



The new oil – Profitable storage and usage of geological data

wissen wohin
savoir où
sapere dove
knowing where



2nd European meeting on 3D geological modelling
20th and 21st November 2014

Salomè Michael & Roland Baumberger



Mission of GSO

Geological Survey Organisations usually are in charge of:

- Production of products and data
- Supply of products and data

Production

- Past: Analogue data did not need any harmonisation
- Up to now: autonomic production per department
- Recently: Need for harmonisation identified, but huge resources needed

Supply

- Internet! Download it!
- But: Offered data is often harmonised to minimum extent only
- Really bad situation



Commitment

“80% of political decisions are based on spatial data”

GSO have to make sure that the data they provide is easily

- accessible and manageable,
- of immediate benefit to the users
- readily usable in a client’s typical workday

It is our task to acquire, process, produce, store, supply and distribute geological data in a beneficial/profitable way.

We need to invent, develop and adapt methodologies, processes and tools to support the clients at their best.



One of the most successful inventions in recent times



Malcom McLean (1913 – 2001)

- Inventor of the shipping container
- 18th century: Wooden boxes in England
- 19th century: Different formats of early containers
- 20th century:
 - «Laadkist» in the NL
 - 20s: Standardised railway container in England
 - 40s: pa container used by Deutsche Bahn
 - 40s: Swiss Container cars for railway transport
 - 1956: 58 containers are shipped on a marine vessel for the first time
 - 1961: ISO defined the container





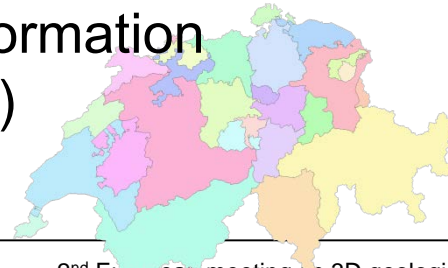
How to work together?

Containers:

- 40'' and 20'' equivalents (+ others)
- standardised locking mechanism

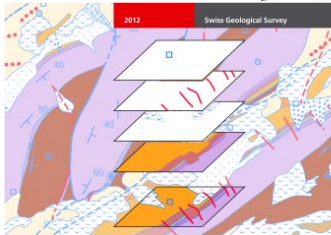
Geological data:

- Between different users: enterprises / organisations / cantons / countries
→ different software in use
- Between any type of modelling software
→ standardised 2D and 3D data formats
- Between different Data Models
→ without loss of any information (geometry, semantics, ...)





Swiss Data Models



Data Model Geology

Description in UML Format and Object Catalogue, Version 2.1

October 2012

Schweizerische Eidgenossenschaft
Confédération suisse
Confederazione Svizzera
Confederaziun svizra
Federal Office of Topography swisstopo

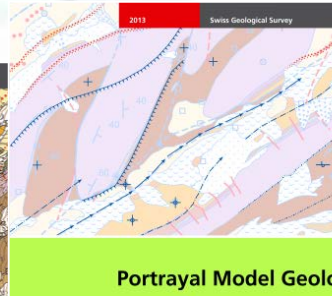


Datenmodelle der nicht-geobasisdaten der Landesgeologie, geophysikalischen und geotechnischen Karten (Pixelkarten)

Objektkatalog und Beschreibung und INTERLIS2, Version 1.0

Dezember 2011

Schweizerische Eidgenossenschaft
Confédération suisse
Confederazione Svizzera
Confederaziun svizra
Bundesamt für Landestopografie swisstopo

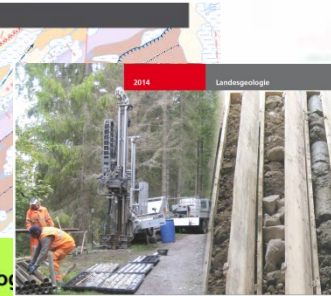


Portrayal Model Geology

Feasibility Study about Swiss Geospatial Symbols using the system-independent OGC SLD/SE Standards

July 2013

Schweizerische Eidgenossenschaft
Confédération suisse
Confederazione Svizzera
Confederaziun svizra
Federal Office of Topography swisstopo



Datenmodell Bohrdaten

Beschreibung des Kernmodells mit Objektkatalog und UML-MC, Version 2.0

September 2014

Schweizerische Eidgenossenschaft
Confédération suisse
Confederazione Svizzera
Confederaziun svizra
Bundesamt für Landestopografie swisstopo



Data Model 3D Geology

Extension of the Data Model Geology Version 2.0

September 2013

Schweizerische Eidgenossenschaft
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Federal Office of Topography swisstopo

AVAILABLE



Data Model Geology

- The Data Model Geology is the basis for the compilation of a seamless, nationwide vector dataset of Switzerland
 - It facilitates the handling of different geological datasets in a GIS-environment
 - To avoid multiple expressions for a particular object we defined standard terms
 - Standardisation means: Ease of users queries and data analysis
- Aim: Fully standardised attributed datasets in either 2D or 3D



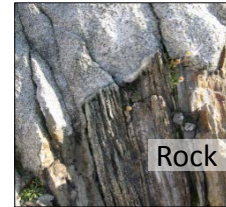
Data Model Geology

Data organisation
(structure and semantics)

- 8 Themes
- 50 Classes
- Object types & attributes

still missing:

- Standardised values for lithostratigraphic units (HARMOS, to be finished by the end of 2014)



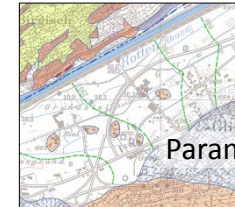
Rock Bodies



Local Add. Information



Geomorphology



Parameter & Modelling



Tectonics



Anthropogenic Features



Measurements
Spatial Orientation

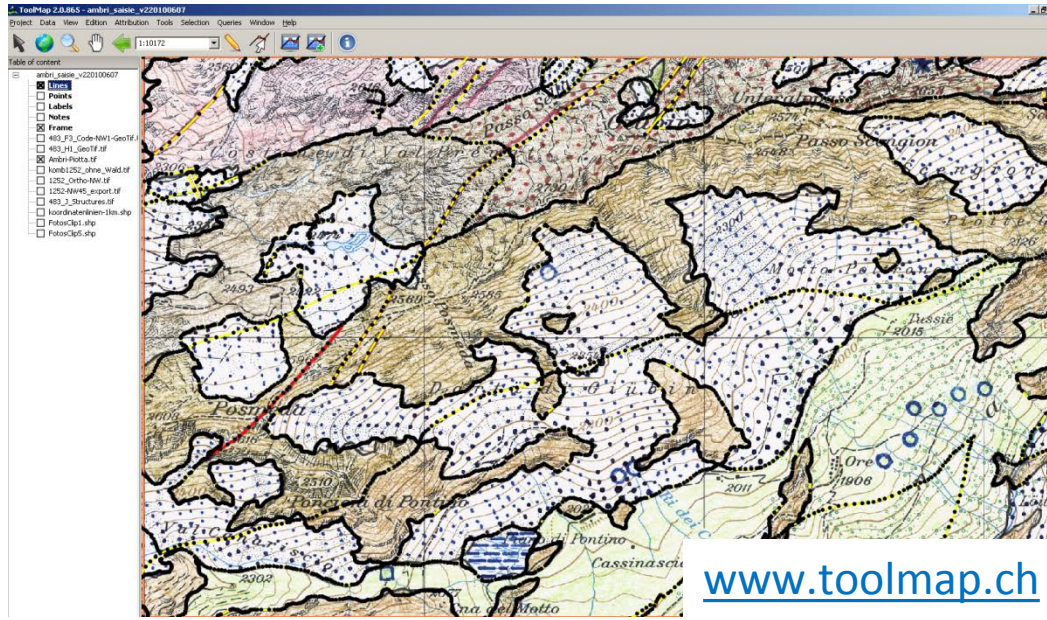


Hydrogeology

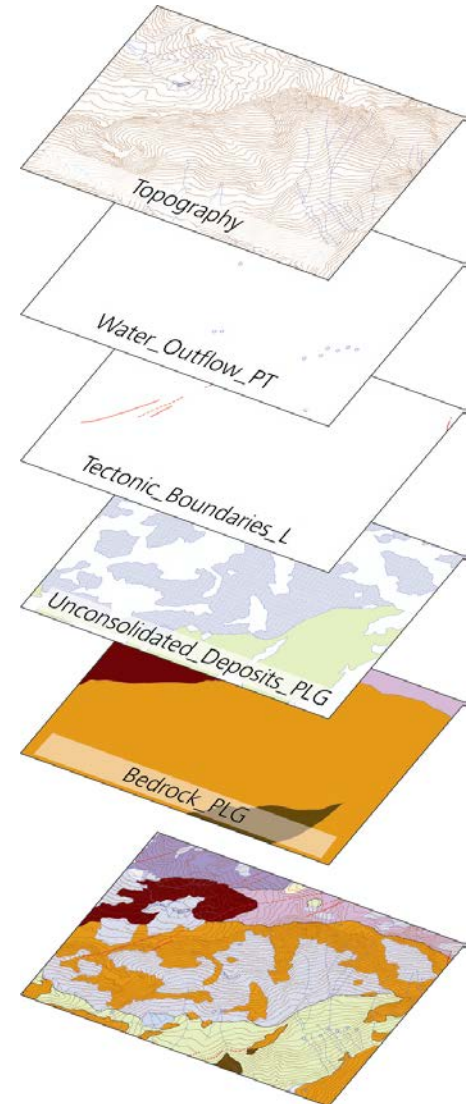


From data acquisition to 2D datasets

- Digitisation of the field map in ToolMap², based on a predefined Data Model
- Automatic export (shapefiles) according to the predefined Data Model

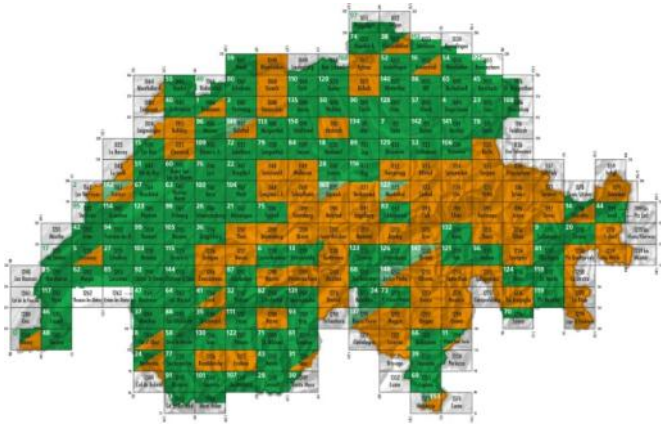


www.toolmap.ch





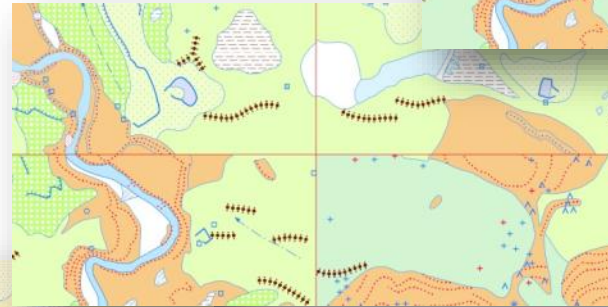
Production geological maps / datasets



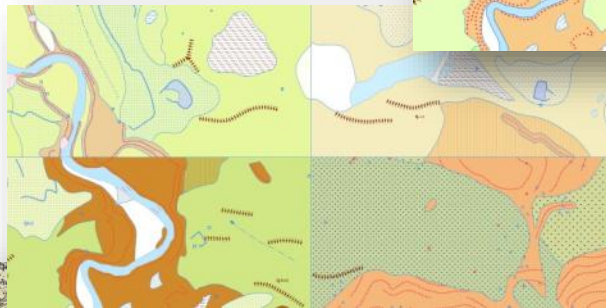
Vector datasets
(2006 – 2012)



Geometric revision
(starting 2015)



HARMOS Project
(2011 – 2014)



Paper & pixel maps
(1930 – 2030)



Degersheim 1930	Hörnli 1970	Bischofszell 1973	Wil 1988	Légende harmonisée
				Rezente Alluvionen
				Spätglaziale Rückzugsschotter
				Moräne der Letzten Vergletscherung
				Moräne der Vorletzten Vergletscherung
				Deckenschotter
				Tannenwald-Formation
				Gesteine der Obere Süsswassermolasse (OSM II)





Data Model goes 3D

- Extension (relevant themes and classes) and Expansion (new themes and classes) of the DMG-2D
- Changes in geometry types from 2D to 3D
- Introduction of new geometry types

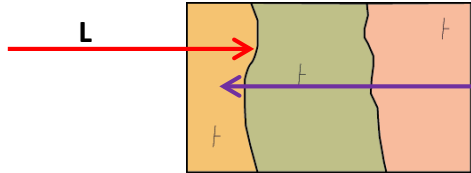
2D representation		3D representation		Example
Point		Point		Dip measurement
Point		Line		Drill hole
Line		Line		Hinge line
Line		Surface		Fault
Polygon		Surface		Rock body
Polygon		Shell		Rock body
Polygon		Volume		Rock body



2D to 3D Data transformation

Kind: geological outline

Status: in general

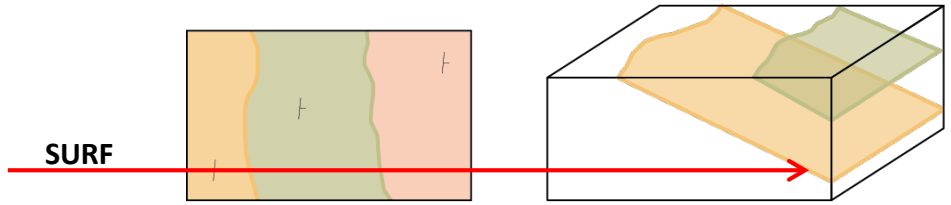


Kind: geological outline

Status: in general

Type: Top

LithoStrat: Lower Freshwater Molasse



PLG

Kind: Lower Freshwater Molasse

Litho: Sandstone

Chrono_T: Burdigalian

Chrono_B: Aquitanian

Tecto: Plateau Molasse

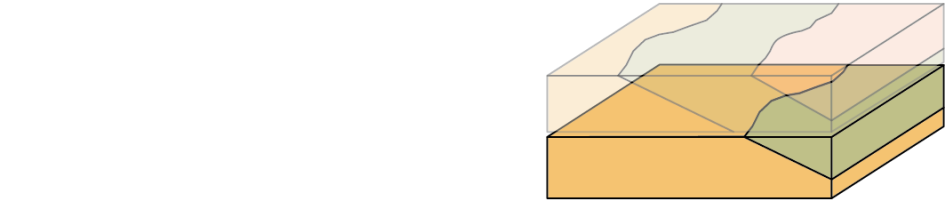
V

Kind: geological outline

Status: in general

Type: Top

LithoStrat: Lower Freshwater Molasse

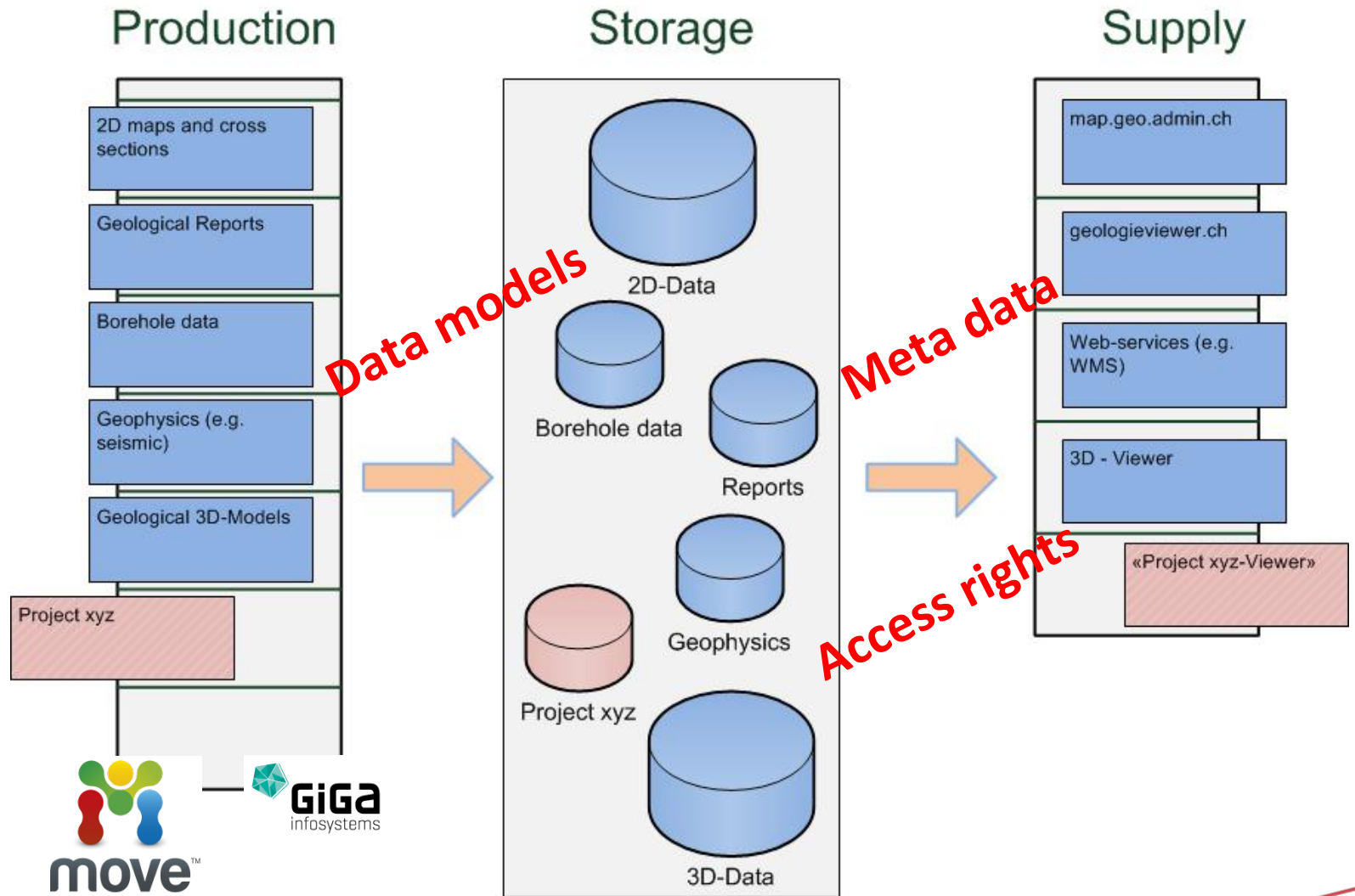


PLG





System view



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WORK IN PROGRESS



Distribution: Data visualisation

The screenshot displays the GeoMol web application interface. At the top, there is a header with the 'GeoMol' logo and a background image of a geological cross-section. Below the header is a navigation bar with tabs for '3D Geology' and '2D Geology', and a menu with options: 'Zoom to all', 'Z Scale', 'Change Background', 'Toggle WMS Overlay', 'Manage WMS', 'Toggle Mesh', 'Troubleshooting', 'About', and 'View Link'. The main interface is split into two panes. The left pane, titled 'Model View', contains a 'Feature View' section with a tree view showing 'Framework' and 'Lausanne'. Below this is a section titled 'Operability of the model' with three icons and labels: 'Rotate 3D Model', 'Move 3D Model', and 'Zoom 3D Model'. At the bottom of this pane is a 'Current Coordinate System' dropdown menu. The right pane shows a 3D visualization of a geological model, which is a topographic map of a region with various colored areas representing different geological units. A small 3D coordinate system icon is visible at the bottom left of the main visualization area.

AVAILABLE

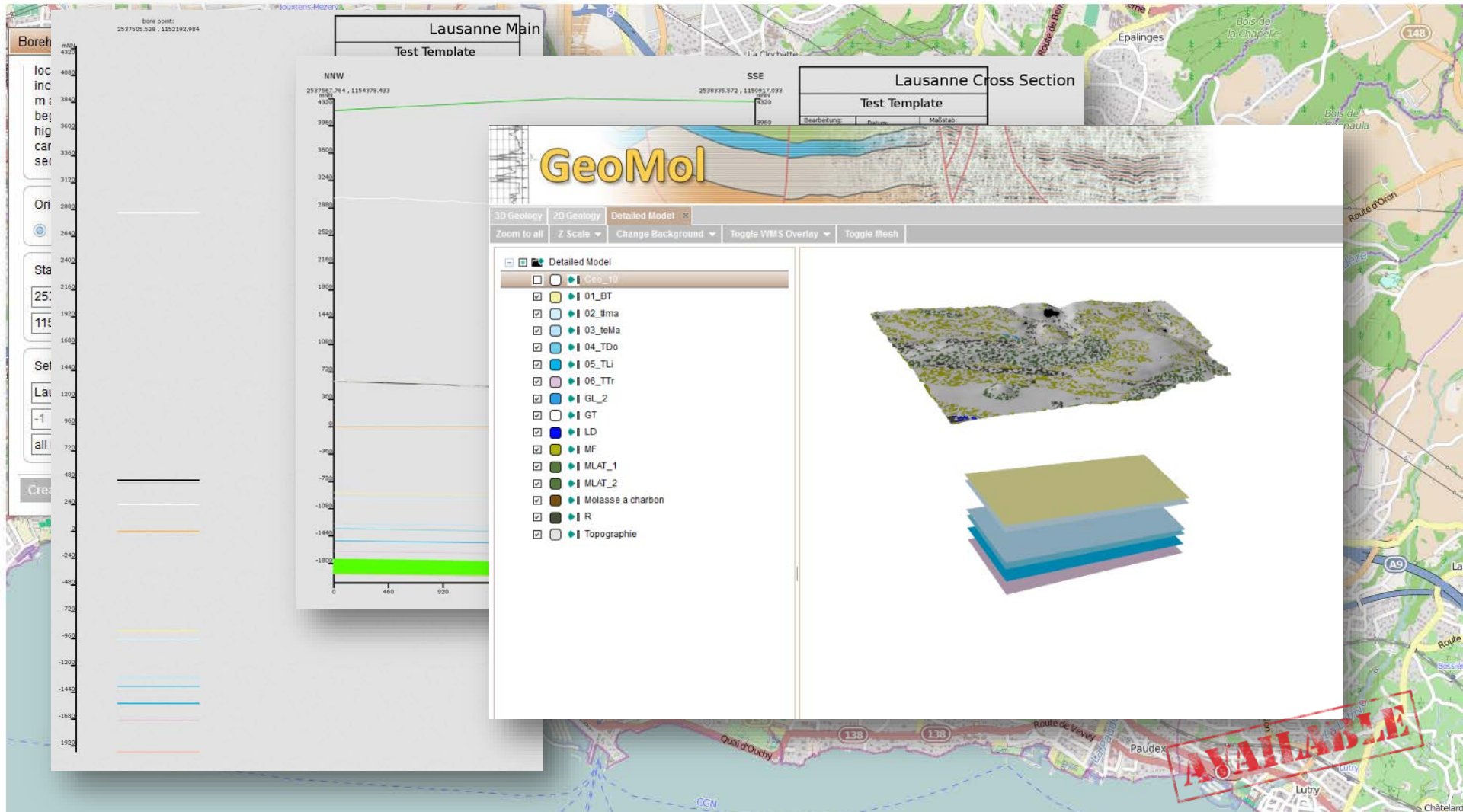


Distribution: Data analysis



GeoMol

3D Geology 2D Geology Borehole Crosssection Area



AVAILABLE



Integration into user's systems

- Data supplied to / obtained by the user needs to be fully attributed according to the Data Models
- Data in use by the user also needs to be attributed based on the DM
- Seamless merging data sets allows the user to immediately processing the downloaded data
- Requirements
 - Integrated, trans-dimensional Data Models
 - Standardised and automated exchange protocols
 - Standardised data formats



Outlook

“The economic benefit of one published geological map sheet is 6 to 8 times higher than the value of the input data”
→ 220 map sheets x 25m CHF = 5.5bn CHF x 6

Additionally, we need

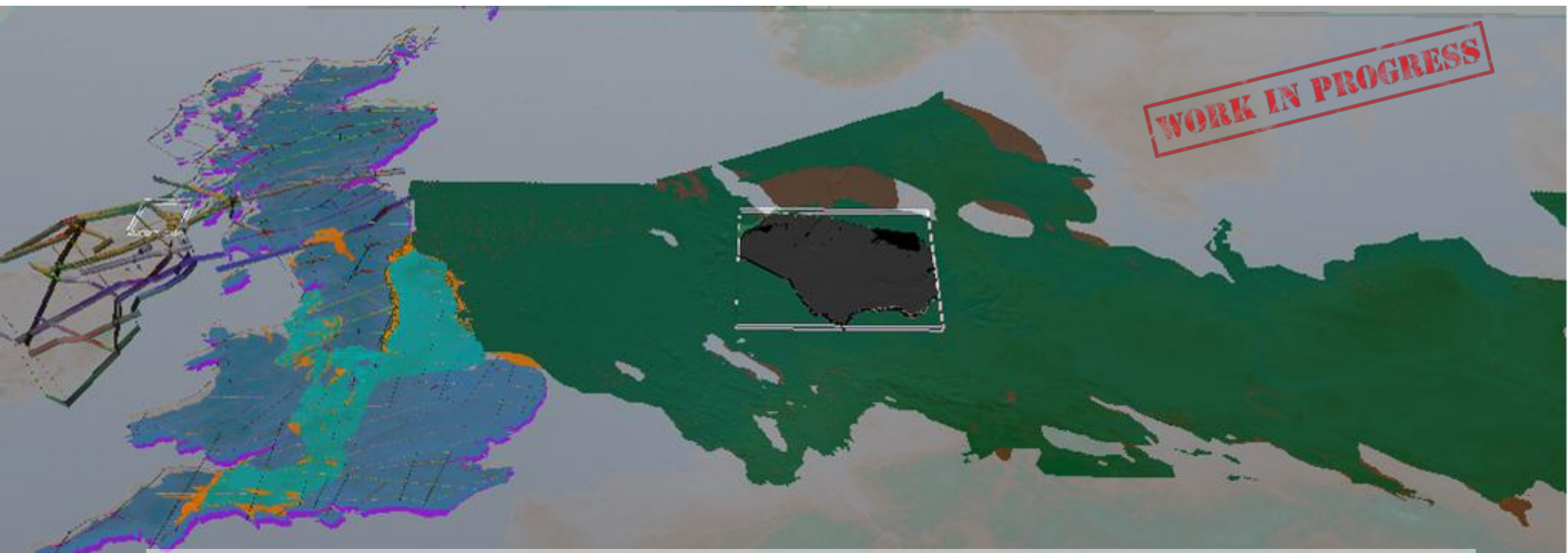
- provide available data in new context and conditioned format
- to reduce the amount of work needed for post-processing the data by the client → economic benefit
- to ensure the availability of comprehensive datasets, nationwide and trans-nationally → economic benefit
- to de-complicate the data exchange between data suppliers and clients

The data is available – we need to hook the clients



Questions & answers

WORK IN PROGRESS



Thank you for your attention

Contact

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