OneGeology-Europe, Lessons learned

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Data Compilation and Harmonisation

Bundesanstalt für Geowissenschaften und Rohstoffe
Federal Institute for Geosciences and Natural Resources

Overview

- OneGeology (global)
- The project OneGeology-Europe
- Challenges, achievements and outcomes
- Lessons learned

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OneGeology (global)

- A global project, supported and carried out by national geological surveys
- Funded by the participating geological surveys (now 119)
- Contribution to the International Year of the Planet Earth 2008 (IYPE)
- Runs on the IUGS-CGI global Mark-up Language and data model GeoSciML and the CGI vocabulary
- Aim: accessibility of geological map data at a 1 : 1 Million scale available - globally - for everyone - via the internet
- Advance interoperability and data sharing

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One Europe …

OneGeology-Europe!

- European contribution to the global OneGeology initiative
- Funded by EC DG Information Society and Media with 2,7 Million € (total budget: 3,25 Million €)
- for 2 years
- 10 Work Packages
- 29 partners in 20 participating countries,
- Start: September 2008

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Thousands of geological data sets in Europe

Main aims

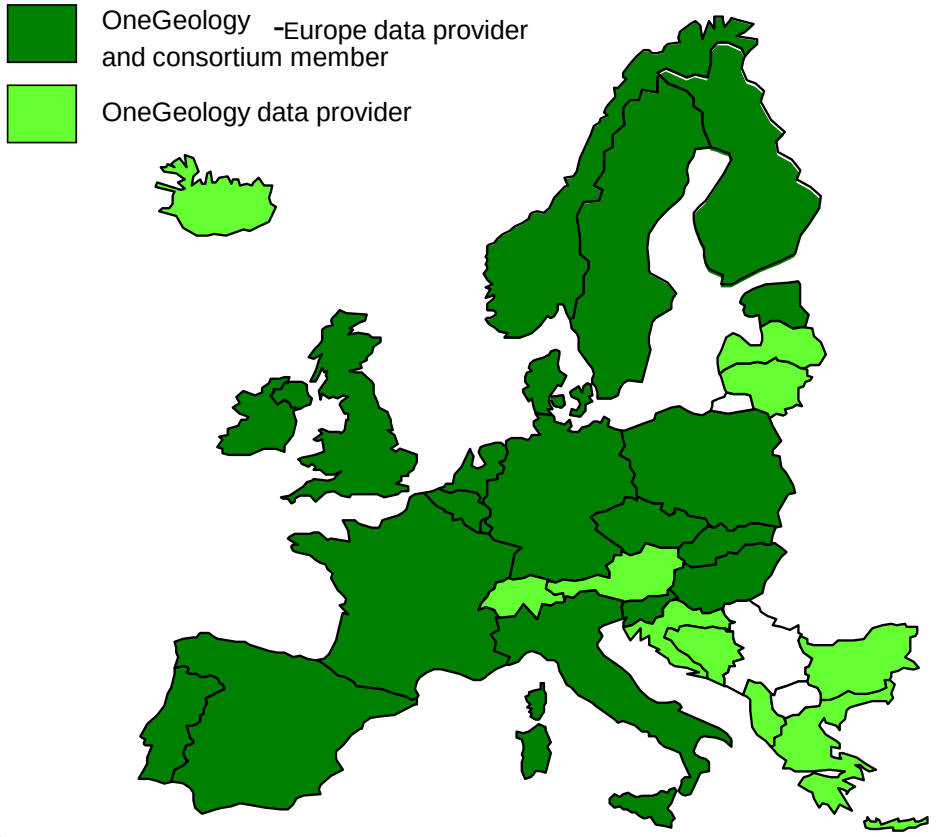
- **Building a Geological spatial data infrastructure for Europe**
- **That includes:**
  making geological information of Europe available for everyone,
- **at a 1 : 1 Million scale,**
- **web accessible,**
- **Globally compatible,**
- **interoperable,**
- **with „progress towards harmonisation“**

20 countries

1	GB	BGS
2	DE	BGR
3	CZ	CGS
4	FR	BRGM
5	NL	TNO
6	IT	APAT
7	BE	KUL
8	DE	RuP
9	SE	SGU
10	SI	GeoZS
11	BE	GSB
12	FI	GTK
13	ES	IGME
14	NO	NGU
15	PL	PGI

OneGeology-Europe data provider
and consortium member

OneGeology -Europe coverage



16	DN	GEUS
17	IE	GSI
18	PT	INETI
19	SK	SGUDS
20	EE	EGK
21	BE	Euromines
22	CZ	CENIA
23	GB	Landmark
24	-	EGS
25	SI	ARSO
26	GB	Lighthill
27	HU	MAFI
28	LU	SGL
29	IE	UCD

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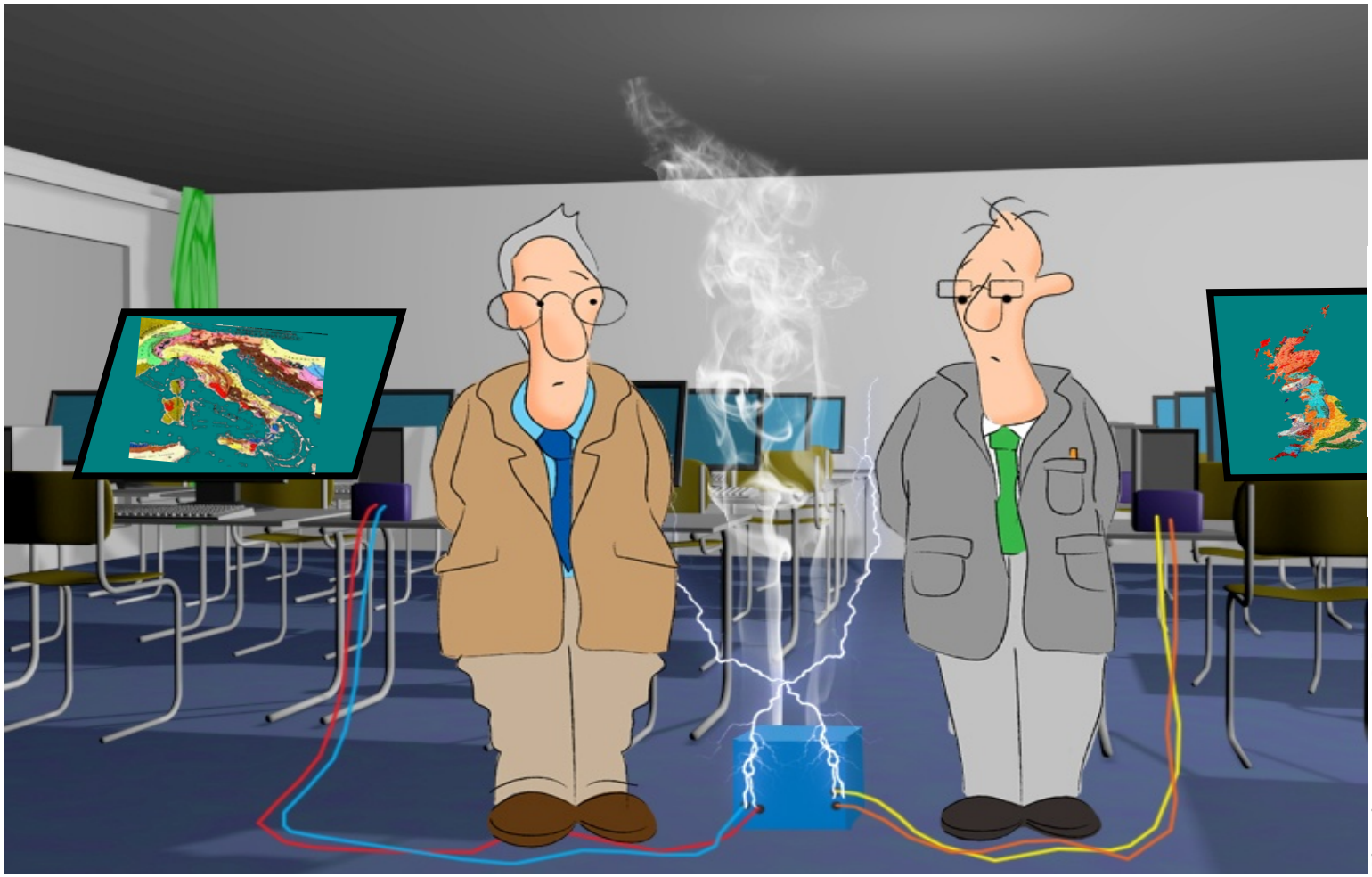
Numerous challenges

- **Numerous different national actors**
- **To understand the problems of interoperability versus harmonisation and develop methods to overcome these in practice;**
- **To apply rules compliant to INSPIRE - with Implementing Rules still in a drafting phase (!)**

… but keep the link with the rest of the world: using existing standards and no re-invention of special “Euro-standards” (no Euro-data models, Euro-vocabularies!)

Interoperability?



Sketch courtesy BGS

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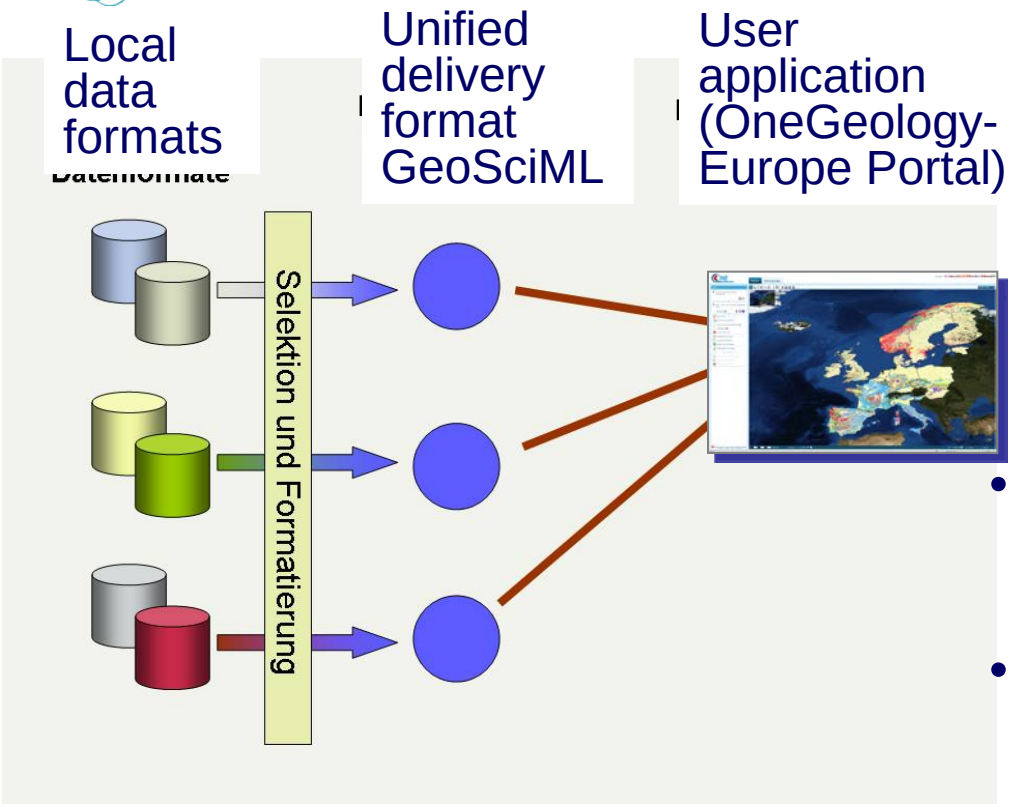
GeoSciML: vehicle for data interoperability

<GeoSciML/>



- GeoScience Markup Language
- A GML application schema…

…to integrate geological information via internet in a standardised and interoperable form

Developed under the umbrella of the Commission for Geoscience Information (CGI) of the IUGS.

- Based on existing standards (ISO 19136, 19156, OGC Obs. & Measurements, …)
- Used by OneGeology-Europe, OneGeology, the INSPIRE „geology“ theme

Data Harmonisation ?

Sketch courtesy BGS

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Interoperability & harmonisation

- **Interoperability** – agreeing the data model/structure and the properties to describe its parts (what GeoSciML does)
  - E.g. agreeing a data model will have the feature of "GeologicUnit" with properties of "age" and "lithology"

- **Semantic harmonisation** – agreeing the use of the same definitions and classifications to describe a "concept"(term)
  - E.g. 'clay'. The same "concept" can be labelled with several terms ("argilla" in Italian, "Ton" in German), but needs to have the same definition, in this case:
    > 50% particles < 0,004 mm (Wentworth grade scale).

- **Geometric harmonisation** – coping with mismatches at national boundaries

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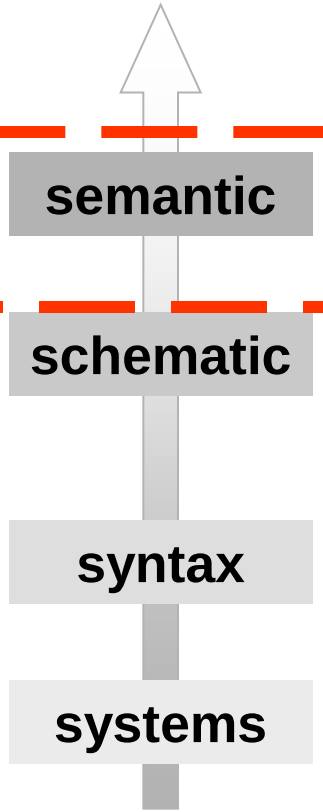
Steps towards harmonisation

Harmonization requirements

Interoperability Working Group



Data content (ontologies, vocabularies, definitions)

Data structure (e.g. GeoSciML, Obs.& Measurements)

Data technical language (GML, XML)

Data services (WFS, WMS, WCS)

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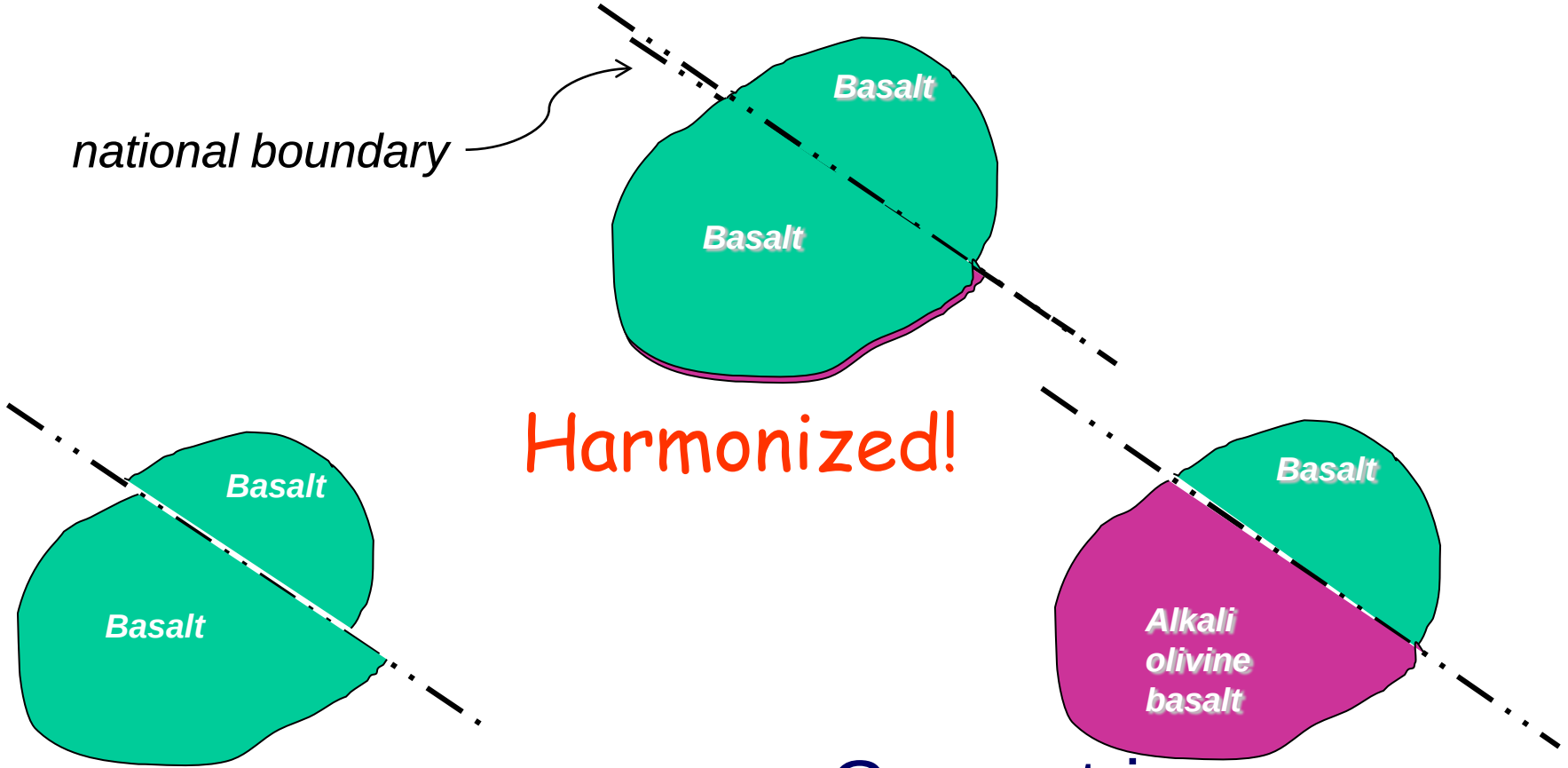
Harmonization?



Semantic harmonisation

Geometric harmonisation

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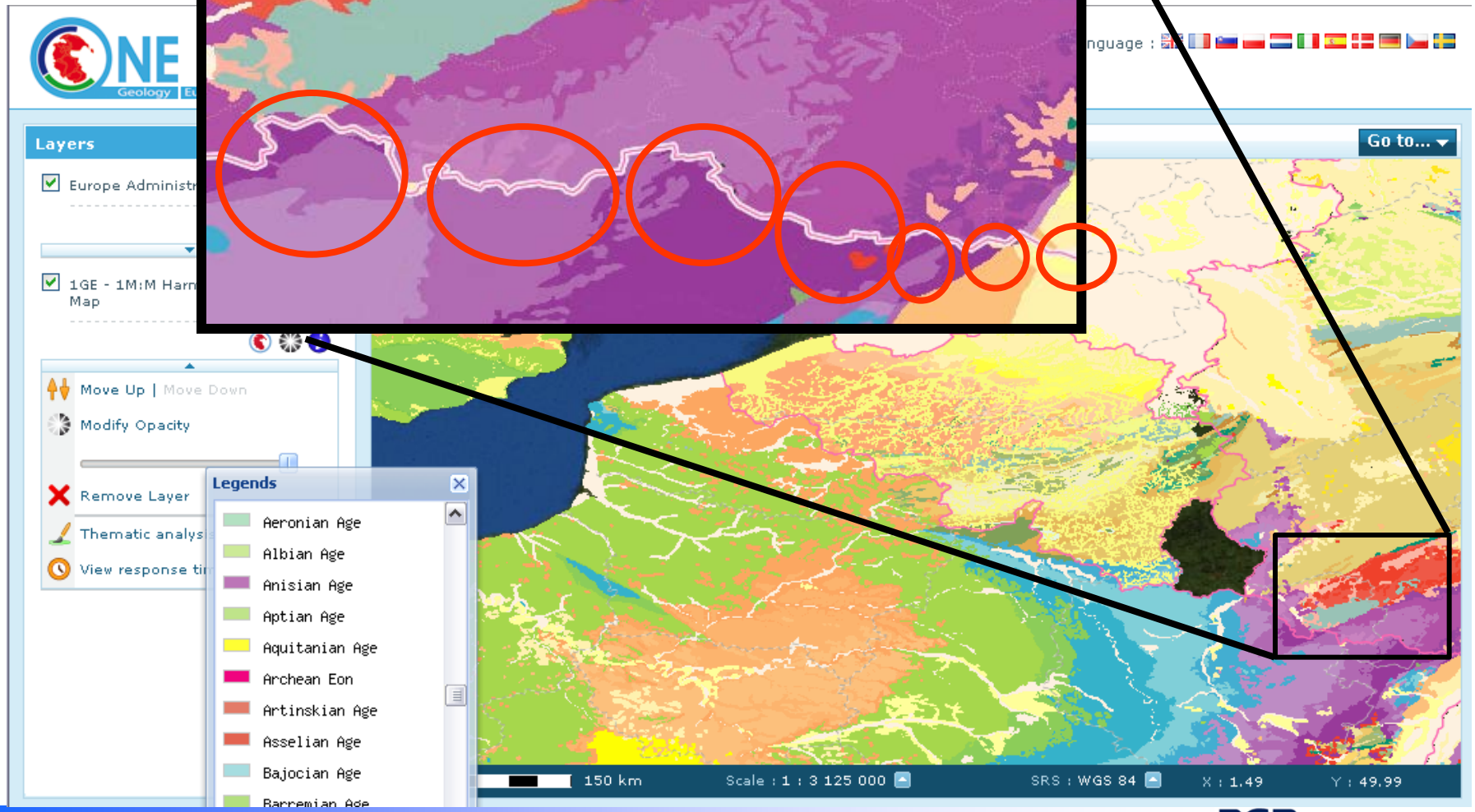
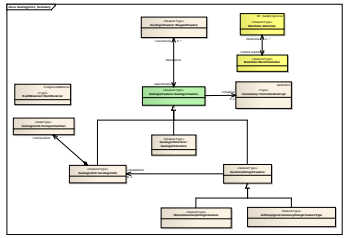
„Disharmony“
across > 11 000 km political boundarie



Essential for data interoperability and harmonisation



- **A common data model for all participants**

- **516 agreed defined terms and definitions**
- **were used by all participants on:**
  - **lithology**
  - **age**
  - **structures,**
  - **genesis (event and process)**

- **> 100 new terms, definitions and features types added the global IUGS CGI vocabulary and GeoSciML**
  (e.g lignite, clay, silt …)

- **Base for INSPIRE geology data specifications**

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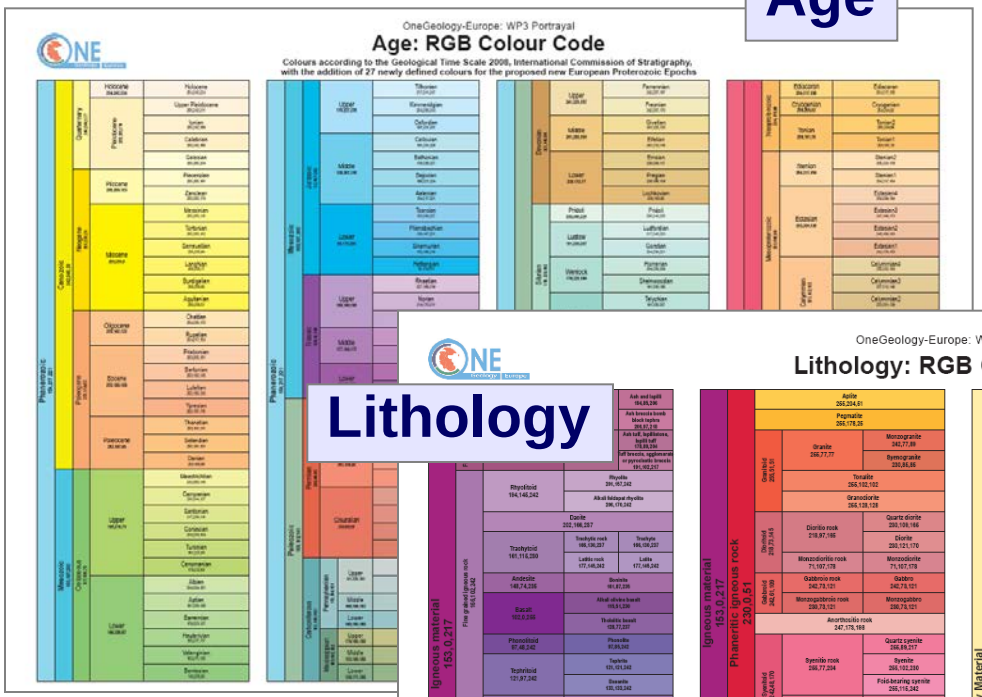
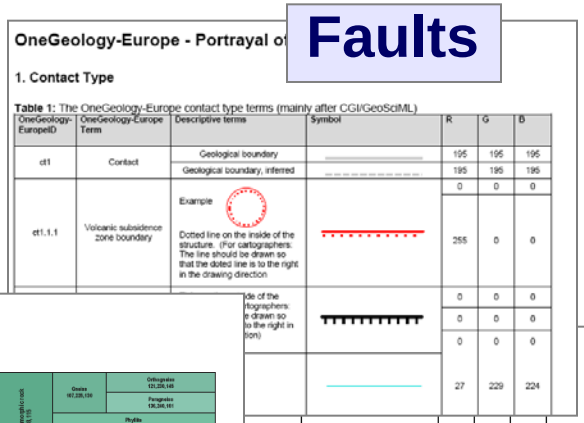
Important for comparability: Common portrayal rules

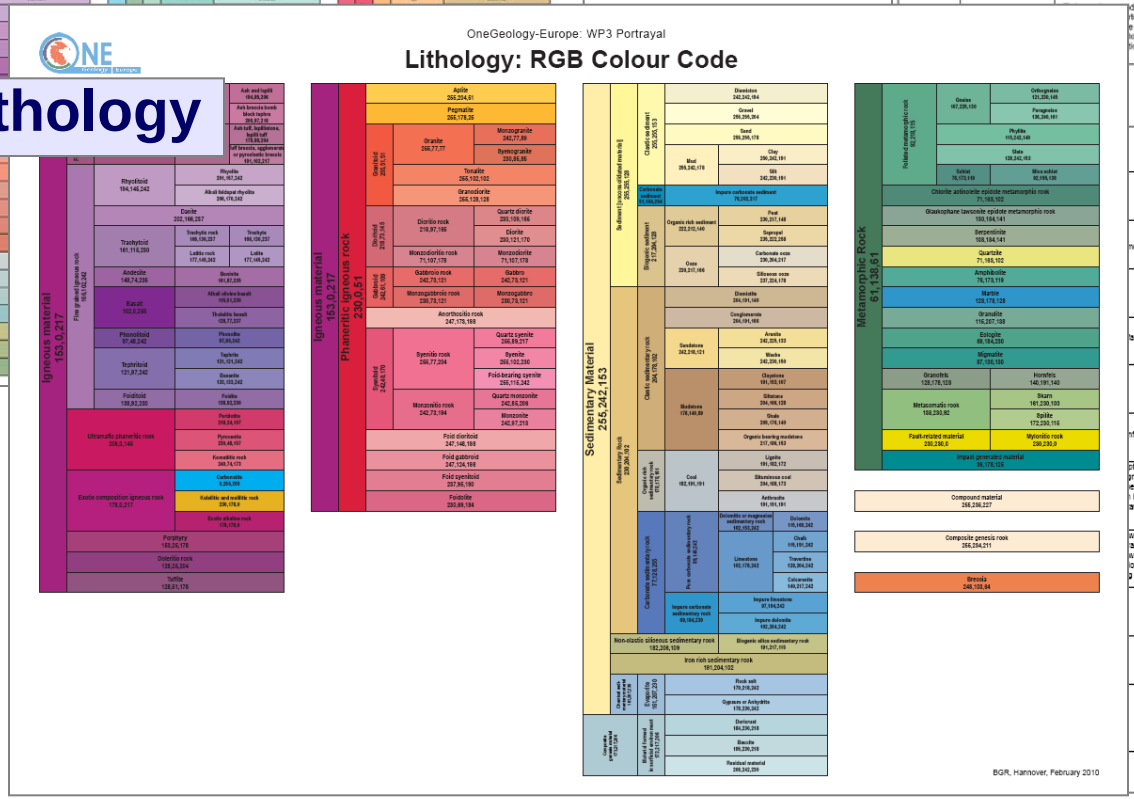
Age



Faults



Lithology



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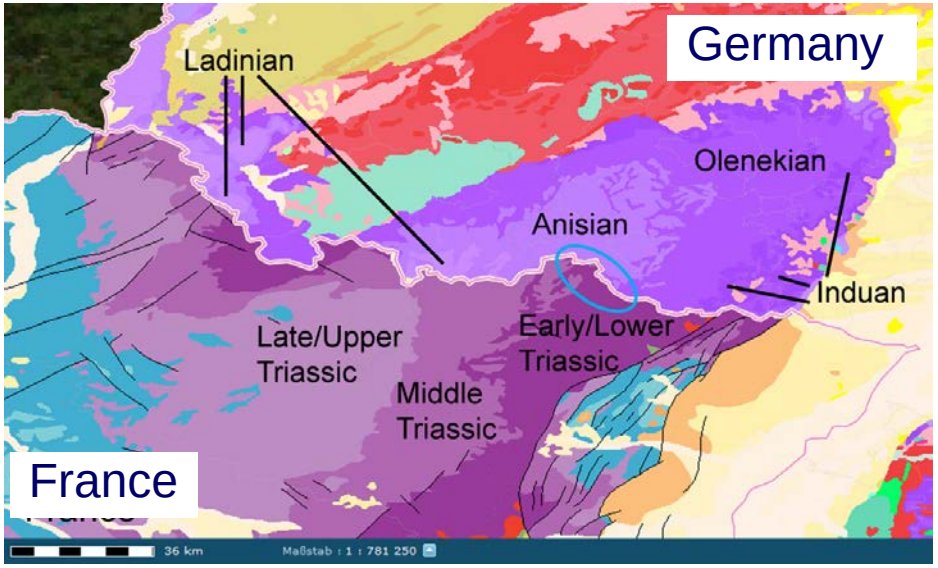
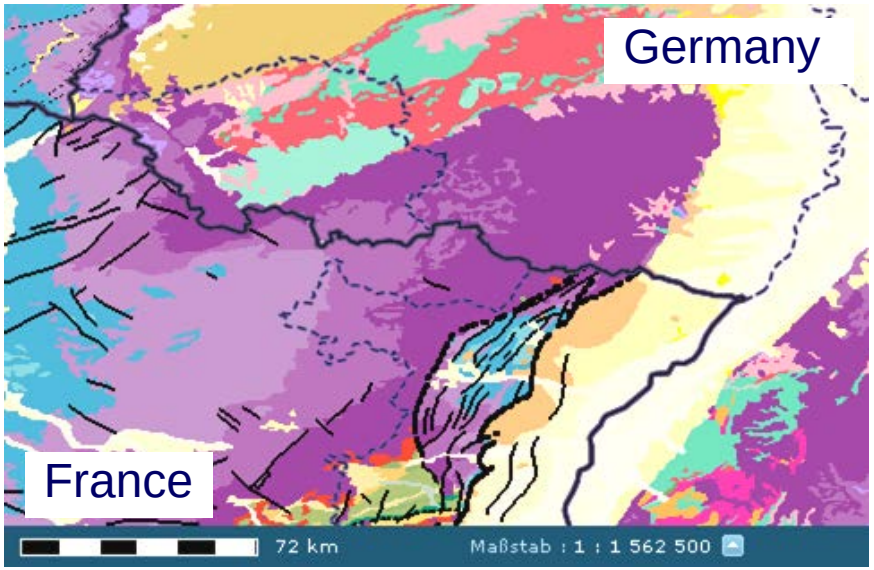
Progress in data harmonisation …

Same Vocabulary, same portrayal: complete semantic and geometric harmonisation in several test areas



before



after

Example: Alsace/Pfälzer Wald – rock age

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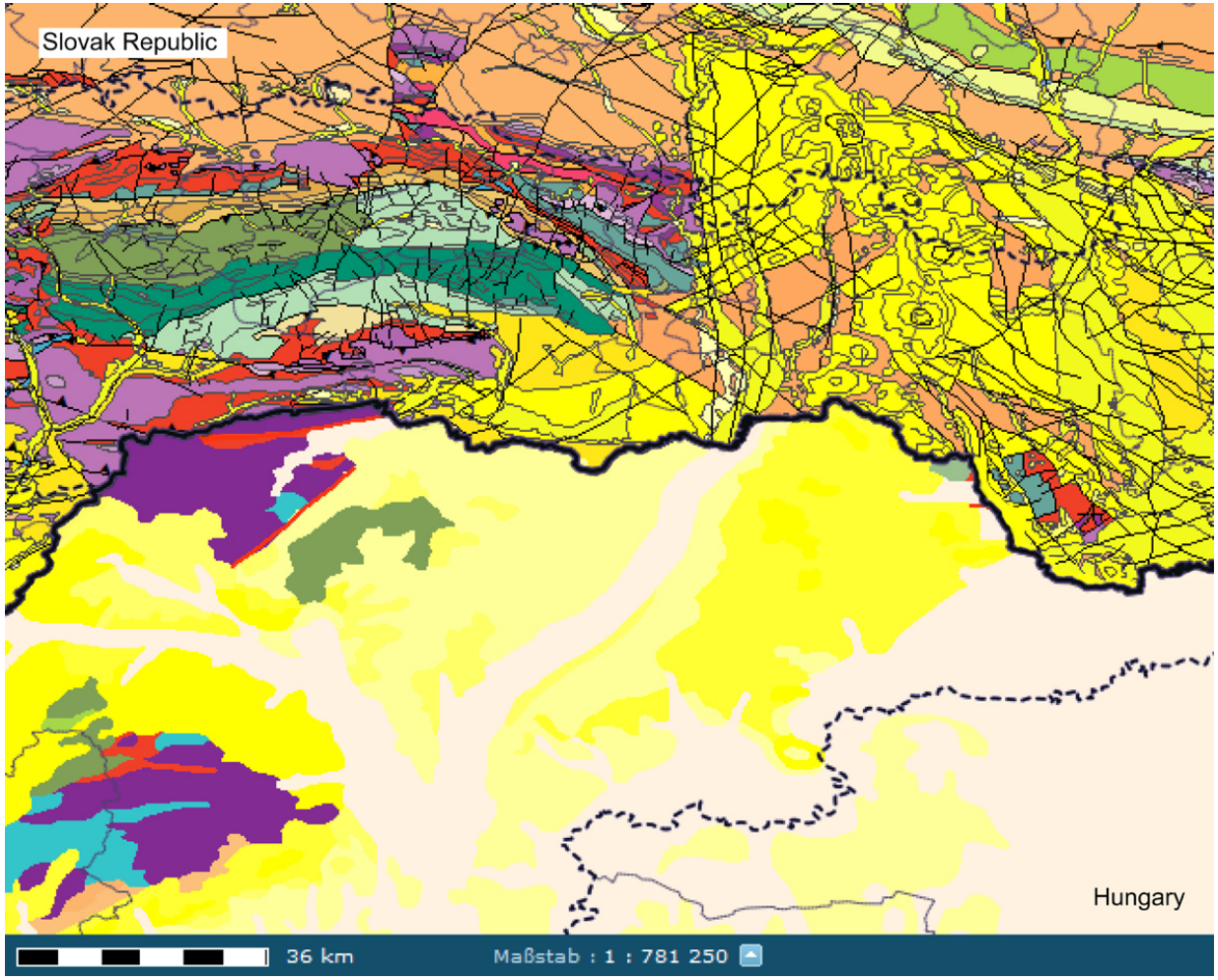
In some cases harmonization is not possible: e.g with hugely differing scales



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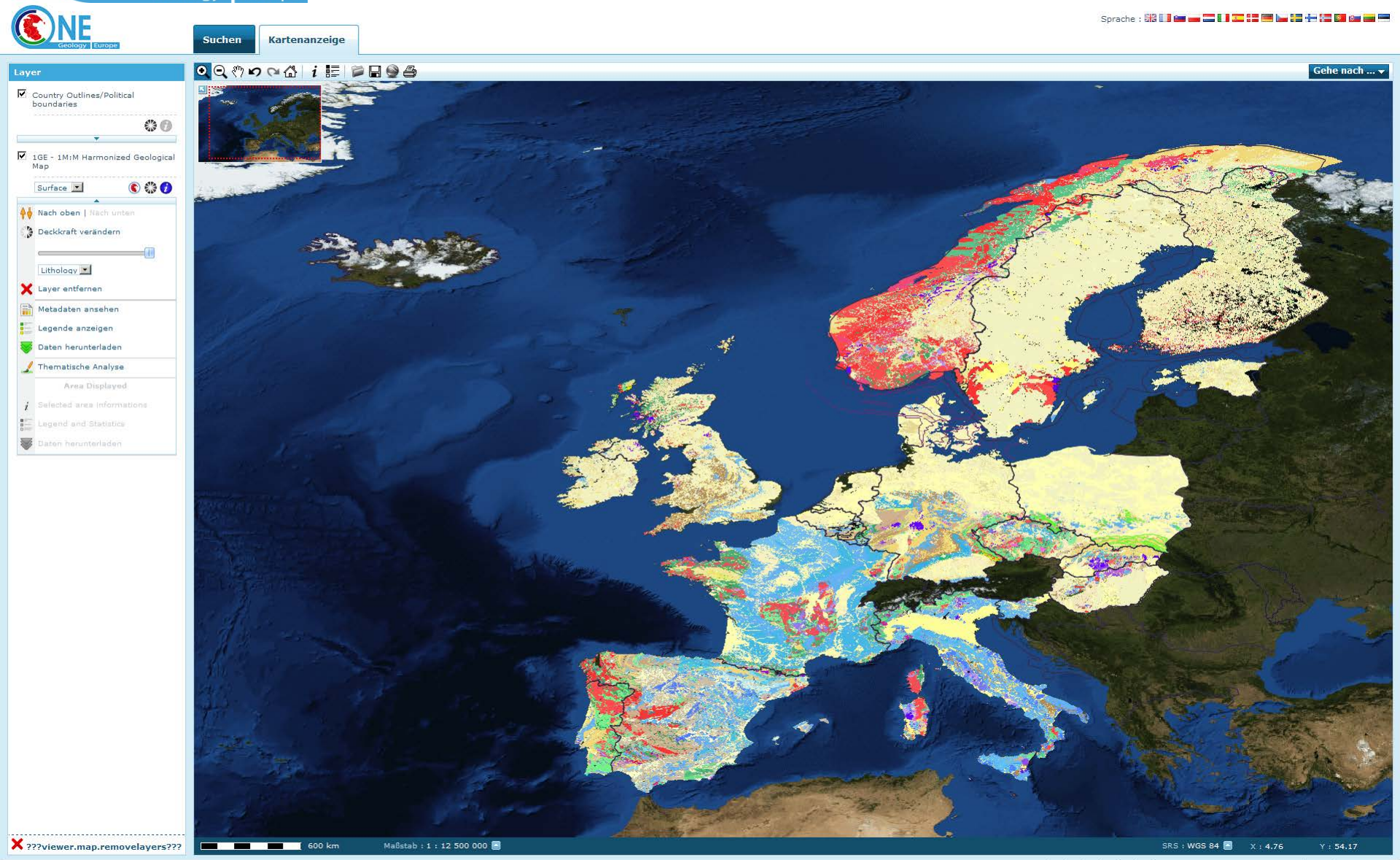
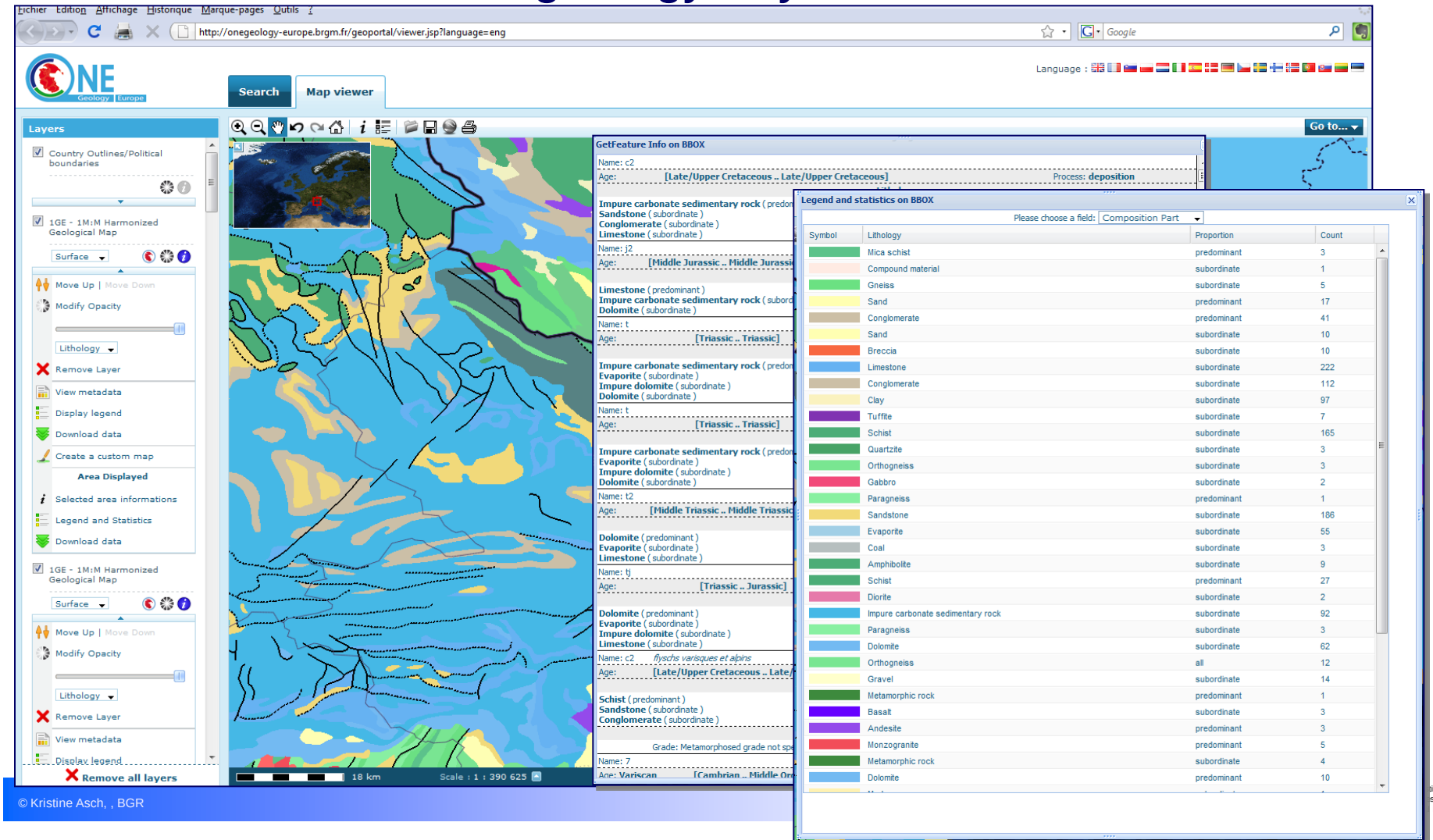
The Portal


Suchen
Kartenanzeige
Sprache :
Layer
Country Outlines/Political boundaries
1GE - 1M:M Harmonized Geological Map
Surface
Nach oben | Nach unten
Deckkraft verändern
Lithology
Layer entfernen
Metadaten ansehen
Legende anzeigen
Daten herunterladen
Thematische Analyse
Area Displayed
Selected area informations
Legend and Statistics
Daten herunterladen
???viewer.map.removelayers???
Gehe nach ...
600 km
Maßstab : 1 : 12 500 000
SRS : WGS 84
X : 4.76
Y : 54.17
Fertig
Internet
100%

The Portal

Detail information and map keys (“legends”) on the geology any selected area



The Portal

Queries on age and/or lithology

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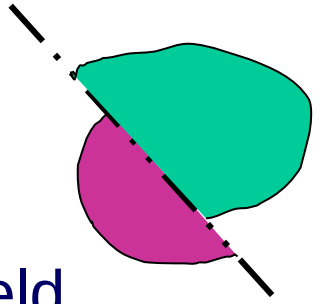
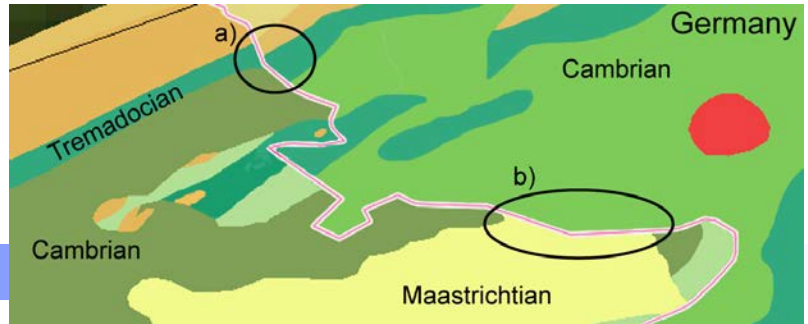
The biggest harmonisation challenges



1. Differing scales of national source data
2. Differing grade of detail at mapping in the field
3. Differing description of the same geological unit respecting age, lithology, genesis
4. No geometric continuation of geological polygones and structures across political boundaries
5. Differing definitions of political boundaries ((-> gaps)
6. Differing mapping focus of the scientists



One-Geology-Europe

Achievements and outcome

- Interoperable on-shore geology spatial dataset with ”progress towards harmonisation”
- Metadata for discovery served through catalogue services
- Geological data model vocabulary and data specifications for Europe
- Investigation of methods to harmonise data
- Multilingual Portal: View and download services

- Use case studies
- 17 languages
- High resolution examples
- Harmonised license code
- Forerunner and “guinea pig” for the implementation of INSPIRE Directive (October 2014 !)

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(a selection of…) Lessons learned

- English: a source for many misunderstandings
- Data harmonisation takes time and patience - > two years too short
- Agreement on common (geological) terms, definitions (and even colours) with geologists need patience, a thick skin and finally dictatorial decisionse
- If scales vary too much, no harmonisation is possibe (-> define a common scale!)
- Harmonisation means generalisation: some detail information will be lost
- License agreements: each geological survey has a different funding/business models and legal background: a lawyer is needed in the project to create a common licens model

Present situation

- **Geology data are now interoperable, comparable, and retrievable for a variety of purposes (e.g. flooding protection, building projects, etc)**
- **Data are maintained and served (WMS and WFS) by participating national geological surveys**
- **Maintenance of portal and catalogue funded by EuroGeoSurveys**

In addition :

→ OneGeology incorporated and maintains 1G-E components (Vocabulary, data model, services)

→ Other projects such as EMODNET (geology lot) use the 1G-E data model, vocabulary and portal …

Thanks to the 1G-E Team

- ***Ian Jackson***
- ***Steve Richard, CGI***
- ***Garry Baker***
- ***Robert Tomas***
- ***Jean-Jacques Serrano***
- ***Agnès Tellez-Arenas***
- ***Chris Schubert***
- ***Marco Klicker***
- ***Horst-G. Troppenhagen***
- ***Mikko Nironen***
- ***Urzula Stepien***
- ***Peter Czupek***
- *Luca DeMicheli*
- *John Laxton*
- *Aleksandra Kuczerawy*
- *Mary Carter*
- *Alexander Tschistiakow*
- *Stephan Gruijters*
- *Marco Pantaloni*
- *Fernando Perez*
- *Stefan Bergman*
- *Stefan Kacer*
- *Pavla Guertlerova*
- *Milos Bavec*
- *Jasna Sinegoj*
- *Claudia Delfini*
- *Jolanta Cylene*
- *Sybille Hennings*
- *Kathryn Bull*
- *Dominique Janjou*
- *Alan Smith*
- *Pierre-Yves Declerq*
- *……*
- *and many more of the 1G-E Team …*

More information on *OneGeology-Europe*

http://onegeology-Europe.org

OneGeology global:

www.onegeology.org

Download of 1G-E vocabulary, Explanatory Notes, and the global CGI Vocabulary:

www.bgr.bund.de/IGSL2010

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Sustaining the services

- 20 national geological surveys have agreed to keep serving their data ✓
- EuroGeoSurveys has agreed to maintain the portal ✓

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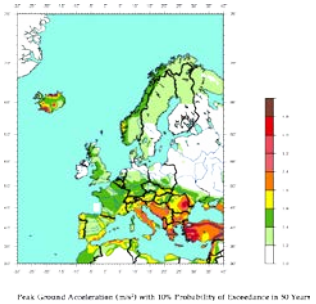
OneGeology-Europe – Future opportunities:



- Infrastructure to be integrated in other domains (geophysics?)
- Improvement of data harmonisation and resolution (1:250 000, 1:50 000, 1 : 25 000)
- Take more European countries on board
- Develop and offer pan-European “applied” derived datasets (flooding, ground stability, landslide risk, etc)
- Add additional data sets, e.g. hydrogeology, mineral resources, tectonics
- Offer the data as an “app” e.g. for iPhones
- Develop European schema interoperability in 3D
- ...

One Geology, One Europe, One Foundation

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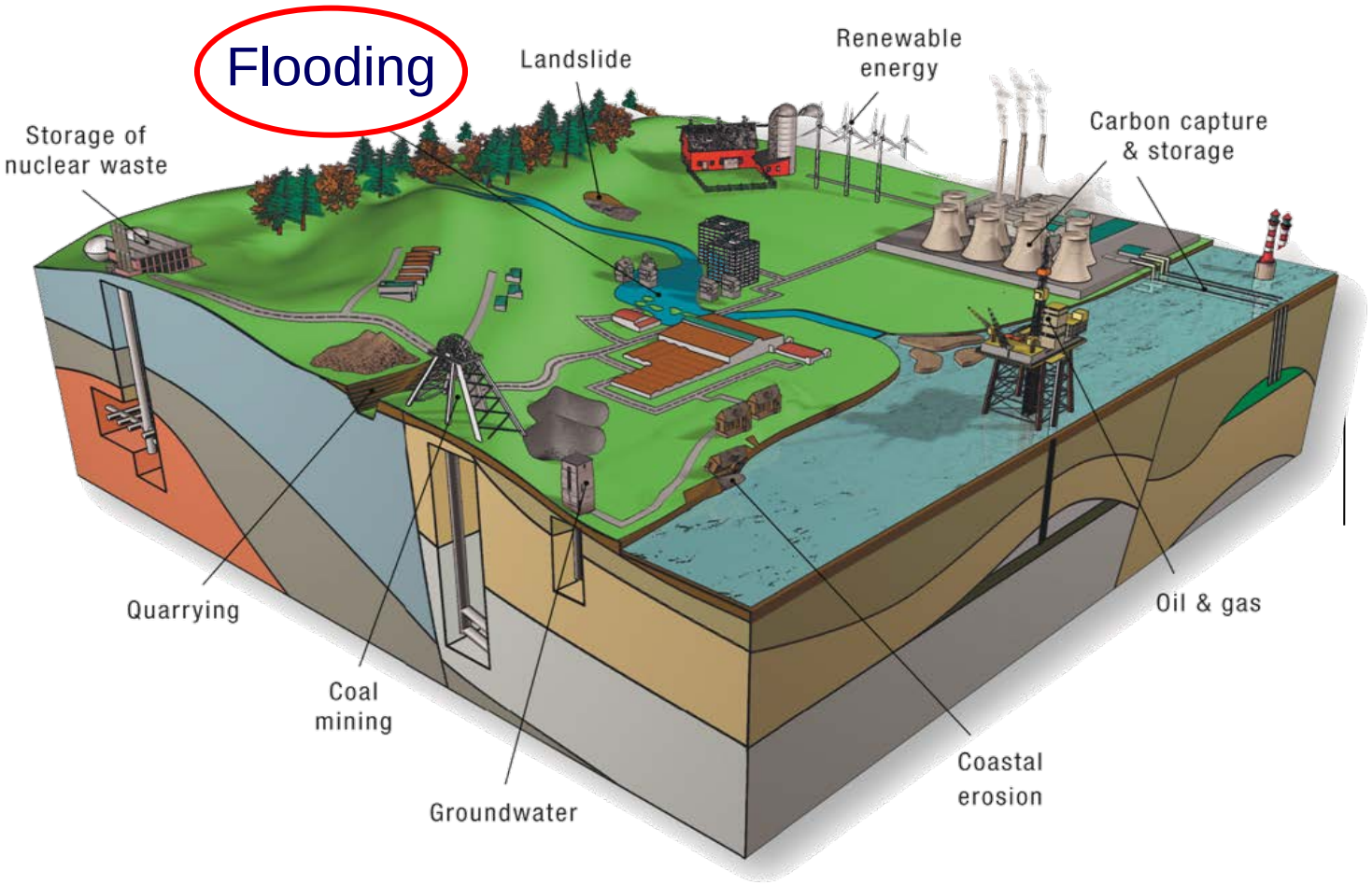
Bundesanstalt für Geowissenschaften und Rohstoffe
Federal Institute for Geosciences and Natural Resources



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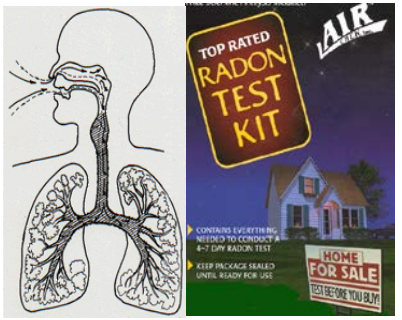




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e.g.: Planning of measures against potential flood damage across political boundaries

–> Base: consistent geological descriptions, e.g. rock type, permeability coefficient and other hydrogeological parameters

ONE Geology Europe

Users

LANDMARK Information Group

euromines

UCD DUBLIN

THE LIGHTHILL RISK NETWORK

cenia

Providers

British Geological Survey
NATURAL ENVIRONMENT RESEARCH COUNCIL

BGR Bundesanstalt für Geowissenschaften und Rohstoffe

Géosciences pour une Terre durable brgm

SGL Service Géologique du Luxembourg

GTK

1919 CZECH GEOLOGICAL SURVEY

GEUS

TNO

EESTI GEOLOOGIAKESKUS OÜ

GSI

NGU Norges geologiske undersøkelse

PAŃSTWOWY INSTYTUT GEOLOGICZNY 1919

APAT

INETI

ŠTÁTNY GEOLOGICKÝ ÚSTAV DIONÝZA ŠTÚRA

Geological Survey of Belgium

SGU Sveriges geologiska undersökning Geological Survey of Sweden

MINISTERIO DE EDUCACIÓN Y CIENCIA

Instituto Geológico y Minero de España

GeoZS

Synergies and links

INSPIRE - Infrastructure for Spatial Information in Europe

KATHOLIEKE UNIVERSITEIT LEUVEN

ies Institute for Environment and Sustainability

UNESCO

International Steering Committee for Global Mapping

GEO

OGC™ Open Geospatial Consortium, Inc.

CCGM CGMW

planetearth Earth Sciences for Society

GeoConnections

IUGS International Union of Geological Sciences

BfN Bundesamt für Naturschutz

European Geoparks

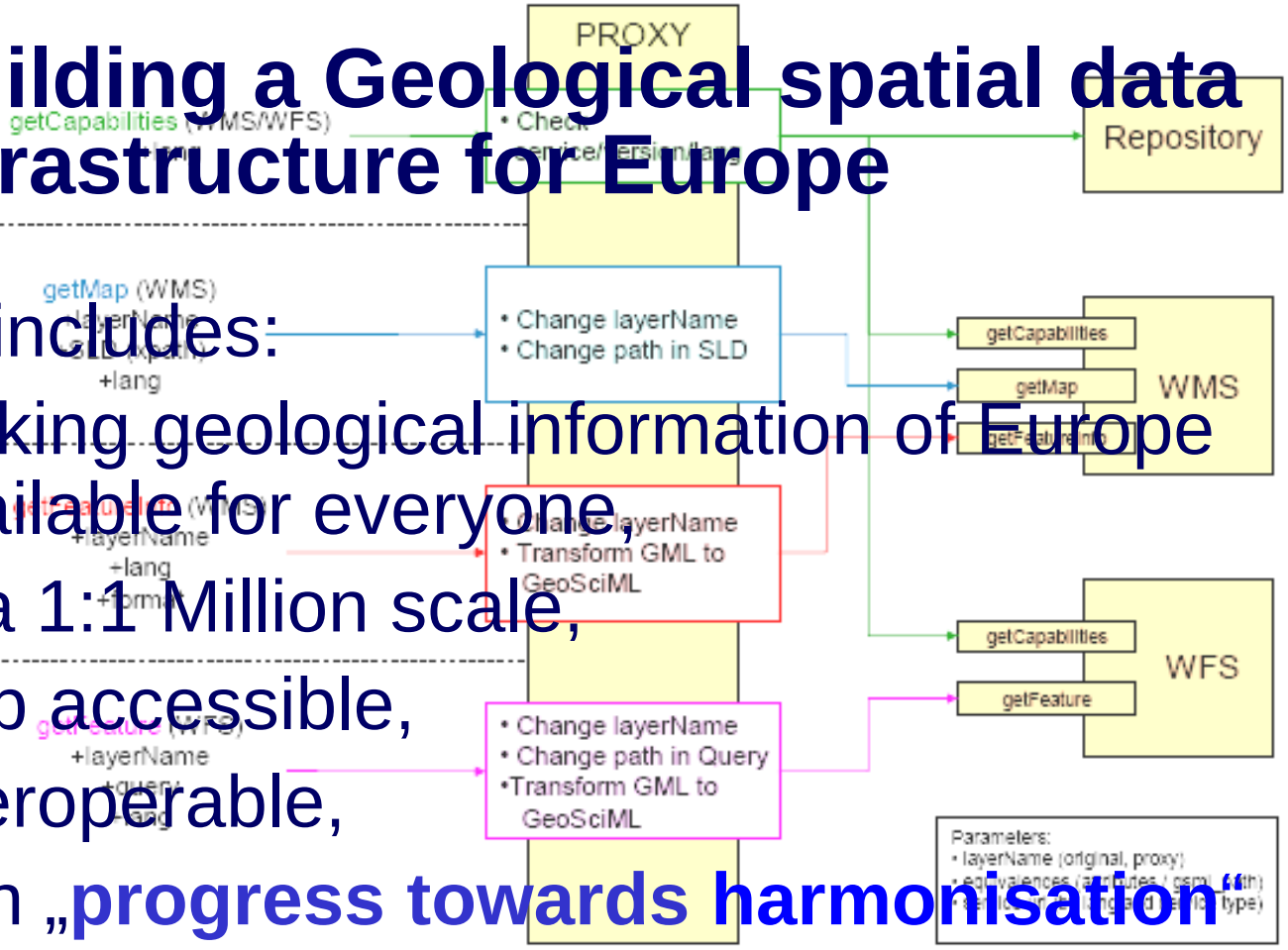
AASG

ONE Geology Global

- **Building a Geological spatial data infrastructure for Europe**

That includes:

- making geological information of Europe available for everyone,
- at a 1:1 Million scale,
- web accessible,
- interoperable,
- with „**progress towards harmonisation**“



In this figure, the IGEconnector is the proxy

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Geology:

an (important !) component of the INSPIRE "multilayered" data themes

- **Information must be useful and usable for environmental policies**

→ **must be understood… (without ambiguity)**

- by geologists

- by other scientists

- by non-scientists

…

by the citizen and politician

… in different languages

and by non-thinking computers

Semantic challenge

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Graphic with kind permission of the BGS

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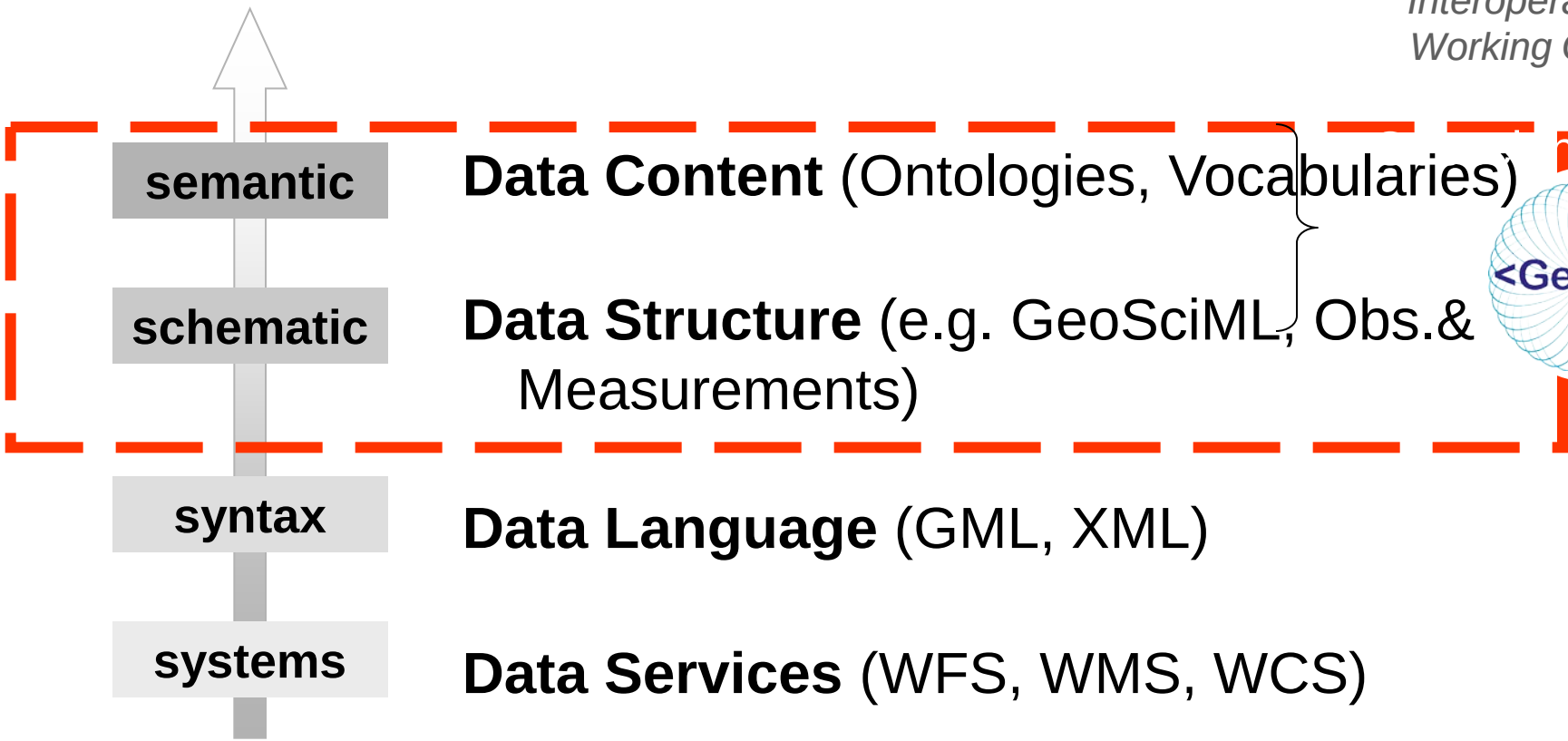
Steps towards harmonisation

Requirements

CGI Commission for the Management and Application of Geoscience Information

Interoperability Working Group



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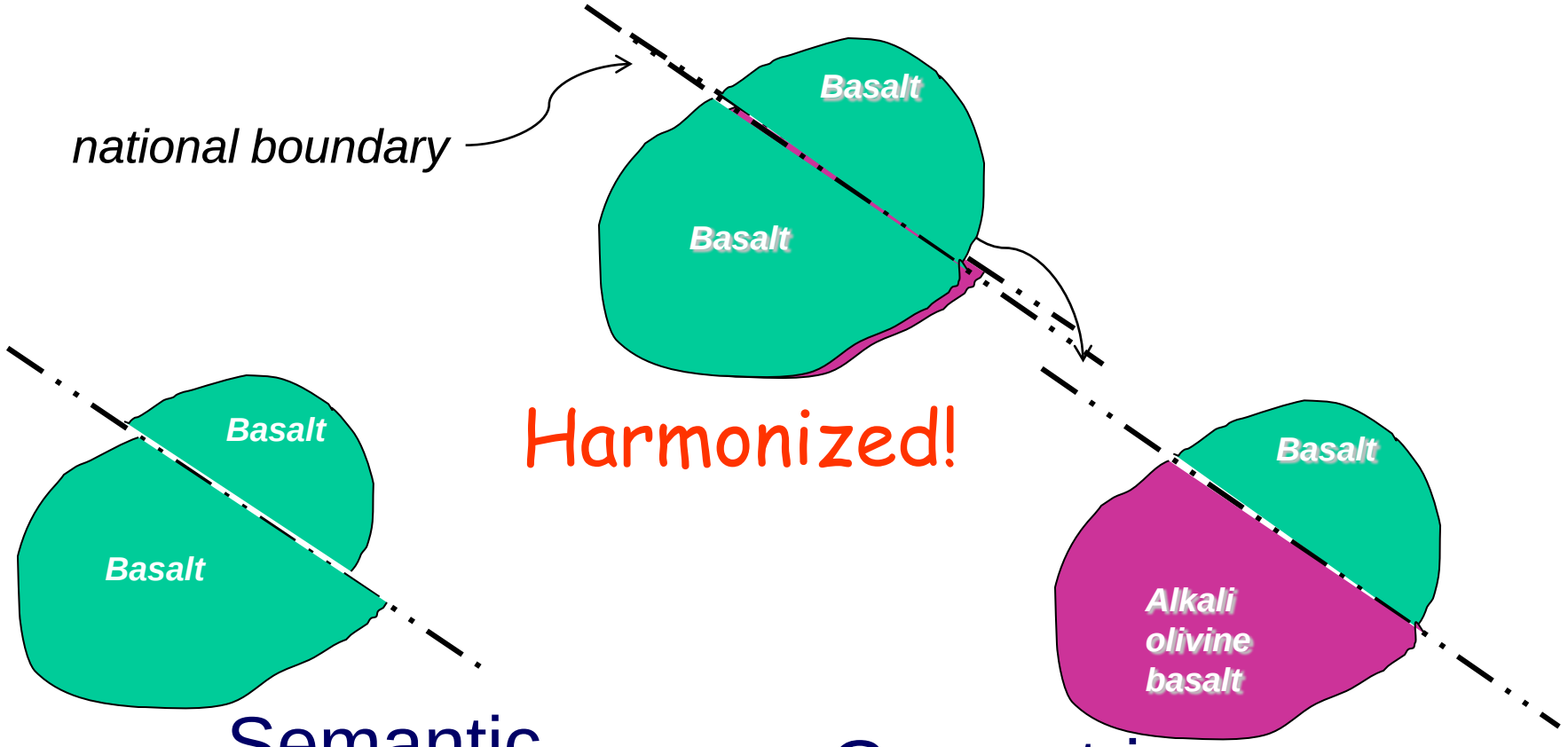
- **Interoperability – agreeing the data model/structure and the properties to describe its parts (what GeoSciML does)**
  - **E.g. agreeing a data model will have the feature of "GeologicUnit" with properties of "age" and "lithology"**
- **Semantic harmonisation – agreeing the use of the same definitions and classifications to describe a concept/term**
  - **E.g. 'clay'. Same concept can be labelled with several terms ("argilla" in Italian, "Ton" in German), but needs to have the same definition, in this case:**
    - Wentworth grade scale: > 50% particles < 0,004 mm;
    - ISO 14688 > 50% particles < 0,002 mm
- **Geometric harmonisation – coping with mismatches at national boundaries**

Harmonized?



Harmonized!

Semantic harmonisation

Geometric harmonisation

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Discovery of datasets and services

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Project deliverables

- Interoperable on-shore geology spatial dataset with ”progress towards harmonisation”
- Geological vocabulary and data specification for Europe
- Multilingual Portal
- Use case studies
- Multilingual metadata for discovery served through catalog services
- Licence agreements
- View and download services
- Forerunner and “guinea pig” for the implementation of INSPIRE Directive (May 2014 !!)

All delivered - map data interoperable, on-line, in 17 languages with progress towards harmonisation

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OneGeology-Europe scientific geological vocabulary reviewed and completed!

- 532 review comments from project partners, CGMW and CGI
- 516 agreed defined terms and definitions on:
  - Lithology (sedimentary, magmatic, metamorphic)
  - geological age
  - genesis
  - faults
- Fed > 100 new terms and definitions into the global CGI vocabulary

- Essential base for semantic harmonisation
- Enables comparability of the information
- Basis for cross-boundary planning

More information on OneGeology-Europe

http://onegeology-Europe.org

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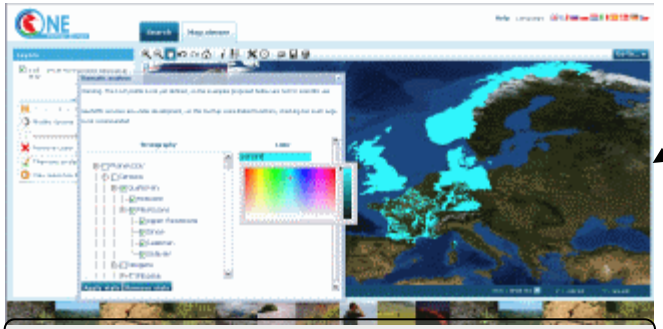
D6.2: First prototyped version of the Geoportal available in 10 languages:

Discover

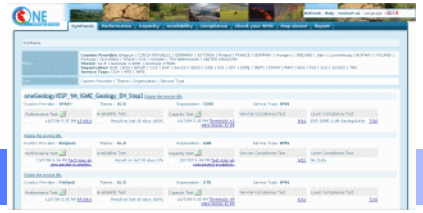
View

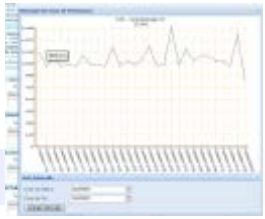


Query then view

View the attributes

Prototyped version of the monitoring platform available (*testing mode*)





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- **There are huge discrepancies in the geological surveys of Europe…**
  - Size
  - Funding/Business models
  - Digital and information management maturity
  - National priorities and focus

- But … all have two things in common
  - All responsible for producing geological maps
  - All have staff who are passionate and committed to the science of geology

Scope and team

Users

LANDMARK Information Group

euromines

UCD

THE LIGHTHILL RISK NETWORK

cenia

Providers

British Geological Survey
NATURAL ENVIRONMENT RESEARCH COUNCIL

BGR Bundesanstalt für Geowissenschaften und Rohstoffe

brgm Géosciences pour une Terre durable

SGL Service Géologique du Luxembourg

GTK

CZECH GEOLOGICAL SURVEY 1919

GEUS

TNO

EESTI GEOLOOGIAKESKUS OÜ

GSI

NGU Norges geologiske undersøkelse

INETI

APAT

SGU Sveriges geologiska undersökning Geological Survey of Sweden

Geological Survey of Belgium

MINISTERIO DE EDUCACIÓN Y CIENCIA

Instituto Geológico y Minero de España

GeoZS

Synergies and links

INSPIRE - Infrastructure for Spatial Information in Europe

KATHOLIEKE UNIVERSITEIT LEUVEN

ies Institute for Environment and Sustainability

UNESCO

International Steering Committee for Global Mapping

GEO

planetearth Earth Sciences for Society

OGC Open Geospatial Consortium, Inc.

CCGM CGMW

GeoConnections

IUGS

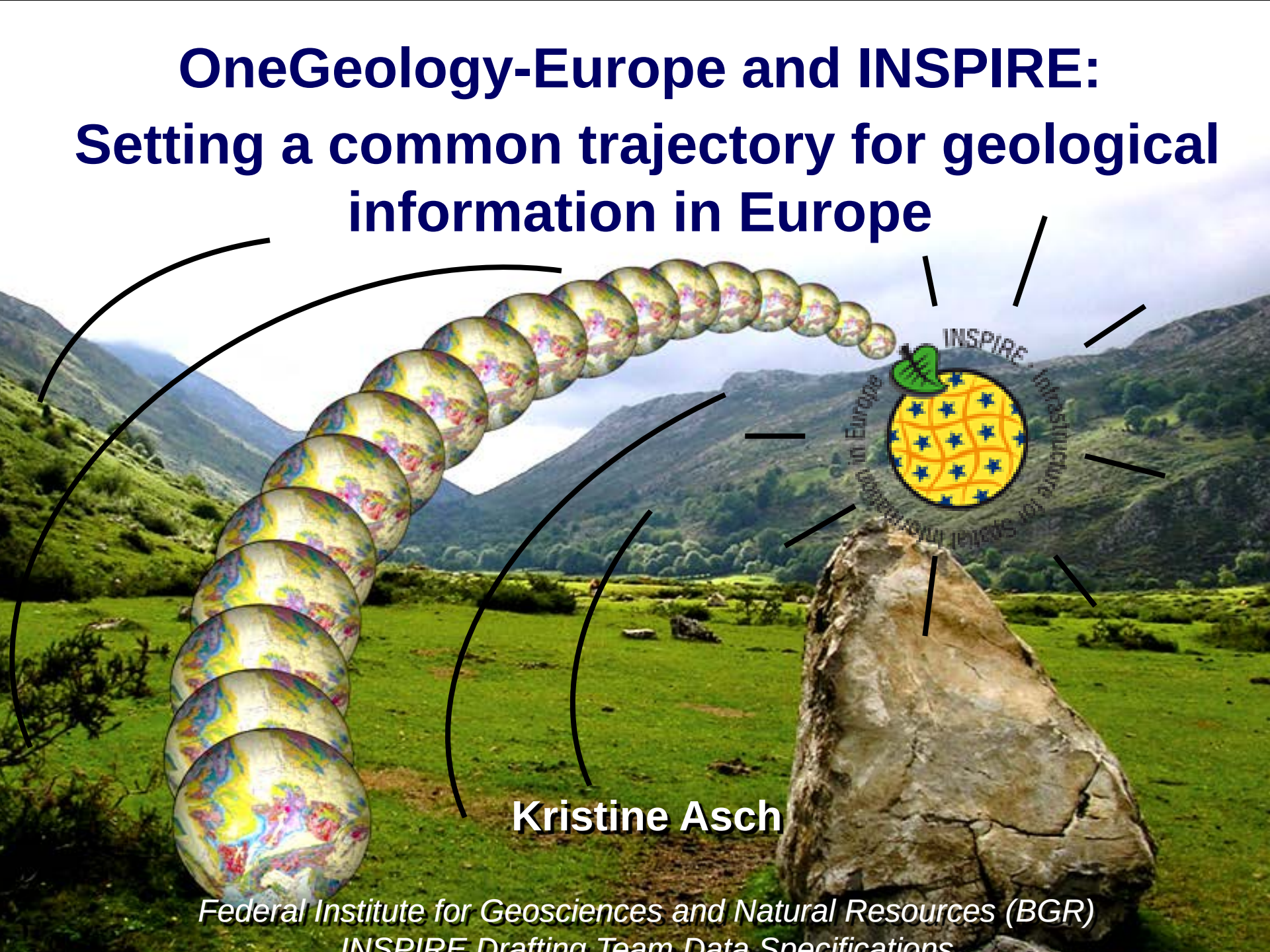
BRGM

Europarc Geoparks

AASG

ONE Geology Global

OneGeology-Europe and INSPIRE: Setting a common trajectory for geological information in Europe



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