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EPOS GEOLOGICAL INFORMATION AND MODELING

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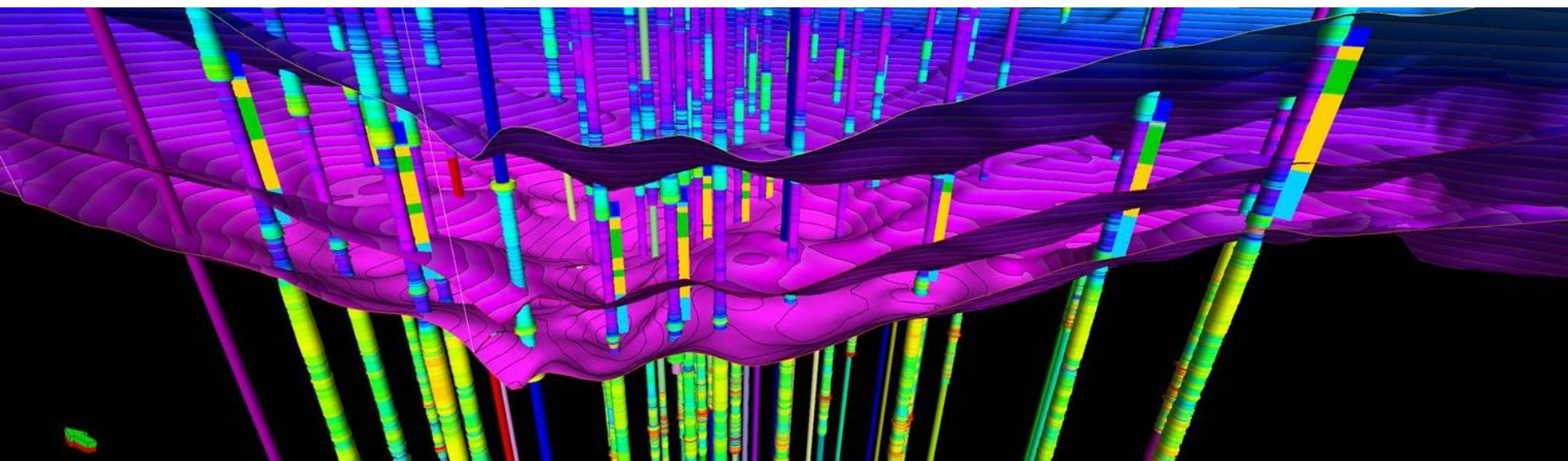
HAL Id: hal-03924684

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

Submitted on 5 Jan 2023

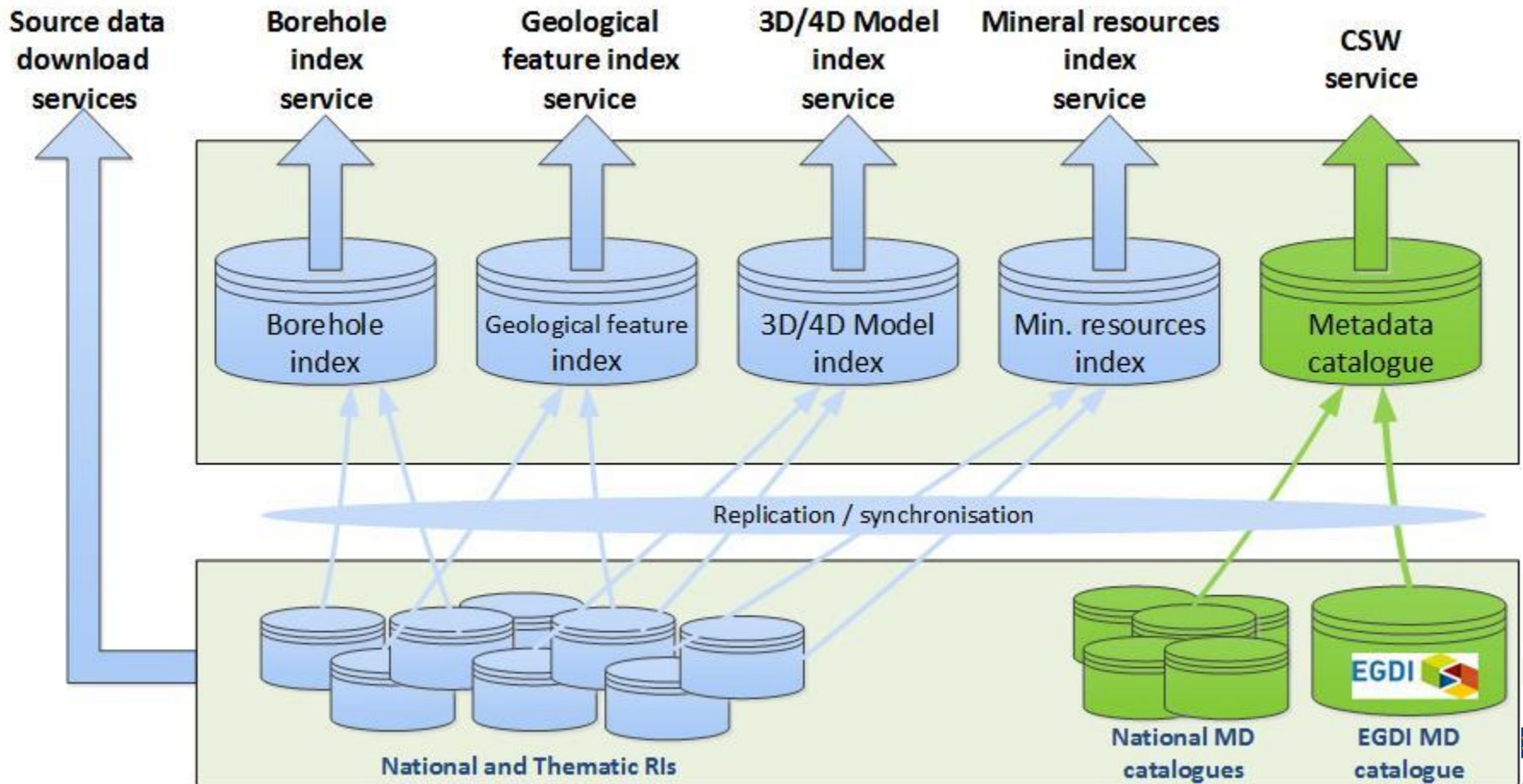
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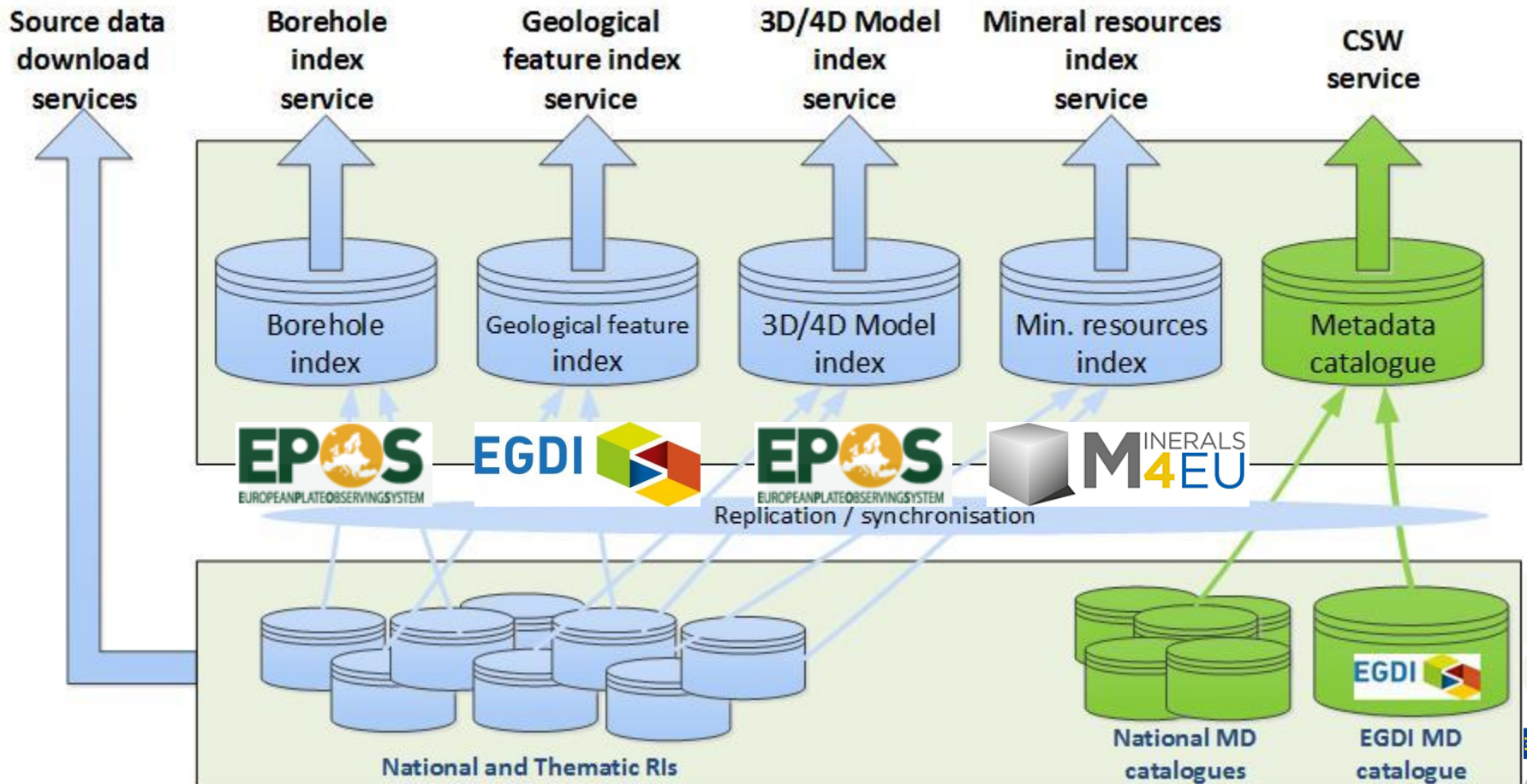


GEOLOGICAL INFORMATION AND MODELING

System architecture



Data sources

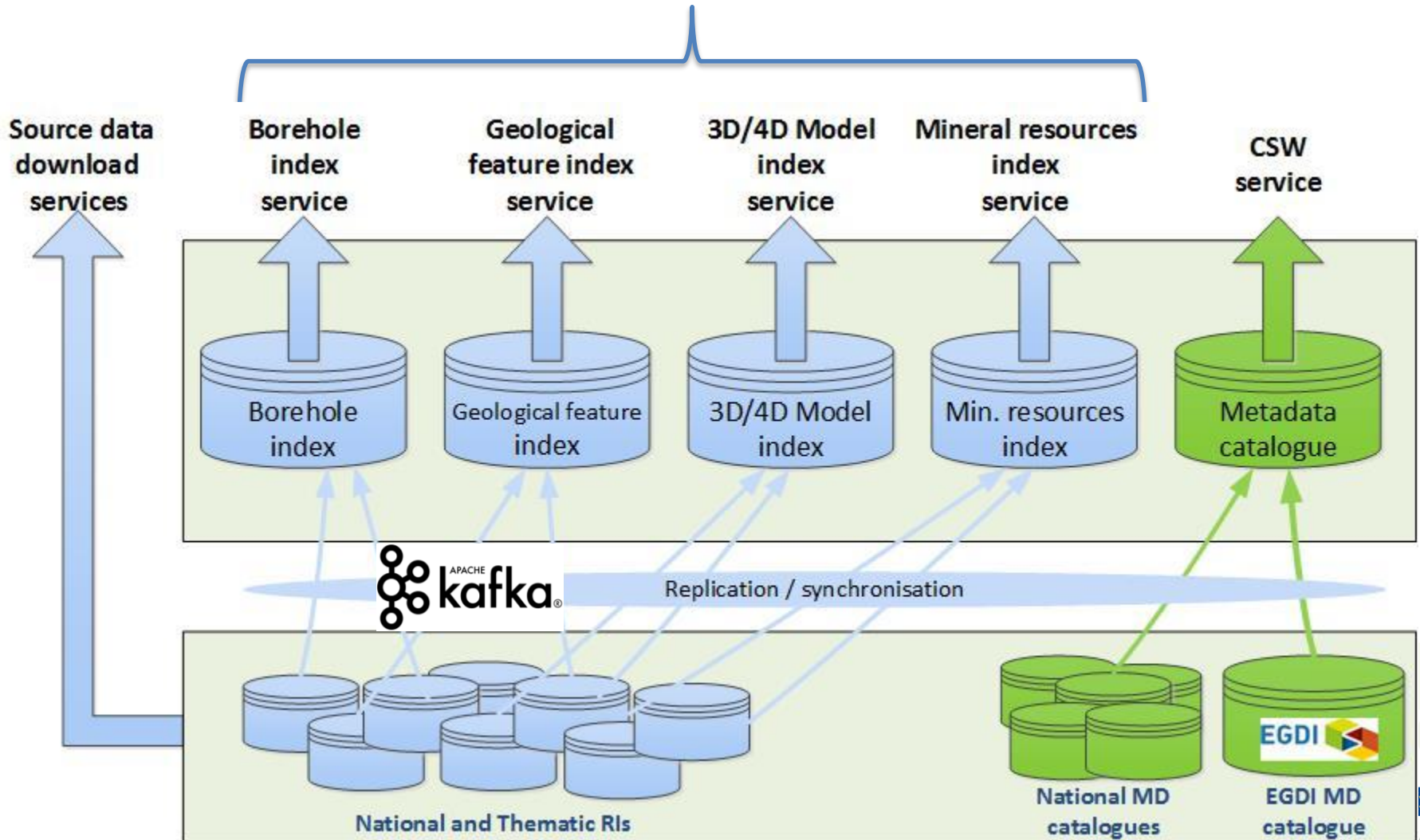


API Services

OGC services

WMS & WFS

CSW



Semantics

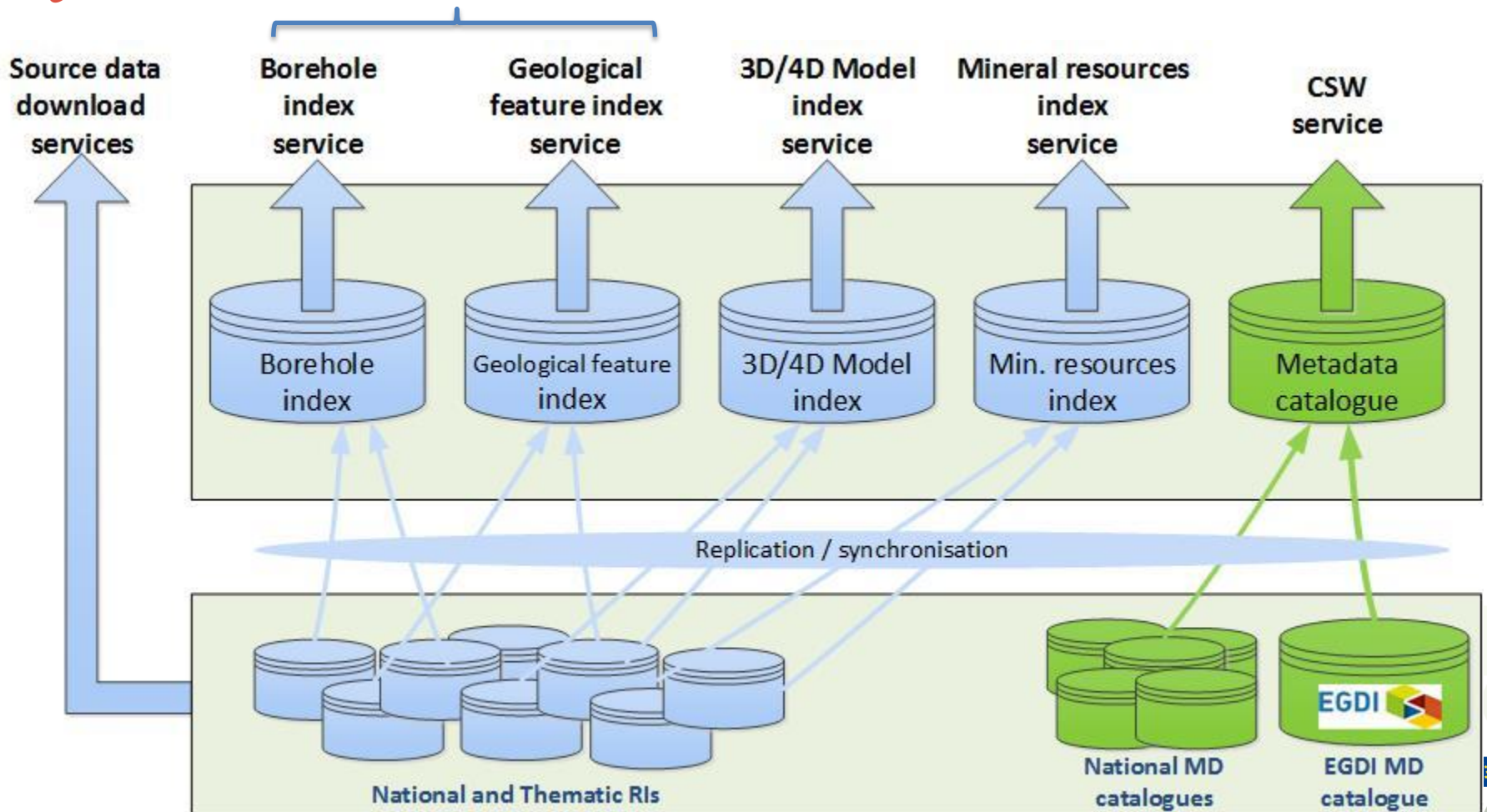
IUGS CGI - OGC
& EPOS defined

IUGS CGI - OGC
GeoSciML Lite

EPOS defined

IUGS CGI
EarthResourceML
Lite

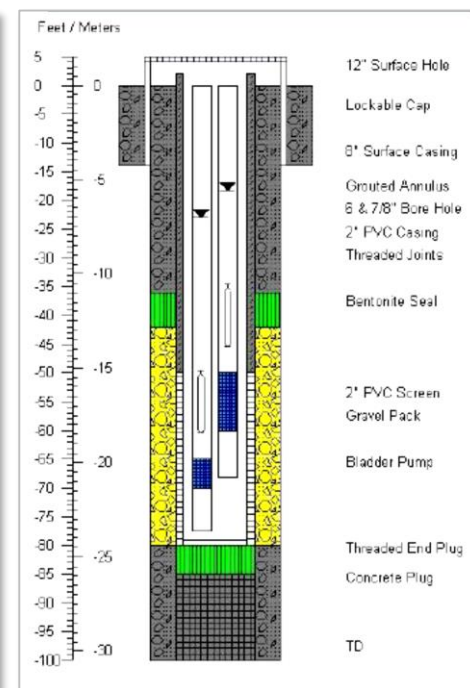
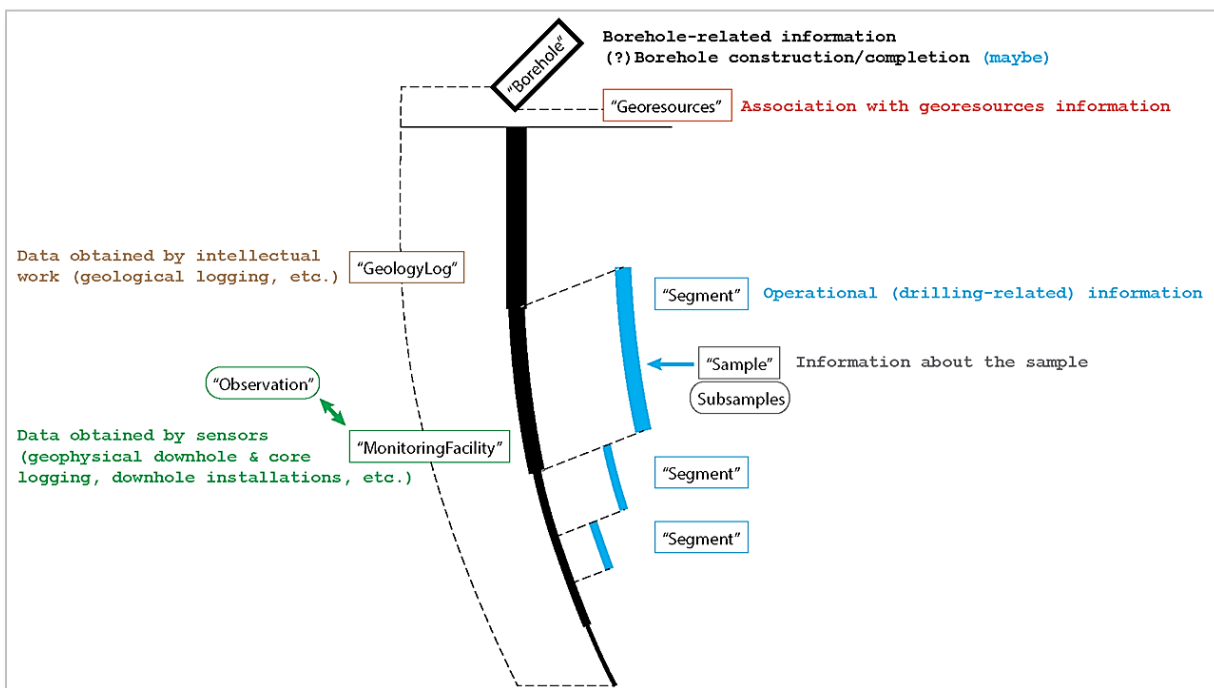
ISO 19115-19139
& DCAT_AP



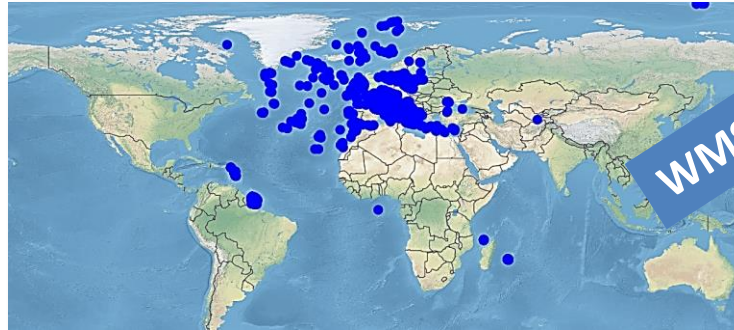
EPOS Borehole model

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-life.xsd">
```

```
<wfs:member>  
<gml:BoreholeView gml:id="BSS001REWW">  
<gml:description>Borehole description</gml:description>  
<gml:status codeListRef="http://inspire.ec.europa.eu/codelist/BoreholeStatus/drillingCompleted" xlink:title="drilling completed"/>  
<gml:drillingMethod codeListRef="http://resource.europe-geology.eu/vocabs/DrillingMethod/hydraulic_rotary_drilling" xlink:title="hydraulic rotary drilling"/>  
<gml:driller>INTRAFOR-COFOR</gml:driller>  
<gml:drillStartDate>1974-11-30Z</gml:drillStartDate>  
<gml:drillEndDate>1974-11-30Z</gml:drillEndDate>  
<gml:startPoint codeListRef="http://resource.europe-geology.eu/vocabs/BoreholeStartPoint/naturalLandSurface" xlink:title="natural land surface"/>  
<gml:inclinationType codeListRef="http://resource.europe-geology.eu/vocabs/BoreholeInclinationType/vertical" xlink:title="vertical"/>  
<gml:boreholeMaterialCustodian>unknown</gml:boreholeMaterialCustodian>  
<gml:boreholeLength_m uom="http://qudt.org/vocab/unit/M">23.0</gml:boreholeLength_m>  
<gml:elevation_m uom="http://qudt.org/vocab/unit/M">223.87</gml:elevation_m>  
<gml:elevation_srs>http://www.opengis.net/def/crs/EPSG/0/5720</gml:elevation_srs>
```

URI to each Borehole Index entry

WFS

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

```
<gml:purpose codeListRef="http://inspire.ec.europa.eu/codelist/BoreholePurposeValue/hydrogeologicalSurvey" xlink:title="levé hydrogéologique, gestion de l'eau"/>  
<gml:status codeListRef="http://inspire.ec.europa.eu/codelist/BoreholeStatus/drillingCompleted" xlink:title="drilling completed"/>  
<gml:drillingMethod codeListRef="http://resource.europe-geology.eu/vocabs/DrillingMethod/hydraulic_rotary_drilling" xlink:title="hydraulic rotary drilling"/>  
<gml:driller>INTRAFOR-COFOR</gml:driller>  
<gml:drillStartDate>1974-11-30Z</gml:drillStartDate>  
<gml:drillEndDate>1974-11-30Z</gml:drillEndDate>  
<gml:startPoint codeListRef="http://resource.europe-geology.eu/vocabs/BoreholeStartPoint/naturalLandSurface" xlink:title="natural land surface"/>  
<gml:inclinationType codeListRef="http://resource.europe-geology.eu/vocabs/BoreholeInclinationType/vertical" xlink:title="vertical"/>  
<gml:boreholeMaterialCustodian>unknown</gml:boreholeMaterialCustodian>  
<gml:boreholeLength_m uom="http://qudt.org/vocab/unit/M">23.0</gml:boreholeLength_m>  
<gml:elevation_m uom="http://qudt.org/vocab/unit/M">223.87</gml:elevation_m>  
<gml:elevation_srs>http://www.opengis.net/def/crs/EPSG/0/5720</gml:elevation_srs>  
<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" xlink:title="Borehole BSS001REWW geologic log available"/>  
<gml:detailedDescription codeListRef="http://www.opengis.net/def/nl/OGC/0/template" xlink:title="template"/>
```

URI to richer information resource

```
<gml:geologicalDescription codeListRef="http://resource.brgm-rec.fr/obs/RawGeologicalLogs/BSS001REWW" xlink:title="Borehole BSS001REWW geologic log available"/>  
<gml:groundWaterLevel codeListRef="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 codeListRef="http://www.opengis.net/def/nl/OGC/0/unknown" xlink:title="unknown"/>  
<gml:rockGeochemistry codeListRef="http://www.opengis.net/def/nl/OGC/0/unknown" xlink:title="unknown"/>  
<gml:poreGasChemistry codeListRef="http://www.opengis.net/def/nl/OGC/0/inapplicable" xlink:title="inapplicable"/>  
<gml:geoTechnicalInfo codeListRef="http://www.opengis.net/def/nl/OGC/0/unknown" xlink:title="unknown"/>  
</gml:BoreholeView>
```


Geological Feature Index

Based on EGDI – European Geological Data Infrastructure

The screenshot displays the EGDI OneGeologyEurope web application interface. 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 layers overlaid. The left sidebar contains a legend with the following items:

- Geological Map 1:5M
- Geological Map 1:1M
- Surface lithology (INSPIRE)
- Surface age (INSPIRE)
- Sandstones (INSPIRE)
- Geological Map 1:100k
- Aggregate occurrences
- Base layers

The map includes a search bar with "Go to location...", a zoom control with "Zoom" and "N North" buttons, and a scale bar for 1000 km. The bottom of the map shows the coordinates POINT(4464120.370370371 3416203.7037037043) and the EPSG codes EPSG:3034 and EPSG:4326.

Mineral Resource Index

Based on European Minerals Knowledge Data Platform



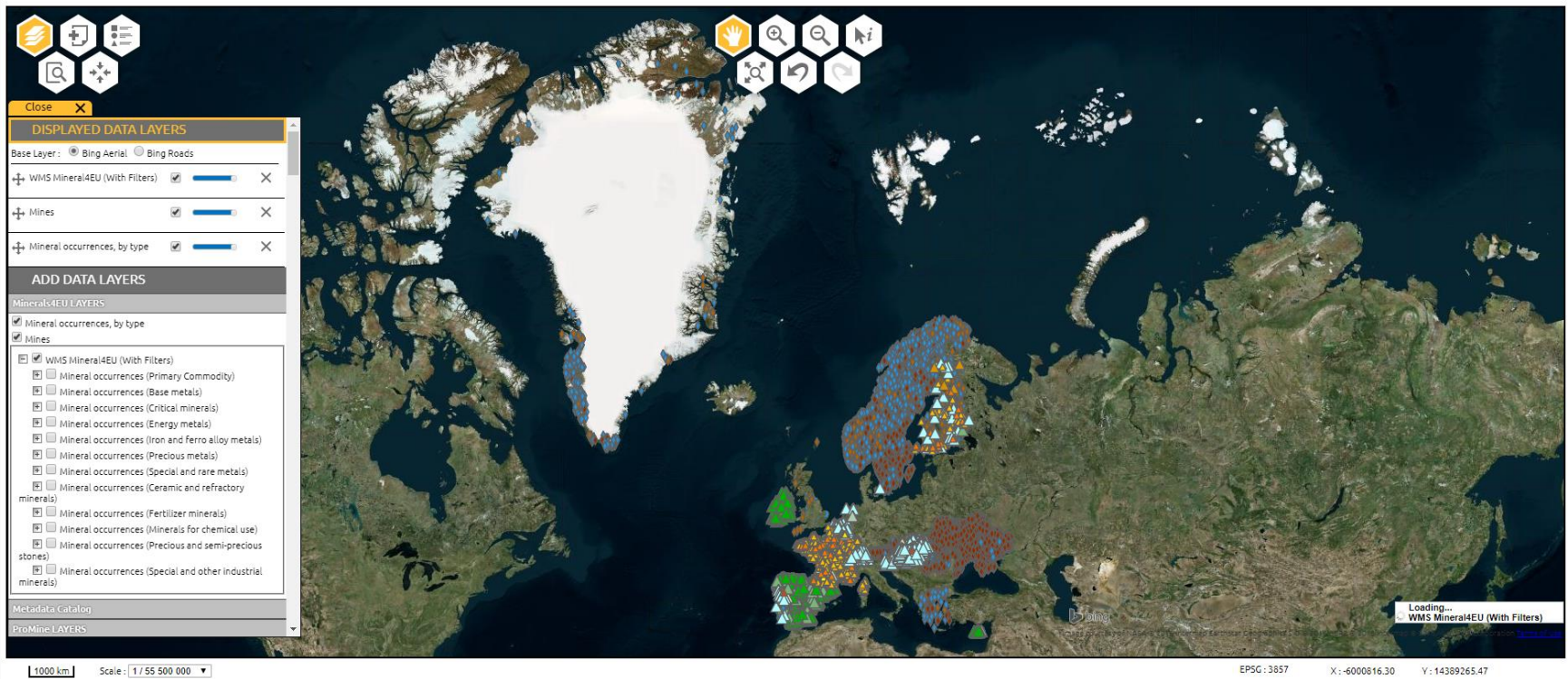
HOME

DATA SEARCH

MAP VIEWER

METADATA CATALOG

YEARBOOK



3D/4D Model Index

Reuse of the model index: example in QGIS

The screenshot displays the QGIS interface with a 3D/4D Model Index window open. The window title is "ModelView (boundingBox) : Total des entités: 2, filtrées: 2, sélectionnées: 1". The main content area shows the XML metadata for a model, with a table structure:

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

The map view on the right shows a geographical area with a yellow bounding box highlighting a specific region. Labels on the map include "Poitiers", "Bern", "Nancy", and "Strasbourg".

Vocabulary Registry: *data.geoscience.earth*

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 obq (e.g. penetrometer) inserted into the substrate that...

Support

Support and contact information goes here.

About this page

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Design and development by [Edimorbits](#)

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.

About this page

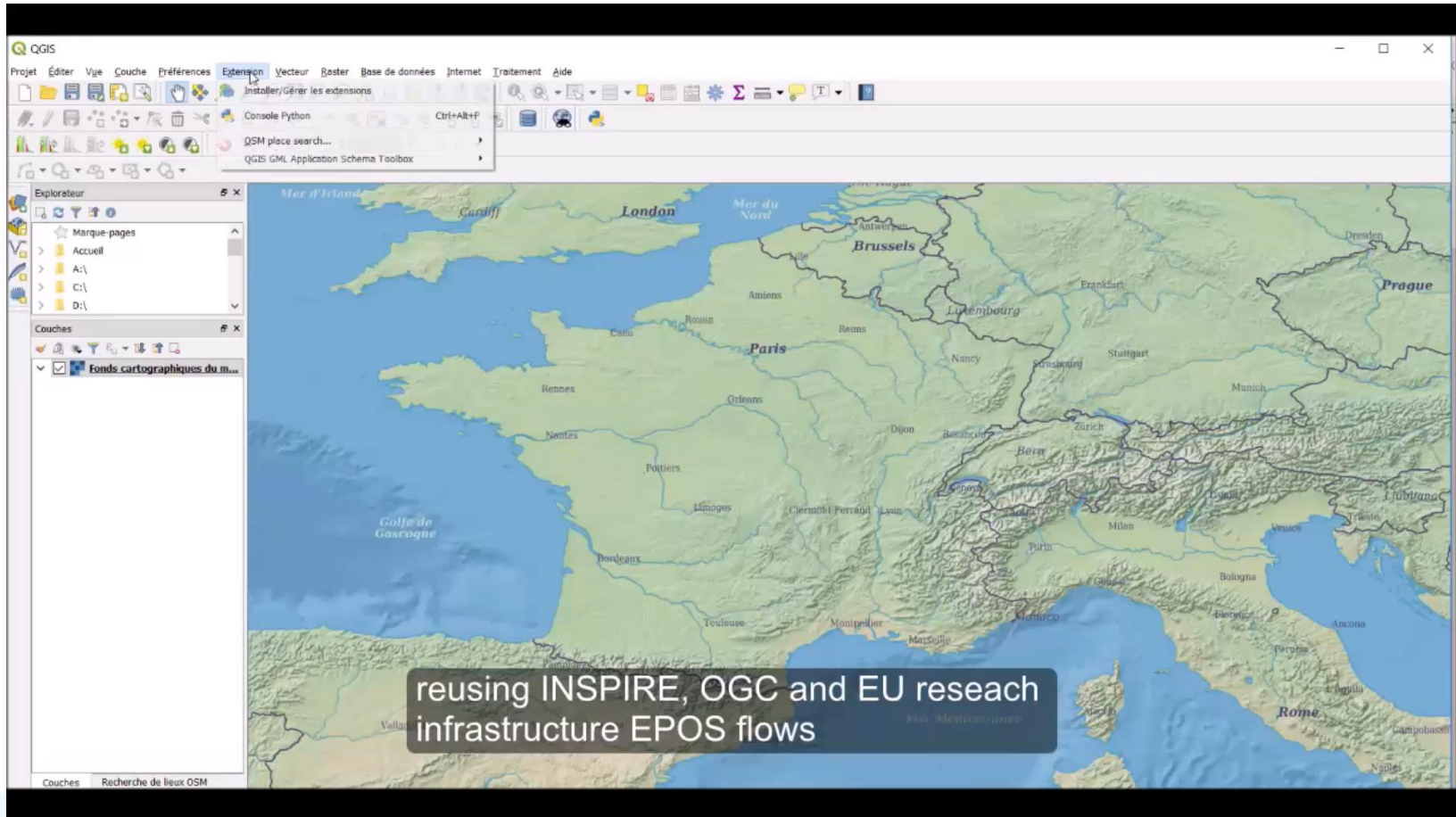
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Design and development by [Edimorbits](#)

```
C:\Users\gr\letsxcurl -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 odr: <http://schema.theodi.org/odr#> .
@prefix sss: <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 .
```

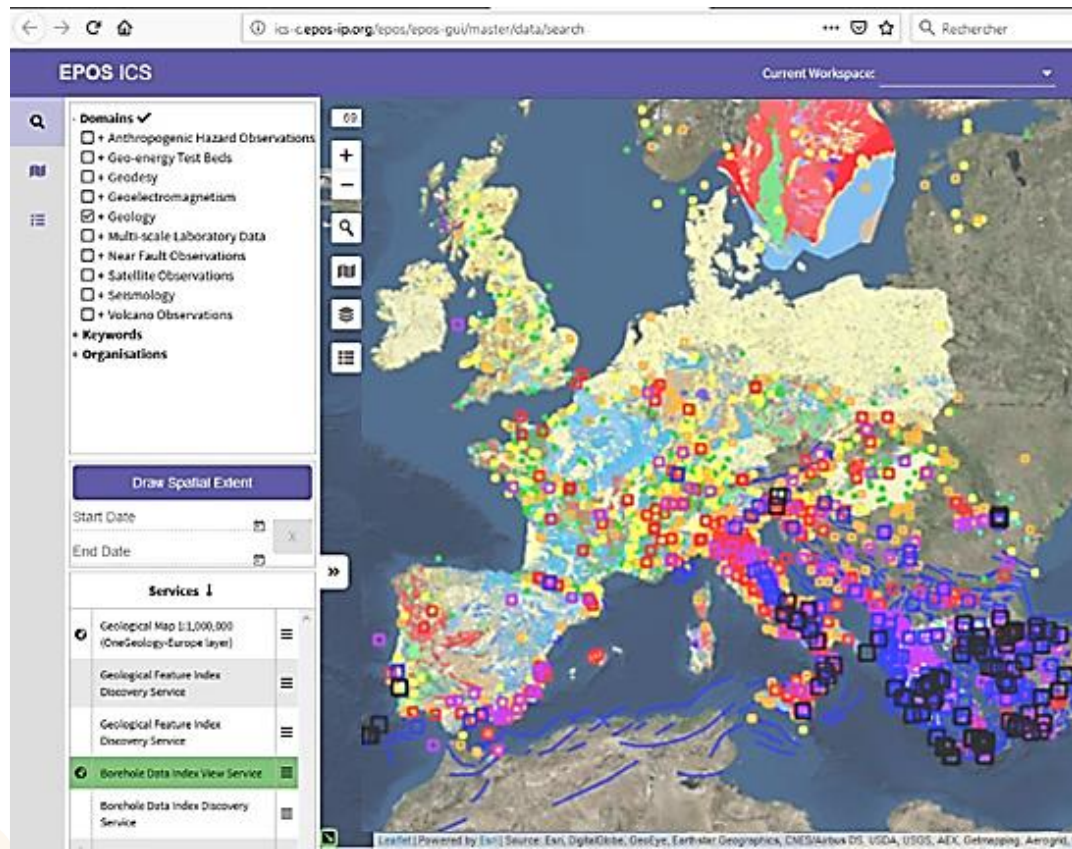

Going through the Borehole data graph

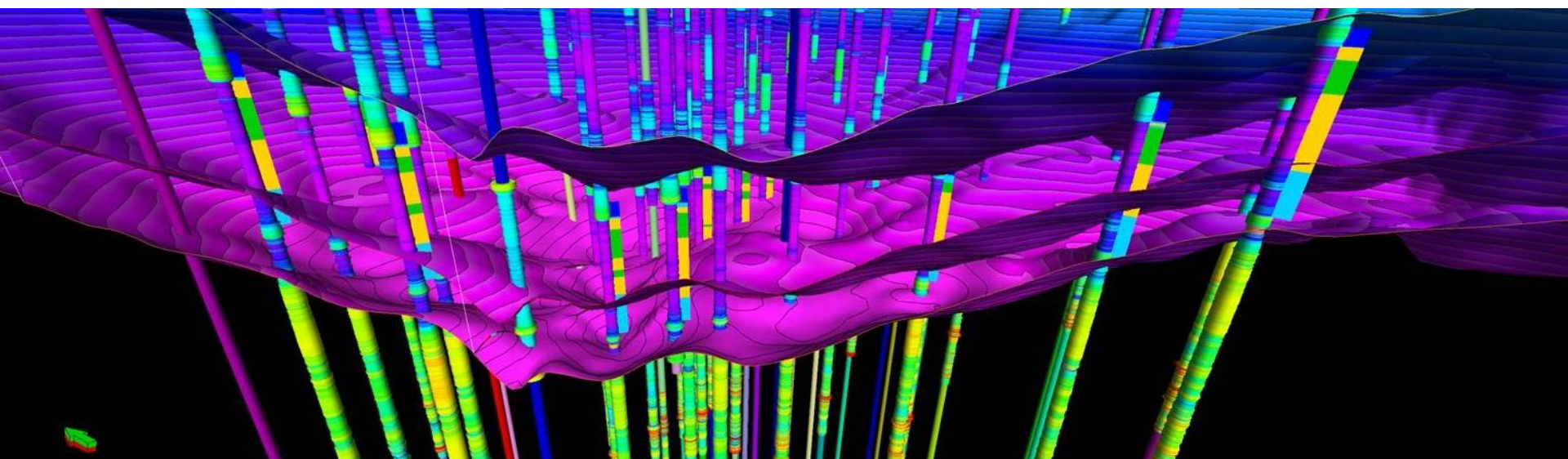
Using QGIS 3 & GML Application Schema Toolbox



EPOS Portal

TCS Geological Information and Modeling data are assessible:
www.epos-ip.org





GEOLOGICAL INFORMATION AND MODELING

CONTACT

m.urvois@brgm.fr

www.epos-ip.org/tcs/geological-information-and-modeling