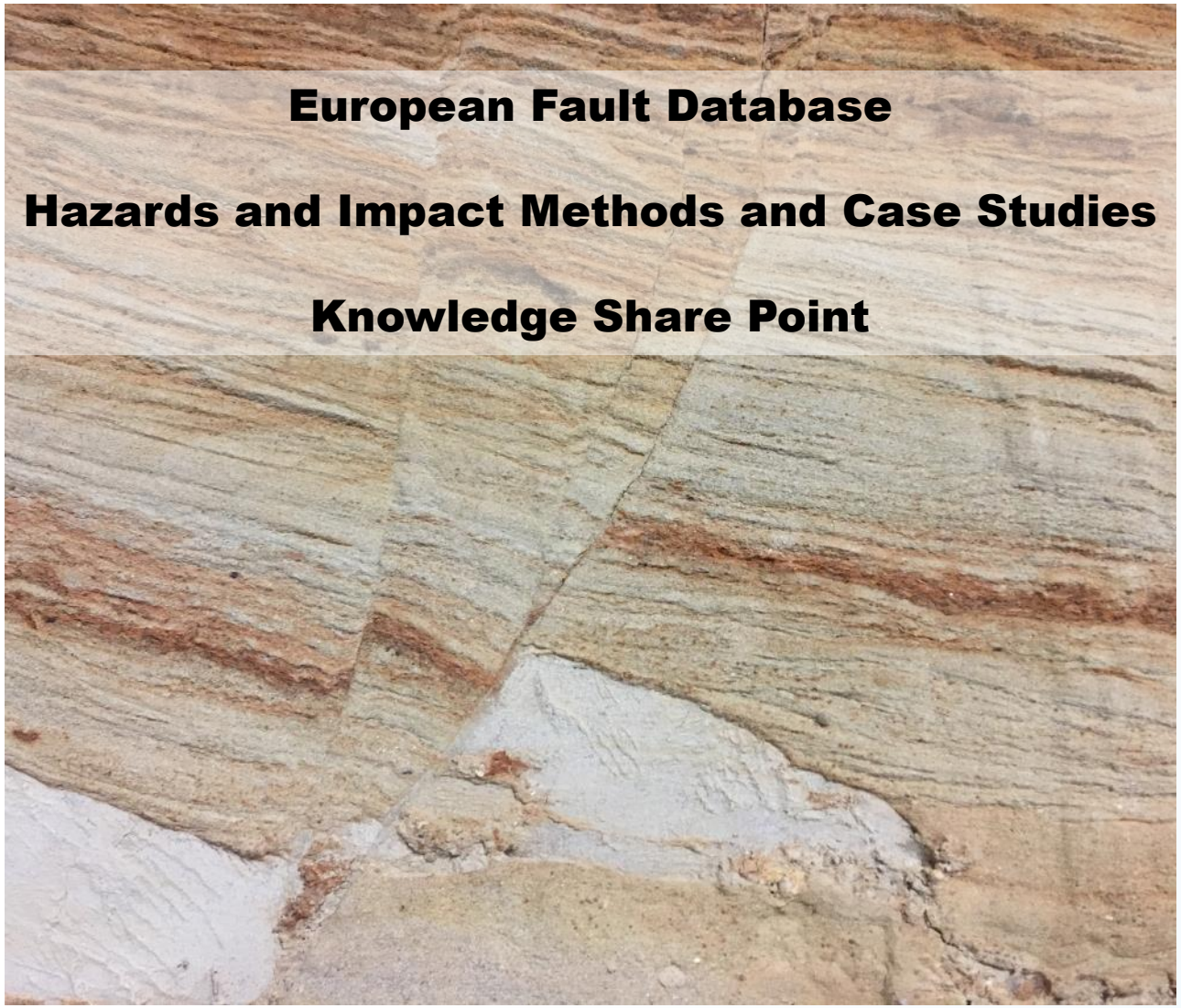
From Faults to Building a structural framework for responsible subsurface development

HIKE

GeoERA GEO-ENERGY

GEO CONNECT³d

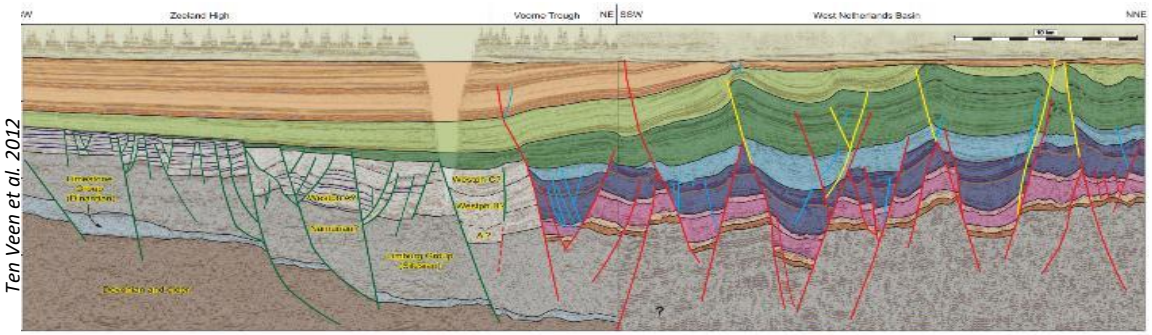
HIKE – Hazards and Impacts Knowledge for Europe



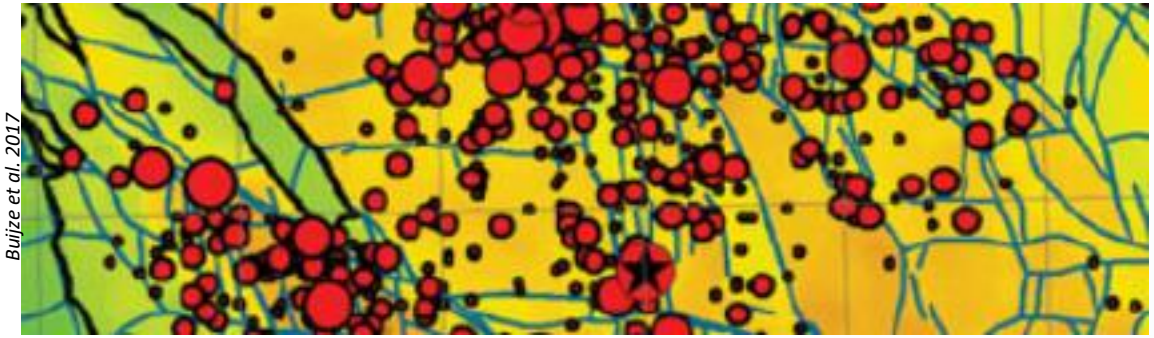
Partners from HIKE and supporting projects:
(Geoconnect3d, HotLime, 3DGeoEU)

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 731166

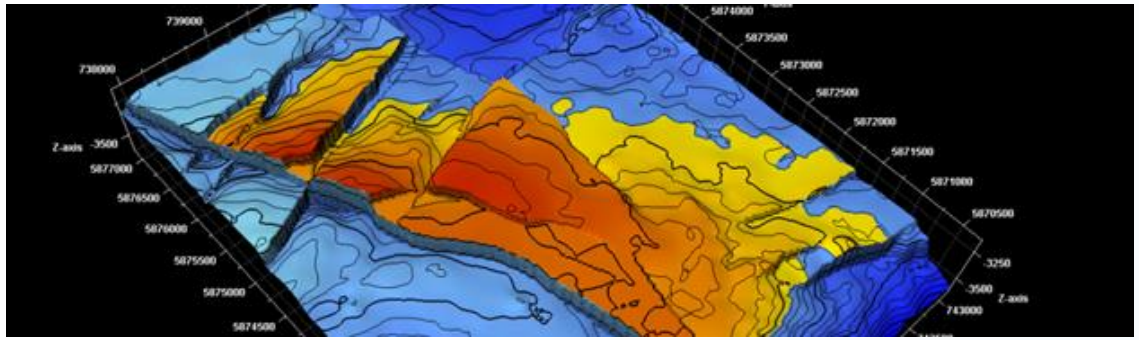
Why do we need fault data



Ten Veen et al. 2012



Bulize et al. 2017



Geological relevance

- 3D framework
- Distribution of resources
- Rock characteristics

Societal relevance & safety

- Natural and induced seismicity
- Leakage and migration
- Ground motion and surface deformation

Economic and environmental relevance

- Reservoir definition (hydrocarbons, storage)
- Exploration risks
- Hydrothermal resources, raw minerals
- Groundwater flow

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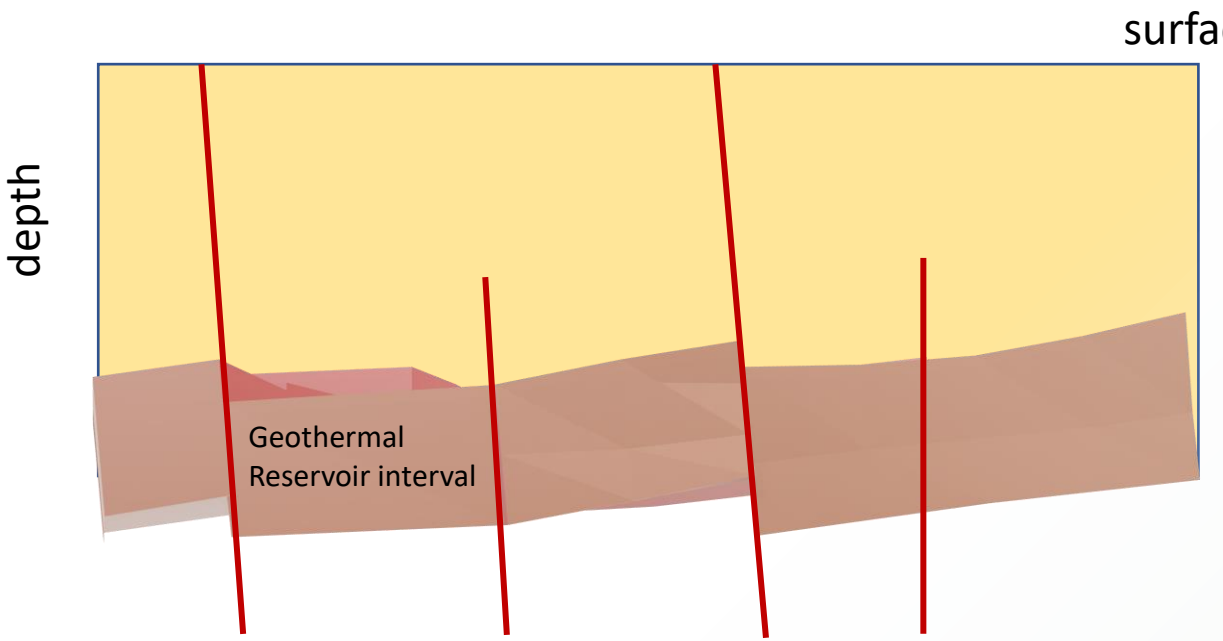
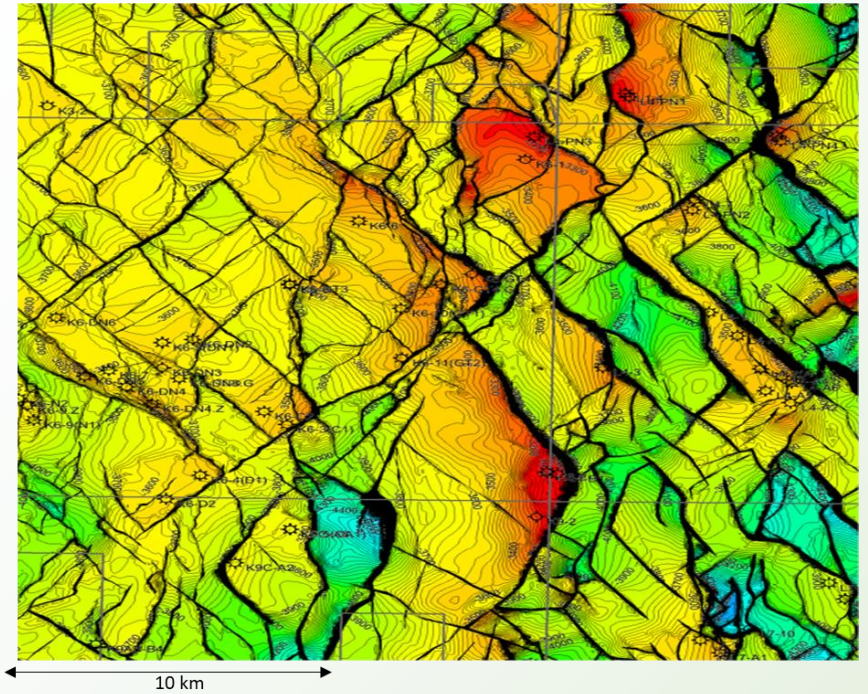
Subsurface faults





Example of a dense fault network at a 3-4 km deep reservoir level

Fault geometries and intersections at surface level and deep layers

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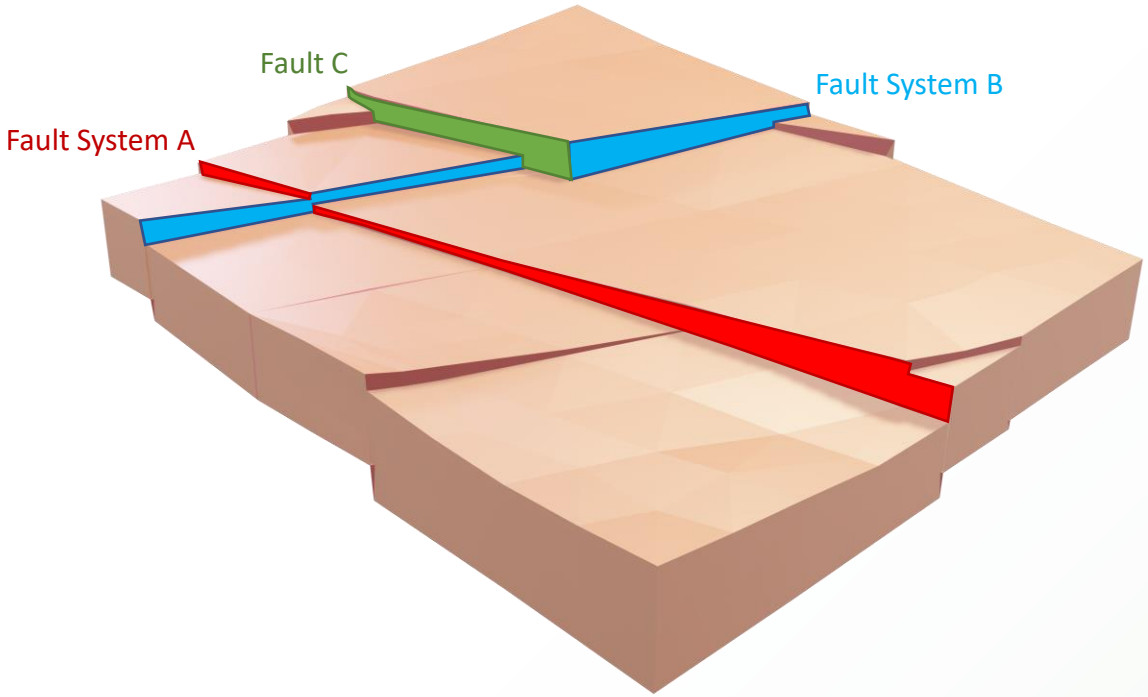
Subsurface faults



Fault classification, names, dependencies and correlation

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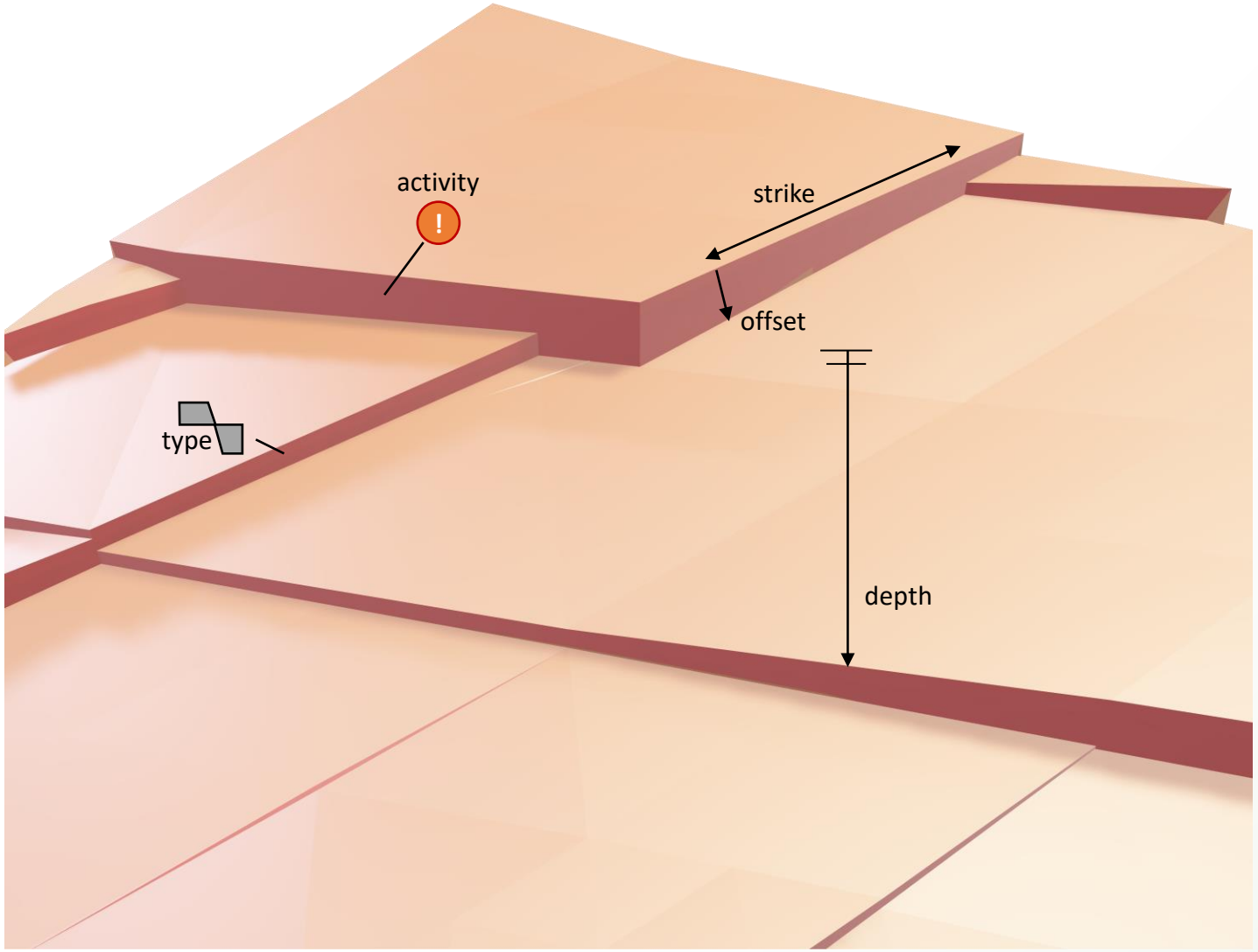
Subsurface faults



comprehensive set of fault parameters and characteristics

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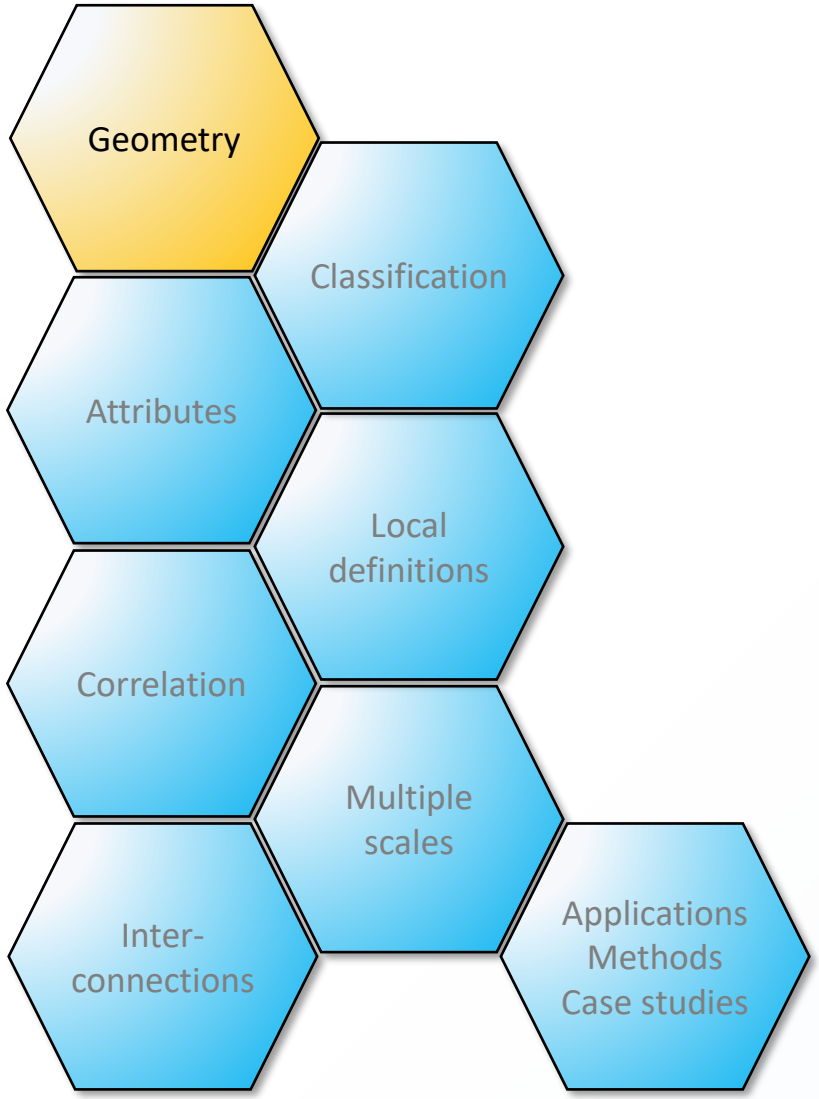
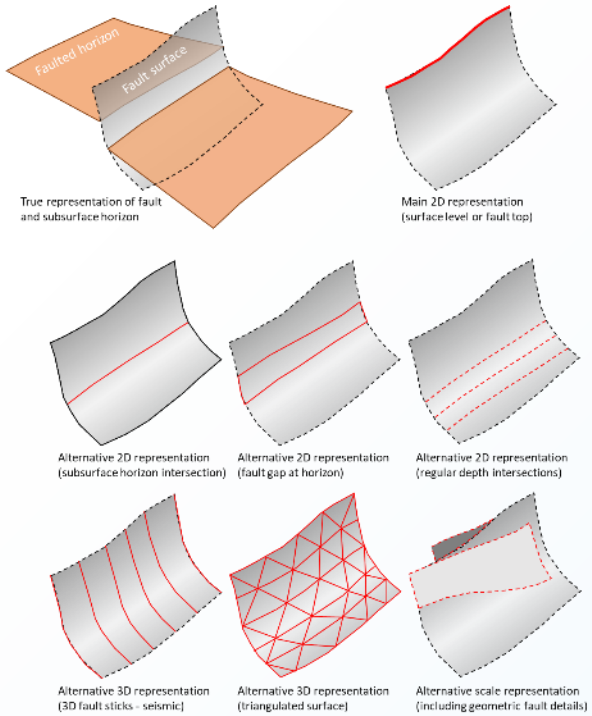
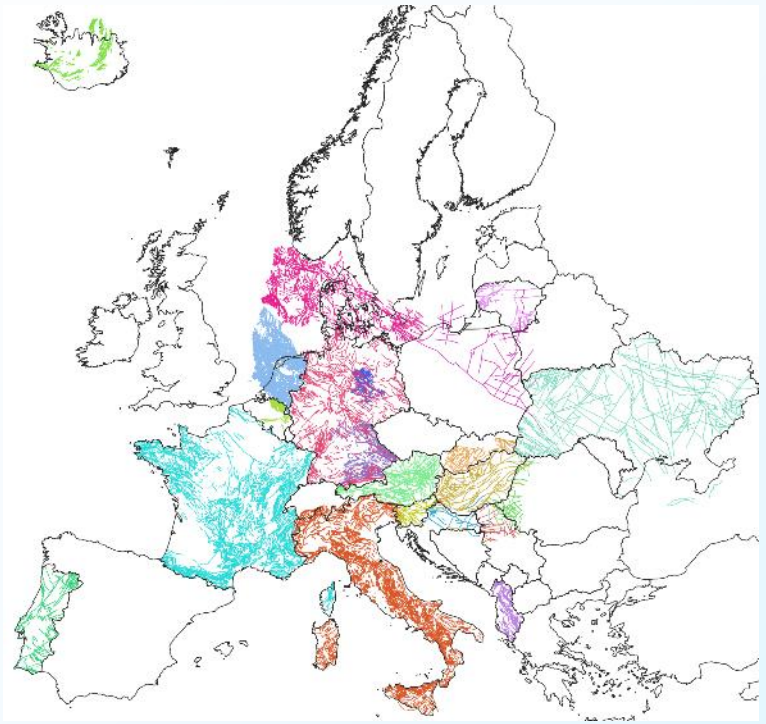
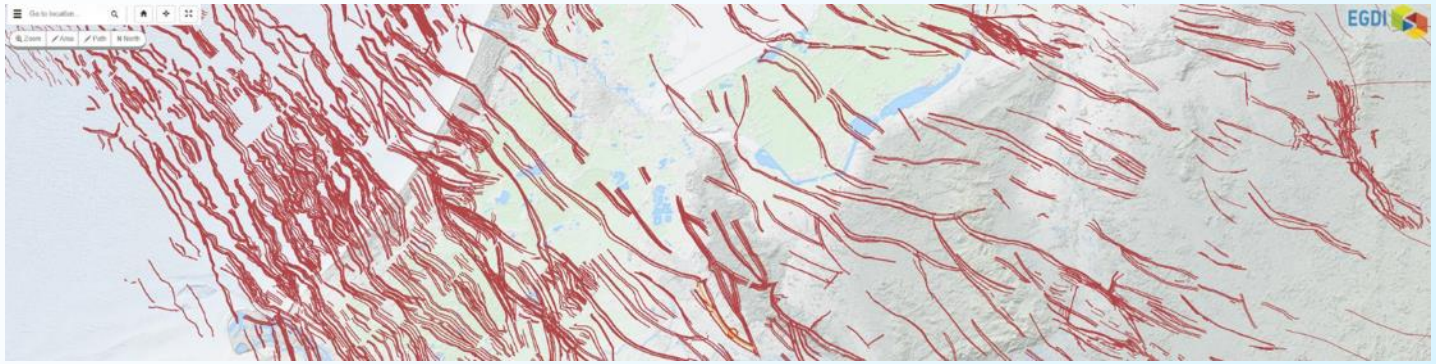
>55.000 faults included in the database









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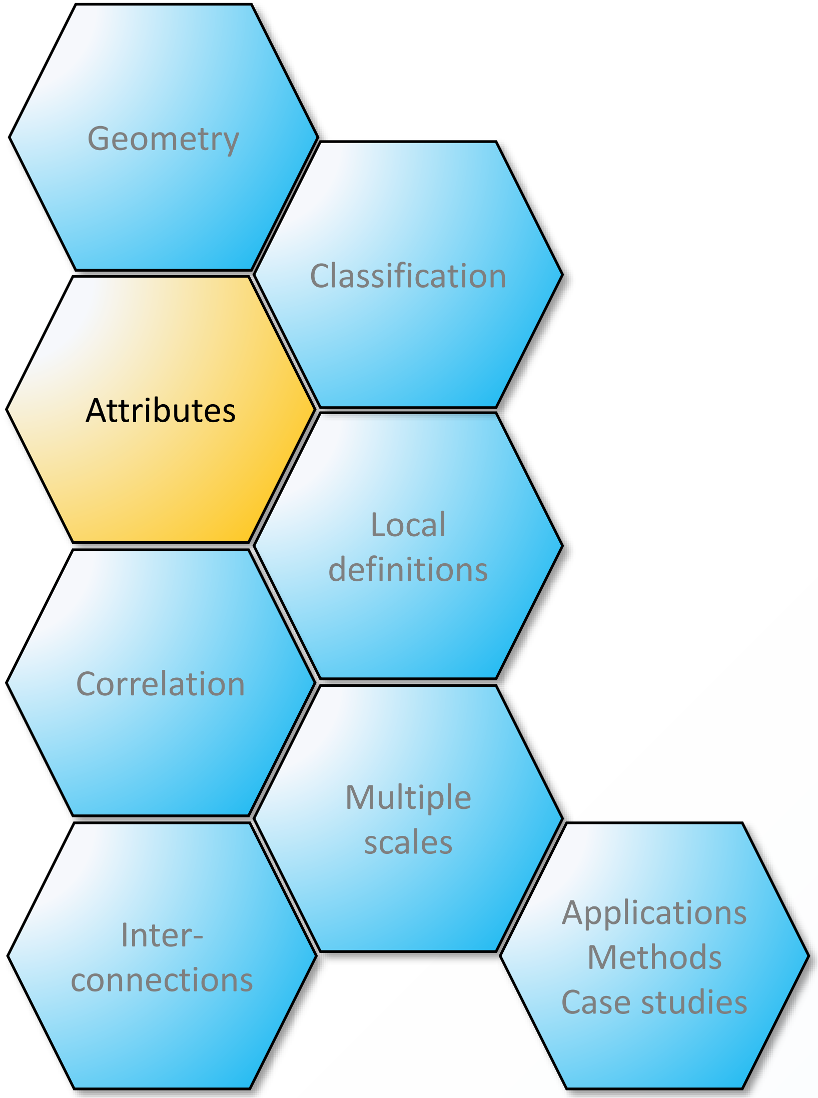
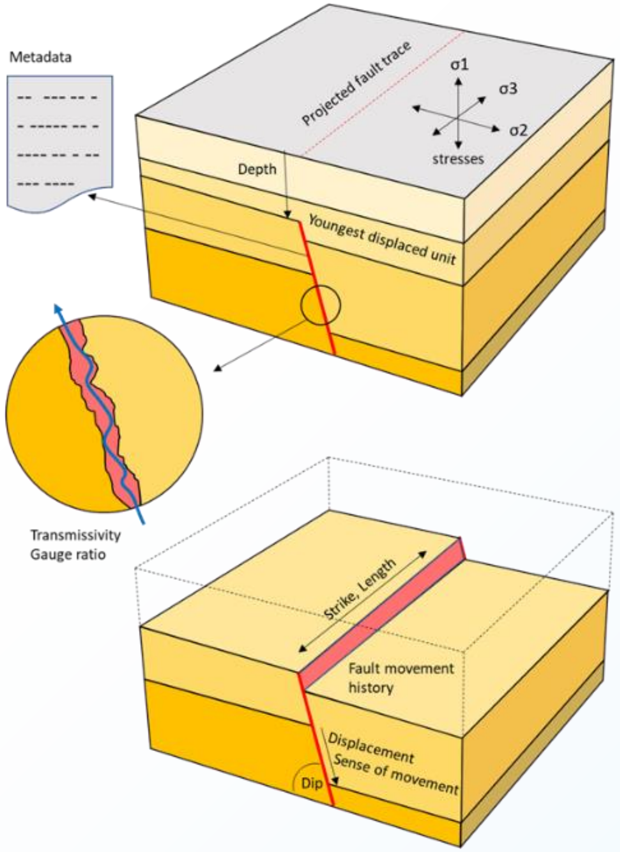
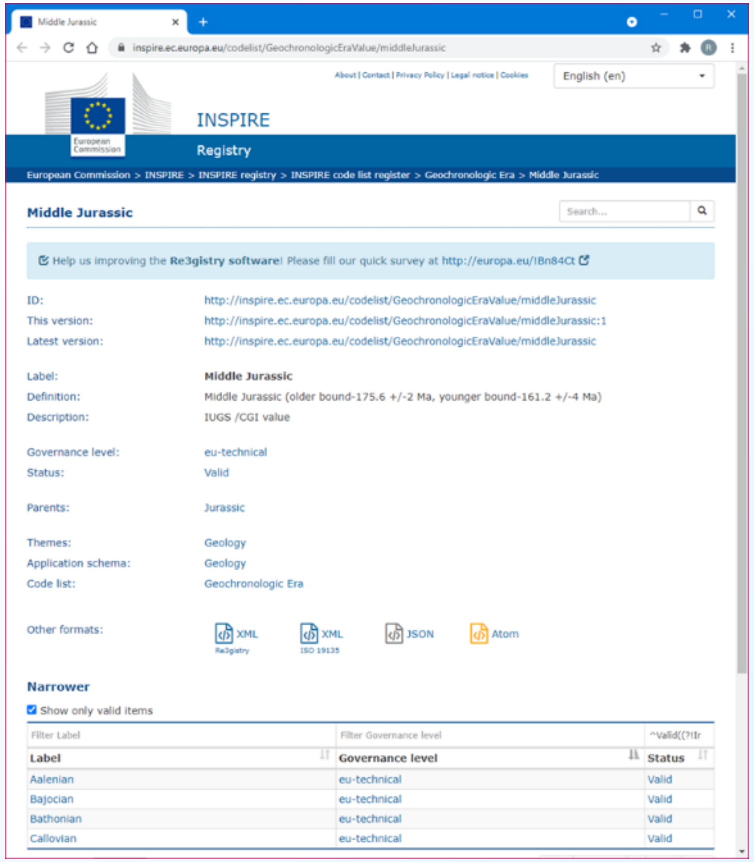
Standardized fault attributes







Go to	Country Cd	Id	Local Name	Concept Uri	Eval Meth	Eval Meth Uri	Observ Meth	Observ Meth Uri	Timing	Timing Uri	Fault Type	Fault Type Uri	Young Unit	Young Unit Uri	Old Unit
	NL	NL-4476	v5_FltStickTWT_ZE_NU_H180015_CK	Link...	inferred	Link...	inferred projection between observed locations	Link...	Upper Cretaceous	Link...	normal fault	Link...	Quaternary	Link...	Permian
	NL	NL-4476	v5_FltStickTWT_ZE_NU_H180015_KN	Link...	inferred	Link...	inferred projection between observed locations	Link...	Lower Cretaceous	Link...	normal fault	Link...	Quaternary	Link...	Permian
	NL	NL-4476	v5_FltStickTWT_ZE_NU_H180015_KN	Link...	inferred	Link...	inferred projection between observed locations	Link...	Lower Cretaceous	Link...	normal fault	Link...	Quaternary	Link...	Permian
	NL	NL-4476	v5_FltStickTWT_ZE_NU_H180015_KN	Link...	inferred	Link...	inferred projection between observed locations	Link...	Lower Cretaceous	Link...	normal fault	Link...	Quaternary	Link...	Permian
	NL	NL-4476	v5_FltStickTWT_ZE_NU_H180015_N	Link...	inferred	Link...	inferred projection between observed locations	Link...	Cenozoic	Link...	normal fault	Link...	Quaternary	Link...	Permian
	NL	NL-4476	v5_FltStickTWT_ZE_NU_H180015_N	Link...	inferred	Link...	inferred projection between observed locations	Link...	Cenozoic	Link...	normal fault	Link...	Quaternary	Link...	Permian
	NL	NL-4476	v5_FltStickTWT_ZE_NU_H180015_N	Link...	inferred	Link...	inferred projection between observed locations	Link...	Cenozoic	Link...	normal fault	Link...	Quaternary	Link...	Permian

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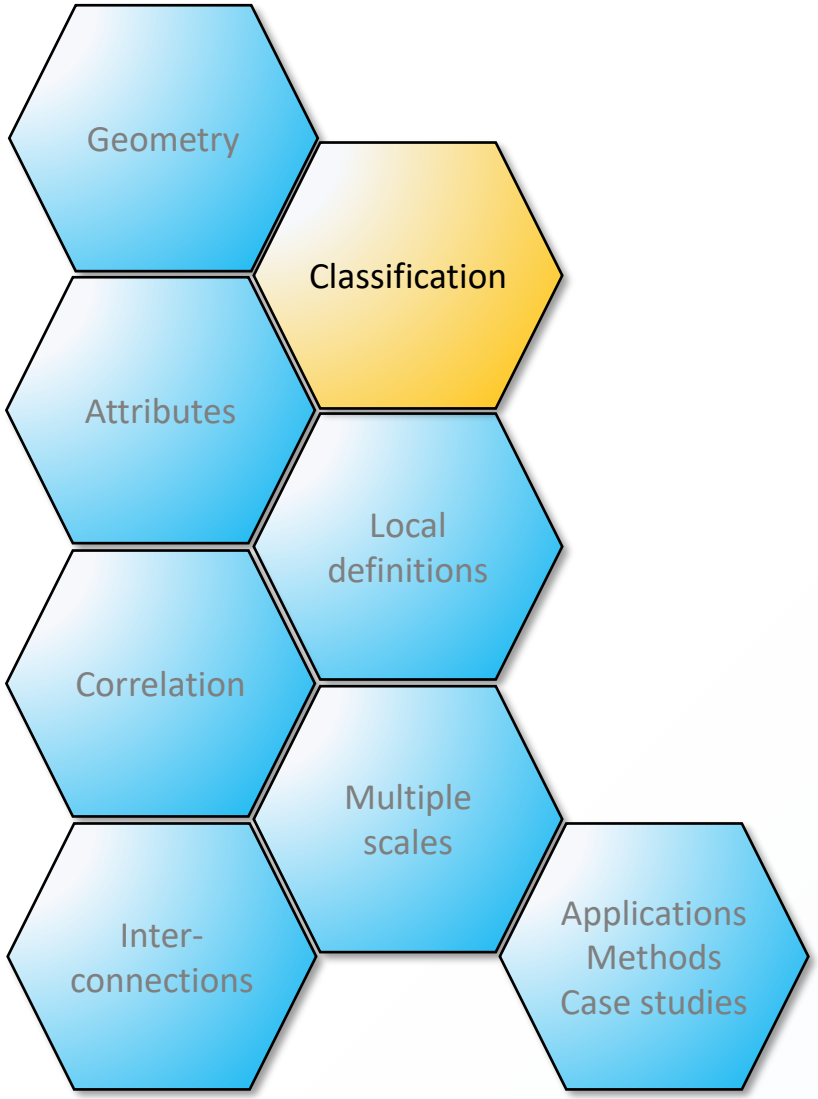
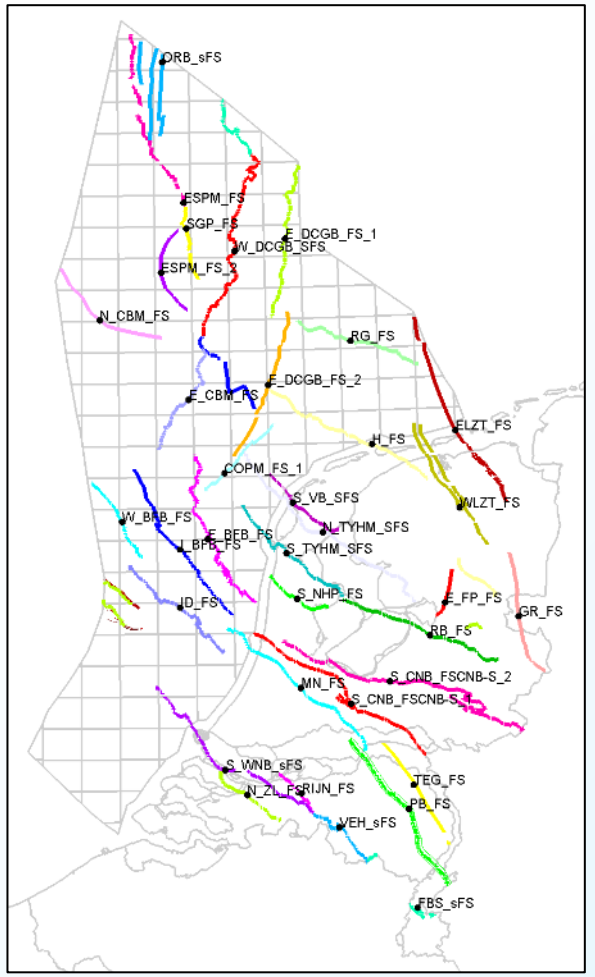
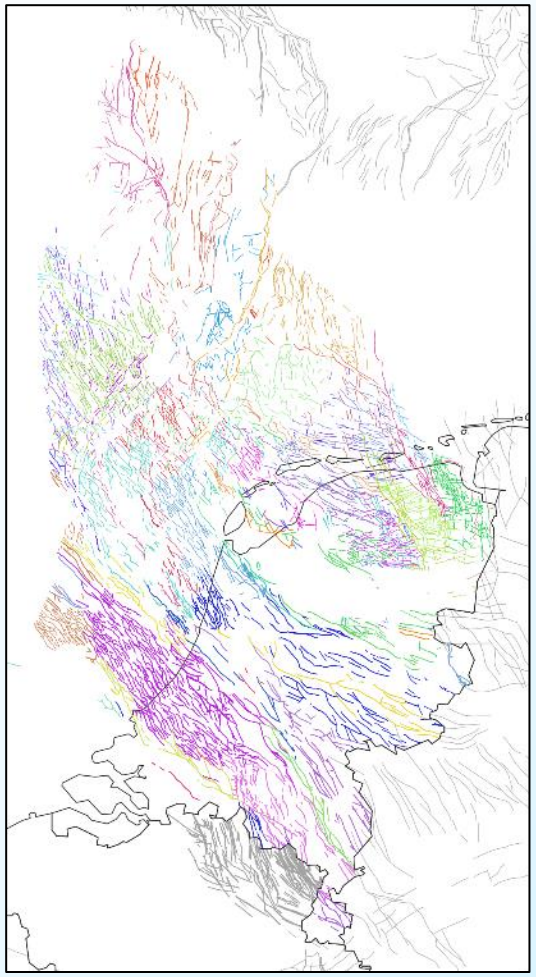
Hierarchical classification of faults and fault systems







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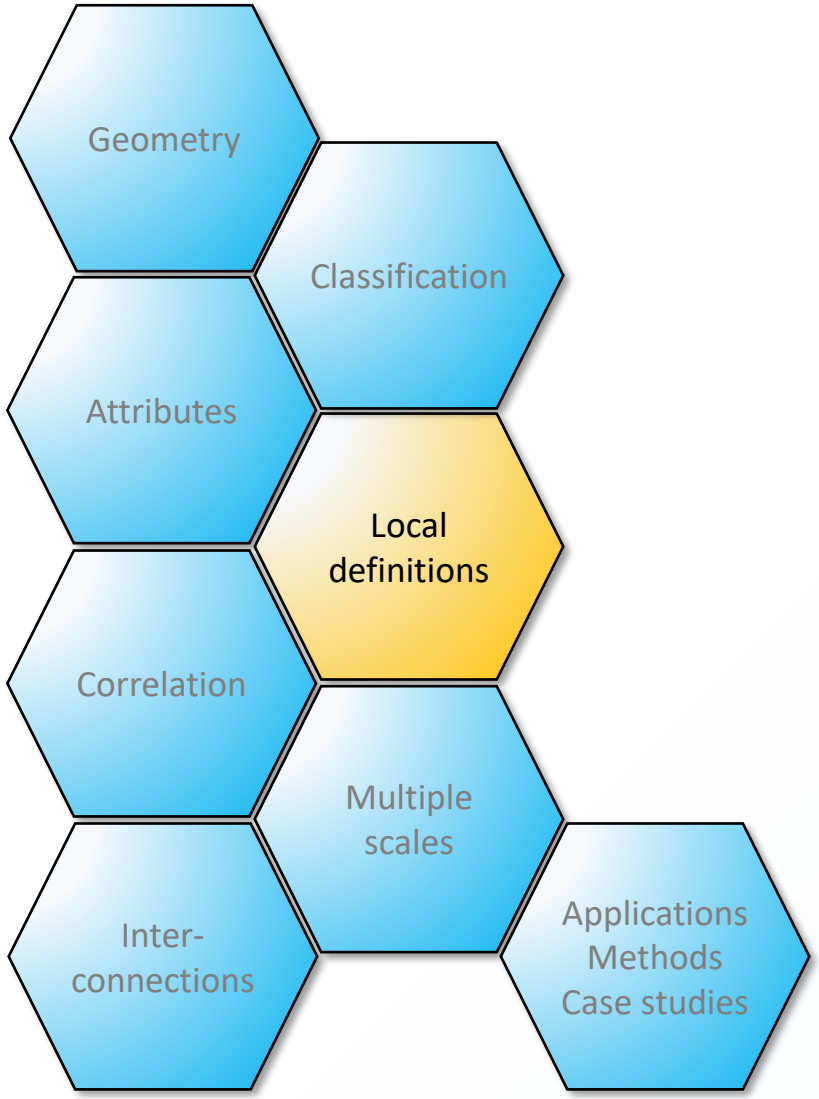
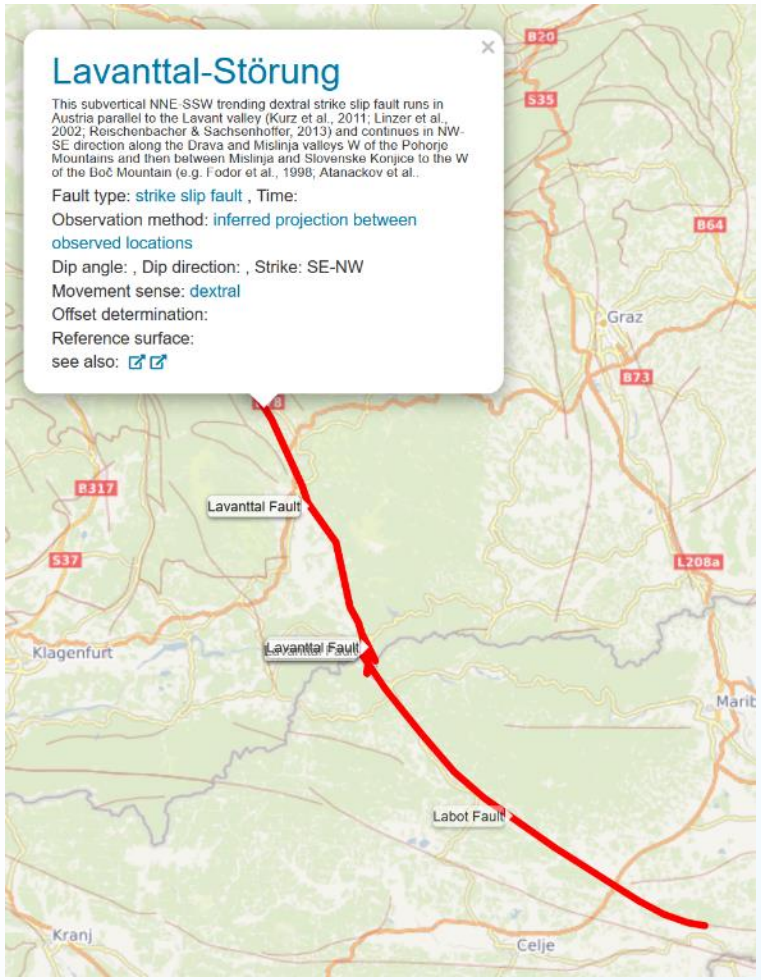
> 3300 named Fault Concepts (national and regional vocabularies)





Lavanttal Fault

URI https://data.geoscience.earth/ncl/geoera/hike/faults/551

Name in several languages

Lavanttal-Störung de Lavanttal Fault en Labotski prelom sl Labot Fault en

Notation: AT-10175 SI-3.001

This subvertical NNE-SSW trending dextral strike slip fault runs in Austria parallel to the Lavant valley (Kurz et al., 2011; Linzer et al., 2002; Reischenbacher & Sachsenhoffer, 2013) and continues in NW-SE direction along the Drava and Mislinja valleys W of the Pohorje Mountains and then be… Slovenske Konjice to the W of the Boč Mountain (e.g. Fodor et al., 1998; Atanackov et al., 2019). GPS measurements suggest the fault is recently active with an estimated average slip-rate of 0.5-1 mm/yr (Pavlovčič Prešeren et al., 2005). In Austria, seismic activity along the fault has been observed (XX)

Definition

References

— Atanackov, J. 2007: *Ocena termodinamičnega vpliva reinjekcijske vrtine na črpalno vrtino Le-2g v Lendavi : diploma thesis. Ljubljana: [J. Atanackov]: 56 p.*
— Fodor, L., Jelen, B., Márton, E., Skaberne, D., Čar, J. & Vrabec, M. (1998): *Miocene-Pliocene tectonic evolution of the Slovenian Periadriatic fault: Implications for Alpine-Carpathian extrusion models. - Tectonics 17, 5, 690-709*
— Kurz, W., Wölfler, A., Rabitsch, R., Genser, J: *2011. Polyphase movement on the Lavanttal Fault Zone (Eastern Alps): reconciling the evidence from different geochronological indicators. Swiss J Geosci, 104:323–343.*
— Linzer, H.-G., Decker, K., Peresson, H., Dell'Mour, R. & Frisch, W. (2002): *Balancing lateral orogenic float of the Eastern Alps.- In: Tectonophysics 354, Nr. 3-4, S. 211-237*
— Pavlovčič Prešeren, P., Stopar, B., Vrabec, M. 2005: *Displacement rates along the faults in NE Slovenia: campaigns from 1996, 1999 and 2002. Geodetski vestnik, 49, 407-415.*
— Reischenbacher, D. & Sachsenhofer, R.F. (2013): *Basin formation during the post-collisional evolution of the Eastern Alps: The example of the Lavanttal Basin. - International Journal of Earth Sciences (Geologische Rundschau) 102, 2, 517-543*

Concept relations

broader	Pöls-Lavanttal Fault System (5)
exactMatch	structure/151 (GBA)

Hierarchy

Link to other Vocabularies

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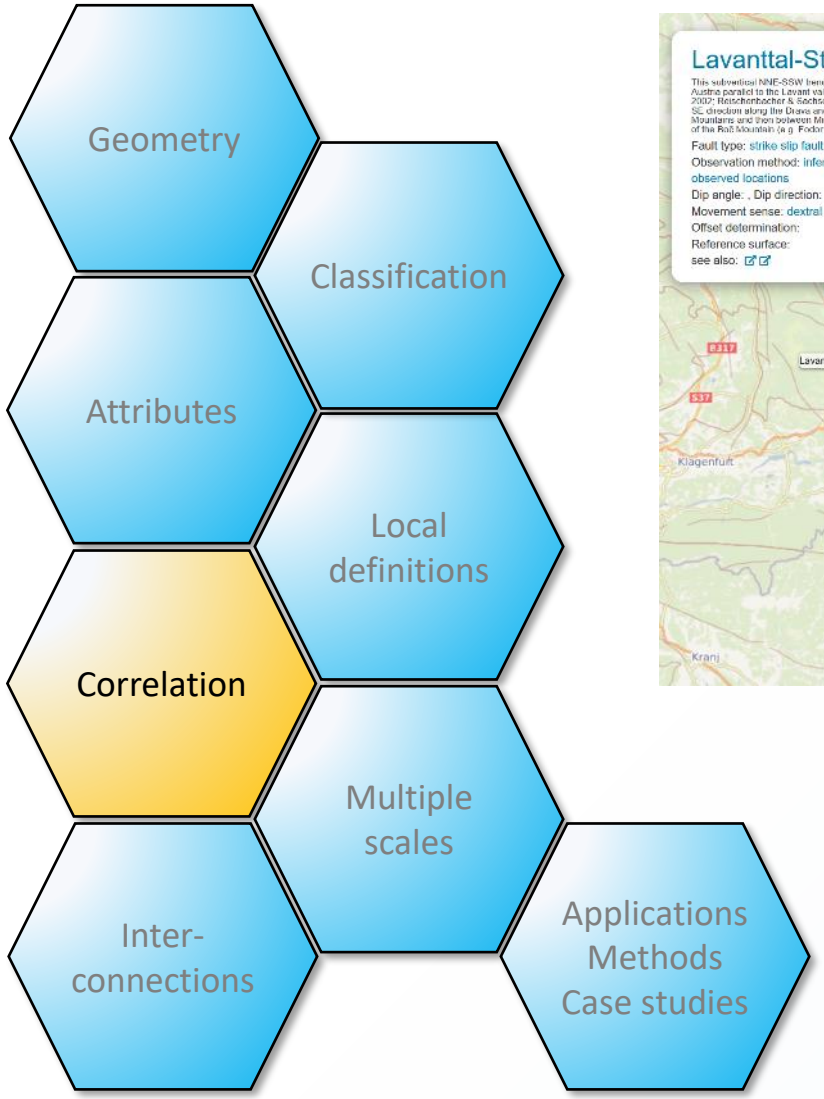
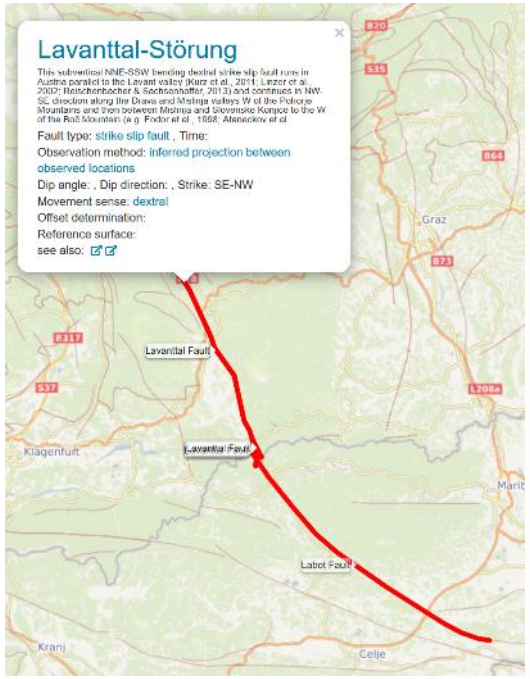
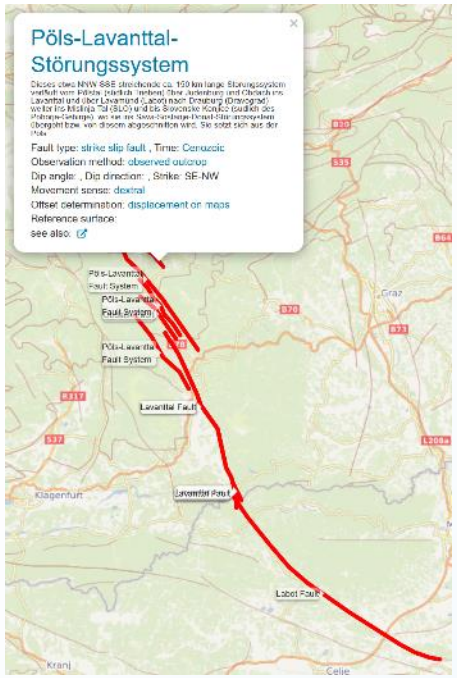
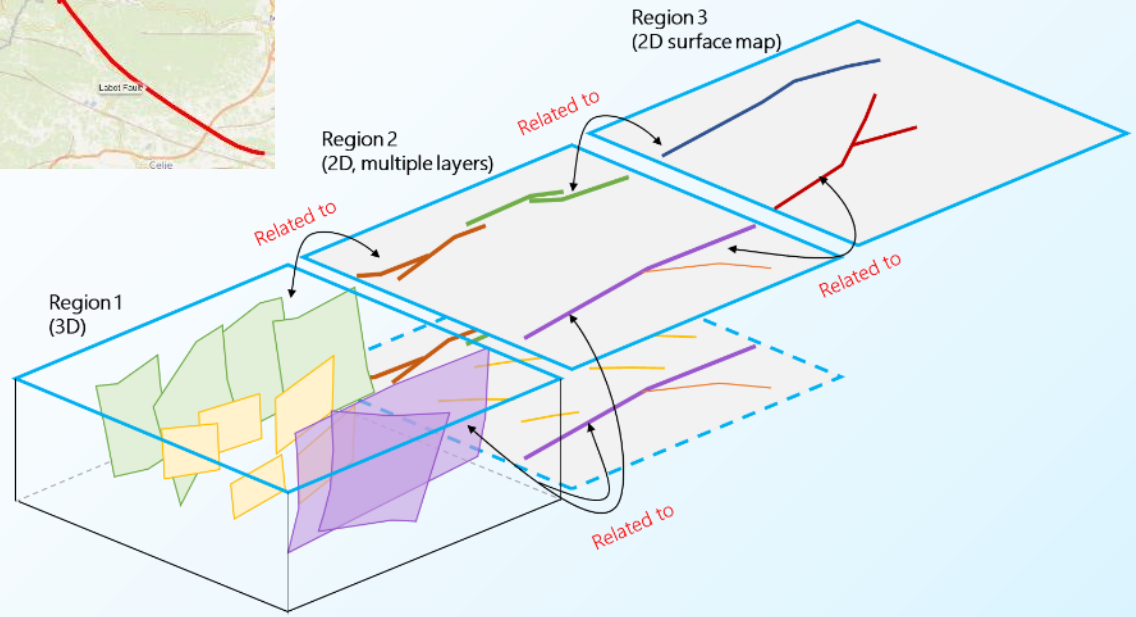
Cross-border correlation of faults using named concepts









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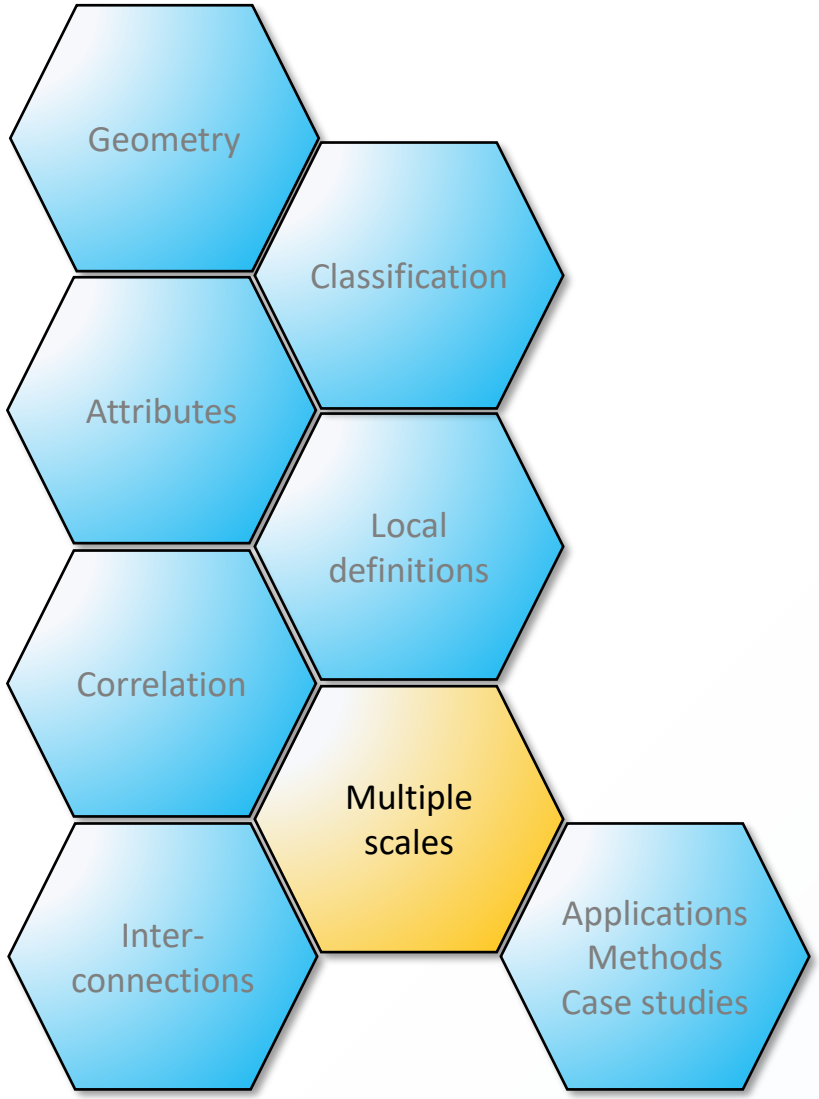
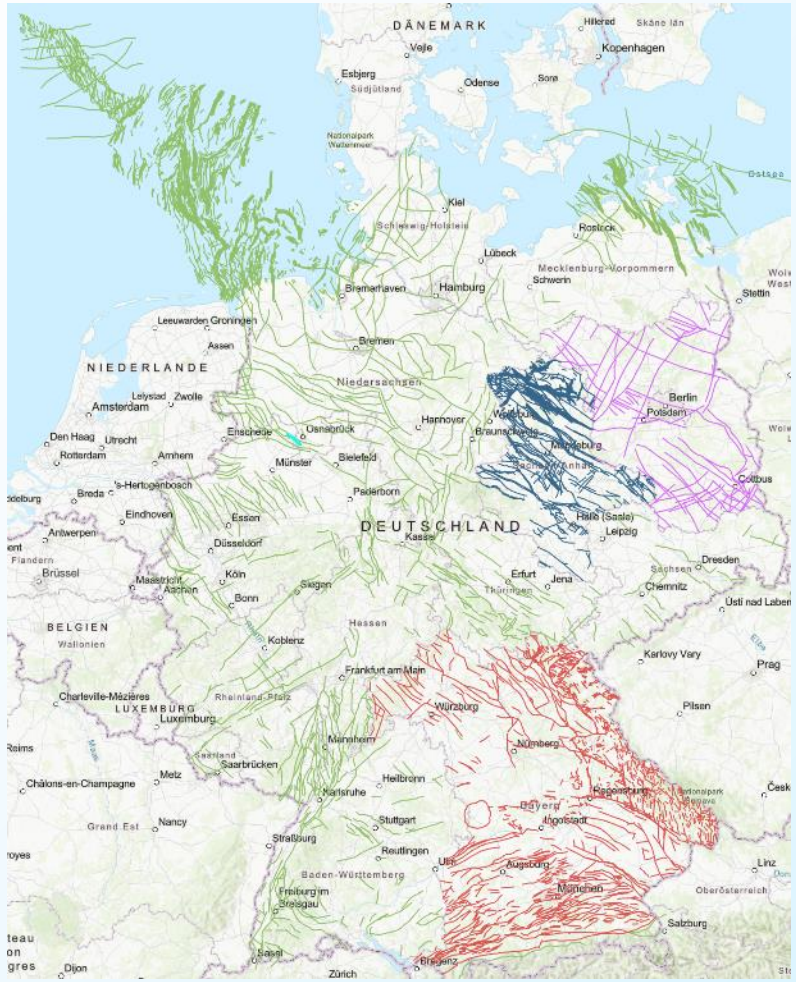
Multi-scale definitions, link between national and regional datasets





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Linking fault data to external sources and databases

Geometry

Classification

Attributes

Local definitions

Correlation

Multiple scales

Inter-connections

Applications
Methods
Case studies

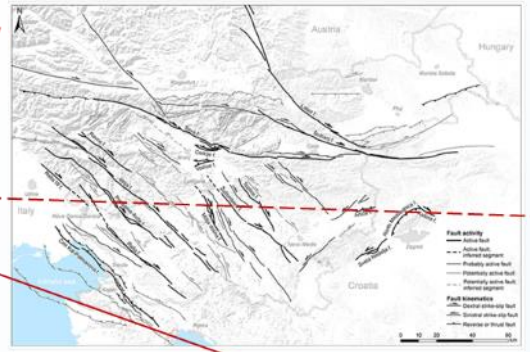
Lavanttal Fault

URI https://data.geoscience.earth/ncl/geoera/hike/faults/551

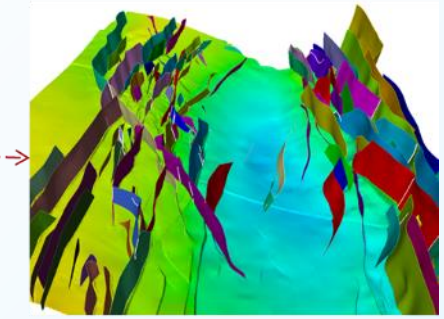
Lavanttal-Störung de Lavanttal Fault en Labotski prelom sl Labot Fault en

Notation: AT-10175 SI-3.001

other fault databases



3D fault models



fault database entries of the same fault

SHARE The European Database of Seismogenic Faults

Source Info Summary | References

General information

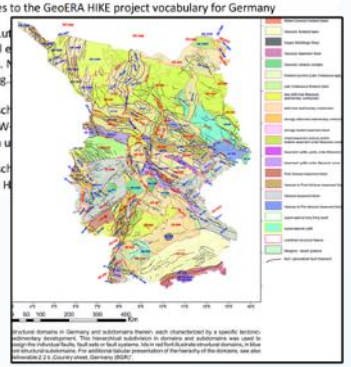
Region	Central Europe
Code	ATCS009
Name	Lavanttal
Compiler(s)	Garcia Moreno D.(1)
Contributor(s)	Garcia Moreno D.(1), Decker K.(2), Camelbeeck T.(1)
Created	09/02/2010
Updated	09/02/2010

ITHACA - Catalogo delle faglie capaci

AREA GEODINAMICA, GEORISORSE, PERICOLOSITA' E IMPATTI EVENTI NATURALI E INDOTTI

additional references / figures

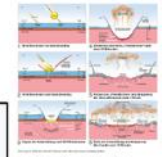
Collected references to the GeoERA HIKE project vocabulary for Germany



websites

The Formation of the Ries Crater

About 14.5 million years ago, a cosmic body races toward Earth. This asteroid, about 1 kilometer in diameter, is accompanied by a satellite about 150 meters in diameter (figure 1). Traveling over 70,000 km/h, both crash into the



The formation of the Ries Crater explained in six phases

DBpedia

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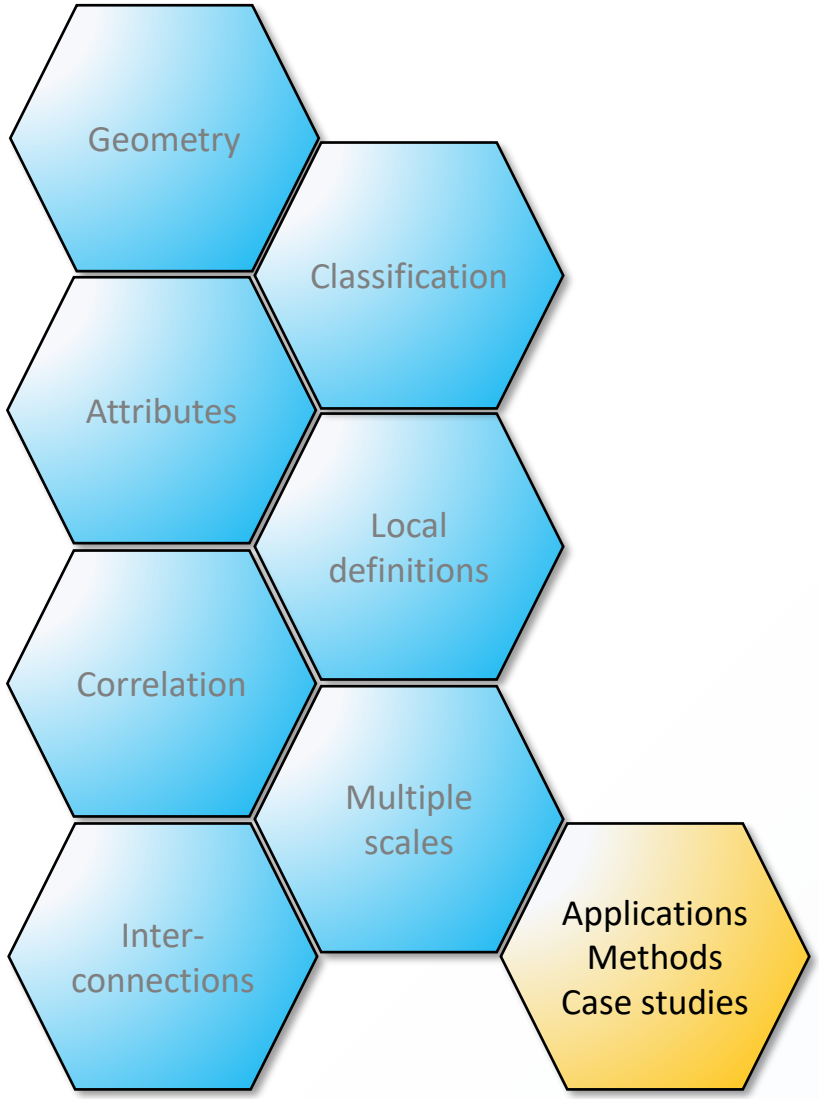
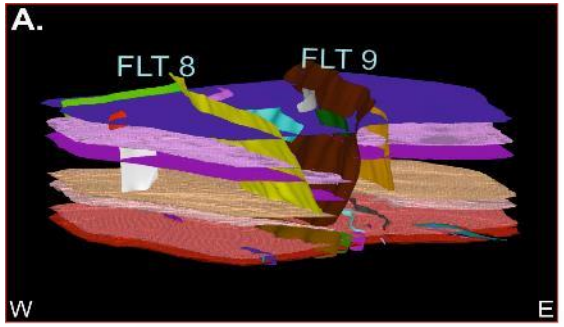
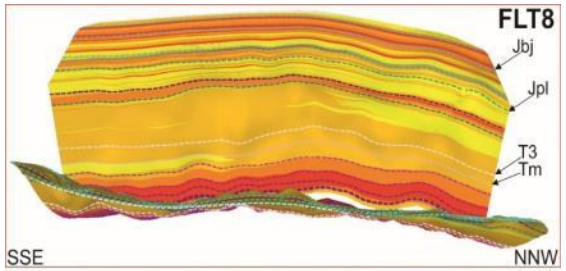
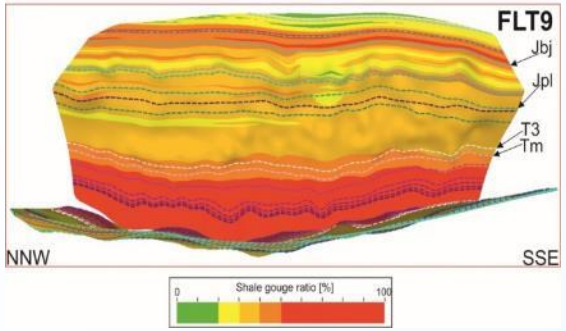
Four advanced hazard/impact case studies based on state-of art methods

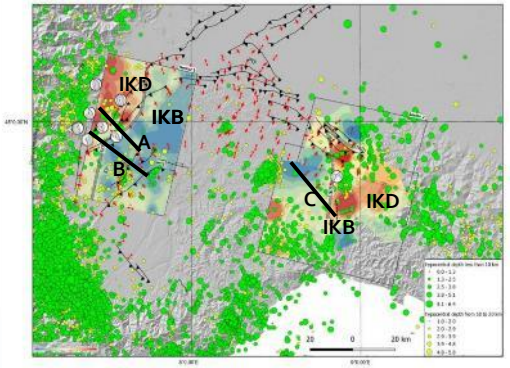


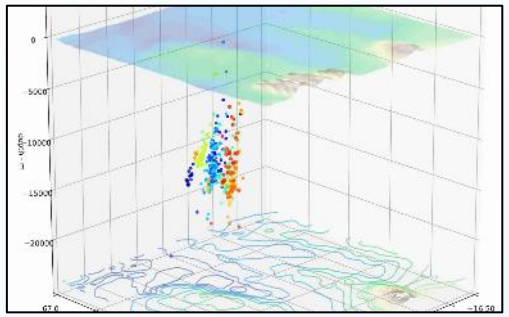
Seismicity, ground motion, surface deformation, leakage & migration

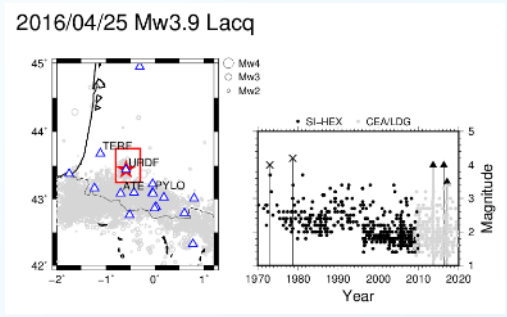


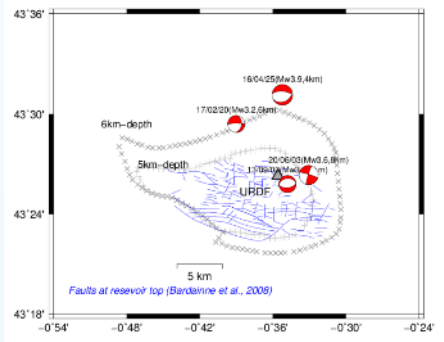


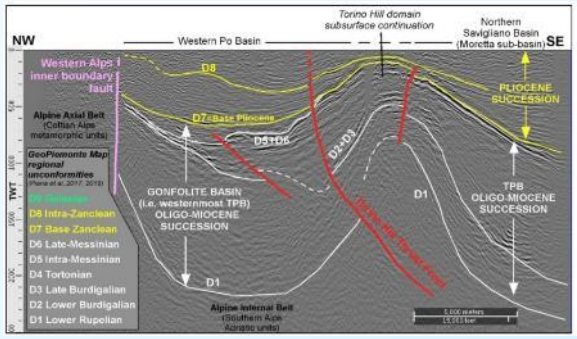












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All results at your finger tips via the novel FDB platform in EGDI

https://geoera.eu/projects/hike10/

Establishing the European Geological Surveys Research Area to deliver a Geological Service for Europe

GeoERA

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Hazard and Impact Knowledge for Europe (HIKE)

The HIKE project aims to stimulate the development of common information repositories and a knowledge sharing infrastructure in order to support induced hazard and risk assessments at the geological survey organizations and other research institutions

A synopsis of the achievements, results and background of the HIKE project can be read here. The data and functionality can be accessed through the links below:

HIKE GeoERA GEO-ENERGY

European Fault Database

The European Fault Database is the first effort to include passive and active faults at different depths. Fault geometries and structured fault information can be accessed via the MapViewer.

Semantic Network

The semantic network stores further information to the named fault inventory of the European Fault Database, the attributes and the hierarchical fault classification. The SKOS relations within the vocabulary itself, and with existing vocabularies and links to online sources creates an extensive network of information.

Knowledge Sharepoint

HIKE GeoERA

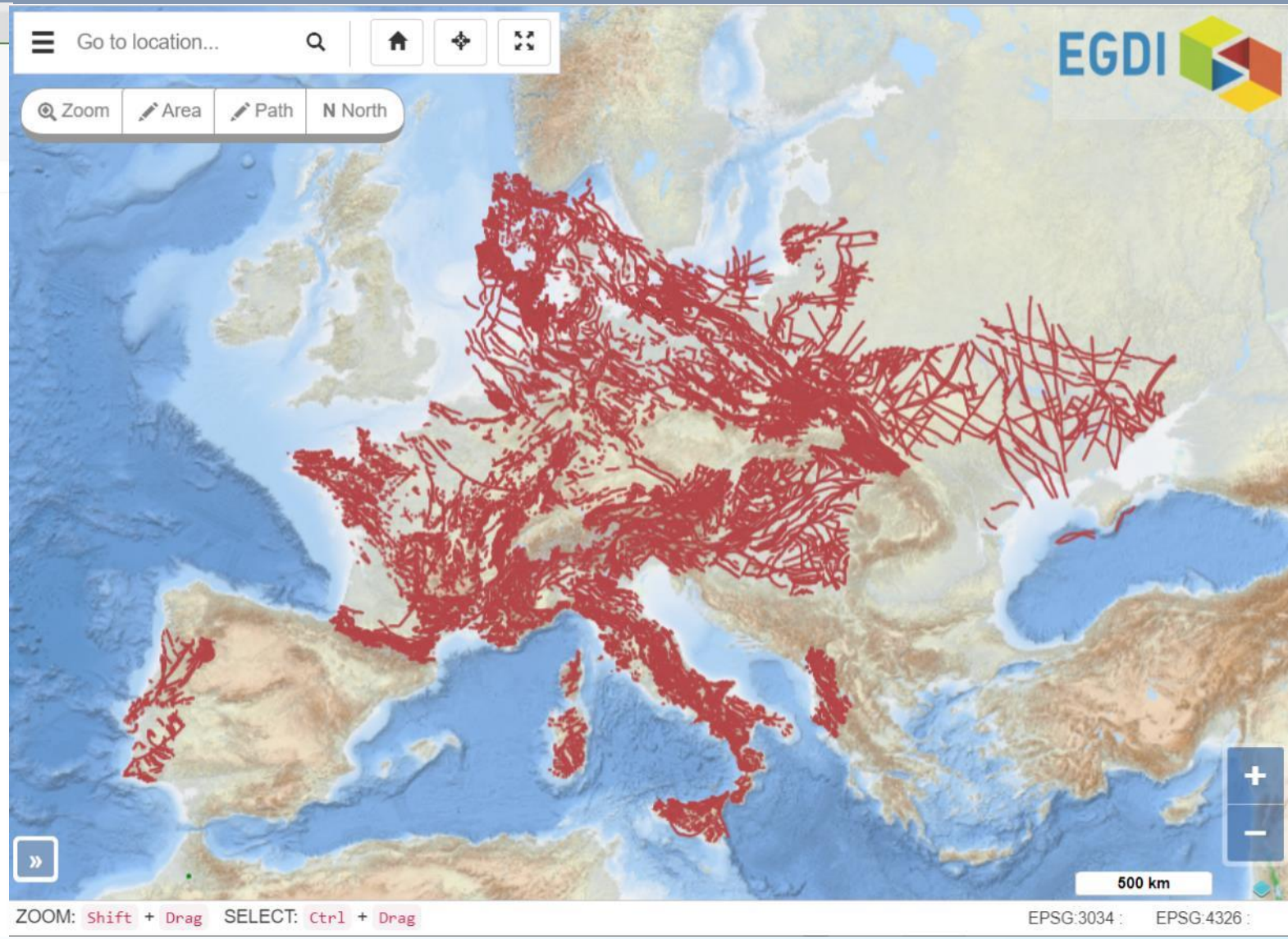
Knowledge Sharepoint

The knowlege sharepoint provides access to a guided search regarding the risks and hazards of human subsurface activities and the mitigation and management of it.

Case Studies

Background Info & Partner Organizations

Documentation & Reports



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HIKE GeoERA GEO-ENERGY

GeoConnect3d