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## EPOS GEOLOGICAL INFORMATION AND MODELING

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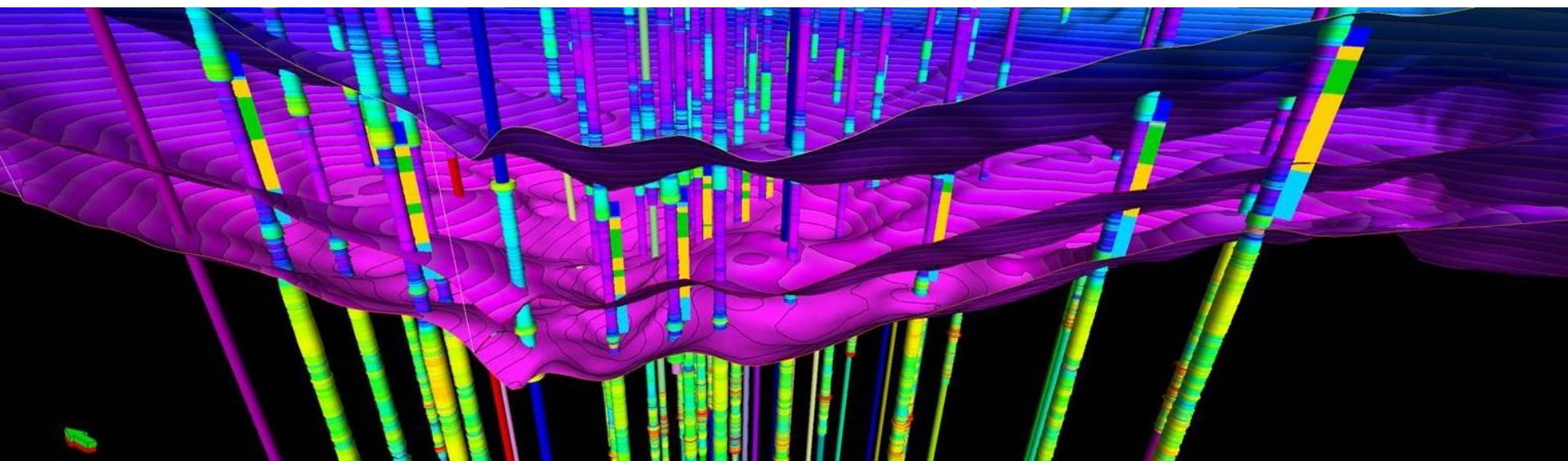
**HAL Id: hal-03924684**

**<https://brgm.hal.science/hal-03924684>**

Submitted on 5 Jan 2023

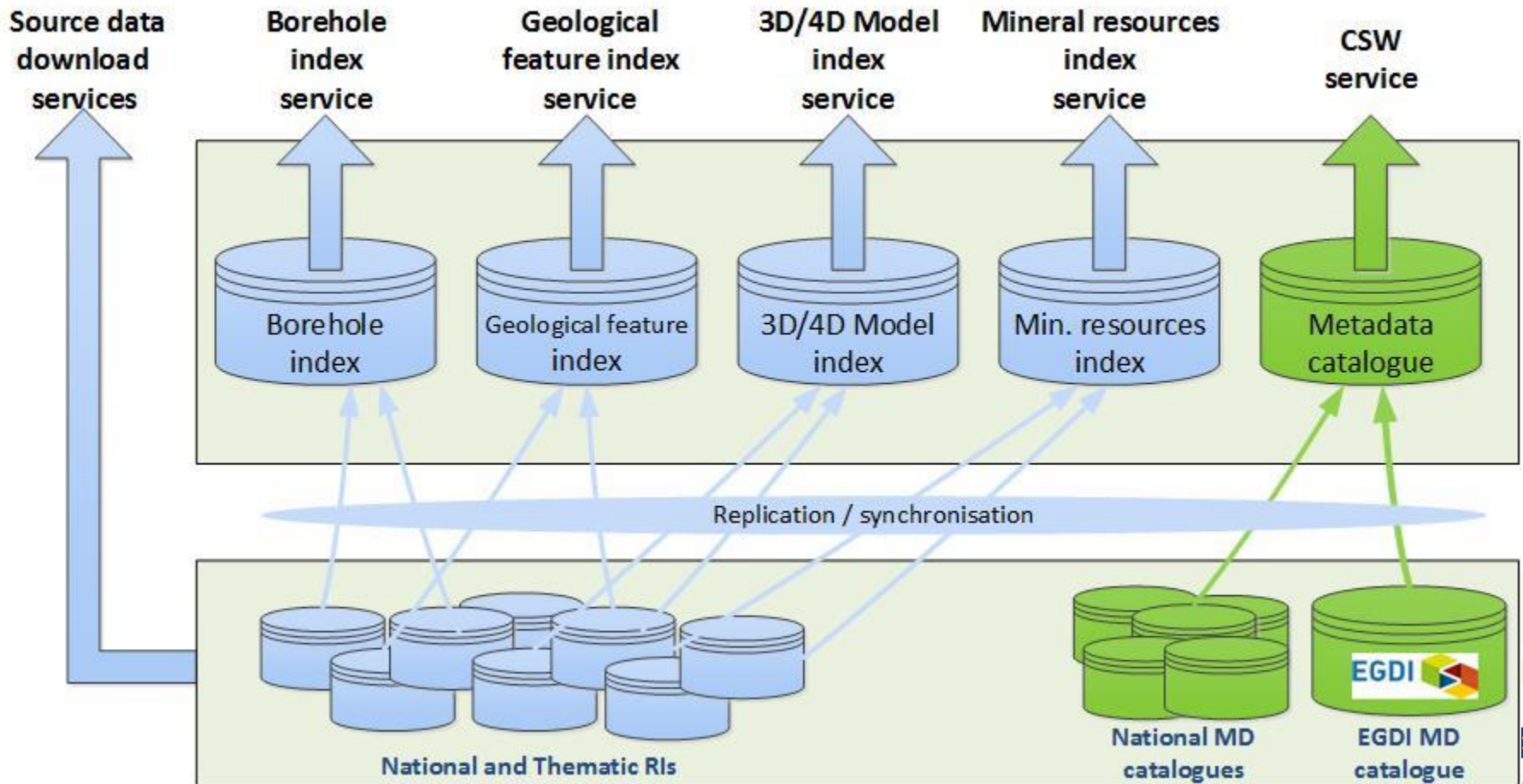
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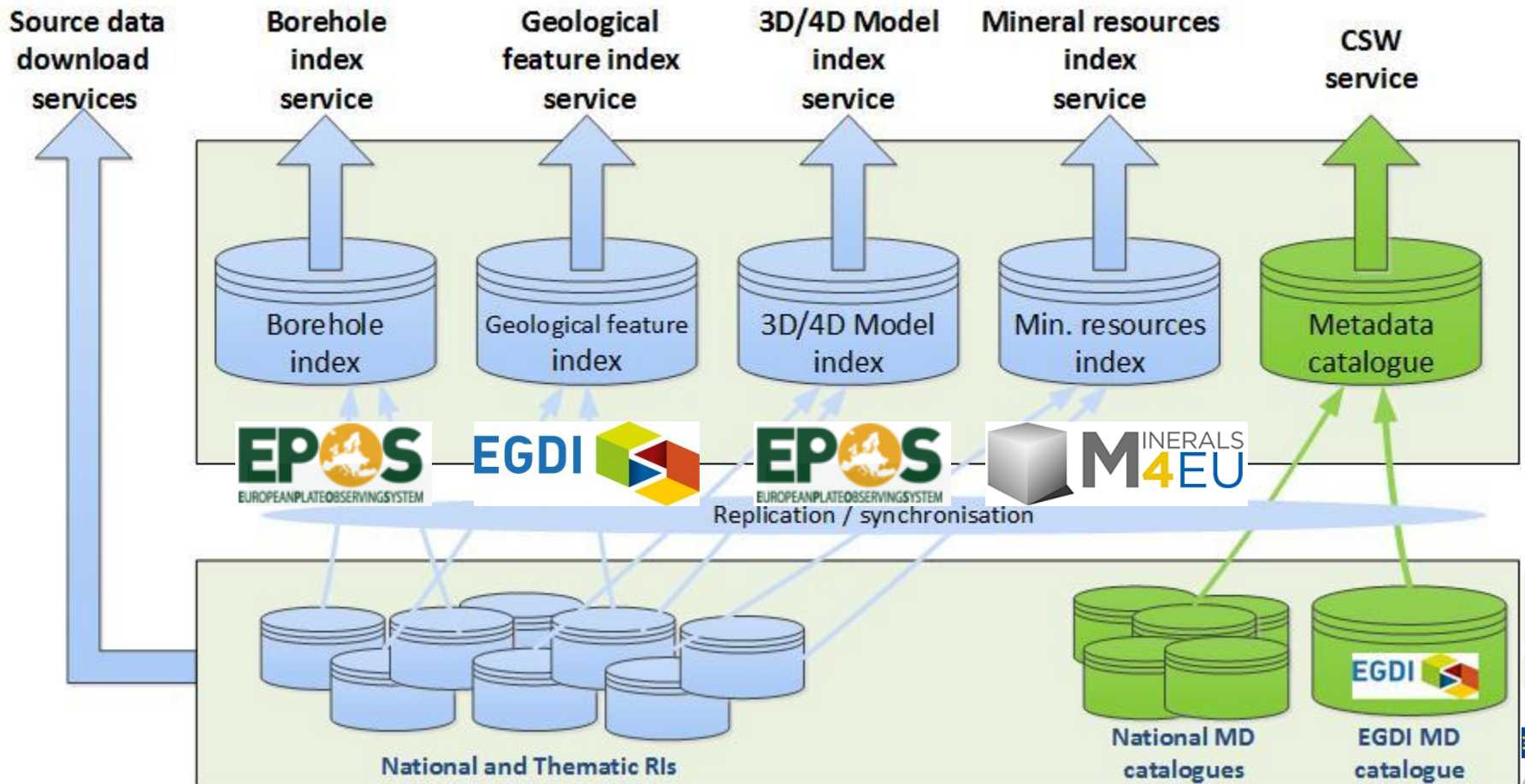


## GEOLOGICAL INFORMATION AND MODELING

# System architecture



# Data sources



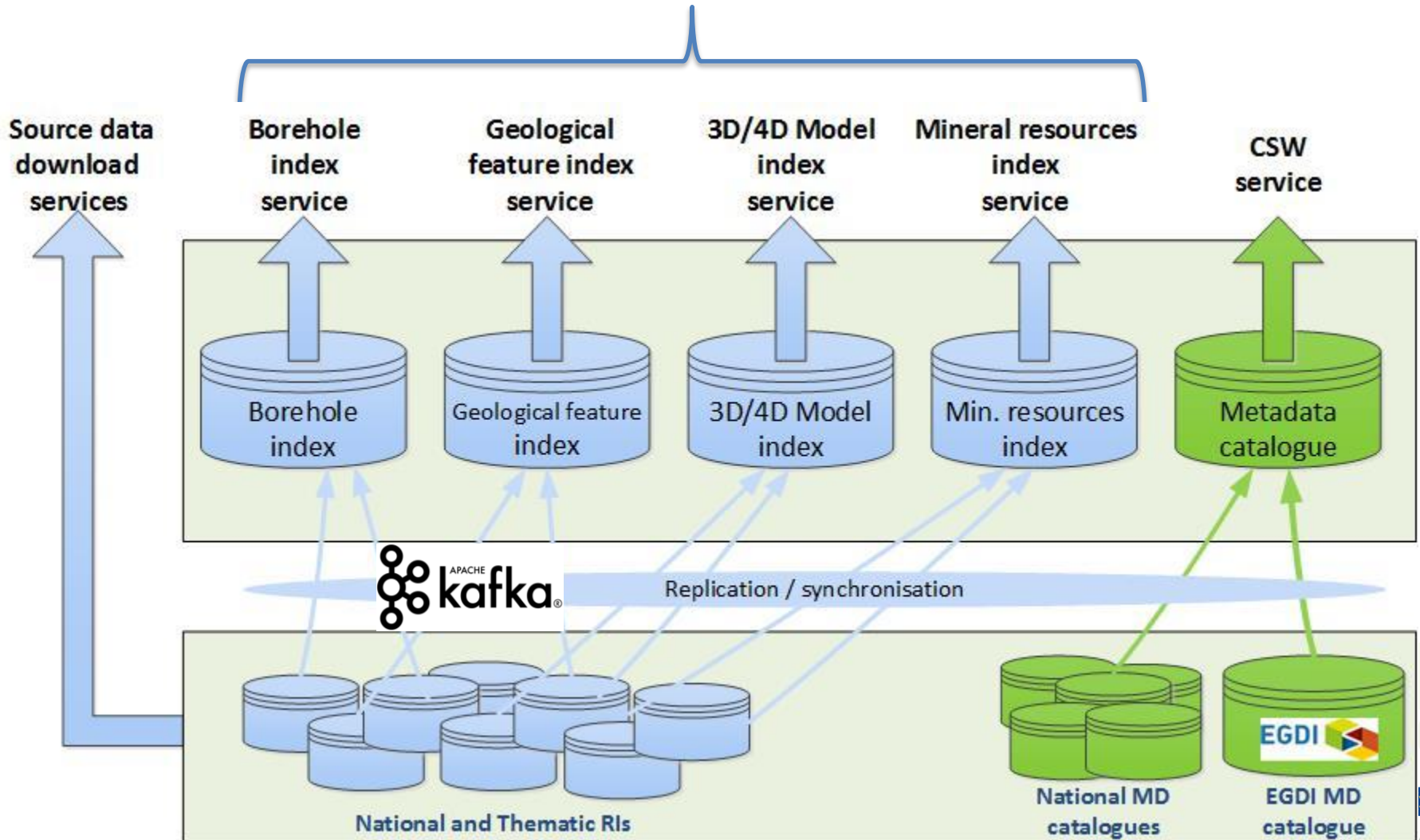


# API Services

OGC services

WMS & WFS

CSW



# Semantics

IUGS CGI - OGC  
& EPOS defined

IUGS CGI - OGC  
GeoSciML Lite

EPOS defined

IUGS CGI  
EarthResourceML  
Lite

ISO 19115-19139  
& DCAT\_AP

Source data  
download  
services

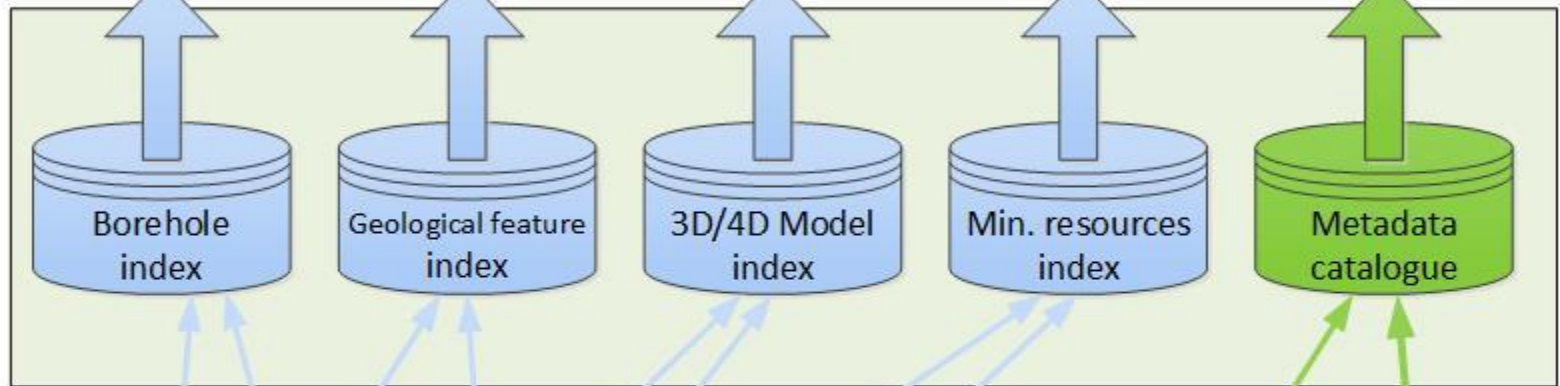
Borehole  
index  
service

Geological  
feature index  
service

3D/4D Model  
index  
service

Mineral resources  
index  
service

CSW  
service



Borehole  
index

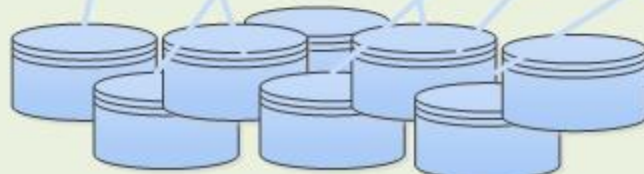
Geological  
feature  
index

3D/4D Model  
index

Min. resources  
index

Metadata  
catalogue

Replication / synchronisation



National and Thematic RIs



National MD  
catalogues

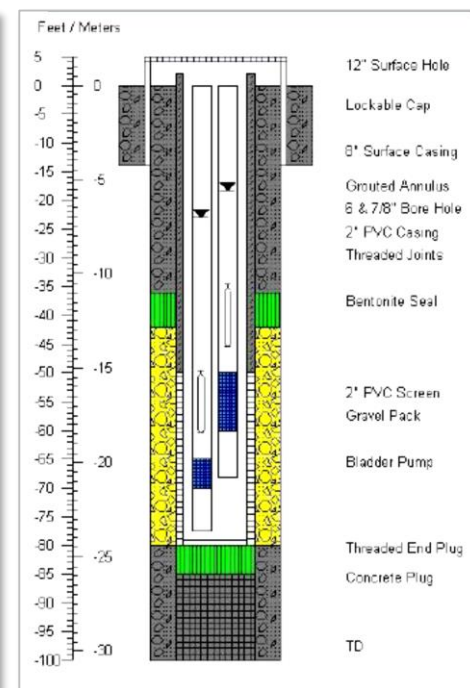
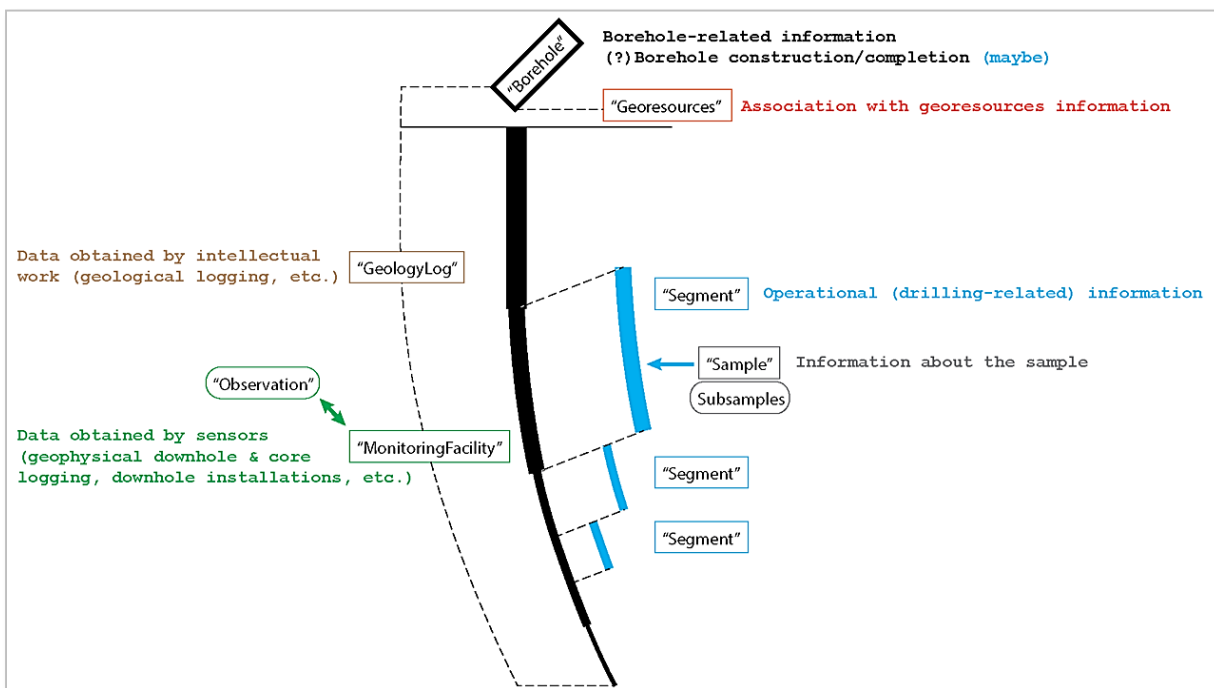


EGDI MD  
catalogue

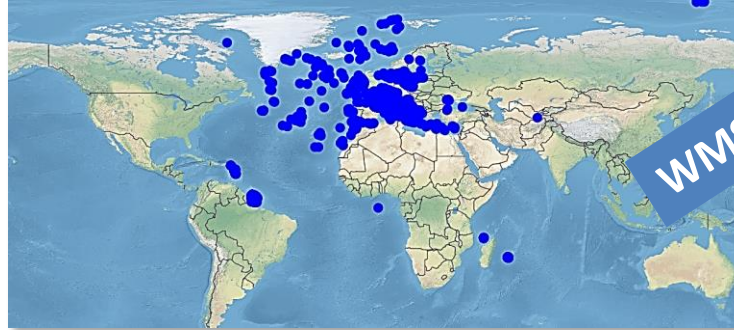
# EPOS Borehole model

Pushed to OGC Borehole Interoperability Experiment

<https://github.com/opengeospatial/boreholeie/wiki>



# Borehole Index



```
<-><wfs:FeatureCollection numberMatched="unknown" numberReturned="1" timeStamp="2017-09-05T07:42:27.003Z" xsi:schemaLocation="http://www.opengis.net/gml/3.2 http://schemas.opengis.net/gml/3.2.1/gml.xsd http://www.opengis.net/wfs/2.0 http://schemas.opengis.net/wfs/2.0/wfs.xsd https://forge.brgm.fr/svnrepository/epos/trunk/schemas https://forge.brgm.fr/svnrepository/epos/trunk/schemas/epos-ite.xsd">
```

WMS

WFS

```
<-><wfs:member>  
<-><gml:BoreholeView gml:id="BSS001REWW">  
<gml:description>Borehole description</gml:description>  
<gml:status code="BSS001REWW" xlink:href="http://resource.brgm-rec.fr/data/BoreholeView/BSS001REWW" />  
<gml:drillingMethod code="BSS001REWW" xlink:href="http://resource.brgm-rec.fr/data/BoreholeView/BSS001REWW" />  
</gml:BoreholeView>
```

URI to each Borehole Index entry

```
<gml:purpose xlink:href="http://inspire.ec.europa.eu/codelist/BoreholePurposeValue/hydrogeologicalSurvey" xlink:title="levé hydrogéologique, gestion de l'eau"/>  
<gml:status xlink:href="http://resource.europe-geology.eu/vocabs/BoreholeStatus/drillingCompleted" xlink:title="drilling completed"/>  
<gml:drillingMethod xlink:href="http://resource.europe-geology.eu/vocabs/DrillingMethod/hydraulic_rotary_drilling" xlink:title="hydraulic rotary drilling"/>  
<gml:driller code="INTRAFOR-COFOR" xlink:href="http://resource.europe-geology.eu/vocabs/Driller/INTRAFOR-COFOR" />  
<gml:drillEndDate="1974-11-30Z" />  
<gml:startPoint xlink:href="http://resource.europe-geology.eu/vocabs/BoreholeStartPoint/naturalLandSurface" xlink:title="natural land surface"/>  
<gml:inclinationType code="vertical" xlink:href="http://resource.europe-geology.eu/vocabs/BoreholeInclinationType/vertical" xlink:title="vertical"/>  
<gml:boreholeMaterialCustodian code="unknown" />  
<gml:boreholeLength uom="m" value="23.0" />  
<gml:elevation uom="m" value="223.87" />  
<gml:elevation_srs="http://www.opengis.net/def/crs/EPSG/0/5720" />  
<gml:source>  
http://ficheinfoterre.brgm.fr/InfoterreFiche/ficheBss.action?id=06512X0037/STREMY  
</gml:source>  
<gml:metadata uri="http://www.geocatalogue.fr/Detail.do?fileIdentifier=BR_BSS_BAA" />  
<gml:genericSymbolizer>Not provided</gml:genericSymbolizer>  
<gml:shape></gml:shape>  
<gml:cored>false</gml:cored>  
<gml:accessToPhysicalDrillCore>false</gml:accessToPhysicalDrillCore>  
<gml:boreholeUse code="surveillance" xlink:href="http://inspire.ec.europa.eu/codelist/BoreholePurposeValue/groundwaterLevelMonitoring" xlink:title="surveillance du niveau de la nappe phréatique"/>  
<gml:detailedDescription code="template" xlink:href="http://www.opengis.net/def/nl/OGC/0/template" xlink:title="template" />
```

URI to codeList entries (INSPIRE, TCS Geological Information and Modeling)

```
<gml:geologicalDescription code="BSS001REWW" xlink:href="http://resource.brgm-rec.fr/obs/RawGeologicalLogs/BSS001REWW" xlink:title="Borehole BSS001REWW geologic log available"/>  
<gml:groundWaterLevel code="BSS001REWW" xlink:href="http://resource.brgm-rec.fr/data/Piezometre/06512X0037/STREMY.2" xlink:title="Description of Piezometre attached to BSS001REWW. Provides link to SensorObservationService offering"/>  
<gml:groundWaterChemistry code="unknown" />  
<gml:rockGeochemistry code="unknown" />  
<gml:poreGasChemistry code="inapplicable" />  
<gml:geoTechnicalInfo code="unknown" />
```

URI to richer information resource



# Geological Feature Index

Based on EGDI – European Geological Data Infrastructure

The screenshot displays the EGDI OneGeologyEurope web application. At the top, the EGDI logo is visible, followed by a navigation menu with links for Onshore, Marine, Minerals, Geohazards, Energy, Soil, Groundwater, All Maps, Metadata, and About EGDI. The main heading is "OneGeologyEurope". Below this, a map of Europe is shown with various geological features overlaid in different colors. The left sidebar contains a layer list with the following items: "Geological Map 1:5M", "Geological Map 1:1M", "Surface lithology (INSPIRE)" (checked), "Surface age (INSPIRE)", "Sandstones (INSPIRE)", "Geological Map 1:100k", "Aggregate occurrences", and "Base layers". A "Project page" section is also visible, featuring the "ONE Geology Europe" logo. The map interface includes a search bar, zoom controls, and a scale bar (1000 km). The bottom of the map shows the coordinates "POINT(4464120.370370371 3416203.7037037043)" and the coordinate system "EPSG:3034 : EPSG:4326 :".

# Mineral Resource Index

Based on European Minerals Knowledge Data Platform



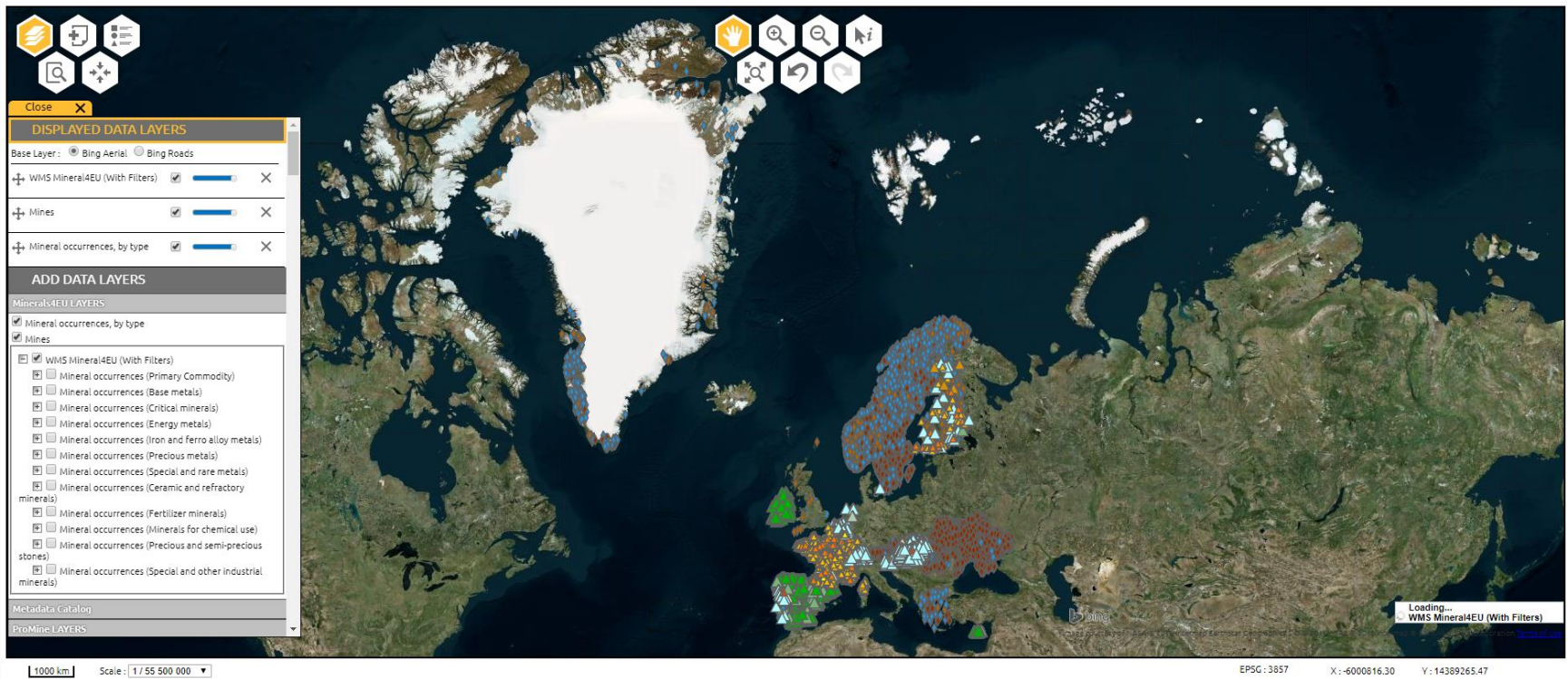
HOME

DATA SEARCH

MAP VIEWER

METADATA CATALOG

YEARBOOK



# 3D/4D Model Index

## Reuse of the model index: example in QGIS

ModelView (boundingBox) :: Total des entités: 2, filtrées: 2, sélectionnées: 1

| Element                          | Value   |
|----------------------------------|---|
| gml:identifier                   | <a href="http://ressource.brgm-rec.fr/data/Modelview/Vfr1">http://ressource.brgm-rec.fr/data/Modelview/Vfr1</a>   |
| @codeSpace                       | <a href="http://www.ietf.org/rfc/rfc2616">http://www.ietf.org/rfc/rfc2616</a>   |
| gml:name                         | Modèle géologique régional 3D du Massif des Vosges et du Fossé rhénan   |
| gml:creationDate                 | 2013-05-27  |
| gml:releaseDate                  | 2015-08-28  |
| gml:versionNumber                |   |
| gml:type                         | <a href="http://resource.europe-geology.eu/vocabs/ModelType/Implicit">http://resource.europe-geology.eu/vocabs/ModelType/Implicit</a>                                     |
| @link:href                       | <a href="http://resource.europe-geology.eu/vocabs/ModelType/Implicit">http://resource.europe-geology.eu/vocabs/ModelType/Implicit</a>                                     |
| @link:title                      | Implicit  |
| gml:purpose                      | <a href="http://resource.europe-geology.eu/vocabs/ModelPurpose/ScientificResearch">http://resource.europe-geology.eu/vocabs/ModelPurpose/ScientificResearch</a>           |
| @link:href                       | <a href="http://resource.europe-geology.eu/vocabs/ModelPurpose/ScientificResearch">http://resource.europe-geology.eu/vocabs/ModelPurpose/ScientificResearch</a>           |
| @link:title                      | Scientific research   |
| gml:status                       | <a href="http://resource.europe-geology.eu/vocabs/ModelStatus/Finalised">http://resource.europe-geology.eu/vocabs/ModelStatus/Finalised</a>                               |
| @link:href                       | <a href="http://resource.europe-geology.eu/vocabs/ModelStatus/Finalised">http://resource.europe-geology.eu/vocabs/ModelStatus/Finalised</a>                               |
| @link:title                      | Finalised   |
| gml:individualName               | C. Allanic  |
| gml:individualName               | G. Courrioux  |
| gml:individualName               | S. Gabalda  |
| gml:individualName               | A. Gullen   |
| gml:individualName               | K. Schulmann  |
| gml:individualName               | E. Skrzypek   |
| gml:organisationName             | BRGM  |
| gml:organisationName             | Univ. Strasbourg  |
| gml:projectName                  | PDR13DGR43: chantier RGF pilote Vosges-Fossé Rhénan   |
| gml:projectURI                   |   |
| gml:boundingBox                  |   |
| gml:zMin                         | -40000  |
| @uom                             | <a href="http://qudt.org/vocab/unit/M">http://qudt.org/vocab/unit/M</a>   |
| gml:zMax                         | 3000  |
| @uom                             | <a href="http://qudt.org/vocab/unit/M">http://qudt.org/vocab/unit/M</a>   |
| gml:positionalAccuracy           |   |
| gml:areaOfInterest               | <a href="http://sws.geonames.org/3017382/">http://sws.geonames.org/3017382/</a>   |
| @link:href                       | <a href="http://sws.geonames.org/3017382/">http://sws.geonames.org/3017382/</a>   |
| @link:title                      | France  |
| gml:areaOfInterest               | <a href="http://sws.geonames.org/3038033/">http://sws.geonames.org/3038033/</a>   |
| @link:href                       | <a href="http://sws.geonames.org/3038033/">http://sws.geonames.org/3038033/</a>   |
| @link:title                      | Alsace  |
| gml:areaOfInterest               | <a href="http://sws.geonames.org/2967681/">http://sws.geonames.org/2967681/</a>   |
| @link:href                       | <a href="http://sws.geonames.org/2967681/">http://sws.geonames.org/2967681/</a>   |
| @link:title                      | Vosges  |
| gml:modellingGeologicFeature     |   |
| @link:href                       |   |
| @link:title                      | Tertiaire   |
| gml:modellingGeologicFeature     |   |
| @link:href                       |   |
| @link:title                      | Trias   |
| gml:modellingGeologicFeature     | <a href="http://ressource.brgm-rec.fr/data/GeologicUnit/au.qsmh.2738">http://ressource.brgm-rec.fr/data/GeologicUnit/au.qsmh.2738</a>                                     |
| @link:href                       | <a href="http://ressource.brgm-rec.fr/data/GeologicUnit/au.qsmh.2738">http://ressource.brgm-rec.fr/data/GeologicUnit/au.qsmh.2738</a>                                     |
| @link:title                      | Permien   |
| gml:modellingSoftwareToolName    | GeoModeller   |
| gml:modellingSoftwareToolVersion |   |
| gml:outputGeometryReference      | <a href="https://data.brgm.fr/files/15/1dbf1f7c-13f2-49e9-abad-71e6da509513/output.zip">https://data.brgm.fr/files/15/1dbf1f7c-13f2-49e9-abad-71e6da509513/output.zip</a> |
| gml:distributionFormat           | <a href="http://resource.europe-geology.eu/vocabs/DistributionFormat/Vox">http://resource.europe-geology.eu/vocabs/DistributionFormat/Vox</a>                             |
| @link:href                       | <a href="http://resource.europe-geology.eu/vocabs/DistributionFormat/Vox">http://resource.europe-geology.eu/vocabs/DistributionFormat/Vox</a>                             |

# Vocabulary Registry: *data.geoscience.earth*

[data.geoscience.earth/ncl/](https://data.geoscience.earth/ncl/)

Each register and register entity  
have their URI  
Access for human being and machines

European Geoscience Registry

Register: Borehole Drilling Method

URI: <https://data.geoscience.earth/ncl/DrillingMethod>

This schema specifies concepts used to describe methods used to drill a borehole, as defined by the IUGS Commission for Geoscience Information (CGI) Geoscience Terminology Working Group. By extension, it includes all concepts in this conceptScheme, as well as concepts in any previous versions of the scheme.

Contents (tree view)

- auger Auger drilling is done with a helical screw which is driven...
- hand auger A hand auger consists of extendable steel rods, rotated by ha...
- power auger Mechanically-driven auger drilling, typically used in hand gr...
- percussion drilling A drilling method whereby rock or sediment chips or fragments...
- cable tool drilling A percussion drilling method that uses a heavy drilling tool...
- rotary air blast drilling Percussion rotary air blast drilling (RAB) drilling is an 'op...
- rotary hammer drilling A percussion drilling method using a cutting tool powered by...
- reverse circulation drilling The drilling mechanism for reverse circulation (RC) drilling...
- hydraulic rotary drilling A drilling method using a drill stem equipped with a bit that...
- core drilling A core of sediment, soil, or rock is derived by an unspecifi...
- diamond core Diamond core drilling (or diamond drilling) utilizes an annul...
- direct push Direct push technology includes several types of drilling rig...
- Extended Core Barrel (XCB) The Extended Core Barrel (XCB) coring system is used in sedim...
- vibrocore A core tube is attached to a source of mechanical vibration (...)
- sonic A sonic or vibratory drill head works by sending high frequen...
- air core Air core drilling and related methods use hardened steel or t...
- bulk core A sampling method that obtains a large volume or large surfac...
- sidewall core A method to extract a core or plug from the sidewall of a bor...
- probe An object (e.g. penetrometer) inserted into the substrate that...

Support

Support and contact information goes here.

About this page

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European Geoscience Registry

Entry: core drilling

URI: <https://data.geoscience.earth/ncl/DrillingMethod/coreDrilling>

A core of sediment, soil, or rock is derived by an unspecified core drilling method.

Definition

|                |  |
|----------------|--|
| definition     | A core of sediment, soil, or rock is derived by an unspecified core drilling method. |
| narrower       | vibrocore   Extended Core Barrel (XCB)   direct push   diamond core                  |
| notation       | 4  |
| pref label     | core drilling  |
| source         | This vocabulary  |
| top concept of | Borehole Drilling Method   |
| type           | Concept  |

Support

Support and contact information goes here.

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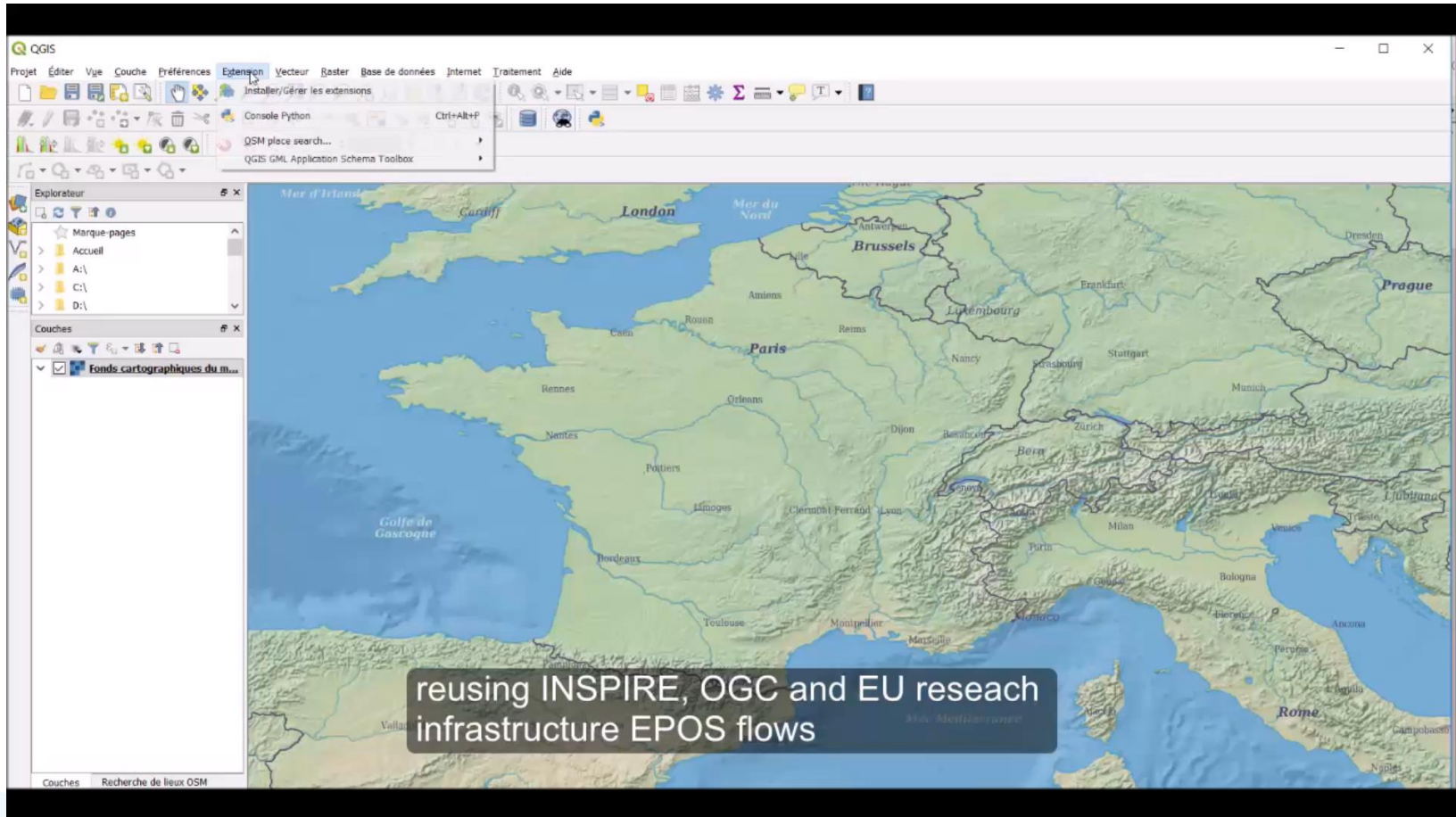
```
C:\Users\gr\lets\curl -k -L -H "Accept: text/turtle" "https://data.geoscience.earth/ncl/DrillingMethod/XCB"
@prefix cc: <http://creativecommons.org/ns#> .
@prefix void: <http://rdfs.org/ns/void#> .
@prefix org: <http://www.w3.org/ns/org#> .
@prefix odrs: <http://schema.theodi.org/odrs#> .
@prefix ssd: <http://www.w3.org/ns/sparql-service-description#> .
@prefix owl: <http://www.w3.org/2002/07/owl#> .
@prefix xsd: <http://www.w3.org/2001/XMLSchema#> .
@prefix env-ui: <http://environment.data.gov.uk/registry/structure/ui/> .
@prefix skos: <http://www.w3.org/2004/02/skos/core#> .
@prefix rdfs: <http://www.w3.org/2000/01/rdf-schema#> .
@prefix version: <http://purl.org/linked-data/version#> .
@prefix qb: <http://purl.org/linked-data/cube#> .
@prefix dgu: <http://reference.data.gov.uk/def/reference/> .
@prefix ui: <http://purl.org/linked-data/registry-ui#> .
@prefix dct: <http://purl.org/dc/terms/> .
@prefix rdf: <http://www.w3.org/1999/02/22-rdf-syntax-ns#> .
@prefix reg: <http://purl.org/linked-data/registry#> .
@prefix ldp: <http://www.w3.org/ns/ldp#> .
@prefix time: <http://www.w3.org/2006/time#> .
@prefix api: <http://purl.org/linked-data/api/vocab#> .
@prefix vann: <http://purl.org/vocab/vann/> .
@prefix vs: <http://www.w3.org/2003/06/sw-vocab-status/ns#> .
@prefix prov: <http://www.w3.org/ns/prov#> .
@prefix foaf: <http://xmlns.com/foaf/0.1/> .
@prefix dc: <http://purl.org/dc/elements/1.1/> .

<https://data.geoscience.earth/ncl/DrillingMethod/XCB>
  a
    skos:Concept ;
  dct:source
    <https://http://joidesresolution.org/node/2186> ;
  skos:broader
    <https://data.geoscience.earth/ncl/DrillingMethod/coreDrilling> ;
  skos:definition
    "The Extended Core Barrel (XCB) coring system is used in sedimentological, climate, and paleoceanographic studies. The XCB is used to recover 9.5 m long core samples from soft to moderately hard formations. The XCB is typically deployed when the formation becomes too stiff to piston core (i.e., upon piston coring "refusal") or when it is not hard enough to permit efficient recovery with the Rotary Core Barrel (RCB)."@en ;
  skos:notation
    "4.4"^^xsd:ID ;
  skos:prefLabel
    "Extended Core Barrel (XCB)"@en .
```



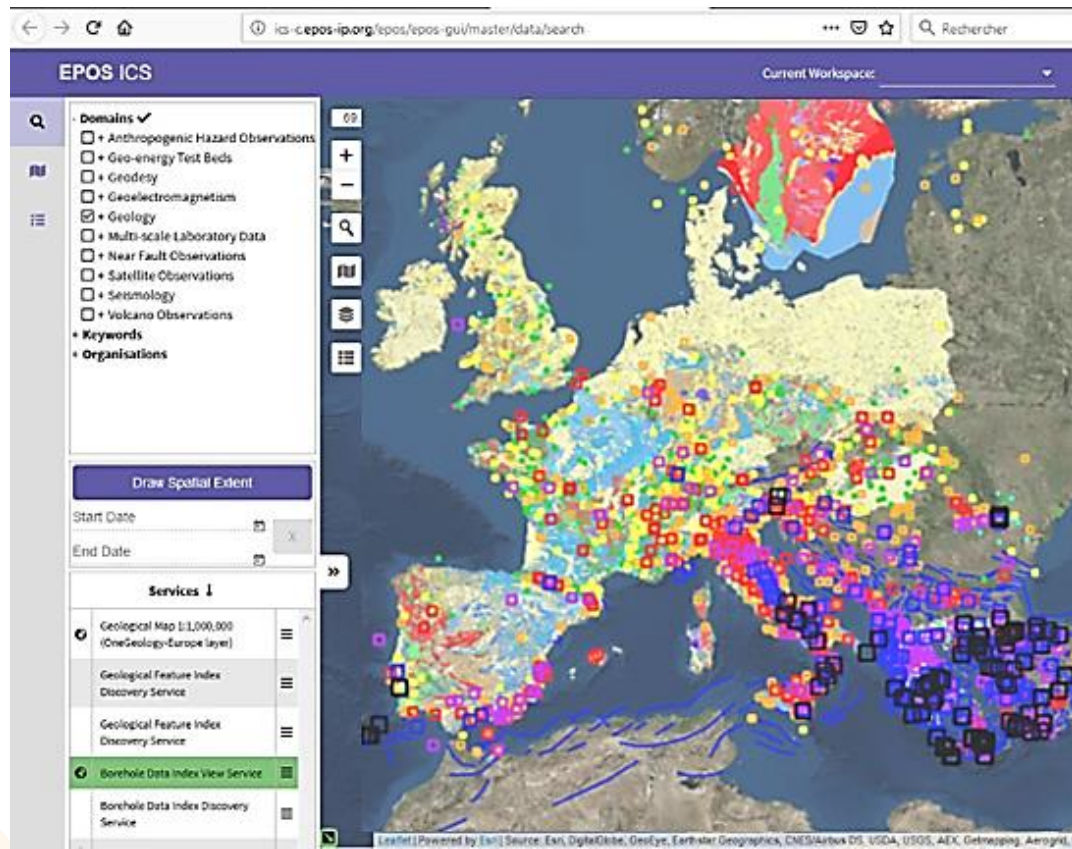
# Going through the Borehole data graph

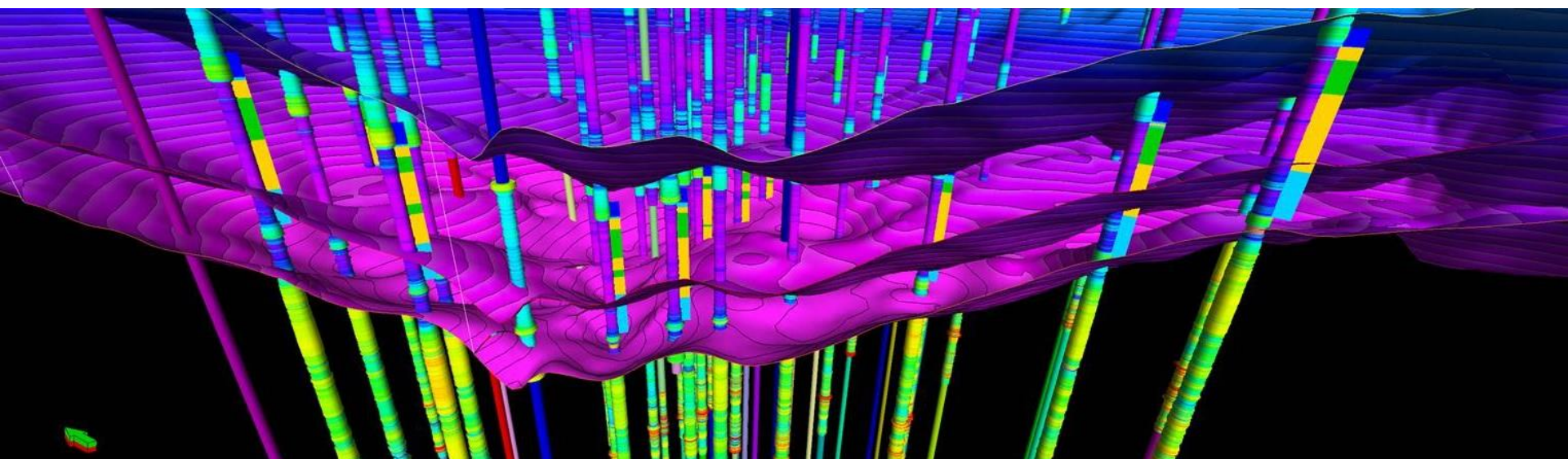
## Using QGIS 3 & GML Application Schema Toolbox



# EPOS Portal

TCS Geological Information and Modeling data are assessible:  
[www.epos-ip.org](http://www.epos-ip.org)





## GEOLOGICAL INFORMATION AND MODELING

### CONTACT

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

[www.epos-ip.org/tcs/geological-information-and-modeling](http://www.epos-ip.org/tcs/geological-information-and-modeling)