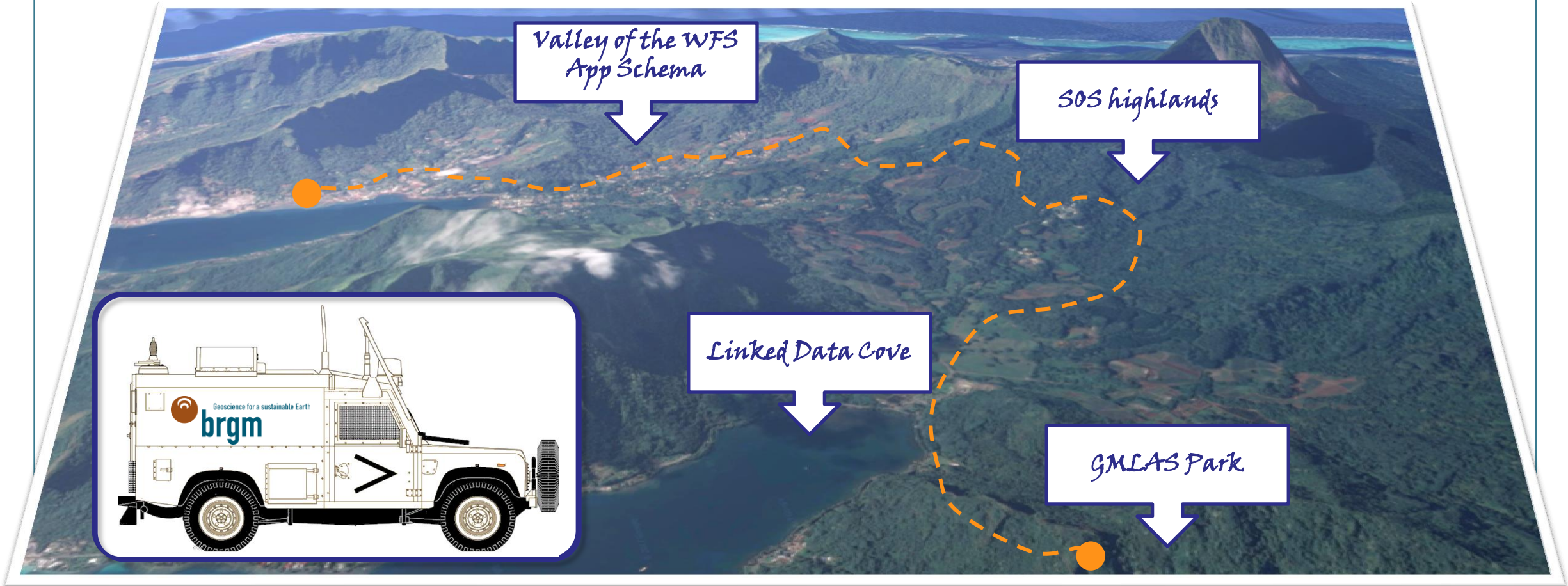
# An Information System to fulfill that use case

- > Serving data through interoperable web services (in conformance with INSPIRE)
- > Linking data through dereferencable persistent identifiers
- > Providing tools to work with those data





# Roadmap of the trip



# WFS App Schema to provide features

## > Implementation

- Decision to use GeoServer and its AppSchema extension and to contribute to its enhancement



## > Feedback

- AppSchema configuration is tricky
  - Diffusion of « HowTo » for Borehole abstract description in EPOS-IP H2020 Project
- GetFeatureByID is OK
  - But what is needed is a GetFeatureByIdentifier
- GetFeatures with filters is not satisfying
  - Very long response time (when not crashing)
- Performance issues
  - with on the fly mapping (eg. CONCAT)
    - Workaround: specific tables are set for WFS AppSchema (however this is data duplication)
  - when serving millions of instances
    - Workaround: currently planning to finance a connection to SolR index

# SOS to provide O&M

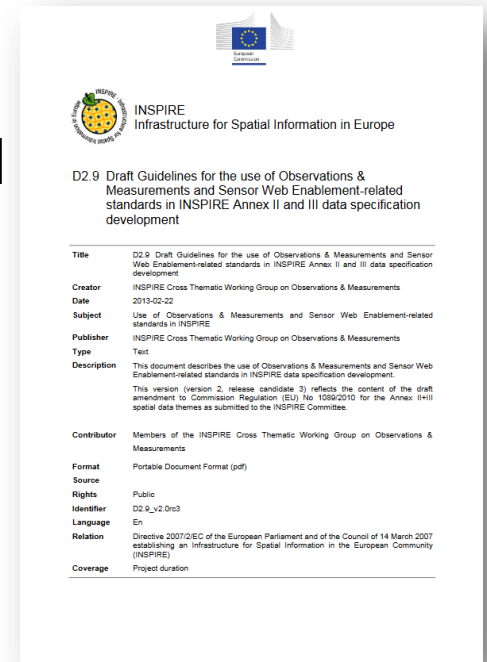
> BRGM is editor of « D2.9 Guidelines for the uses of O&M + SWE in INSPIRE »

## > Implementation

- Based on 52°North solution (with specific developments)
- One webapp is deployed per observation property (groundwater levels, geologic logs, ...)

## > Feedback

- 52°North solution has its own database schema
  - Data duplication from raw data base (yet MaterializedViews)
- User feedback: Limitations with filters
  - Filter on result is not yet possible according of OGC specs (eg. GetBoreholeLogs that cross that lithology)
- Reusing the REST API and JSON encoding for lot of applications





# Identifiers and Linked Data

## > Rationale

- Persistent identifiers on observation and domain features are the glue in an interoperable system
- Core idea is to put a URI as a first class element instead of the OGC getFeature/getObservation request

<http://ressource.brgm-rec.fr/obs/RawEarthMaterialLog/BSS001REWW>

Rewrite in proxy mode

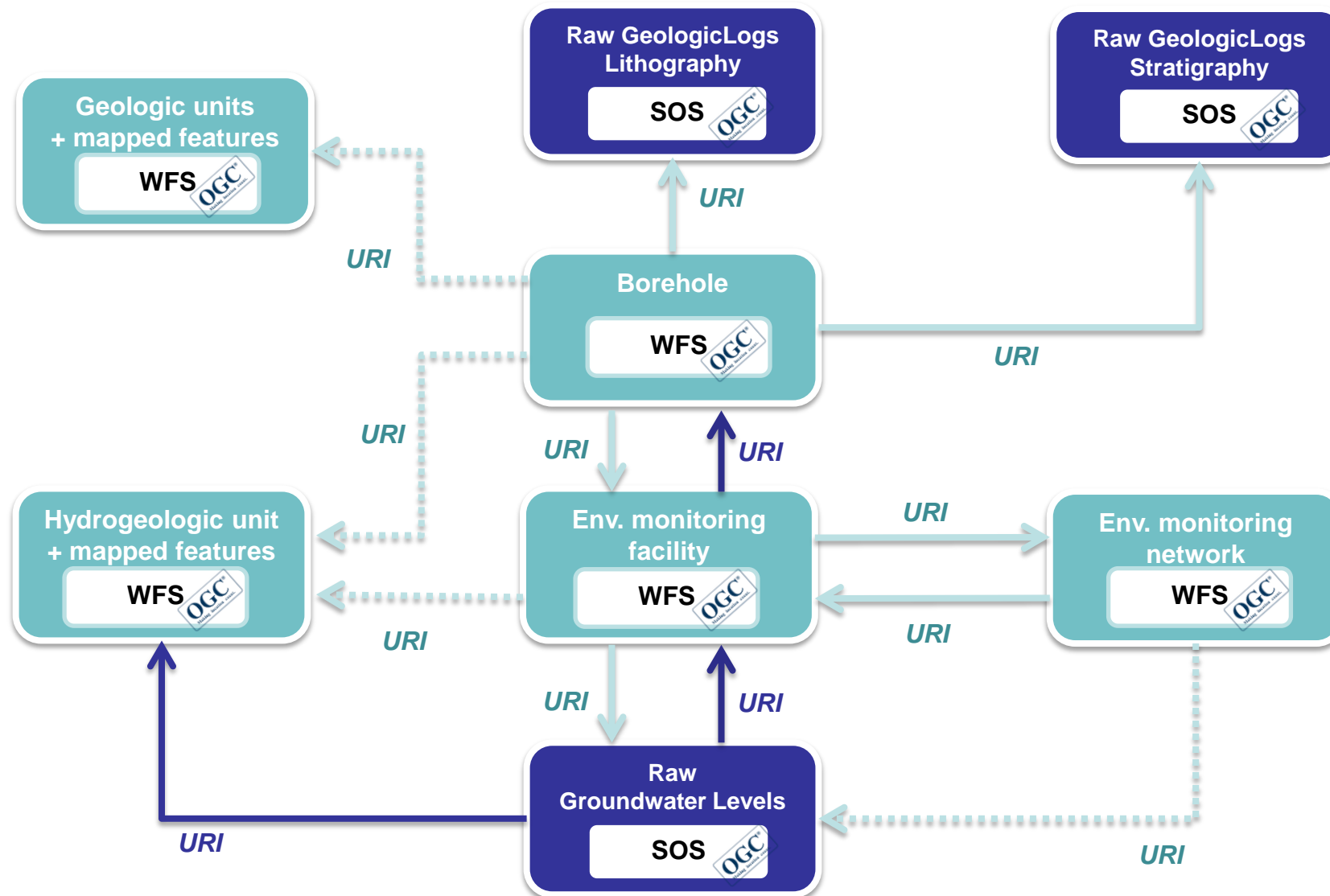
<http://192.168.6.208/52n-sos-raw-geologiclogs/service?service=SOS&version=2.0.0&request=GetObservationById&observedproperty=earthmaterial&observation=http://ressource.brgm-rec.fr/obs/RawEarthMaterialLog/BSS001REWW>

- This is too often overlooked in INSPIRE discussions (should resolve vs shall) !



## > Implementation

- Apache mod\_rewrite : to « translate » the URI in the OGC service requests

# BRGM data services (v2017)



**Legend:**

-  Features
-  Observation(s)

# GML Application Schema suite

> Funded by BRGM and European Environment Agency (Copernicus)

> GMLAS: the converter

- As part of GDAL
- Offer converting functionalities developed to handle Complex Features
- (e.g. Convert GML App Schema files in PostGIS and SQLite format)



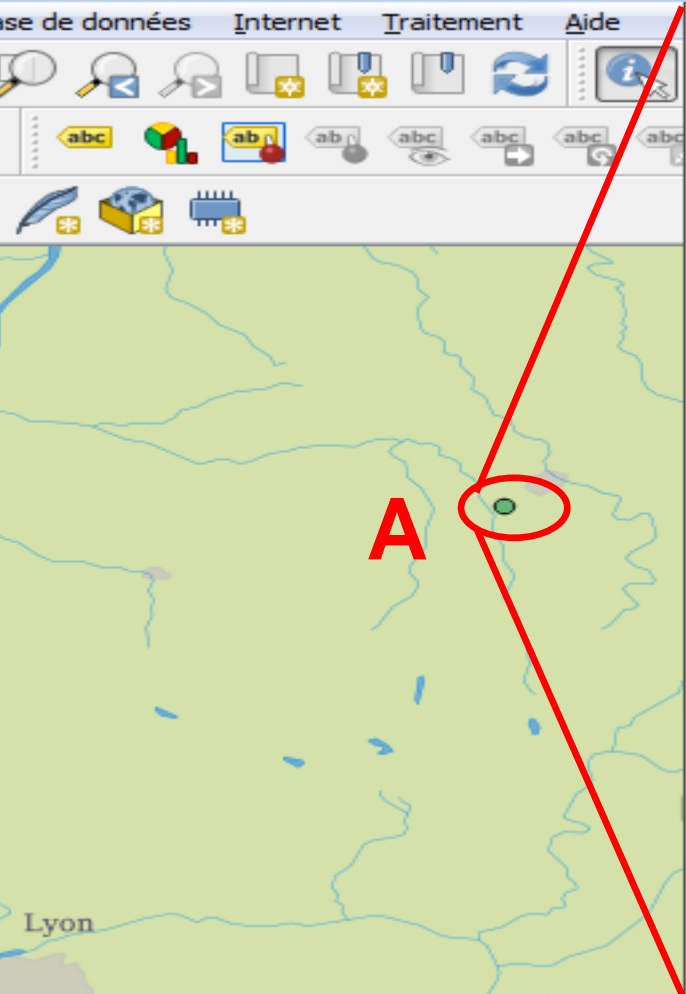
> GMLAS Toolbox: the client

- A plugin for QGIS
- Available for testing through OSGEO4W (AdvancedInstall/qgis-dev 2.99)
- Github : [https://github.com/BRGM/gml\\_application\\_schema\\_toolbox](https://github.com/BRGM/gml_application_schema_toolbox)



# QGIS GML Application Schema Toolbox

Borehole



BoreholeView (points) - Attributs d'entités

fid <http://ressource.brgm-rec.fr/data/BoreholeView/BSS001REWW>

| Element                         | Value   |
|---------------------------------|---|
| @gml:id                         | BSS001REWW  |
| gml:description                 | Borehole description  |
| gml:identifier                  | <a href="http://ressource.brgm-rec.fr/data/BoreholeView/BSS001REWW">http://ressource.brgm-rec.fr/data/BoreholeView/BSS001REWW</a>   |
| @codeSpace                      | <a href="http://www.ietf.org/rfc/rfc2616">http://www.ietf.org/rfc/rfc2616</a>   |
| gml:name                        | Forage BSS001REWW   |
| gsmlp:identifier                | <a href="http://ressource.brgm-rec.fr/data/Borehole/BSS001REWW">http://ressource.brgm-rec.fr/data/Borehole/BSS001REWW</a>   |
| gsmlp:purpose                   | <a href="http://inspire.ec.europa.eu/codelist/BoreholePurposeValue/hydrogeologicalSurvey">http://inspire.ec.europa.eu/codelist/BoreholePurposeValue/hydrogeologicalSurvey</a>     |
| @xlink:href                     | <a href="http://inspire.ec.europa.eu/codelist/BoreholePurposeValue/hydrogeologicalSurvey">http://inspire.ec.europa.eu/codelist/BoreholePurposeValue/hydrogeologicalSurvey</a>     |
| @xlink:title                    | levé hydrogéologique, gestion de l'eau  |
| gsmlp:status                    | <a href="http://resource.europe-geology.eu/vocabs/BoreholeStatus/drillingCompleted">http://resource.europe-geology.eu/vocabs/BoreholeStatus/drillingCompleted</a>                 |
| @xlink:href                     | <a href="http://resource.europe-geology.eu/vocabs/BoreholeStatus/drillingCompleted">http://resource.europe-geology.eu/vocabs/BoreholeStatus/drillingCompleted</a>                 |
| @xlink:title                    | drilling completed  |
| gsmlp:drillingMethod            | <a href="http://resource.europe-geology.eu/vocabs/DrillingMethod/hydraulic_rotary_drilling">http://resource.europe-geology.eu/vocabs/DrillingMethod/hydraulic_rotary_drilling</a> |
| @xlink:href                     | <a href="http://resource.europe-geology.eu/vocabs/DrillingMethod/hydraulic_rotary_drilling">http://resource.europe-geology.eu/vocabs/DrillingMethod/hydraulic_rotary_drilling</a> |
| @xlink:title                    | hydraulic rotary drilling   |
| gsmlp:operator                  | BRGM (PIEZOMETRIE)  |
| gsmlp:driller                   | INTRAFOR-COFOR  |
| gsmlp:drillEndDate              | 1974-11-30Z   |
| gsmlp:startPoint                | <a href="http://resource.europe-geology.eu/vocabs/BoreholeStartPoint/naturalLandSurface">http://resource.europe-geology.eu/vocabs/BoreholeStartPoint/naturalLandSurface</a>       |
| @xlink:href                     | <a href="http://resource.europe-geology.eu/vocabs/BoreholeStartPoint/naturalLandSurface">http://resource.europe-geology.eu/vocabs/BoreholeStartPoint/naturalLandSurface</a>       |
| @xlink:title                    | natural land surface  |
| gsmlp:inclinationType           | <a href="http://resource.europe-geology.eu/vocabs/BoreholeInclinationType/vertical">http://resource.europe-geology.eu/vocabs/BoreholeInclinationType/vertical</a>                 |
| @xlink:href                     | <a href="http://resource.europe-geology.eu/vocabs/BoreholeInclinationType/vertical">http://resource.europe-geology.eu/vocabs/BoreholeInclinationType/vertical</a>                 |
| @xlink:title                    | vertical  |
| gsmlp:boreholeMaterialCustodian | unknown   |
| gsmlp:boreholeLength_m          | 23.0  |
| @uom                            | <a href="http://qudt.org/vocab/unit/M">http://qudt.org/vocab/unit/M</a>   |

XML

# QGIS GML Application Schema Toolbox

Borehole

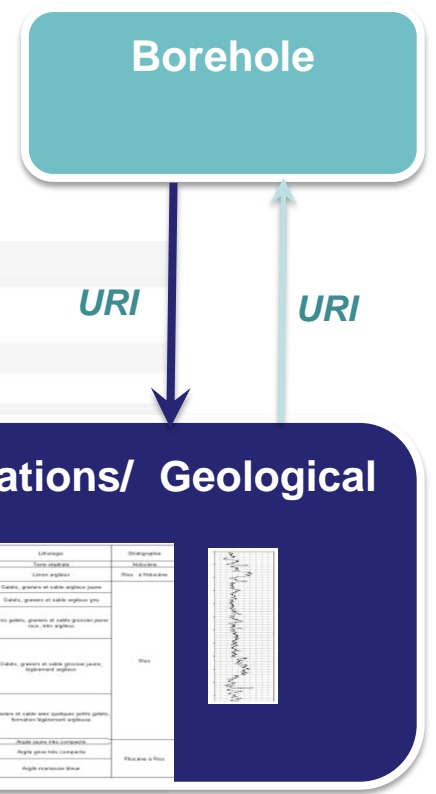
http://ressource.brgm-rec.fr/data/BoreholeView/BSS001REWW

| Element                                | Value   |
|--|---|
| <b>gsmlp:drillEndDate</b>              | 1974-11-30Z   |
| ▾ <b>gsmlp:startPoint</b>              |   |
| @xlink:href                            | <a href="http://resource.europe-geology.eu/vocabs/BoreholeStartPoint/naturalLandSurface">http://resource.europe-geology.eu/vocabs/BoreholeStartPoint/naturalLandSurface</a>             |
| @xlink:title                           | natural land surface  |
| ▾ <b>gsmlp:inclinationType</b>         |   |
| @xlink:href                            | <a href="http://resource.europe-geology.eu/vocabs/BoreholeInclinationType/vertical">http://resource.europe-geology.eu/vocabs/BoreholeInclinationType/vertical</a>                       |
| @xlink:title                           | vertical  |
| <b>gsmlp:boreholeMaterialCustodian</b> | unknown   |
| ▾ <b>gsmlp:boreholeLength_m</b>        | 23.0  |
| @uom                                   | <a href="http://qudt.org/vocab/unit/M">http://qudt.org/vocab/unit/M</a>   |
| ▾ <b>gsmlp:elevation_m</b>             | 223.87  |
| @uom                                   | <a href="http://qudt.org/vocab/unit/M">http://qudt.org/vocab/unit/M</a>   |
| <b>gsmlp:elevation_srs</b>             | <a href="http://www.opengis.net/def/crs/EPSG/0/5720">http://www.opengis.net/def/crs/EPSG/0/5720</a>   |
| <b>gsmlp:source</b>                    | <a href="http://ficheinfoterre.brgm.fr/InfoterreFiche/ficheBss.action?id=06512X0037/STREMY">http://ficheinfoterre.brgm.fr/InfoterreFiche/ficheBss.action?id=06512X0037/STREMY</a>       |
| <b>gsmlp:metadata_uri</b>              | <a href="http://www.geocatalogue.fr/Detail.do?fileIdentifier=BR_BSS_BAA">http://www.geocatalogue.fr/Detail.do?fileIdentifier=BR_BSS_BAA</a>   |
| <b>gsmlp:genericSymbolizer</b>         | Not provided  |
| ▾ <b>gsmlp:shape</b>                   |   |
| ▾ <b>gml:Point</b>                     |   |
| @srsDimension                          | 2   |
| @srsName                               | urn:ogc:def:crs:EPSG::4326  |
| @gml:id                                | gsmlp.shape.BSS001REWW  |
| <b>gml:pos</b>                         | 46.1909541655103 5.18713262971692   |
| <b>gsmlp:cored</b>                     | false   |
| <b>gsmlp:accessToPhysicalDrillCore</b> | false   |
| ▾ <b>gsmlp:boreholeUse</b>             |   |
| @xlink:href                            | <a href="http://inspire.ec.europa.eu/codelist/BoreholePurposeValue/groundwaterLevelMonitoring">http://inspire.ec.europa.eu/codelist/BoreholePurposeValue/groundwaterLevelMonitoring</a> |
| @xlink:title                           | surveillance du niveau de la nappe phrÃ©atique  |
| ▾ <b>gsmlp:detailedDescription</b>     |   |
| @xlink:href                            | <a href="http://www.opengis.net/def/nil/OGC/0/template">http://www.opengis.net/def/nil/OGC/0/template</a>   |
| @xlink:title                           | template  |
| ▾ <b>gsmlp:geophysicalLogs</b>         |   |
| @xlink:href                            | <a href="http://www.opengis.net/def/nil/OGC/0/unknown">http://www.opengis.net/def/nil/OGC/0/unknown</a>   |
| @xlink:title                           | unknown   |
| ▾ <b>gsmlp:geologicalDescription</b>   |   |
| @xlink:href                            | <a href="http://ressource.brgm-rec.fr/obs/RawGeologicLogs/BSS001REWW">http://ressource.brgm-rec.fr/obs/RawGeologicLogs/BSS001REWW</a>   |
| @xlink:title                           | Borehole BSS001REWW geologic log available.   |
| ▾ <b>gsmlp:groundWaterLevel</b>        |   |
| @xlink:href                            | <a href="http://ressource.brgm-rec.fr/data/Piezometre/06512X0037/STREMY.2">http://ressource.brgm-rec.fr/data/Piezometre/06512X0037/STREMY.2</a>   |
| @xlink:title                           | Description of Piezometer attached to BSS001REWW. Provides link to SensorObservationService offering  |



# QGIS GML Application Schema Toolbox

|  |   |  |
|--|---|--|
| <b>gsmpl:shape</b>                     |   |  |
| <b>gml:Point</b>                       |   |  |
| @srsDimension                          | 2   |  |
| @srsName                               | urn:ogc:def:crs:EPSG::4326  |  |
| @gml:id                                | gsmpl.shape.BSS001REWW  |  |
| <b>gml:pos</b>                         | 46.1909541655103 5.18713262971692   |  |
| <b>gsmpl:cored</b>                     | false   |  |
| <b>gsmpl:accessToPhysicalDrillCore</b> | false   |  |
| <b>gsmpl:boreholeUse</b>               |   |  |
| @xlink:href                            | <a href="http://inspire.ec.europa.eu/codelist/BoreholePurposeValue/groundwaterLevelMonitoring">http://inspire.ec.europa.eu/codelist/BoreholePurposeValue/groundwaterLevelMonitoring</a> |  |
| @xlink:title                           | surveillance du niveau de la nappe phrÃ©atique  |  |
| <b>gsmpl:detailedDescription</b>       |   |  |
| @xlink:href                            | <a href="http://www.openqgis.net/def/nil/OGC/0/template">http://www.openqgis.net/def/nil/OGC/0/template</a>   |  |
| @xlink:title                           | template  |  |
| <b>gsmpl:geophysicalLogs</b>           |   |  |
| @xlink:href                            | <a href="http://www.openqgis.net/def/nil/OGC/0/unknown">http://www.openqgis.net/def/nil/OGC/0/unknown</a>   |  |
| @xlink:title                           | unknown   |  |
| <b>gsmpl:geologicLog</b>               |   |  |
| @xlink:href                            | <a href="http://ressource.brgm-rec.fr/obs/RawGeologicLogs/BSS001REWW">http://ressource.brgm-rec.fr/obs/RawGeologicLogs/BSS001REWW</a>   |  |
| @xlink:title                           | geologic log available.   |  |
| <b>gsmpl:groundwaterChemistry</b>      |   |  |
| @xlink:href                            | <a href="http://www.openqgis.net/def/nil/OGC/0/unknown">http://www.openqgis.net/def/nil/OGC/0/unknown</a>   |  |
| @xlink:title                           | unknown   |  |
| <b>gsmpl:rockGeochemistry</b>          |   |  |
| @xlink:href                            | <a href="http://www.openqgis.net/def/nil/OGC/0/unknown">http://www.openqgis.net/def/nil/OGC/0/unknown</a>   |  |
| @xlink:title                           | unknown   |  |
| <b>gsmpl:poreGasChemistry</b>          |   |  |
| @xlink:href                            | <a href="http://www.openqgis.net/def/nil/OGC/0/inapplicable">http://www.openqgis.net/def/nil/OGC/0/inapplicable</a>   |  |
| @xlink:title                           | inapplicable  |  |
| <b>gsmpl:geoTechnicalInfo</b>          |   |  |
| @xlink:href                            | <a href="http://www.openqgis.net/def/nil/OGC/0/unknown">http://www.openqgis.net/def/nil/OGC/0/unknown</a>   |  |
| @xlink:title                           | unknown   |  |

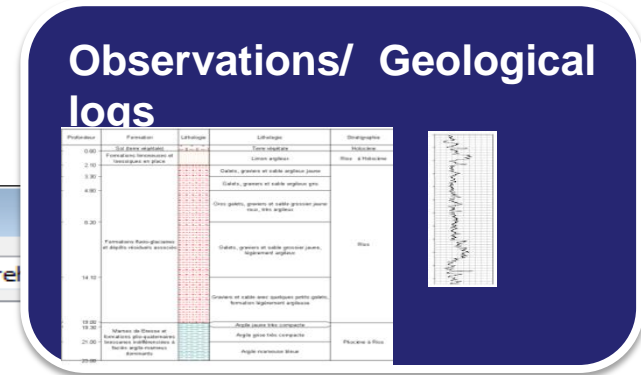


B

Context menu for the `gsmpl:geologicLog` element:

- Copy value
- Copy XPath
- Resolve external
- Embedded
- As a new layer
- Add to layer

# QGIS GML Application Schema Toolbox

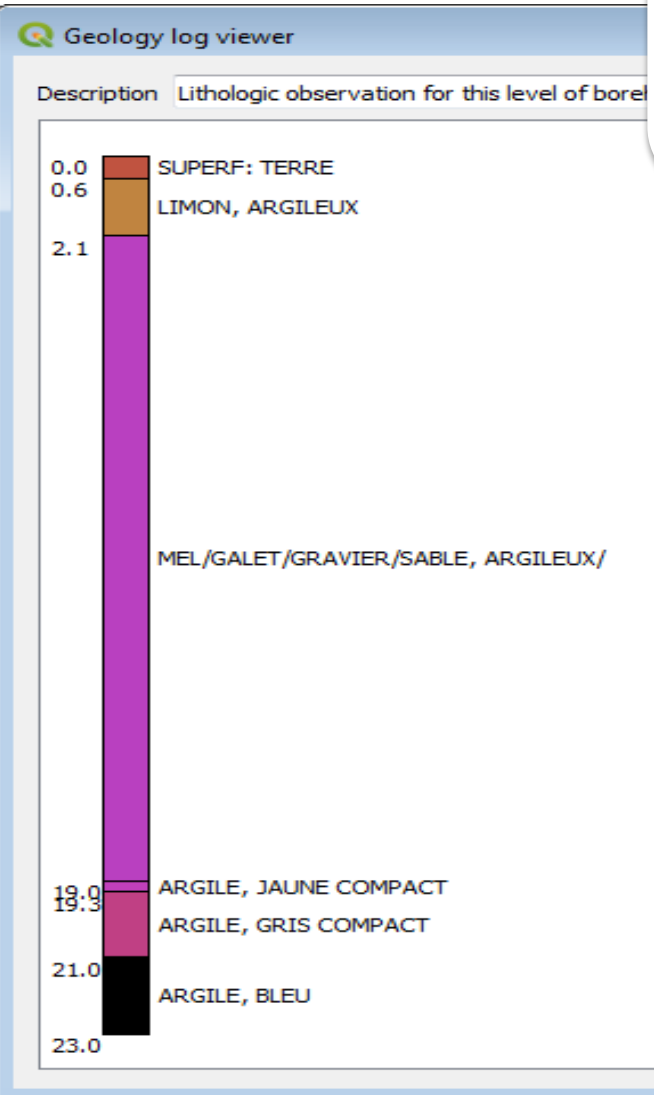


**sos:GetObservationResponse**

- @xlink:href <http://ressource.brgm-rec.fr/obs/RawGeologic...>
- @xlink:title Borehole BSS001REWW geologic log available.
- @xsi:schemaLocation <http://www.opengis.net/sos/2.0> <http://schemas.opengis.net/sos/2.0/observationData.xsd>

**sos:observationData**

- om:OM\_Observation**
  - @gml:id o\_B8A575CD13F439A702FBAD713F09AA17FC
  - gml:description** Lithologic observation for this level of borehole
  - gml:identifier** <http://ressource.brgm-rec.fr/obs/RawEarthMa...>
  - gml:name** RawEarthMaterialLogObservation BSS001REWW
  - om:type**
  - om:phenomenonTime**
  - om:resultTime**
  - om:procedure**
  - om:parameter**
  - om:parameter**
  - om:parameter**
  - om:parameter**
  - om:observedProperty**
    - @xlink:href <http://www.opengis.net/def/gwml/2.0/observe...>
    - @xlink:title Earth Material
  - om:featureOfInterest**
  - om:result**
- sos:observationData**
  - om:OM\_Observation**
- gsmlp:groundWaterLevel**
  - @xlink:href <http://ressource.brgm-rec.fr/data/Piezometre/06512X0037/STREMY.2>
  - @xlink:title Description of Piezometer attached to BSS001REWW. Provides link to SensorObservationService offering



# BRGM perspectives

- > Continue implementing more and more feature types with the current solutions we identified
  - CSW with GeoNetwork
  - WMS with MapServer
  - WFS AppSchema with GeoServer
  - SOS with 52°North solution
  
- > Yet, continue exploring new horizons and contribute in (financing) technologies improvements
  - GMLAS toolbox still being developed
  - GeoServer connection to solR index to handle huge volumes of data
  - Pub/Sub to notify users of updates in the system
  - SensorThings approach to facilitate sensor data integration

# Conclusion

## > Building an information system is not a one-time process

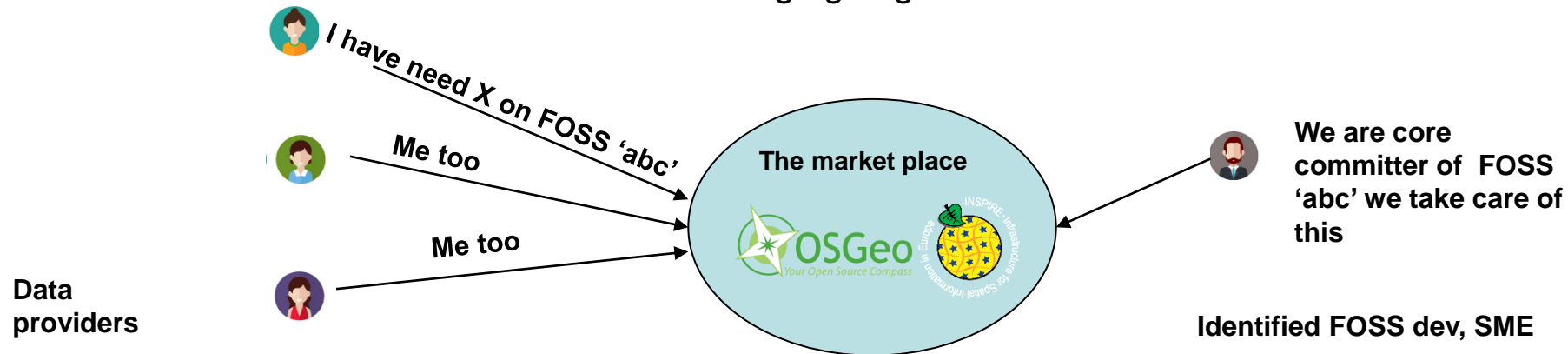
- Labs help testing things and get feedback from users
- Users participates in building the system, then it helps getting their support

## > Technologies need improvements

- Yet a lot of things have been already done
- Technology providers are willing to help, but we have to feed their efforts (providing use cases, feedback and finance developments)

## > We have common needs. Why don't we build a common solution?

- In order to share the efforts. Make things going faster.



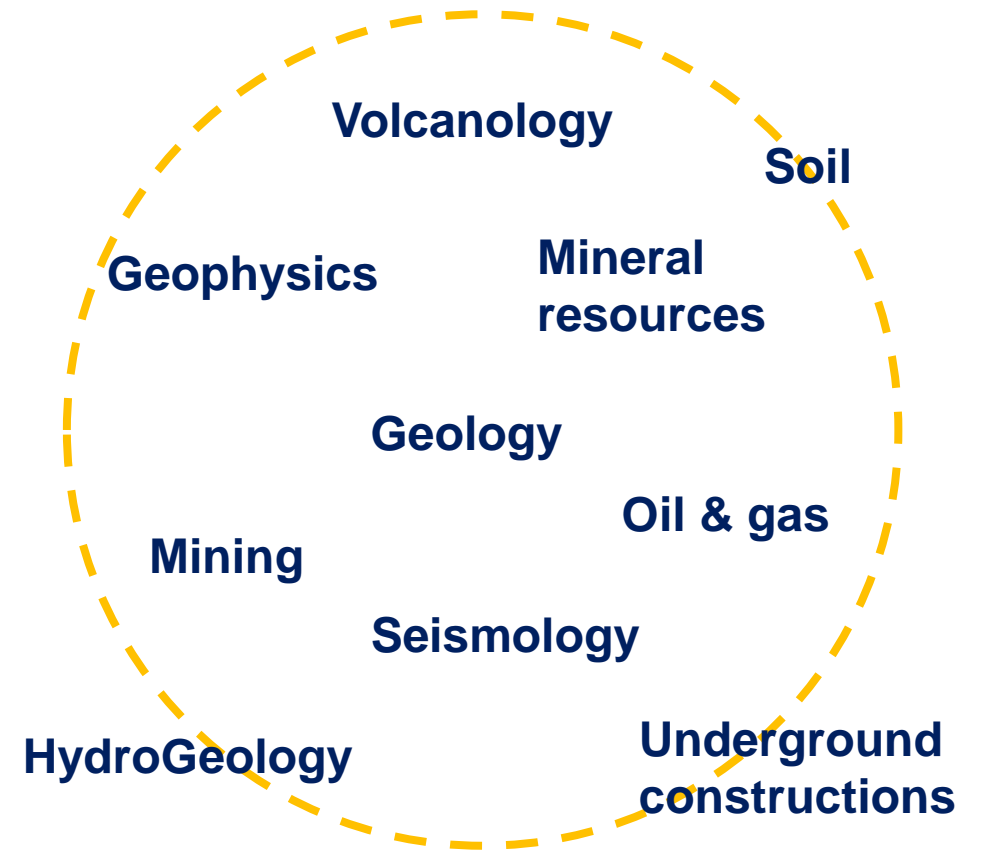
# GeoScience DWG

- > A Domain Working Group especially dedicated to push GeoScience data interoperability

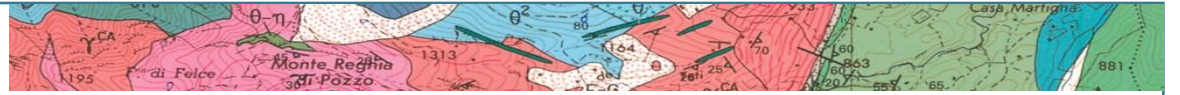


- > First meeting next week in Southampton OGC TC
  - Thursday 14, 8AM-12AM (UK local time)
  - Discussion and action for:
    - Borehole description
    - 3d geological modelling
    - Urban geology and geotechnics

- > Join us!







Thanks for your attention

[m.beaufils@brgm.fr](mailto:m.beaufils@brgm.fr)