

Open access to geological information and 3D modelling data sets in the European Plate Observing System platform (EPOS)

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EGU General Assembly 2020

Open access to geological information and 3D modelling data sets in the European Plate Observing System platform (EPOS)

Marc Urvois, Sylvain Grellet, Abdelfettah Feliachi (BRGM - French Geological Survey); Rainer Haener (GFZ - German Research Centre for Geosciences, Germany); Henning Lorenz (Uppsala University, Sweden); Christian Brogaard Pedersen, Martin Hansen (GEUS - Geological Survey of Denmark and Greenland); Luca Guerrieri, Carlo Cipolloni (Institute for Environmental Protection and Research, Italy); Mary Carter (GSI - Geological Survey Ireland)

Chat time: Monday, 4 May 2020, 08:30-10:15

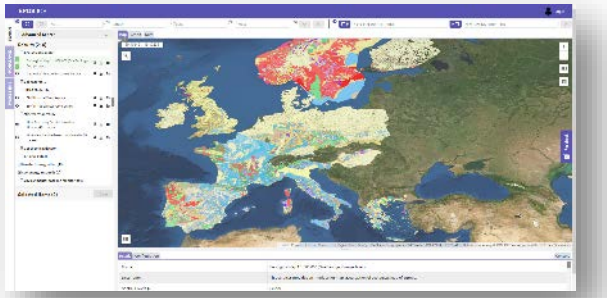
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Geological Information and Modelling (GIM) in EPOS

- EPOS: multi-disciplinary European Research Infrastructure for Solid Earth science
- Integrates a series of 10 domain-specific Thematic Core Services
- Discovery and access to Data, Data products, Software and Services
- GIM: 5 groups of services in operational conditions
  - Boreholes
    - Borehole Data Index
    - Borehole Data Index Discovery Service
    - Borehole Data Index View Service
  - Geologic Map
    - Geological Map 1:1,000,000 GeologicalFeature Index
    - GeologicalFeature Index Discovery Service
  - 3D/4D Models
    - 3D/4D Model Index Discovery Service
    - 3D/4D Model Index
    - 3D/4D Model Index View Service
  - Mineral Resources
    - Georesources (Mine Discovery Service and Mine View Service
  - Data & Service cataloguing
    - TCS15 Catalogue service





https://ics-c.epos-ip.org/

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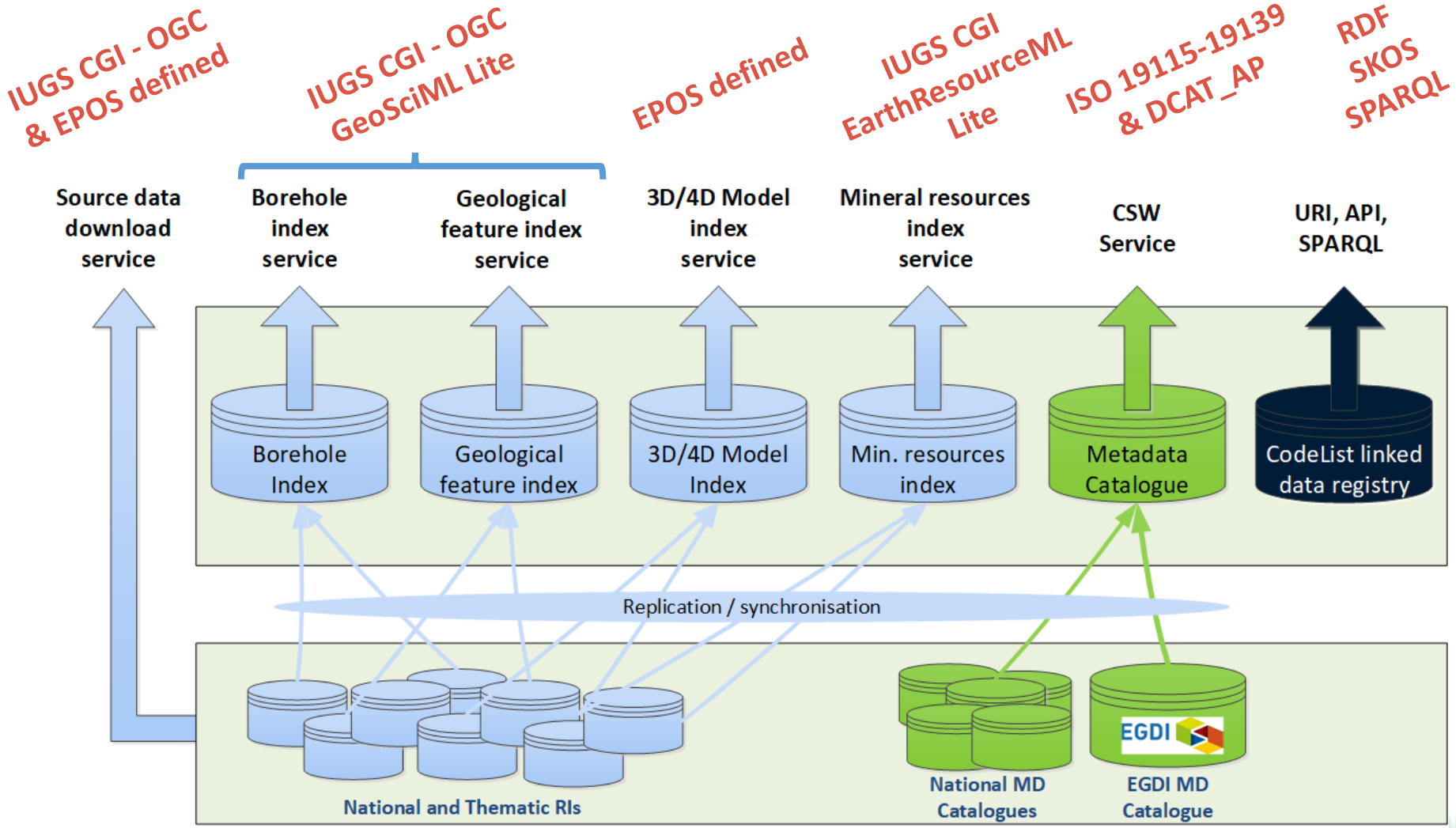
How to disseminate Geological Simple and Complex Features?

- Even though interoperability implementation frameworks are well described and used (ISO, OGC, IUGS/CGI, INSPIRE …), it proved to be difficult for several data providers to deploy in the first place the required OGC services supporting the full semantic definition (OGC Complex Feature) to discover and view millions of geological entities
- Instead, data are collected and exposed using a simpler yet standardised description (GeoSciML Lite & EarthResourceML Lite). Subsequently, the more complex data flows are deployed with the corresponding semantics
- This approach was applied to design and implement the European Borehole Index and associated web services (View-WMS and Discovery-WFS) and extended to 3D Models
- TCS GIM exposes to the EPOS Central Integrated Core Services infrastructure a metadata catalogue service, a series of “index services”, a codeList registry and a Linked Data resolver

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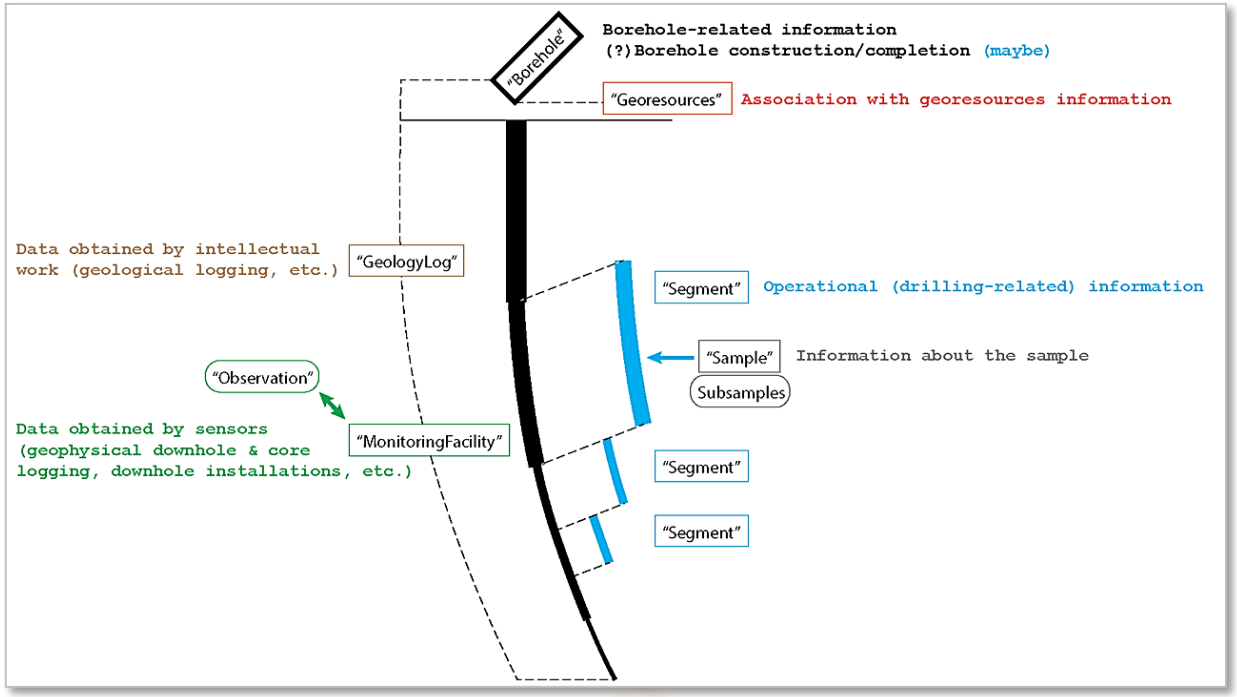
Discovery service architecture and semantics

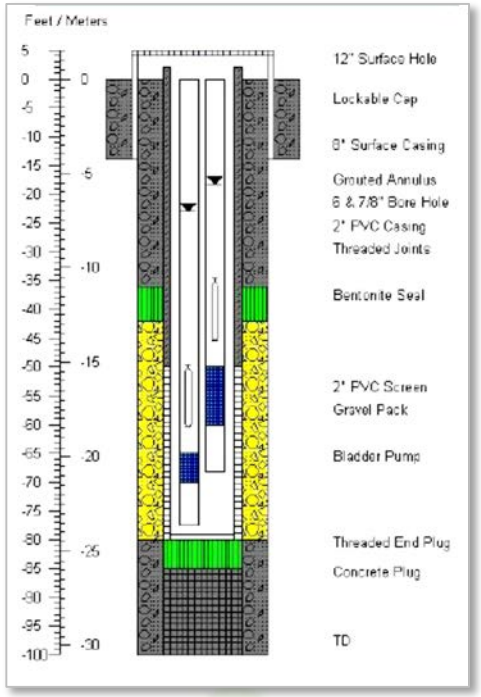


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EPOS GIM Borehole Model

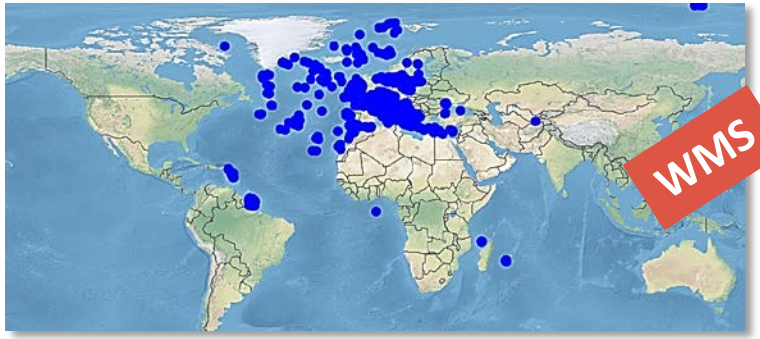
- Semantic reconciliation of several pre-existing ‘Borehole’ models
- Pushed to the OGC Borehole Interoperability Experiment https://github.com/opengeospatial/boreholeie/wiki





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EPOS GIM European Borehole Index



A Borehole Index entry is:

- a ‘Borehole vCard’
- a summary information + HTTP URIs towards richer information flows

WFS

```
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  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-lite.xsd">
  - <wfs:member>
    - <gsmlp:BoreholeView gml:id="BSS001REWW">
        <gml:description>Borehole description</gml:description>
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          http://ressource.brgm-rec.fr/data/BoreholeView/BSS001REWW
        </gml:identifier>
        <gml:name>Forage BSS001REWW</gml:name>
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        </gsmlp:identifier>
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        <gsmlp:status xlink:href="http://resource.europe-geology.eu/vocabs/BoreholeStatus/drillingCompleted" xlink:title="drilling completed"/>
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  </wfs:FeatureCollection>
```

URI to each Borehole Index entry

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

URI to a richer information resource

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Sharing European geological data with the Linked Data approach

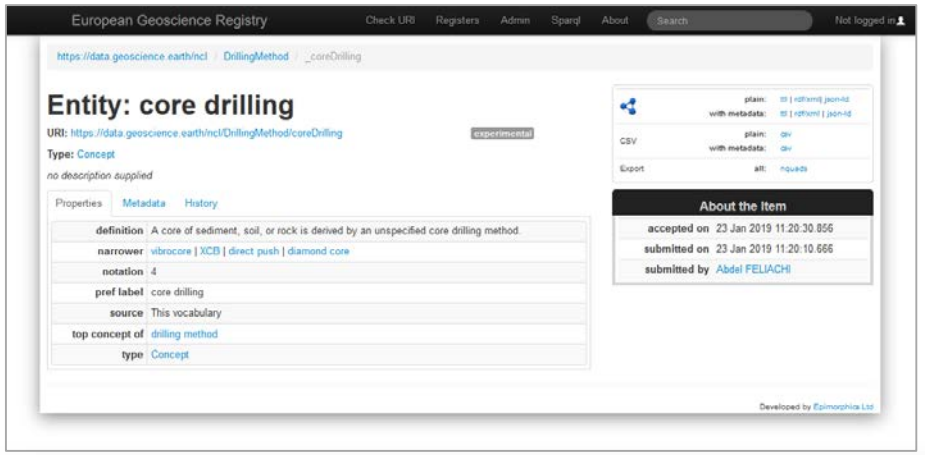
- Each instance is associated with a HTTP URI and points to other information resources also using HTTP URIs
- The Linked Data principles ensure the best semantic description (e.g. HTTP URIs to shared codeList registries entries) and also enrich an initial “information seed” (e.g. a set of Borehole entries matching a search) with more contents (e.g. HTTP URIs to more Features or a more complex description)
- As a result, this pattern including Simple Feature and Linked Data has a positive effect on the IT architecture: interoperable services are simpler and faster to deploy and there is no need to harvest a full OGC Complex Feature dataset
- This architecture is also more scalable and sustainable

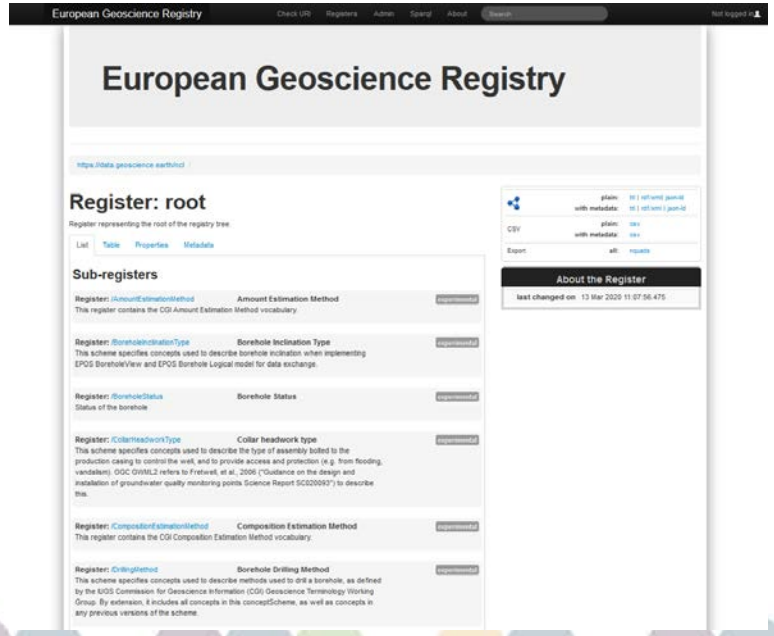
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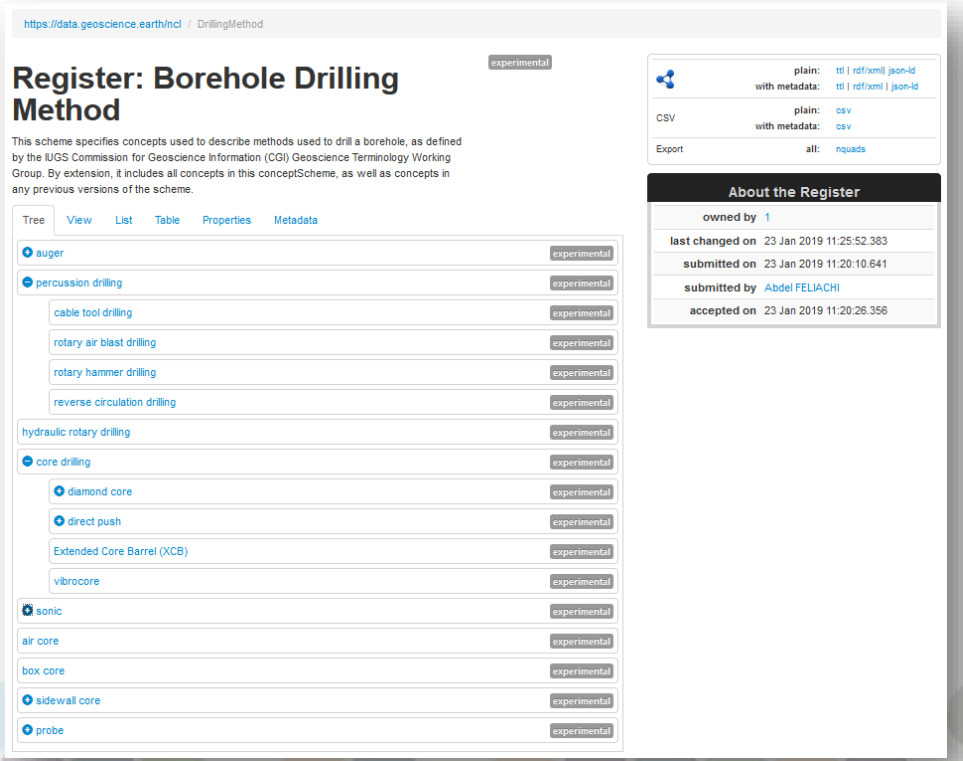
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Vocabulary registry

- Domain controlled geoscience vocabularies through the European Geoscience Registry https://data.geoscience.earth/ncl/
- Each register and register entity has its URI
- Accessible to humans and machines
- Part of the INSPIRE Register Federation



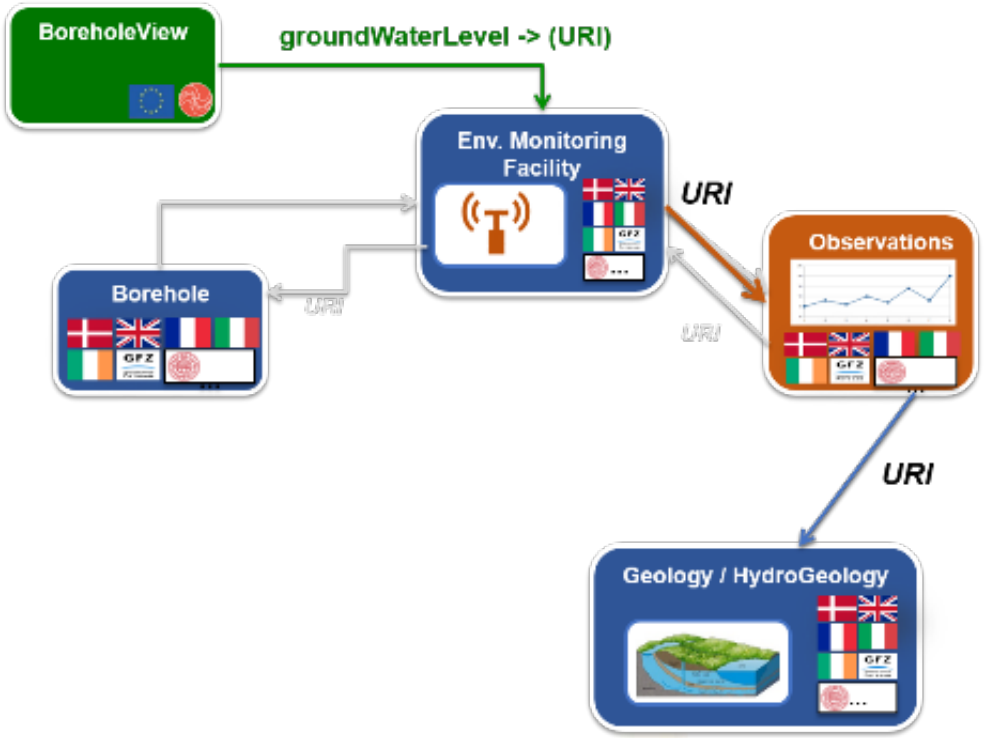


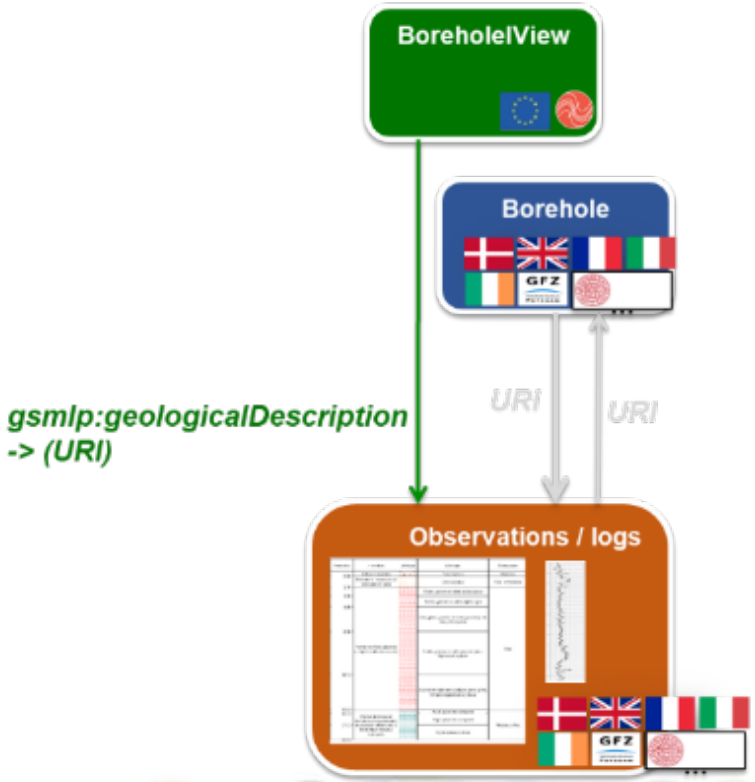


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Accessing additional information through the data graph

From one entry point in the data graph (example: the BoreholeIndex entry point), it is possible to access richer information using URIs

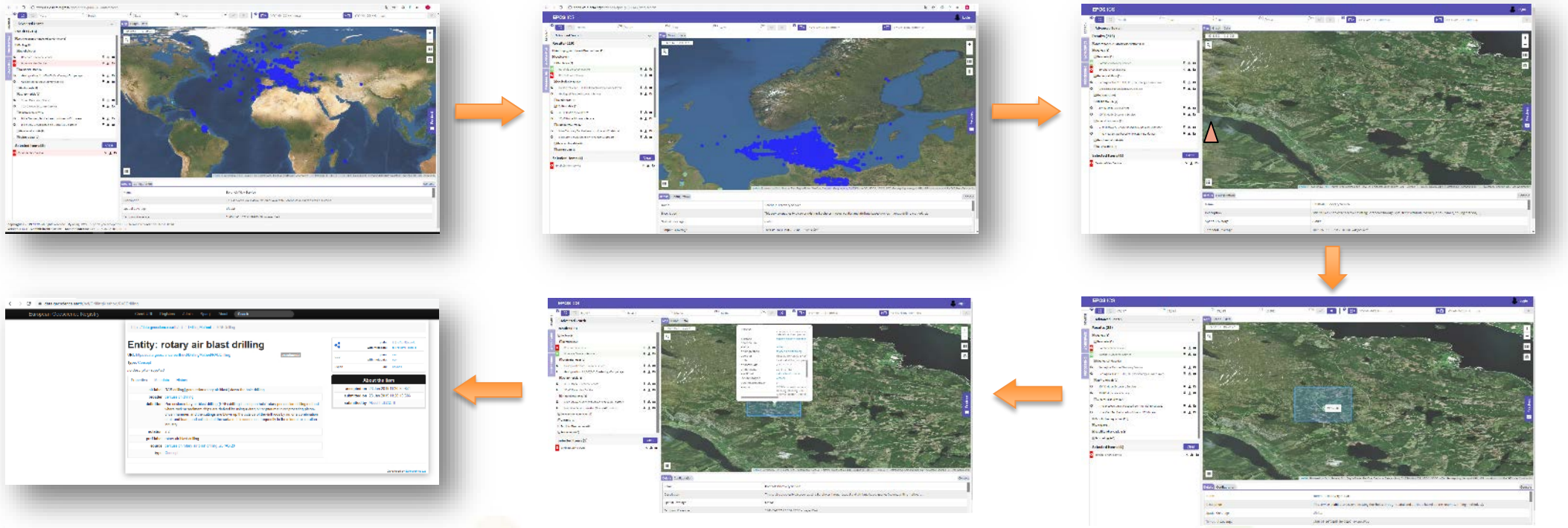




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Navigating through the data graph

- From the BoreholeIndex entry point, navigate through all borehole-related features (ex.: logs) and display them using the borehole visualisation tool libraries
- This linked data mechanism is applied to all “Geological Information and Modelling” datasets



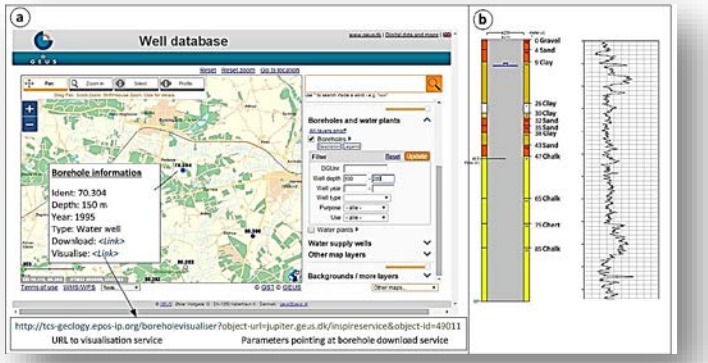
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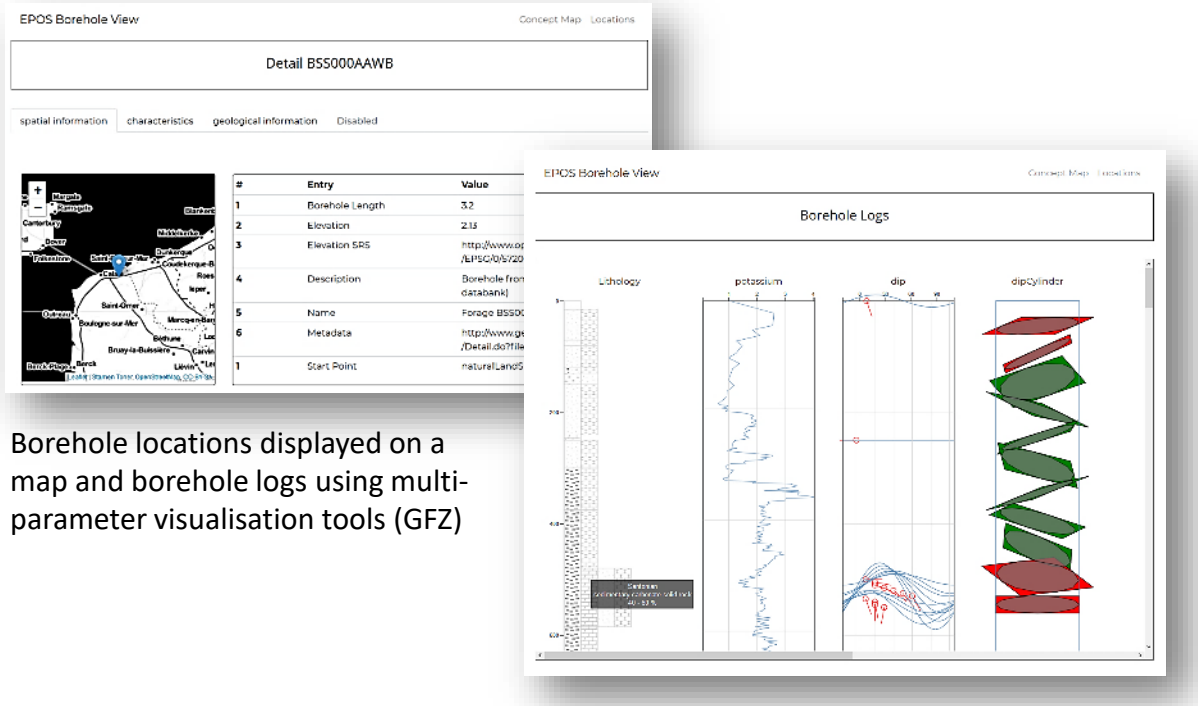
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Borehole visualisation services

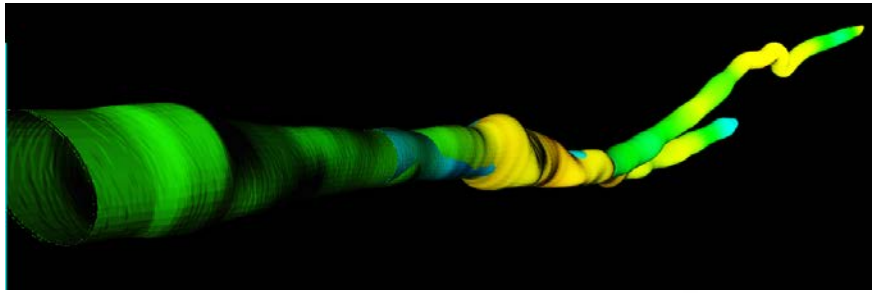
2D and 3D multi-parameter visualisation tools on top of EPOS GIM data and based on the previously mentioned Vocabularies e.g. Chronostratigraphy, Grain Size, Rock Names and many more



Borehole locations displayed on a map and borehole logs using multi-parameter visualisation tools (GEUS)



Borehole locations displayed on a map and borehole logs using multi-parameter visualisation tools (GFZ)



Generic consumption of the interoperable borehole trajectory description by the visualisation tool. The colours reflect the borehole diameter (GFZ)

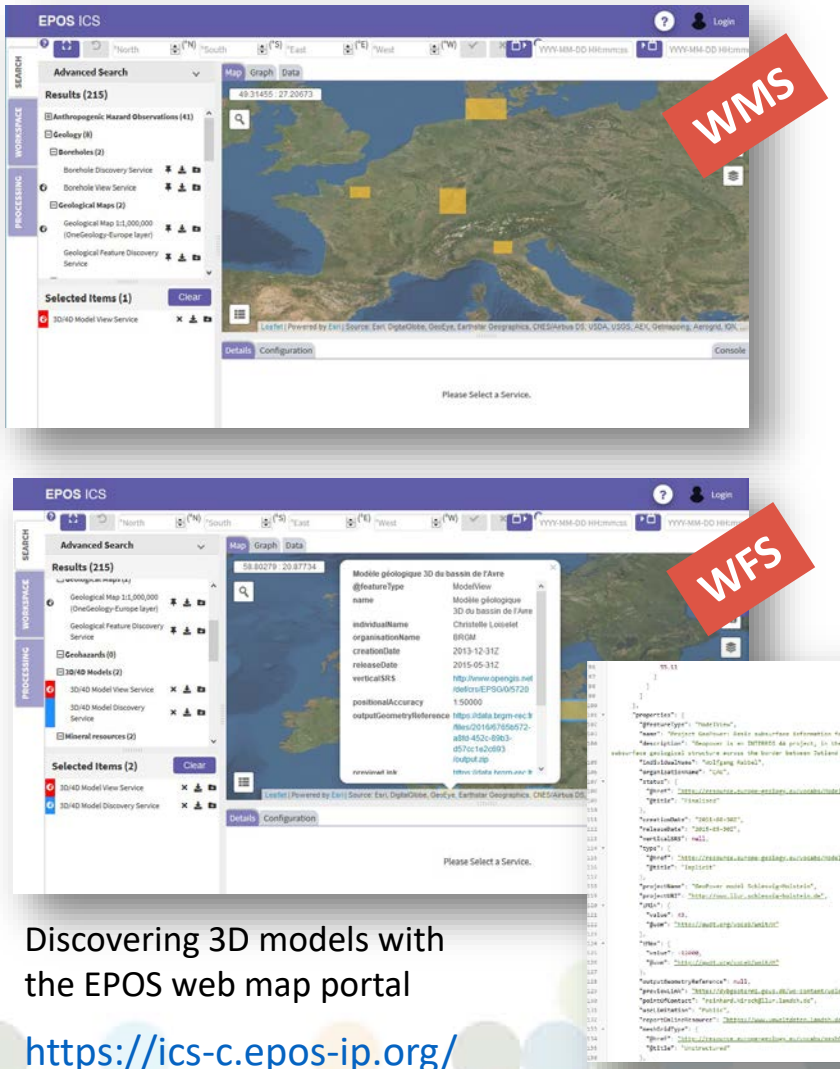
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EPOS GIM European Model Index

- Basic information for describing & discovering subsurface models (3D, 4D, geophysical, etc.)
- Unlike the actual ISO19115 metadata catalogues, each entry is a feature based on a specific Feature model

- A Model Index entry is:
  - a 'Model vCard'
  - A summary information + HTTP URIs towards richer information flows (including download links)

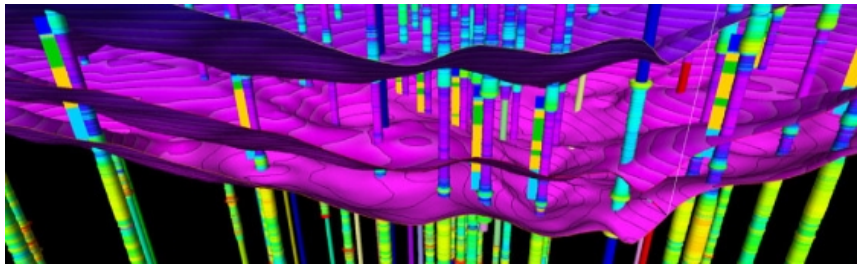


Discovering 3D models with the EPOS web map portal

https://ics-c.epos-ip.org/

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Merci pour votre attention

Thank you for your attention

Marc Urvois (m.urvois@brgm.fr)

BRGM – French Geological Survey

https://www.epos-ip.org/tcs/geological-information-and-modeling/data-services/wp15-services-and-architecture

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