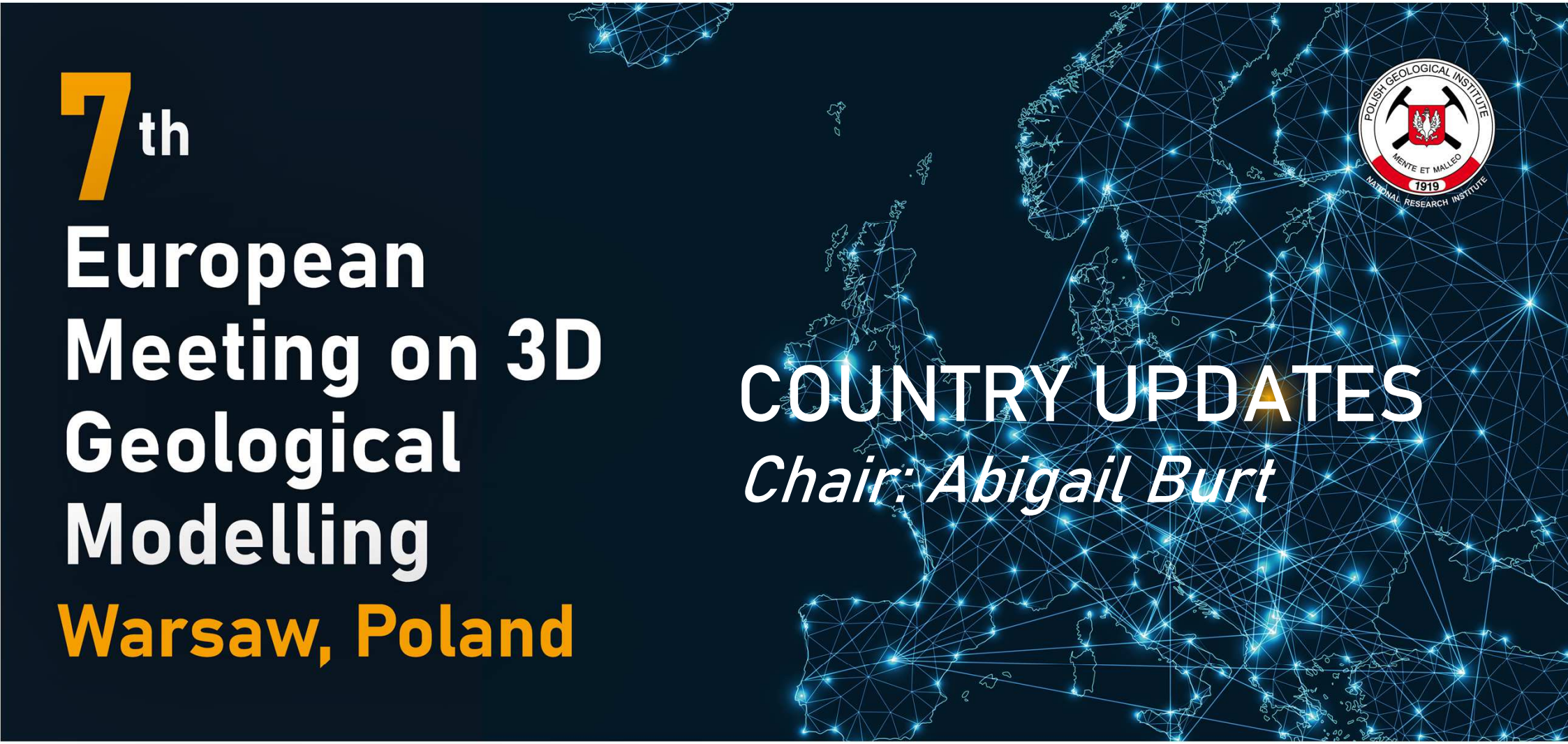
7th European Meeting on 3D Geological Modelling

Warsaw, Poland



COUNTRY UPDATES

Chair: Abigail Burt

POLAND25.EU

Partners: BOGDANKA, GiGa infosystems, GEOScene3D ...by I•GIS, NATIONAL FUND FOR ENVIRONMENTAL PROTECTION AND WATER MANAGEMENT

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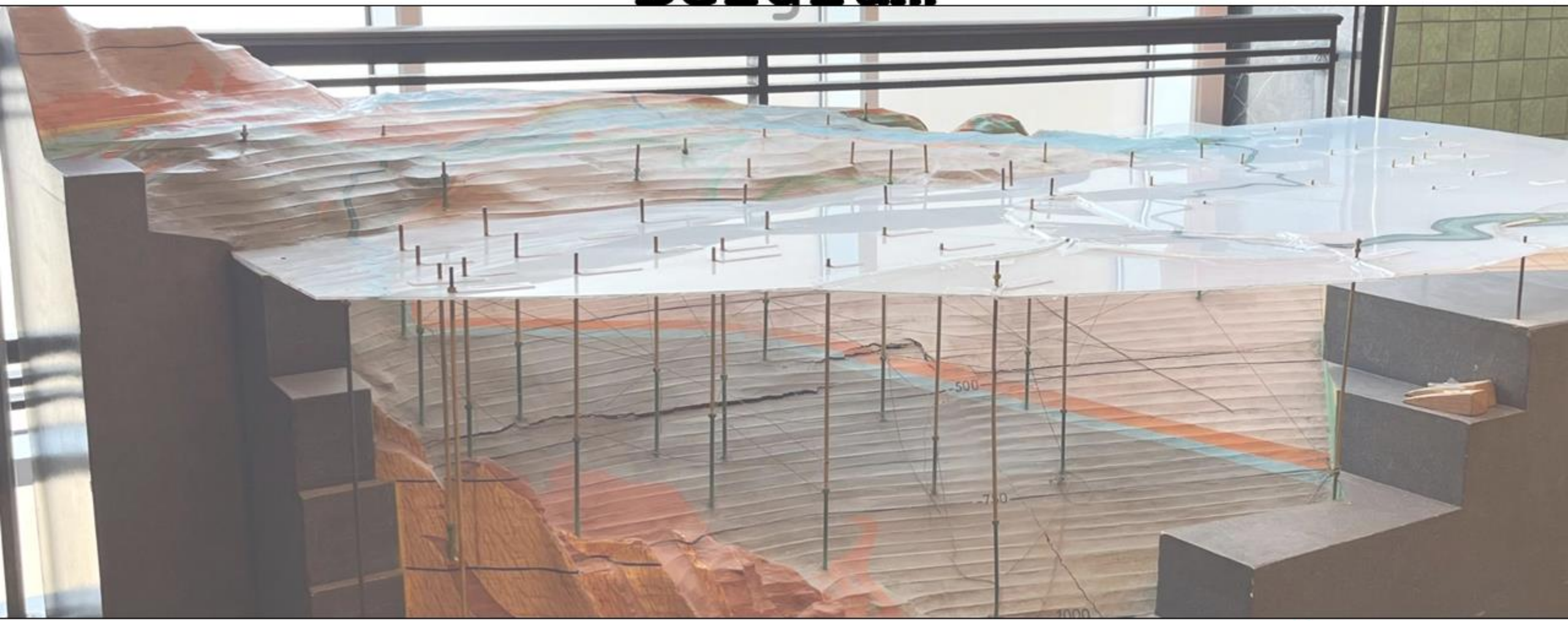
Country update: Belgium



Presented by
Jan Walstra (GSB)

natural sciences .be
Geological Survey of Belgium
Flanders State of the Art
vito
Wallonie
be be.brussels

Flanders Geological 3D Models

Integration 3D Models

geological knowlegde, G3Dv3 and derived models

H3O, natural resources models, shallow urban models, deep parameter model (Dinantian – Westfalian)

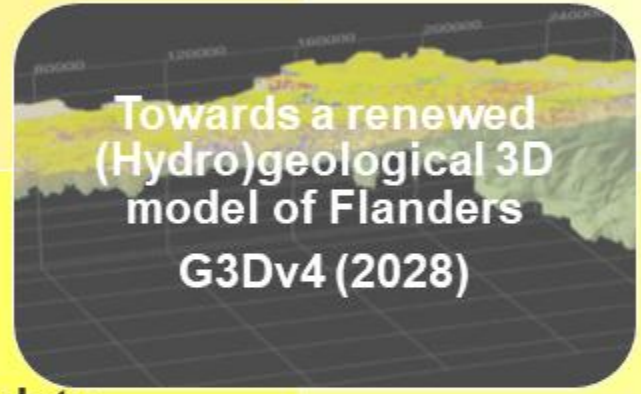
Voxel model

Geological and application parameters

Reservoir parameters

Innovative techniques (AVO-analysis)

+ **visualisation**



Procedural update

Data – Quality control

Conversion to new CRS

(ETRS89 Belgian Lambert 2008)

Modellers

Integration with field work and scientific research

Flanders State of the Art

vito

Higher potential for subsurface application and tools

- **General-purpose model with potential for meeting societal needs**
- Societal challenges: Risk assessment, raw material supply, energy, environmental policy, usage of underground space (in urban areas), climate adaptation and mitigation.

Policy Ministry of Environment 2024-2029

- Efficient and sustainable shallow and deep subsurface management
- Natural resources Plan
- Critical Raw Materials Act
- Integral Vision Deep Subsurface
- Deep Subsurface Decree, including risk assessment
- Einstein telescope

Cross-border collaboration

- H3O modelling
- Integration of data, interpretations and methodologies
- Subsurface and groundwater policy

Hydrogeology

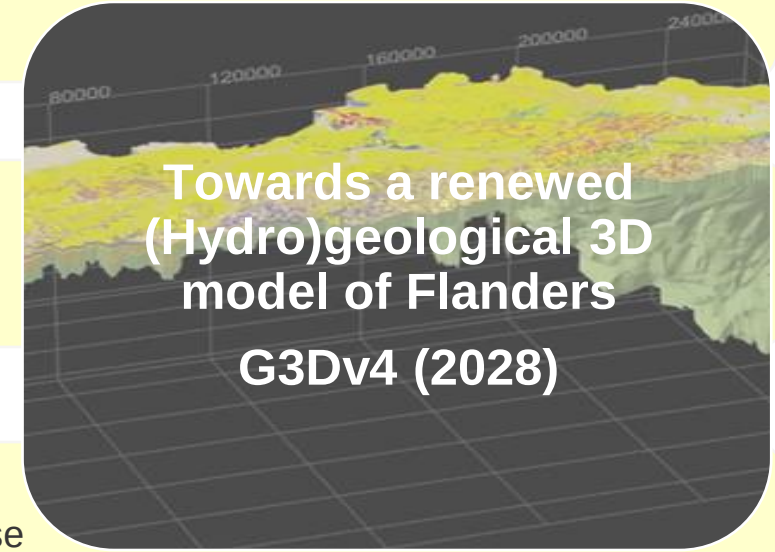
- Uniform geo-hydro base model for government and civil society

Scientific backbone and innovation

- GSEU – WP6 3D modelling
- Visualisation: integration geology, applications and subsurface use
- Seismic attributes analyses (AVO,….)

Talk: Modelling anthropogenic disturbance in the Brussels Periphery
Roel De Koninck –Thu 16:45

Poster: 3D modelling for subsurface policy needs
Helga Ferket



Einstein Telescope

- Candidate site for gravitational observatory
- Border region BE-NL-DE
- Drilling campaign ongoing
- Next challenge: geological modelling

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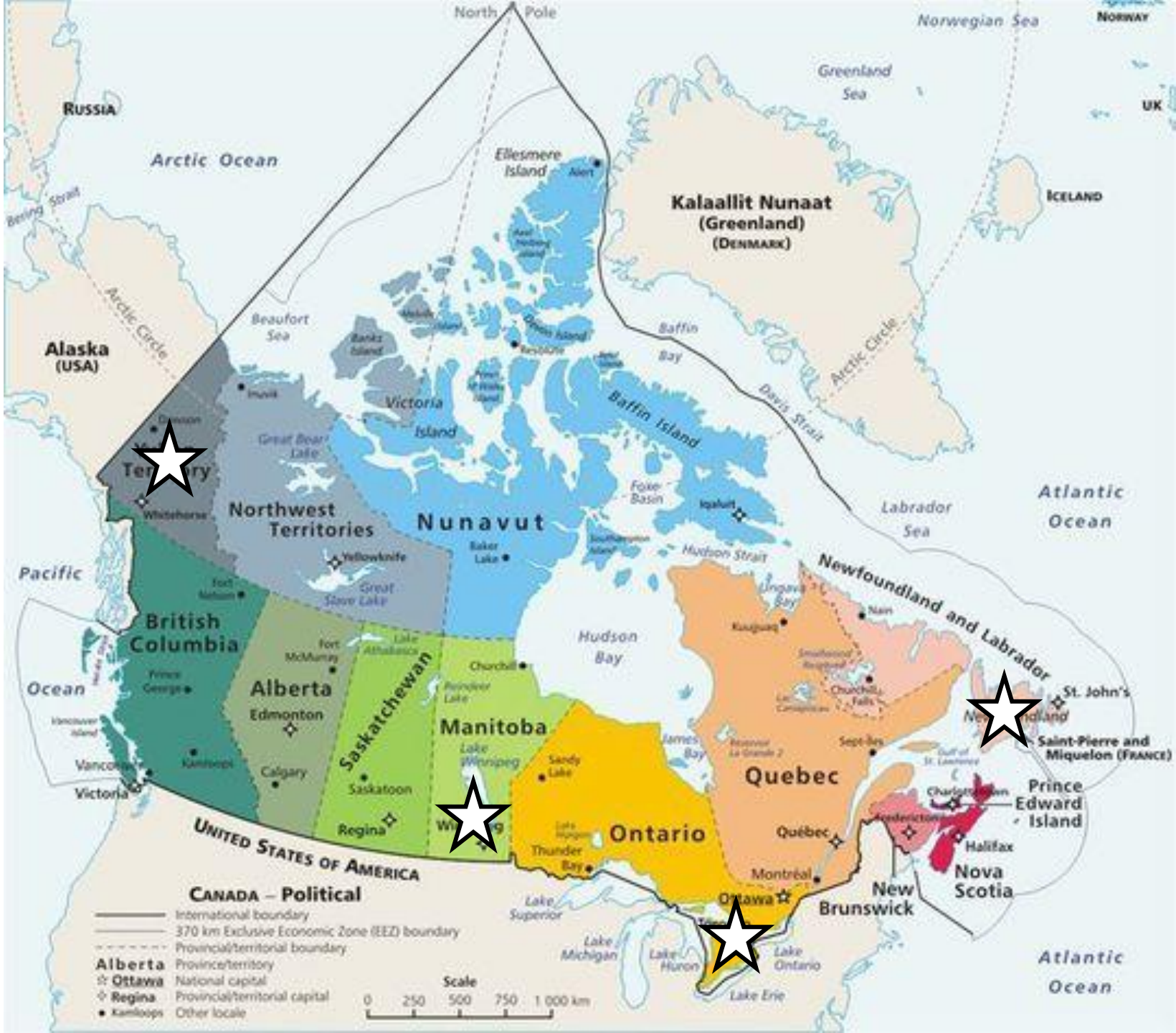
Intergovernmental Geoscience Accord

Geological Survey of Canada

- Multijurisdictional
- Lead on international geoscience activities

Provincial and territorial surveys

- Systematic mapping and thematic studies
- Provincial-regional-local scales

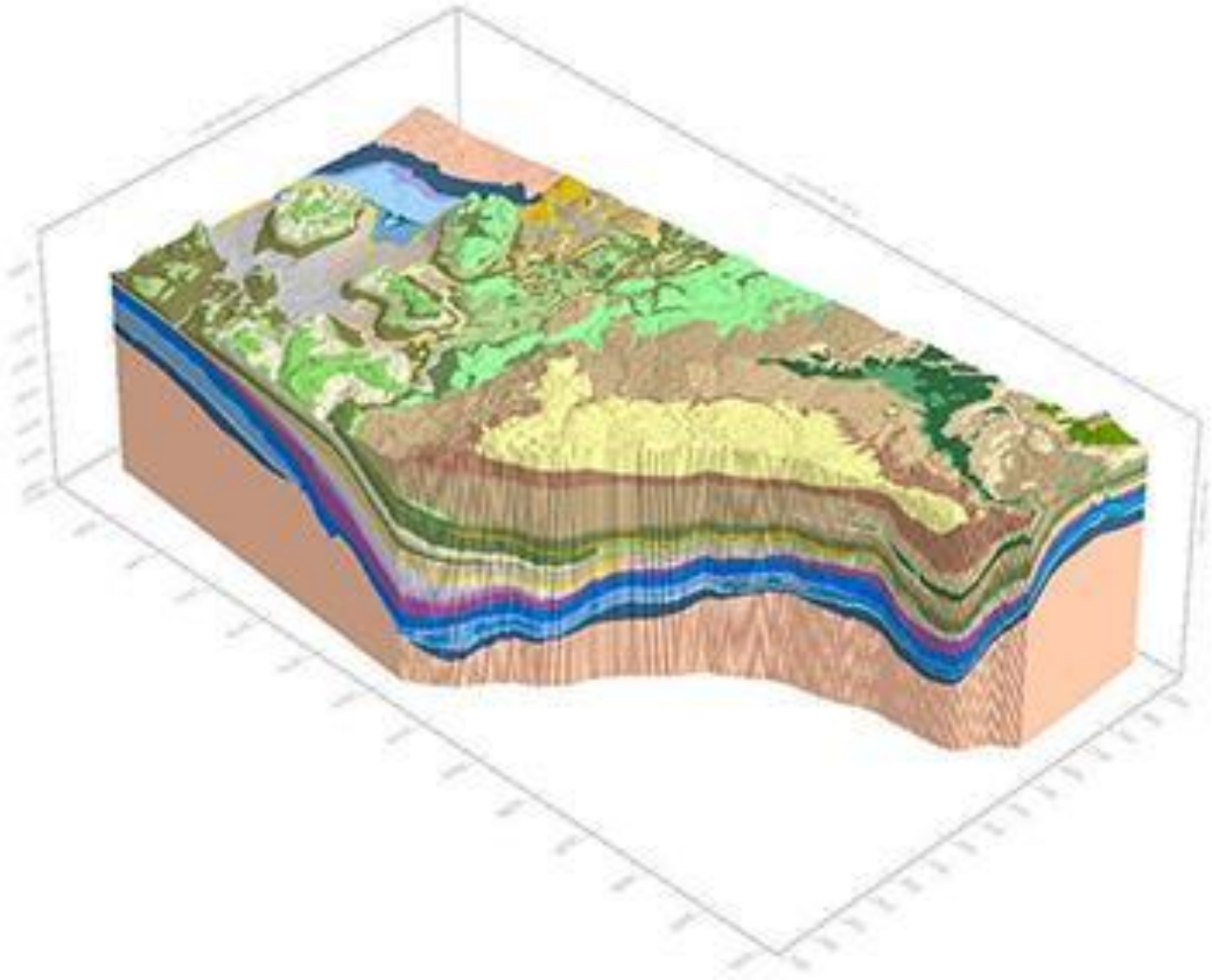


Alberta Geological Survey 3-D Modelling

Geologic framework

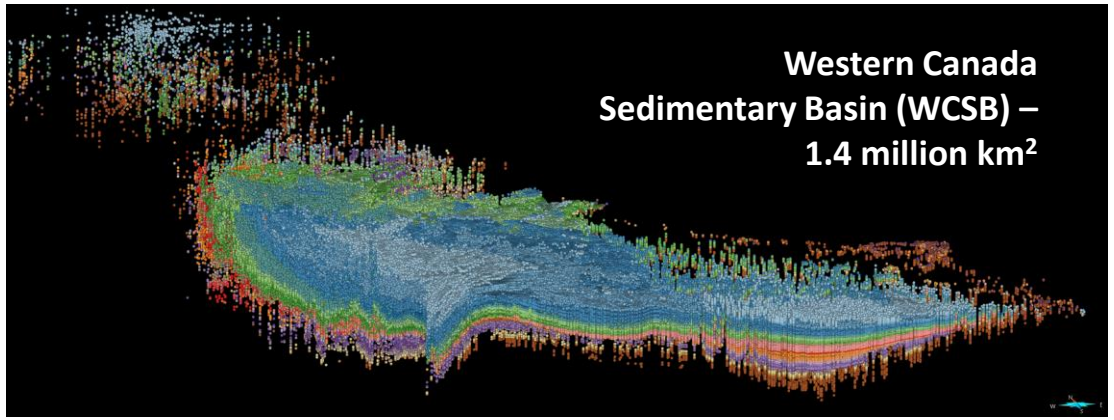
Sub models

Property models

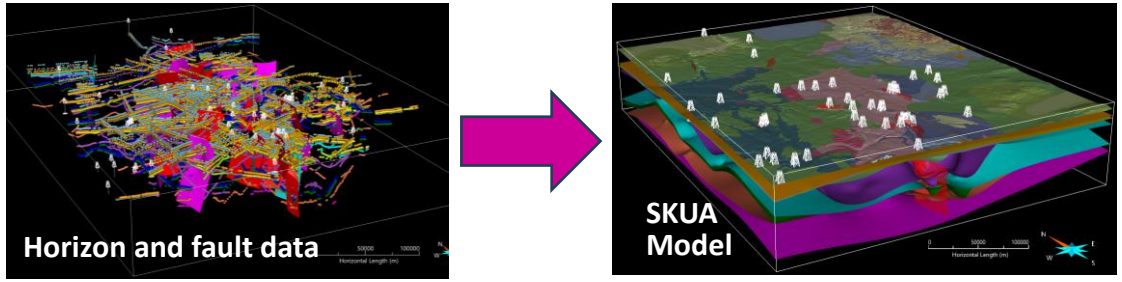


Geological Survey of Canada 3-D Modelling

1. Development of deep learning approach - advanced neural networks



2. Modelling structurally complex, sparse data regions, primarily with map-based data

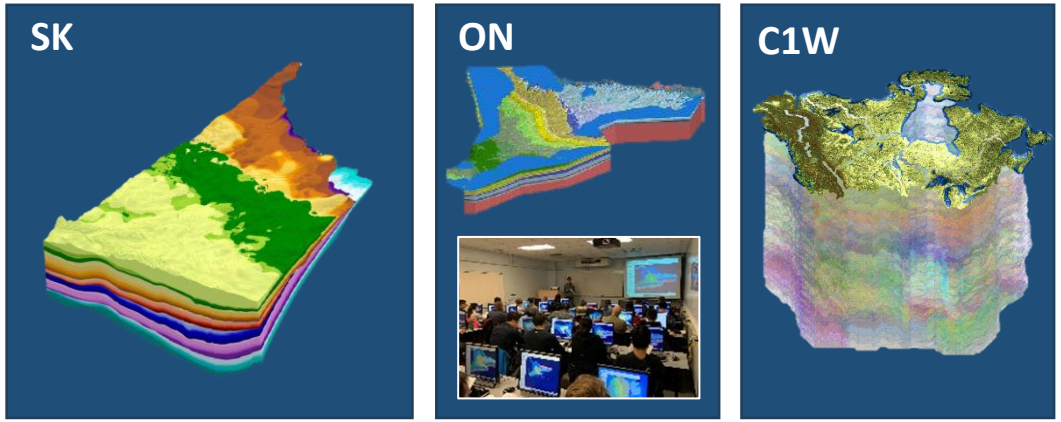


3. Canada1Water (C1W) continental scale numeric groundwater–surface-water modelling

4. Energy transition model support: hydrogen storage, CO_2 sequestration, geothermal, critical minerals.

5. Provincial collaborations

6. 3-D geological education and outreach



M. Hillier: michael.hillier@nrcan-rncan.gc.ca; K. Bédard: karine.bedard@nrcan-rncan.gc.ca; C. Logan: Charles.Logan@nrcan-rnca.gc.ca; H. Russell: Hazen.Russell@nrcan-rncan.gc.ca

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Country update – Czech Republic

Jan Franěk, Ondřej Švagera, Martin Kýhos, Jiří Rez et al.

7th European meeting on 3D geological modelling, 8.-11.4.2025, Warsaw, Poland

Current state and near future plans

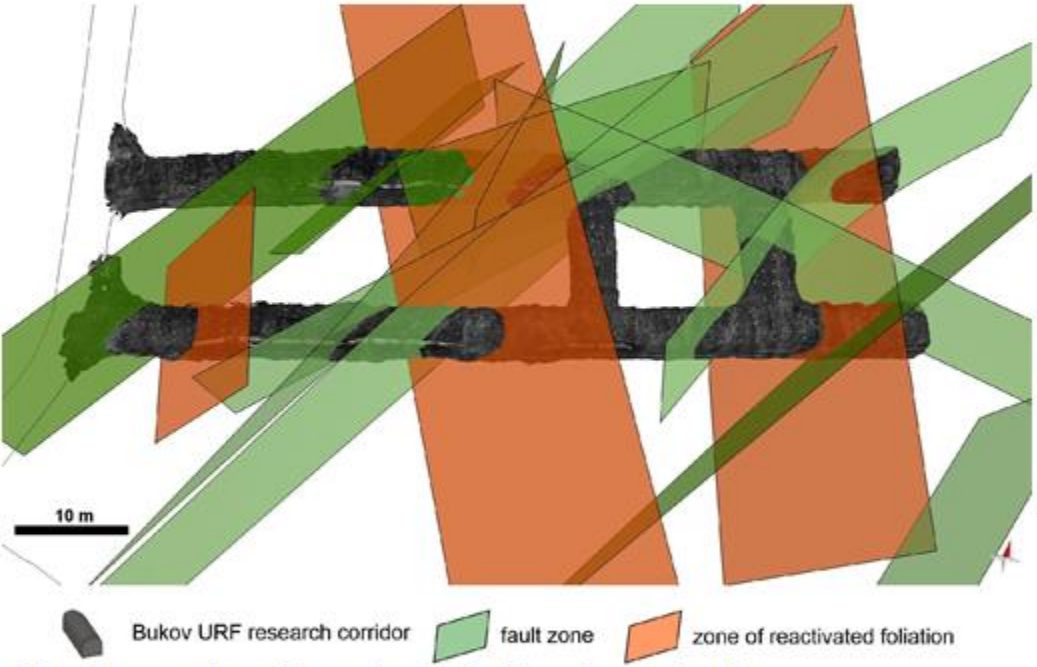
- Mainly project-related modelling of isolated areas of interest
- Model content and modelling techniques thus also project-dependent
- Generalized methodology, storage, metadata and web presentation are being formalized in CGS internal instructions
- Modelling mainly in MOVE sw.

Main development topics are now:

- General geological models for radioactive waste disposal or CO_2 storage research
- Photogrammetric models of surface outcrops and mines/tunnels
- Ore deposits and related mining excavations
- Construction sites of tunnels and power plants incl. exports to BIM IFC format
- Virtual reality for promotion of geology
- Feeding of AI algorithms with geoscientific 3D data

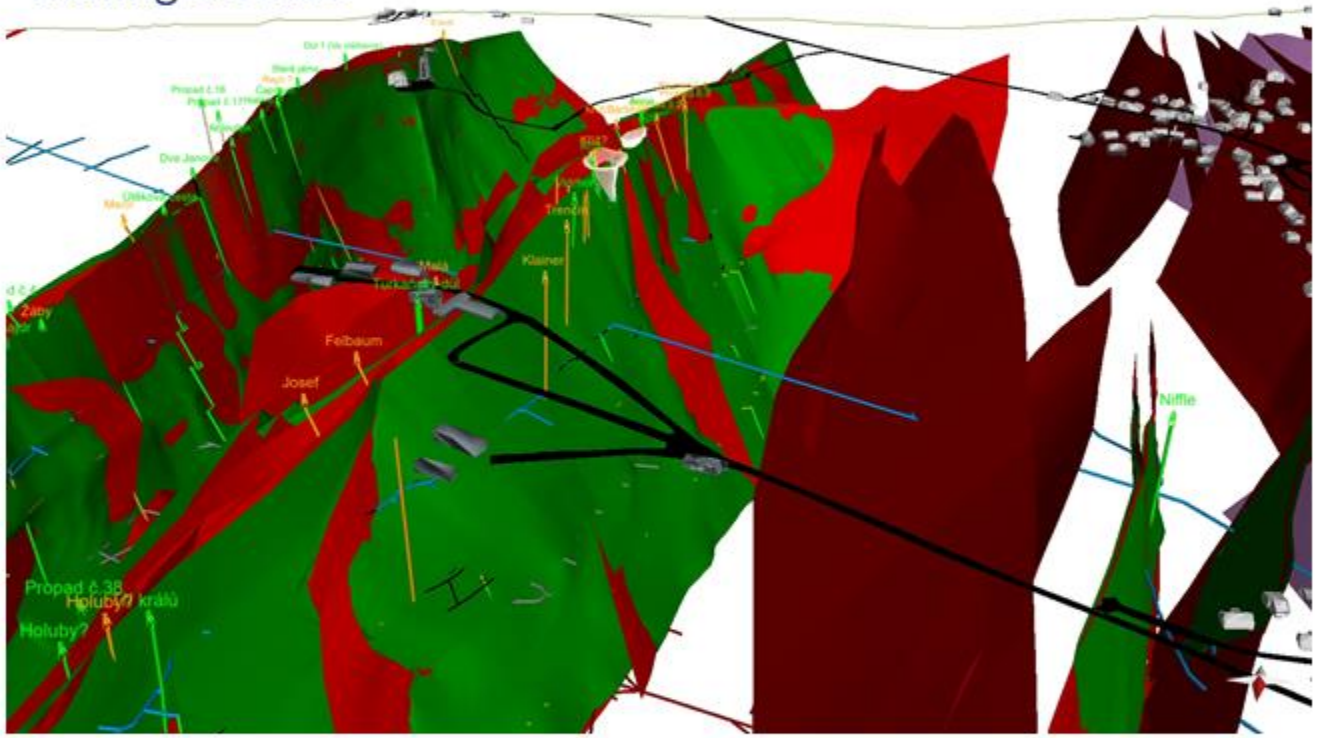
Mining-related models

Example of newly excavated spaces for planning of in-situ experiments related to radioactive waste disposal.



Most prominent geological structures in the northern part of the Bukov Underground Research Facility, captured using in-situ mesoscopic structural measurements and photogrammetric models of the URF corridors.

Modelling part of medieval to subrecent Kutná Hora mining district.

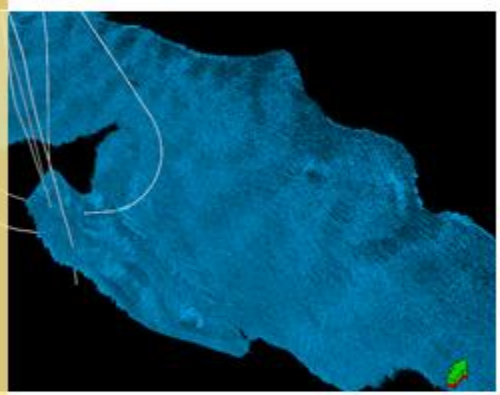


Buildings are grey, roads are black, vertical shafts are green (100% known) or orange (about 80% certain).
Horizontal mining excavations are colored according to depth level.
Red areas are faults to which mineralization is tied (green).
White grid shows mine sinkholes.

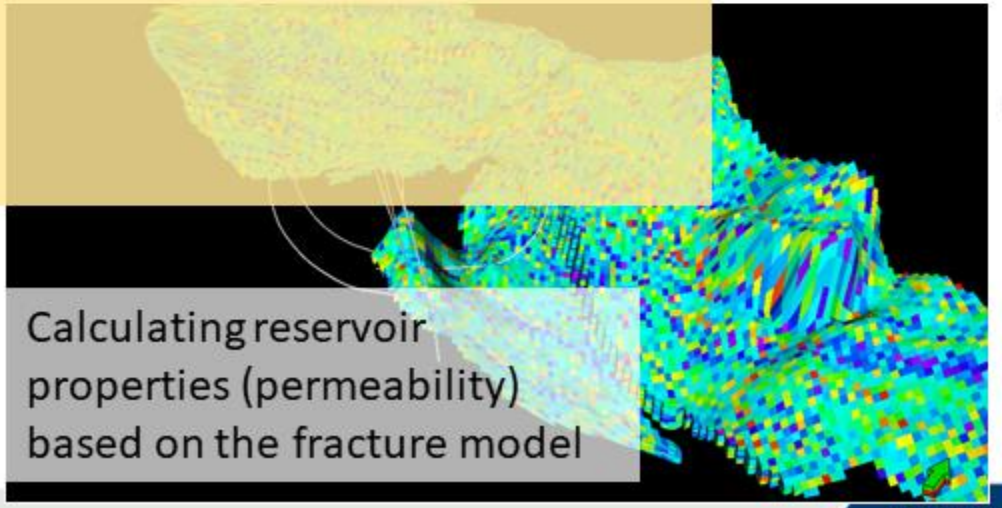
Virtual reality

As part of the 3D modelling projects at the CGS, a "virtual museum" presented in virtual reality is being created. The models can be viewed in VR from all angles at a scale of 1:1 and in a reduced version at a scale of 1:100 in the open source game engine Unreal Engine 4. They are used during promotion activities of the CGS.

CO_2 storage models



Upscaling the FMS data to



Calculating reservoir properties (permeability) based on the fracture model

Interested in construction site modelling and BIM? – see our joint presentation with Z. Rudovský

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Country update - Denmark

Development of new modelling methods for three different domains and better visualisation of geological models

Super-shallow (topmost 50 m):

Development of new probabilistic voxel modelling techniques (presentations by **Høyer et al.** and **Lorentzen et al.**)

Shallow (topmost 400 m):

Development of tools for better uncertainty estimates of the existing national, hydrostratigraphic layer-model

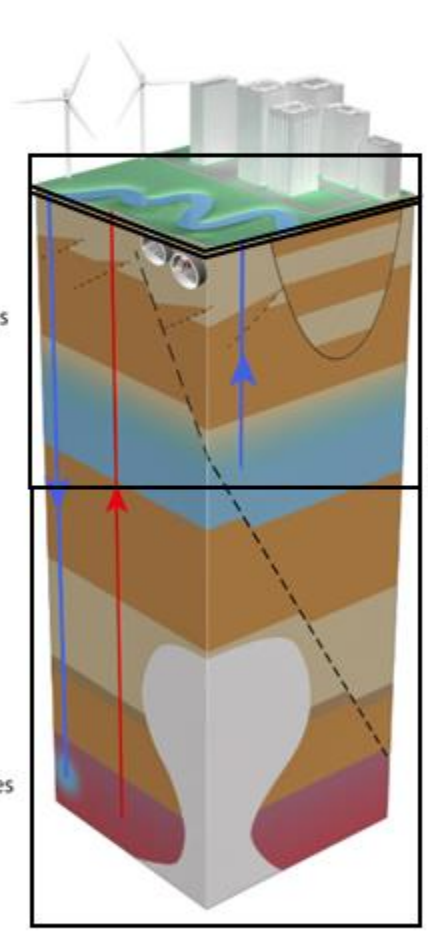
Deep (400 - 3000m):

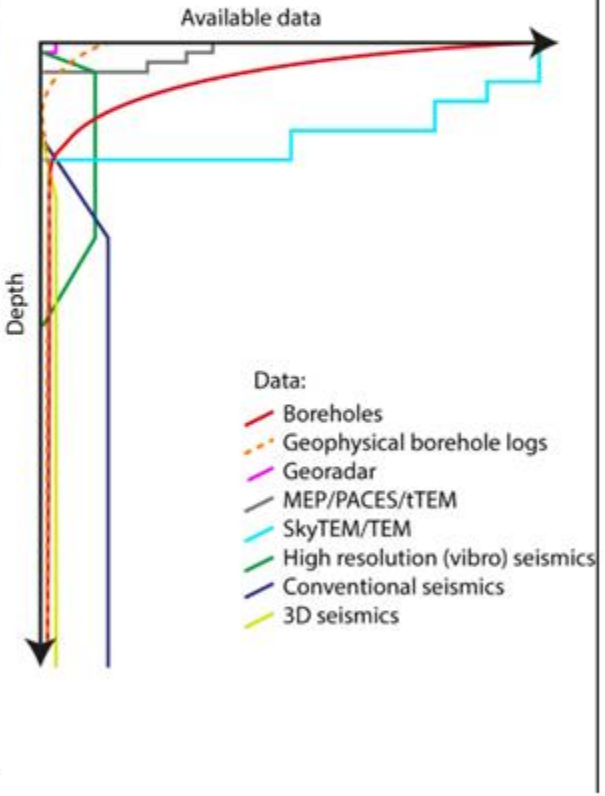
Forward modelling for improved property models (presentation by **Smit et al.**)

3D Database Archive and Visualisation:

Better visualisation of models and uncertainties (poster by **Wiese et al.**)

Application:	Users:
Climate adaption, Environment Construction Energy, Raw Materials	Education Universities Regions Communes Contractors Consultancy firms Metro company Utilities Environmental agency Water works
Groundwater	
Medium-deep geothermal heat CCS	
Deep geothermal heat, CCS	Energy companies Utilities Communes





Super shallow and shallow part

Geological setting:

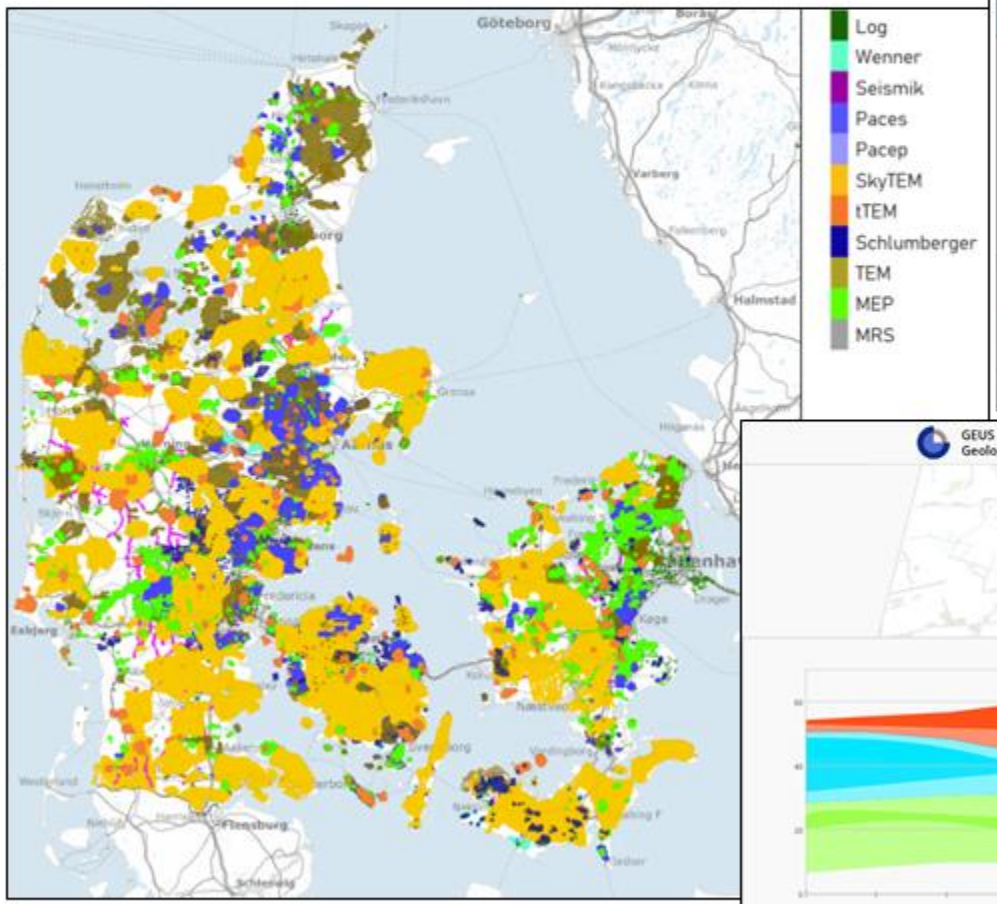
- Sedimentary setting: Complex Quaternary setting (buried valleys, glaciotectonism)

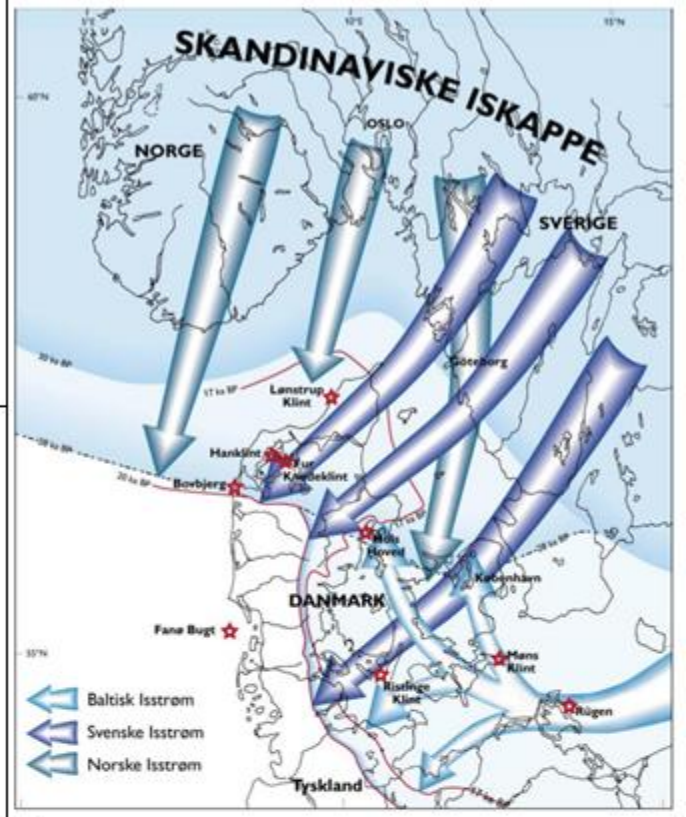
Onshore data:

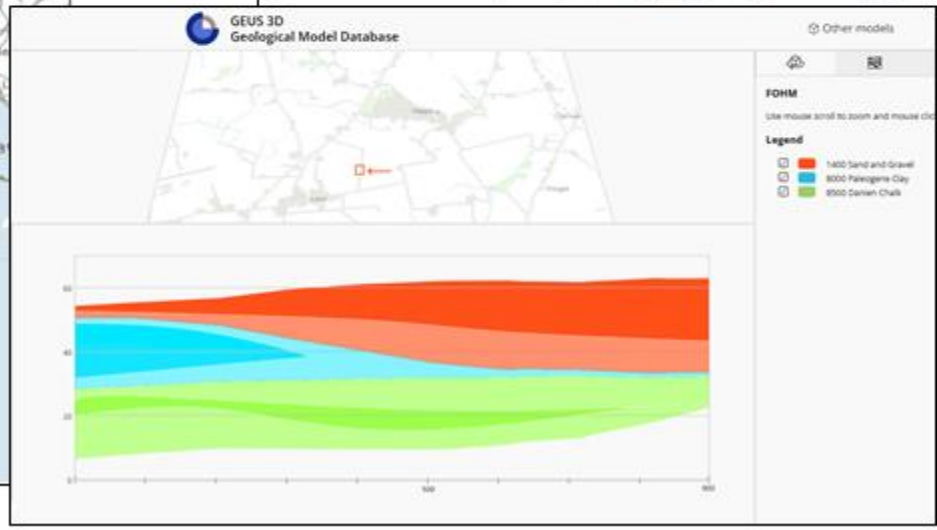
- Many types of near-surface geophysical data (primarily different types of Transient ElectroMagnetic, TEM, data)
- Borehole database (400,000 boreholes, corresponding to 9.5 boreholes/km^2)

Development:

- Super shallow: New voxel modelling methods for better utilisation of dense data **(Høyer et al., Lorentzen et al.)**
- Shallow: Existing layer-model is assigned uncertainties using a new approach
- Visualising models and uncertainties in GEUS' 3D model database **(Wiese et al.)**







Deep part

Geological setting:

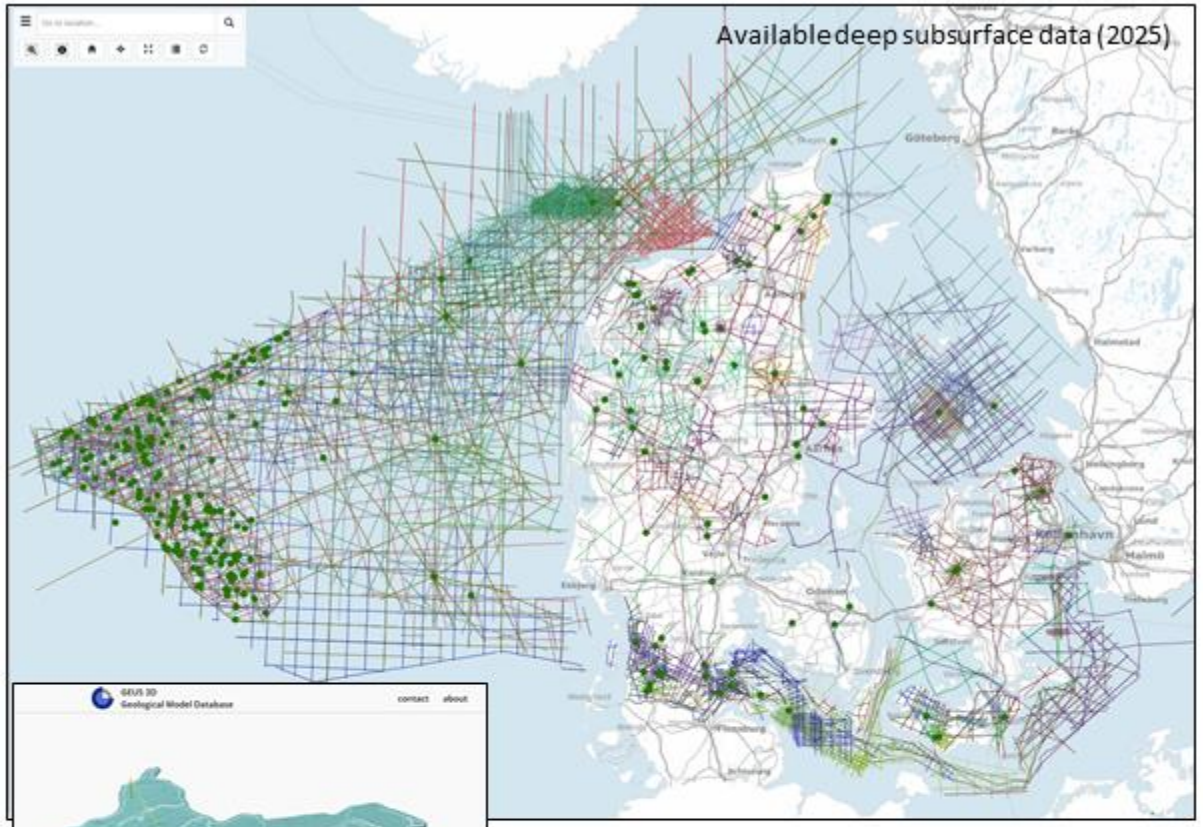
- Sedimentary basin influenced by deep seated fault structures and salt tectonism

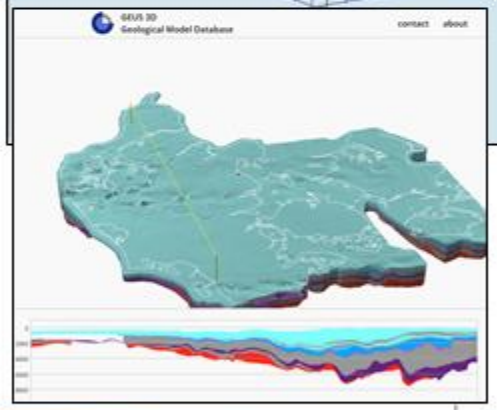
Data:

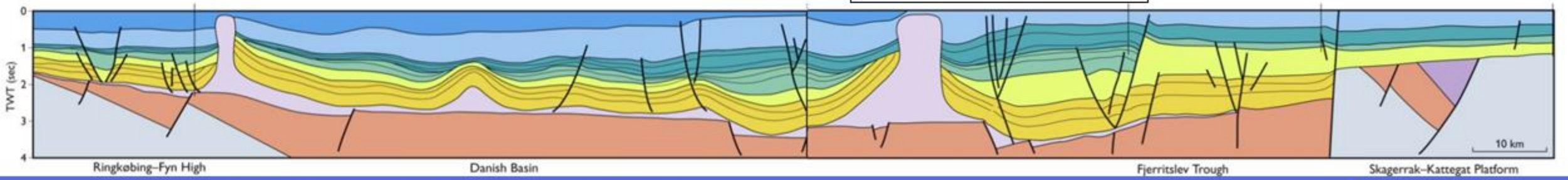
- Vintage 2D seismic data, 3D mainly in Central Graben (O&G)
- Boreholes concentrated in Central Graben, around 50 vintage boreholes onshore

Developments:

- Consolidation seismic interpretation and forward stratigraphic modelling **(Smit et al.)**
- Development of a fault database and better visualisation of existing models in GEUS' 3D model database







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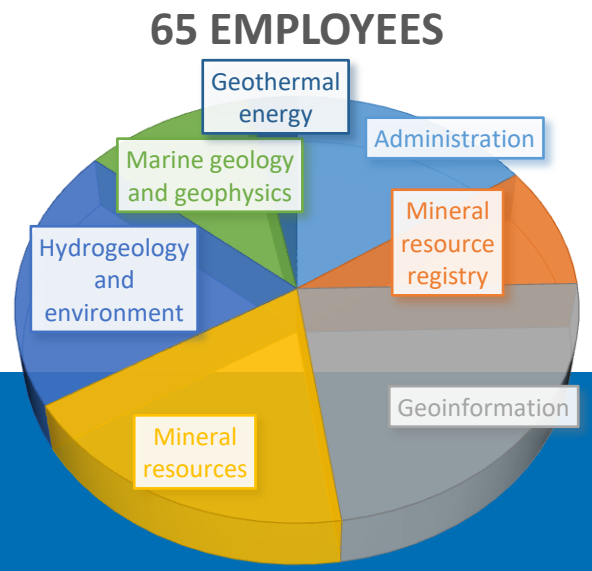
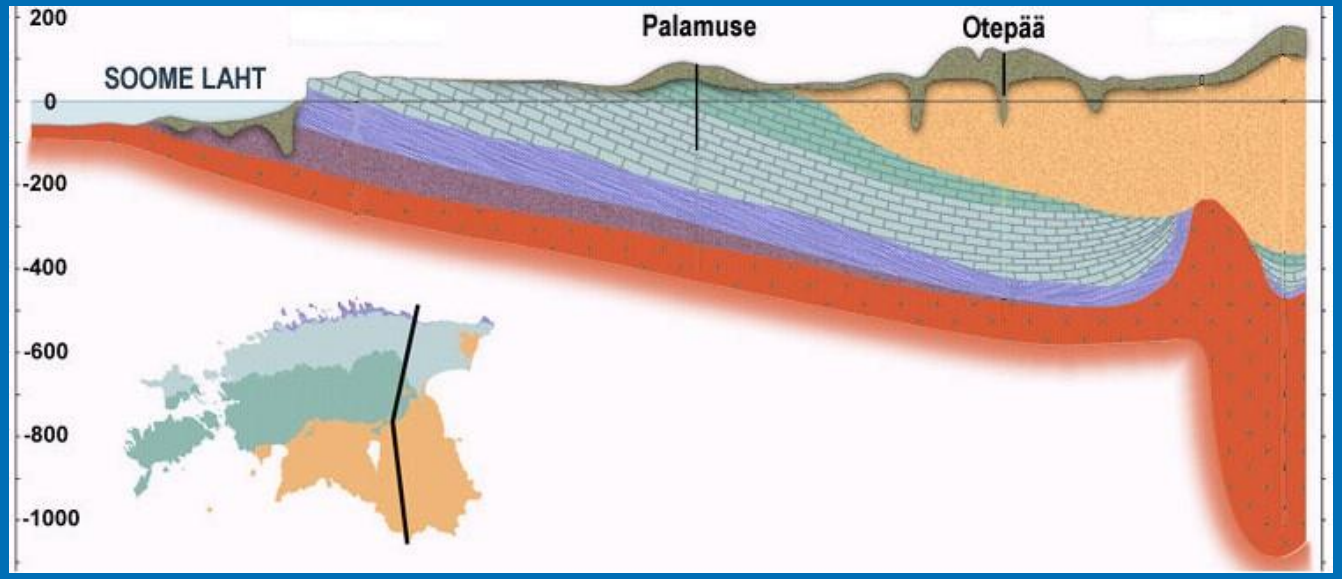
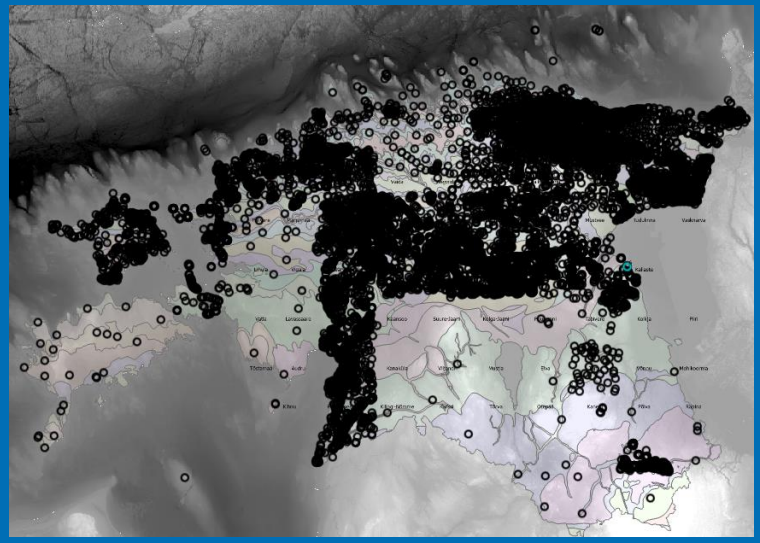
EESTI GEOLOOGIATEENISTUS

Country Update: Estonia





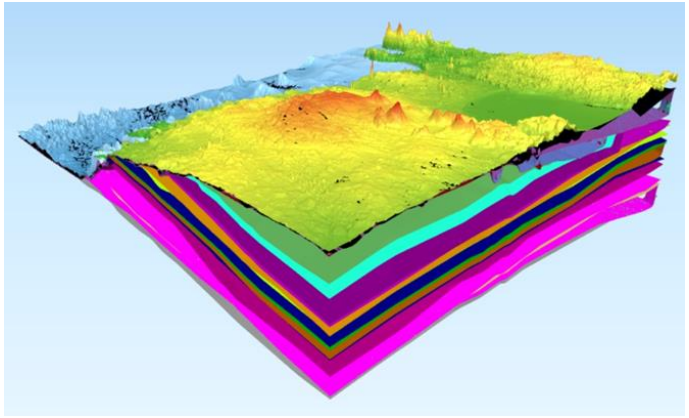


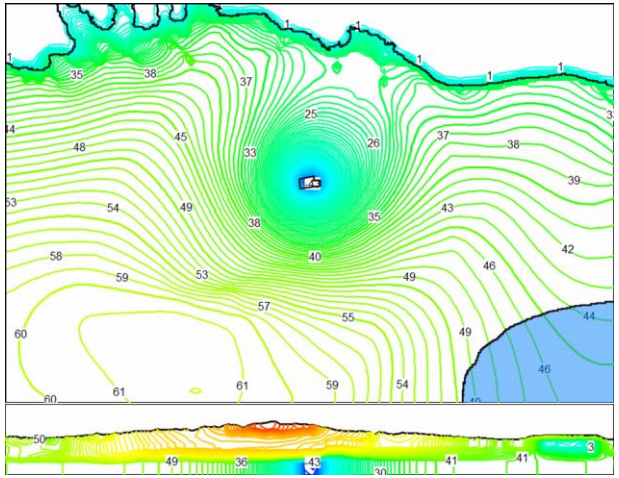
Tavo Ani

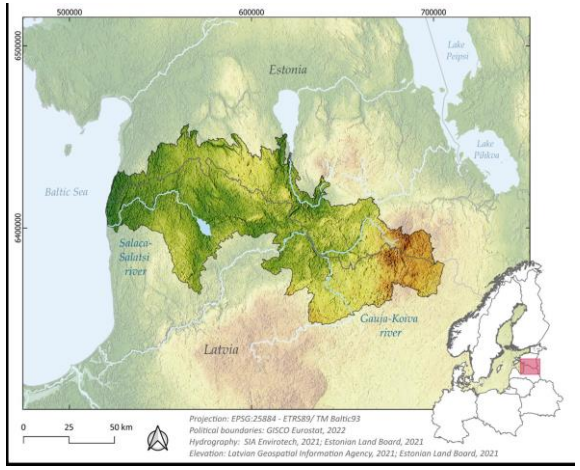
Warsaw, 09.04.2025

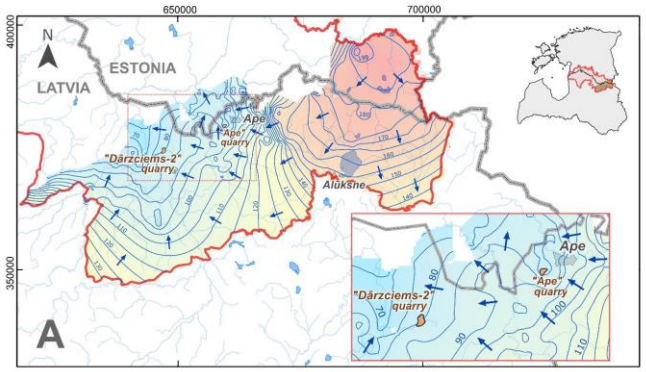
Models that we have

Various hydrogeological models
***Phosphorite exploration**

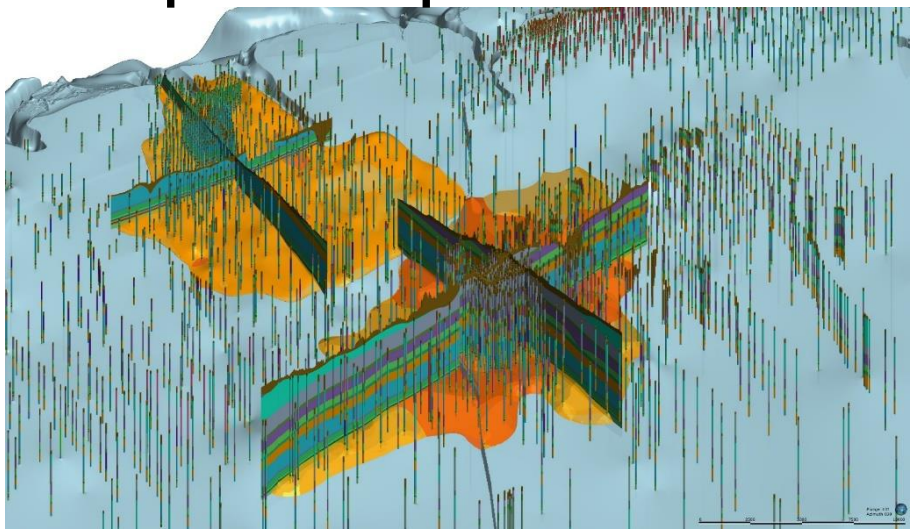




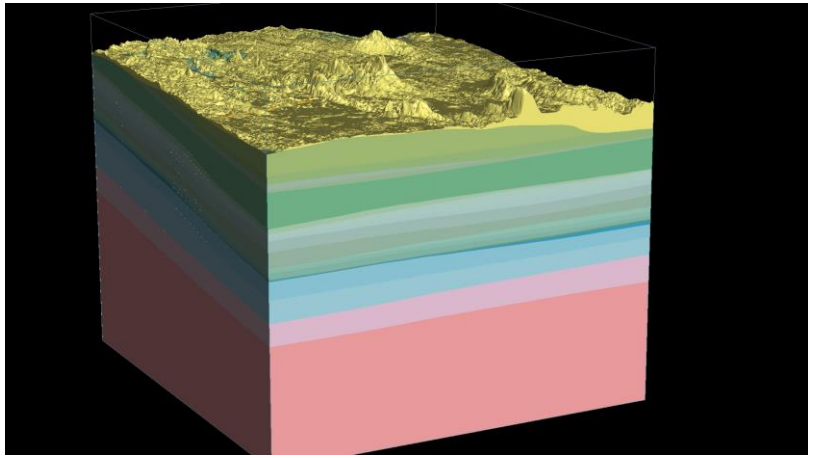




Phosphorite exploration

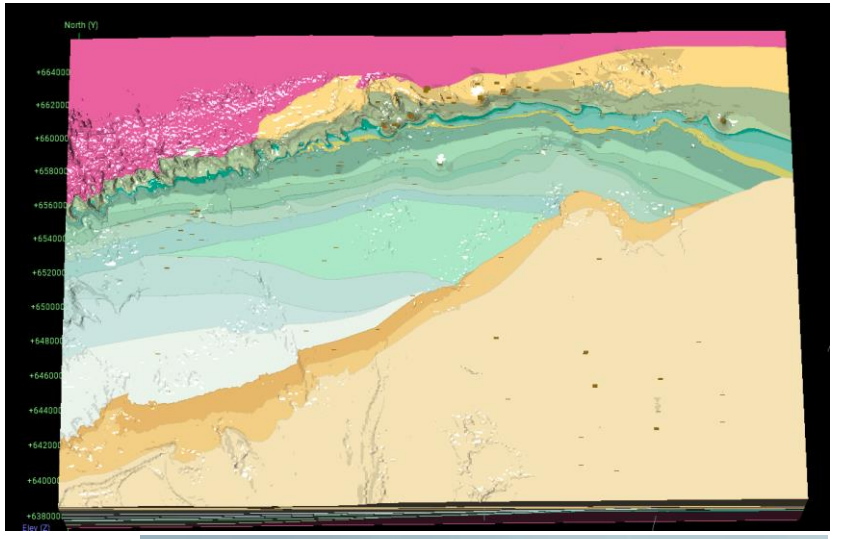


Non-published models for geological mapping



Future plans with 3D

- 3D geological model of Estonia
  - Assignment on Survey level
  - Agreed on modelled units
  - Work in progress
  - Low level priority
- Geophysical data acquisition (tTEM)
  - 2024 2 demo areas (poster)
  - In progress
  - Fast data acquisition
  - Consistent data for:
    - Bedrock elevation model
    - Buried Valleys, karsts
    - Groundwater protection models
- Geological map generation based on 3D models
  - Solution for database QA/QC
  - Automates lots of otherwise manual output



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RÉPUBLIQUE FRANÇAISE
Liberté
Égalité
Fraternité

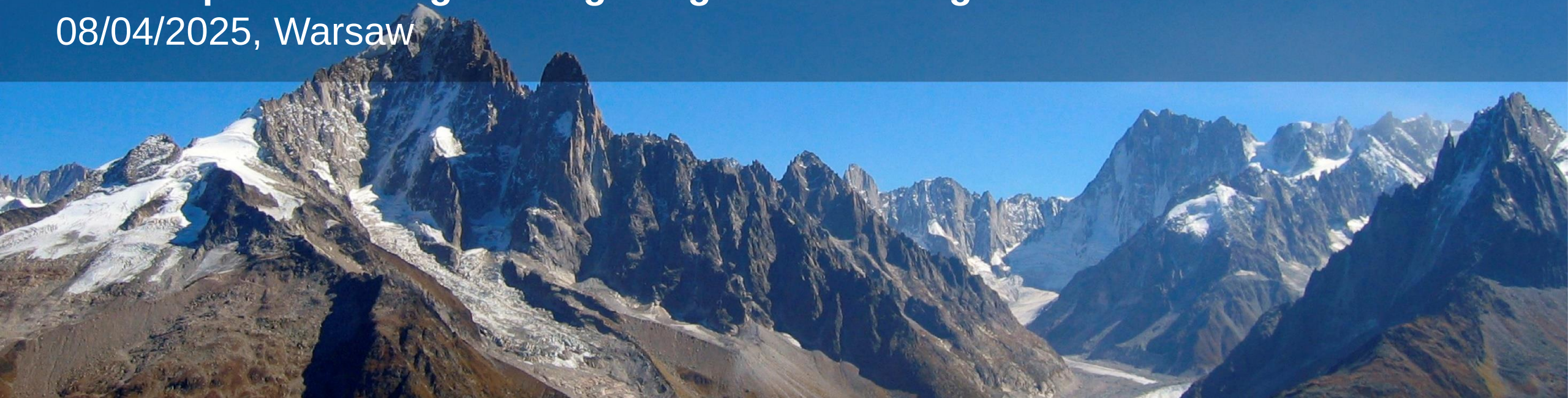
Géosciences pour une Terre durable
brgm

FRANCE - COUNTRY UPDATE

Philippe Calcagno and the BRGM's Geomodelling team

7th European Meeting on 3D geological modelling

08/04/2025, Warsaw



Various levels to support 3D geomodelling

BRGM

- Actions for methodologies/tools development (e.g. ForGEO)
- Actions for modelling strategy (e.g. S3DF)

French community

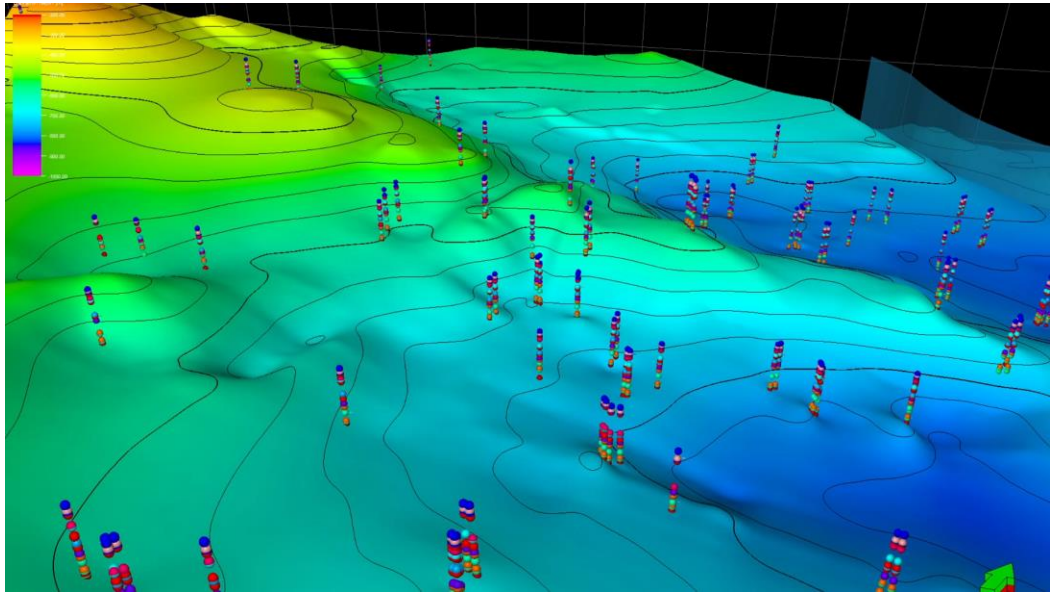
- RGF
- PEPR SousSol
- RING

European

- EuroGeoSurveys
- Geological Service for Europe (HE CSA)
  Task 6.3 dedicated to geomodelling and visualisation,
  led by Simon Lopez (BRGM)

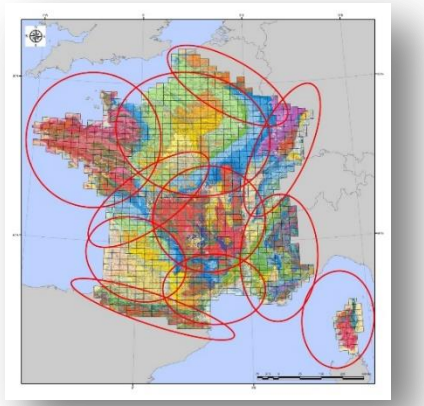
International

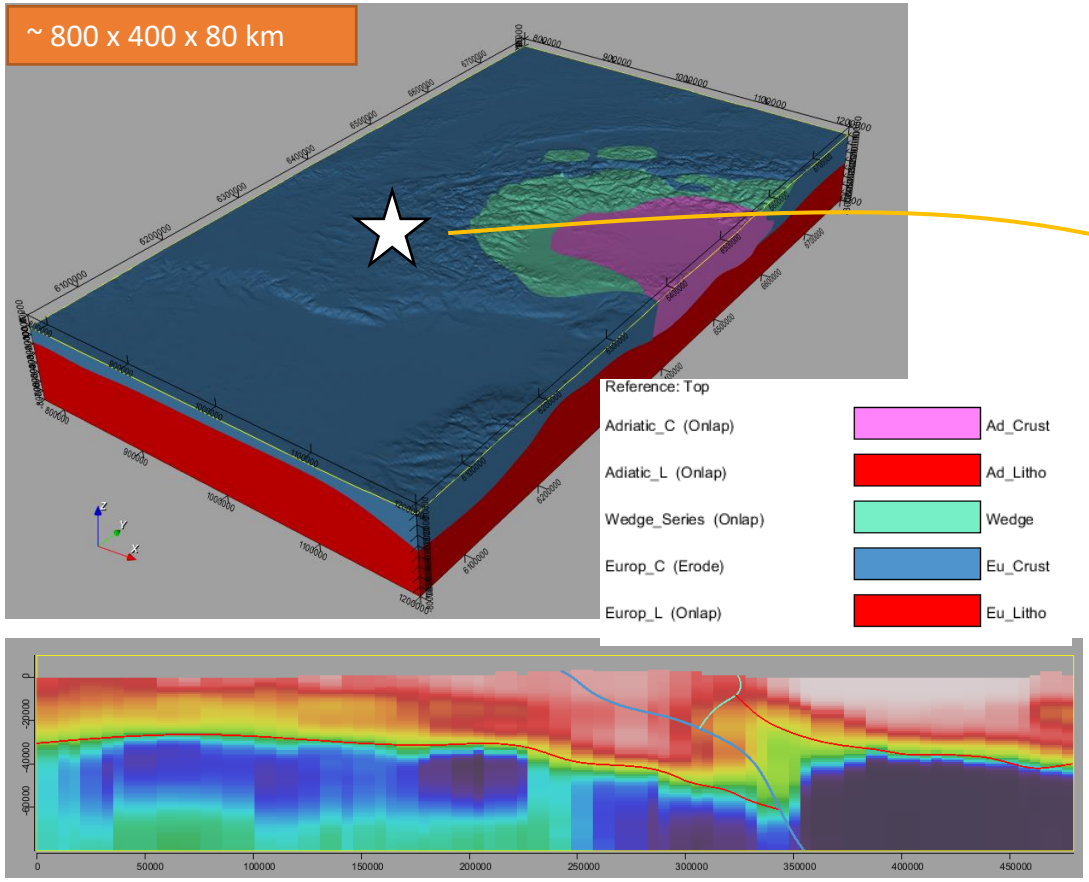
- e.g. Loop



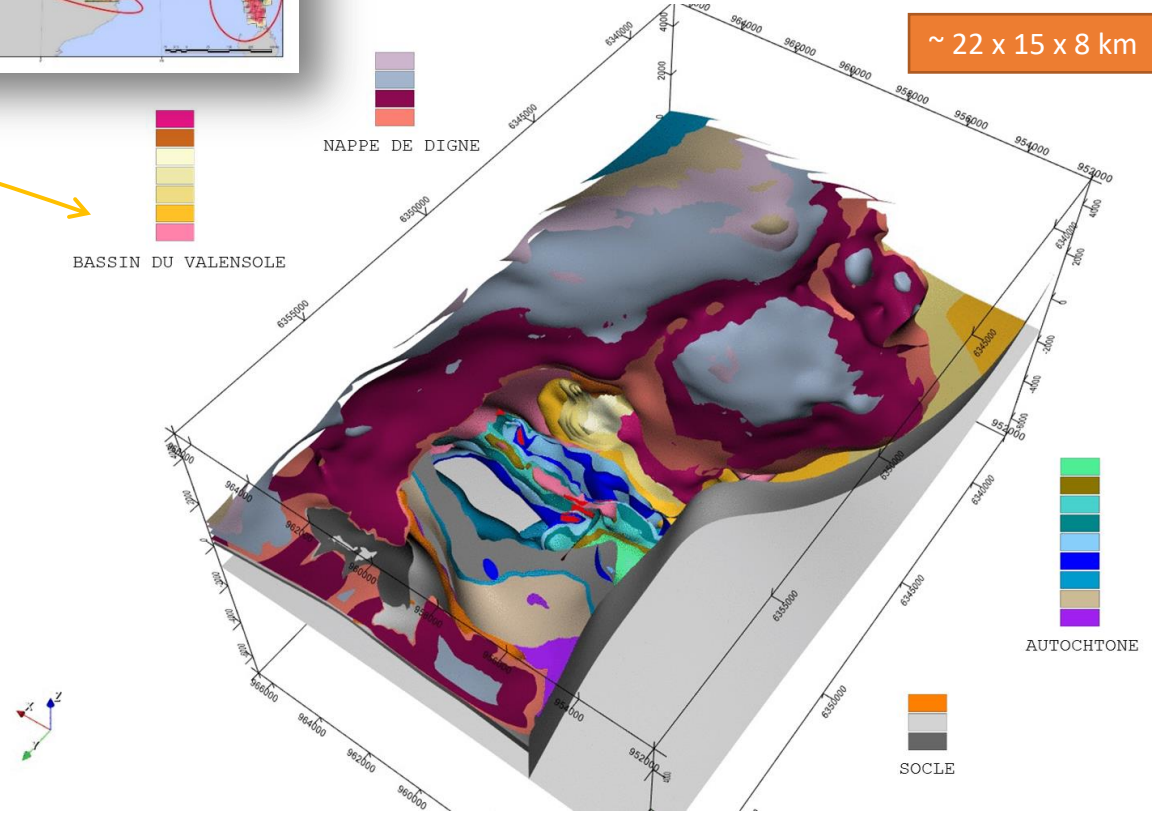
Stratigraphic geometry of the Albian geothermal reservoir of the Paris Basin (ANR UPGEO; Mas, 2022)

Current works





RGF-Alps crustal geomodel

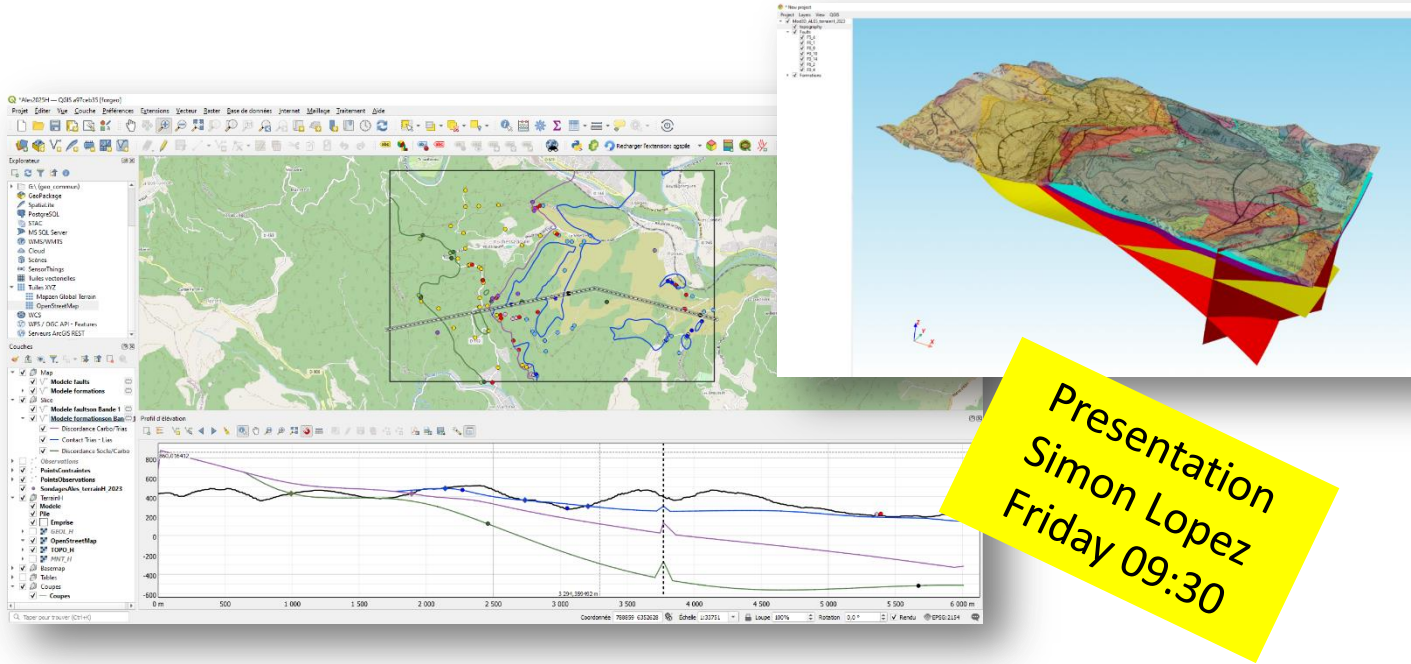


3D geological model of the Digne area (Faure, 2024)

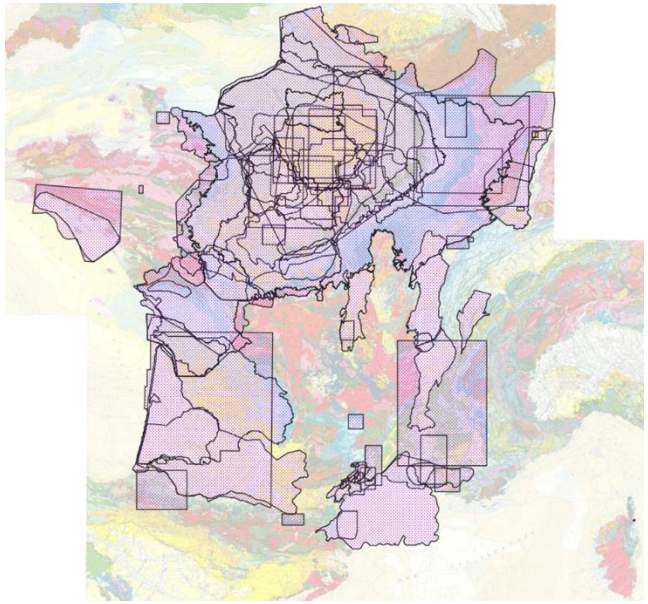
Main challenges

R&D for 3D geomodelling

- From historical tools to versatile open components
- QGIS as an host
- Scientific integrative platform



Presentation
Simon Lopez
Friday 09:30



Geological model of continental France

- 1M scale
- Model development for orogenes and massifs
- Integration
- Multiscale

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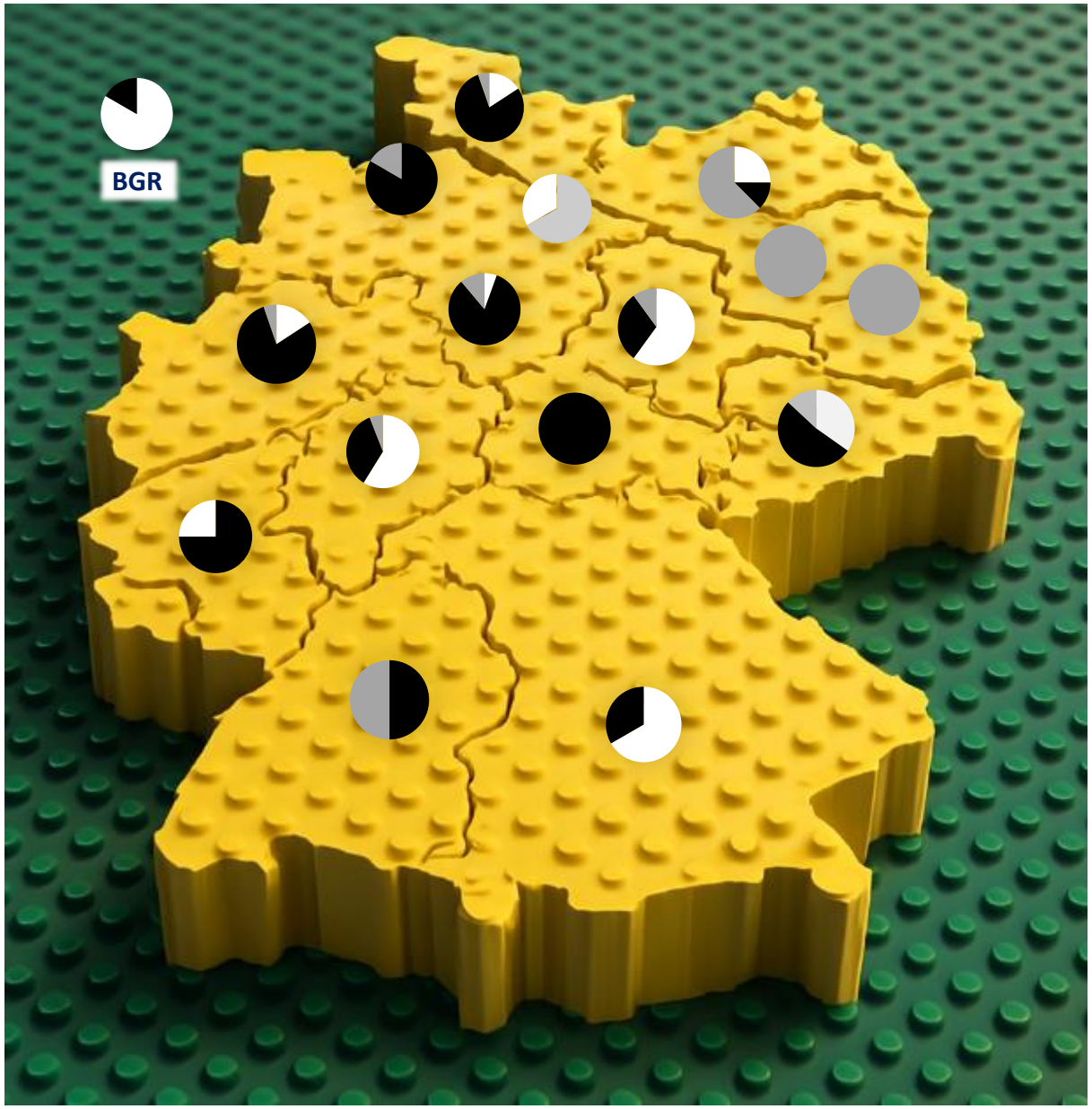
Staatliche Geologische Dienste Deutschlands

Country Update Germany

Joachim **Behlau** (BGR / H)
Kai **Damerau** (BUKEA HH)
Andre **Deutschmann** (LUNG MV)
Dr. Markus **Diehl** (HLNUG HE)
Dr. Andreas **Eberts** (LGB RP)
Sascha **Görne** (LfULG SN)
Christina **Habenberger** (LGB RP)
Dr. Fabian **Hese** (LfU SH)
Ulrike **Hörmann** (SenUVK BE)
Katrin **Lademann** (TLUBN TH)
Bernd **Linder** (GD NRW)
Dr. Alexander **Malz** (LAGB ST)
Dr. Andreas-Alexander **Maul** (BGR / H)
Dr. Rouwen **Lehné** (HLNUG HE)
Robert **Pamer** (LfU BY)
Laura **Paskert** (LGB RP)
Klaus **Pusacker** (LGRB BW)
Isabel **Rupf** (LGRB BW)
Dr. Katherina **Seiter** (GDfB HB)
Dr. Stephan **Steuer** (BGR / H)
Dr. Heidrun Louise **Stück** (BGR / H)
Dr. Sebastian **Weinert** (LBGR BB)
Dr. Jennifer **Ziesch** (LBEG NI)

BGR

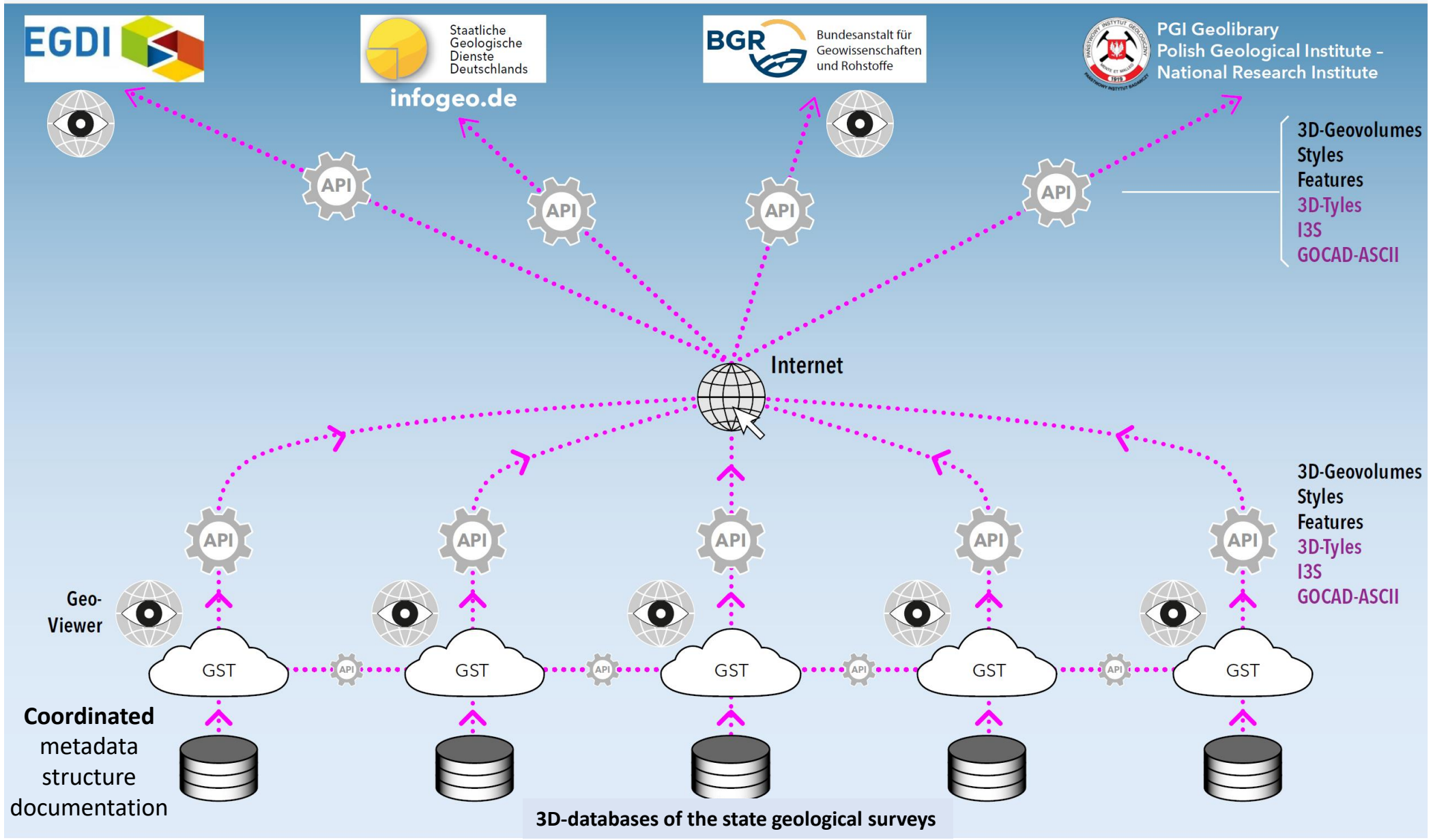


We have a lot of model content

Federal state	local (white)	regional (black)	state wide (grey)
Schleswig-Holstein	3	15	1
Hamburg	10	0	5
Mecklenburg-Vorpommern	2	1	5
Brandenburg	0	0	2
Berlin	0	0	1
Sachsen-Anhalt	6	3	1
Sachsen	8	12	3
Thüringen	0	1	0
Niedersachsen	1	15	2
Bremen	5	0	1
Nordrhein-Westfalen	3	15	1
Rheinland-Pfalz	3	1	0
Saarland	0	0	0
Hessen	10	6	1
Baden-Württemberg	0	1	1
Bayern	10	5	0
BGR	5	1	0
Total	**58**	**60**	**23**

Staatliche Geologische Dienste Deutschlands

Our concept for data provision



Recent activities @ BGR

Focus Northsea

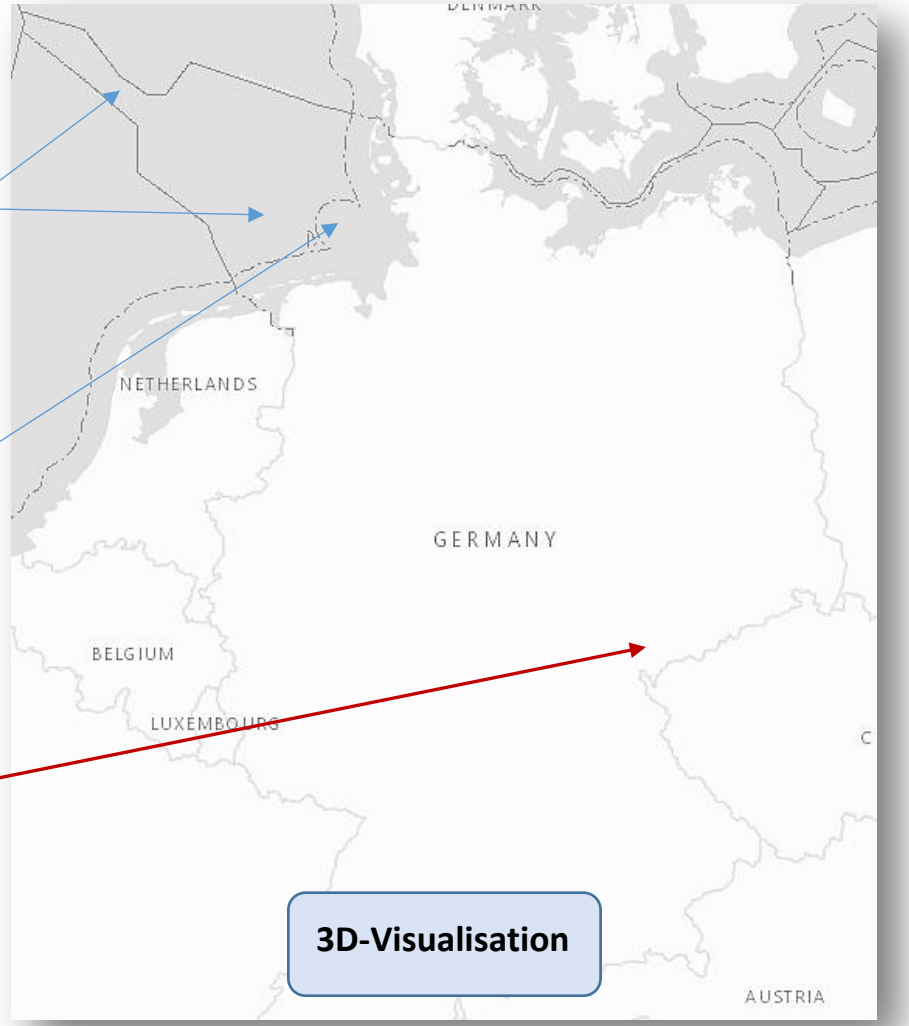
CCS-Potentials / Reservoir-models ger. Northsea: GEOSTOR

Uncertainties: GeoBlocks (RWTH AACHEN UNIVERSITY, UNIVERSITY OF ABERDEEN)

3D-Model Helgoland

Focus Onshore

GeoMetEr



3D-Visualisation

Germany Onshore / Offshore

Data processing/ -integration & Model-Updating: PUDEL

Velocity model North German Basin TUNB Velo 2.0 Tieferer Untergrund Norddeutsches Becken

StörKat: 2D/3D-Fault-database

Staatliche Geologische Dienste Deutschlands

You wanna talk with us? Do it!! ☺

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Kai (Hamburg, kai.damerau[at]bukea.hamburg.de)
André (Mecklenburg-Vorp., andre.deutschmann[at]lung.mv-regierung.de)
Markus (Hessen, markus.diehl[at]hlnug.hessen.de)
Andreas (Rheinland-Pfalz, andreas.eberts[at]lgb-rlp.de)
Sascha (Sachsen, sascha.goerne[at]smekul.sachsen.de)
Christina (Rheinland-Pfalz, christina.neumann[at]lgb-rlp.de)
Fabian (Schleswig-Holstein, fabian.hese[at]lfu.landsh.de)
Ulrike (Berlin, ulrike.hoermann[at]senUVK.berlin.de)
Katrin (Thüringen, katrin.lademann[at]tlubn.thueringen.de)
Bernd (Nordrhein-Westfalen, bernd.linder[at]gd.nrw.de)
Alexander (Sachsen-Anhalt, alexander.malz[at]sachsen-anhalt.de)
Andreas (BGR, andreas-alexander.maul[at]bgr.de)
Rouwen (Hessen, rouwen.lehne[at]hlnug.hessen.de)
Robert (Bayern, robert.pamer[at]lfu.bayern.de)
Laura (Rheinland-Pfalz, laura.Paskert[at]lgb-rlp.de)
Klaus (Baden-Württemberg, klaus.pusacker[at]rpf.bwl.de)
Isabel (Baden-Württemberg, isabel.rupf[at]rpf.bwl.de)
Katherina (Bremen, kseiter[at]gdfb.de)
Stephan (BGR, stephan.steuer[at]bgr.de)
Heidrun (BGR, heidrunlouise.stueck[at]bgr.de)
Jennifer (Niedersachsen, Jennifer.Ziesch[at]lbeg.niedersachsen.de)

7th European Meeting on 3D Geological Modelling

Warsaw, Poland

HUNGARY

POLAND25.EU

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BOGDANKA

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3D geomodelling of Hungary

Gábor Héja, Gyula Maros, Márton Palotai, László Bereczki, Gábor Markos, András Czégény, Zoltán Fridl, Zoltán Lantos, Edit Babinszki

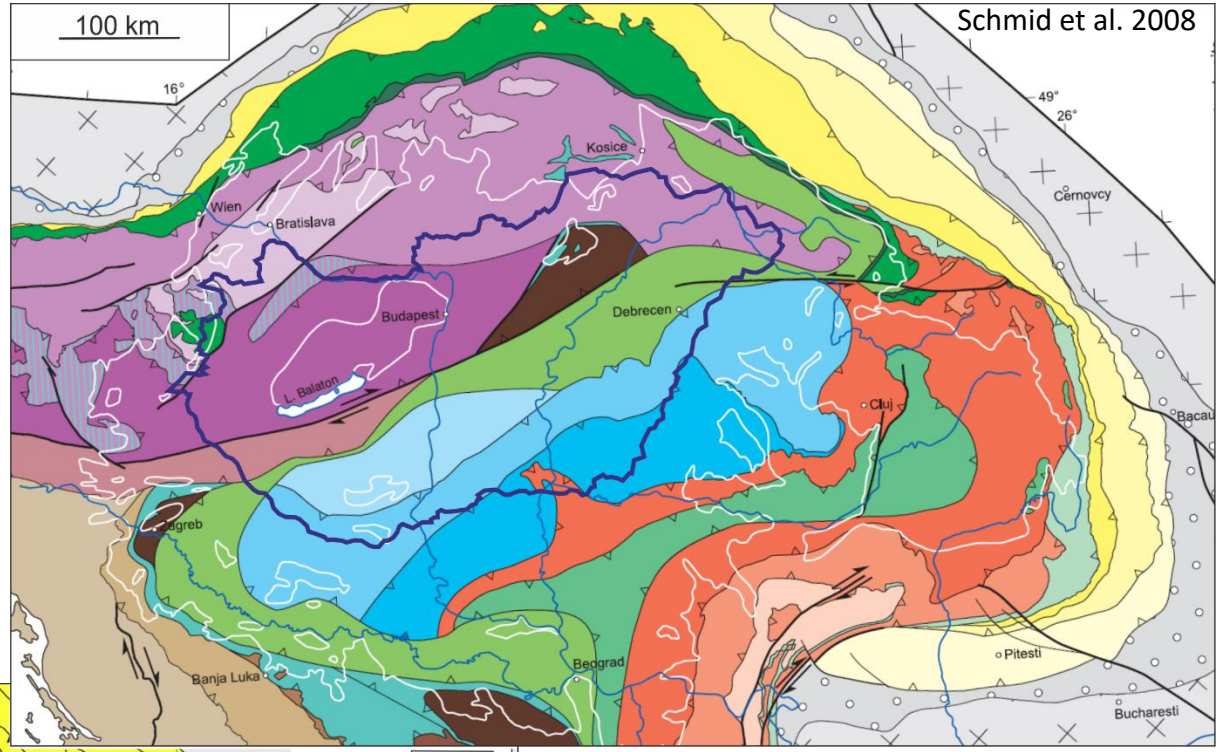
Geological Survey of Hungary

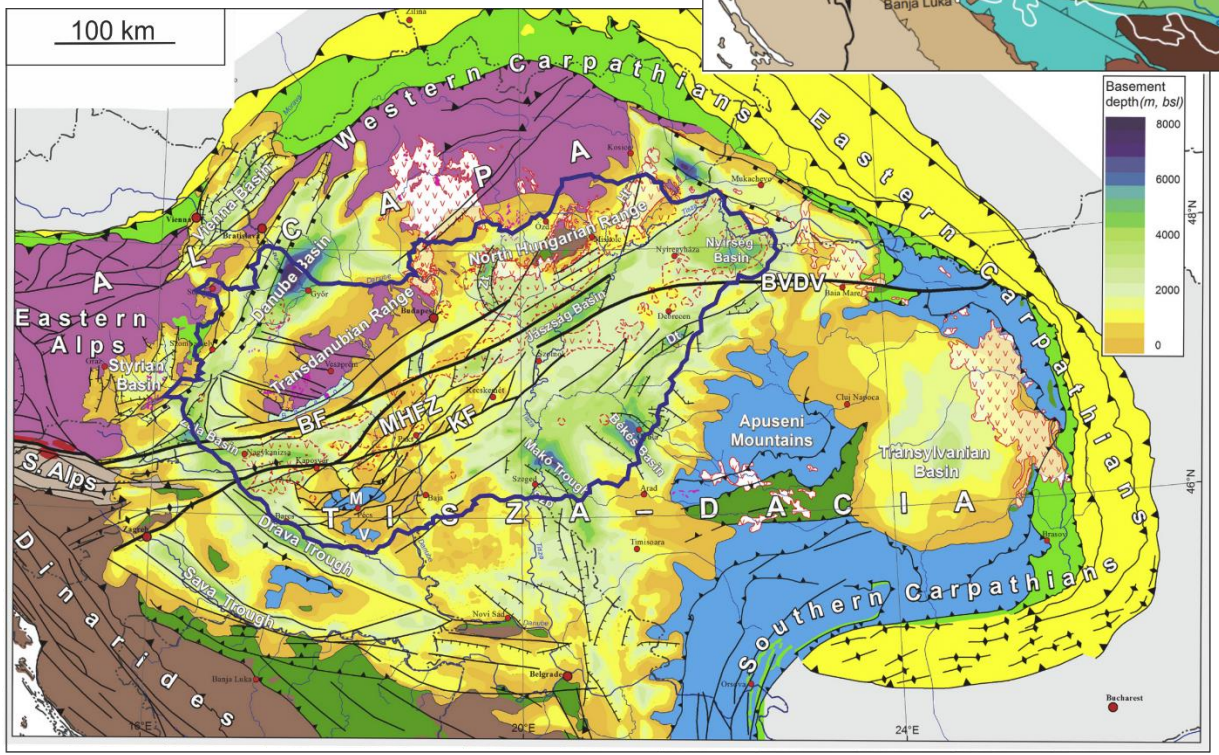
(Supervisory Authority for Regulatory Affairs Hungary)

Geological setting

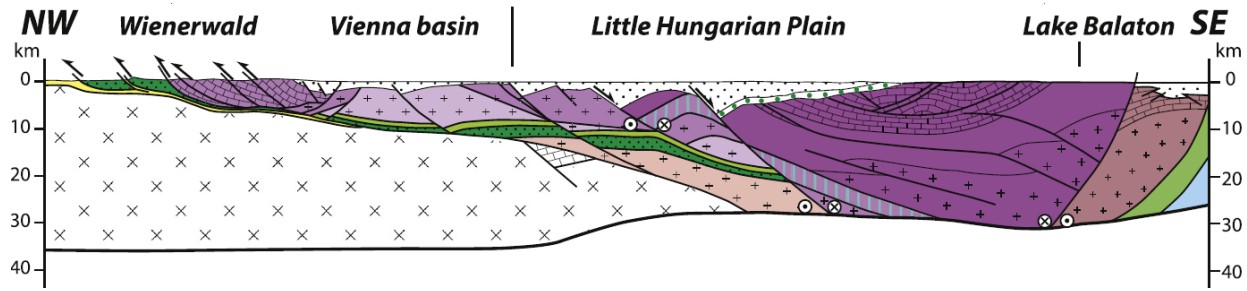
Pannonian Basin

- Variscan basement and Permo-Mesozoic cover
- Late Mesozoic to Paleogene Alpine Orogeny
- Miocene Pannonian back arc basin
- Alpine fold-and thrust belt overprinted by Miocene normal faults





Koroknai et al. 2020

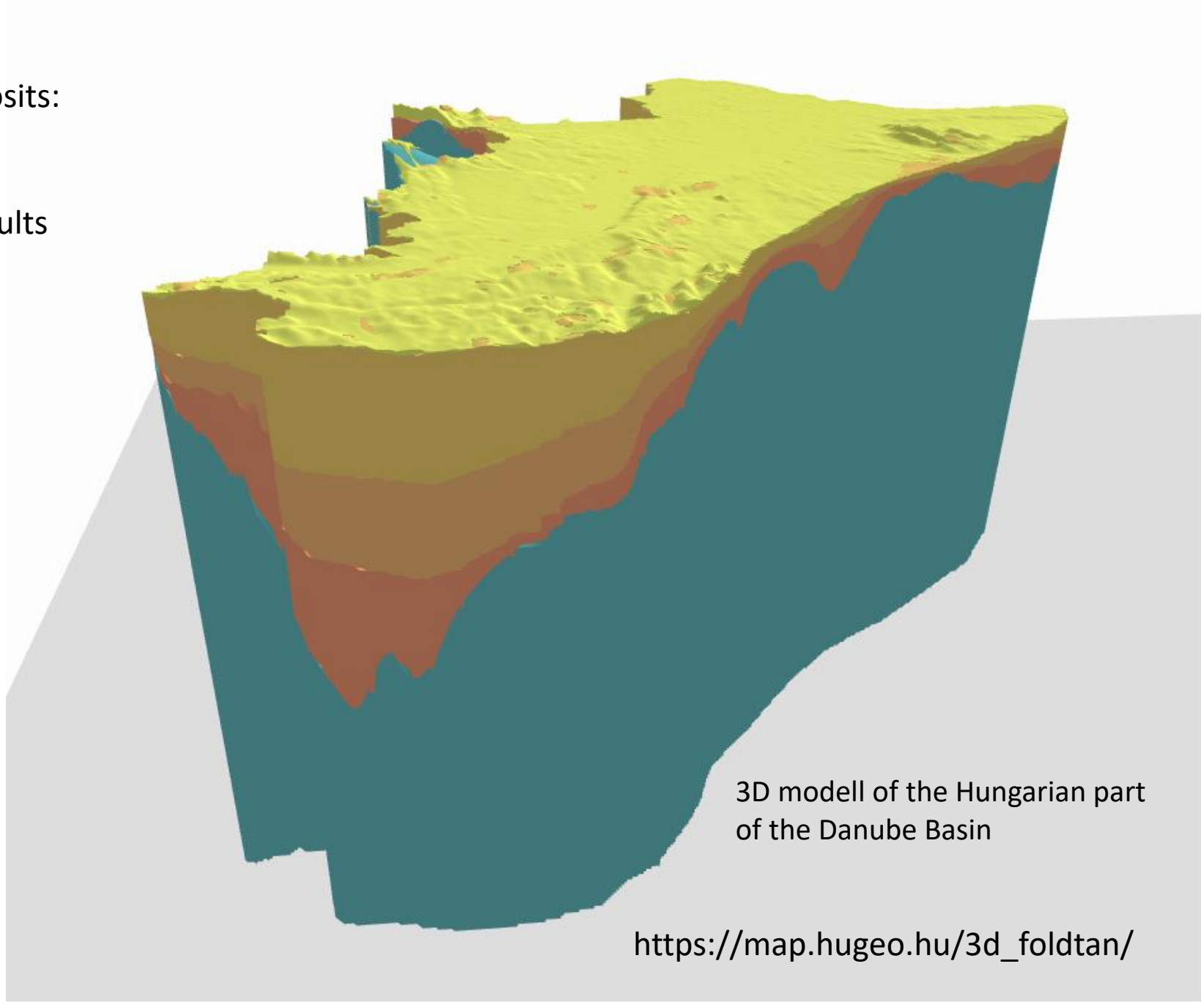


Schmid et al. 2020 after Tari 1994

What have we done?

3D model of the Neogene basin filling deposits:

- Base of syn-rift
- Syn-rift – post-rift boundary
- Surfaces of the major basin bounding faults

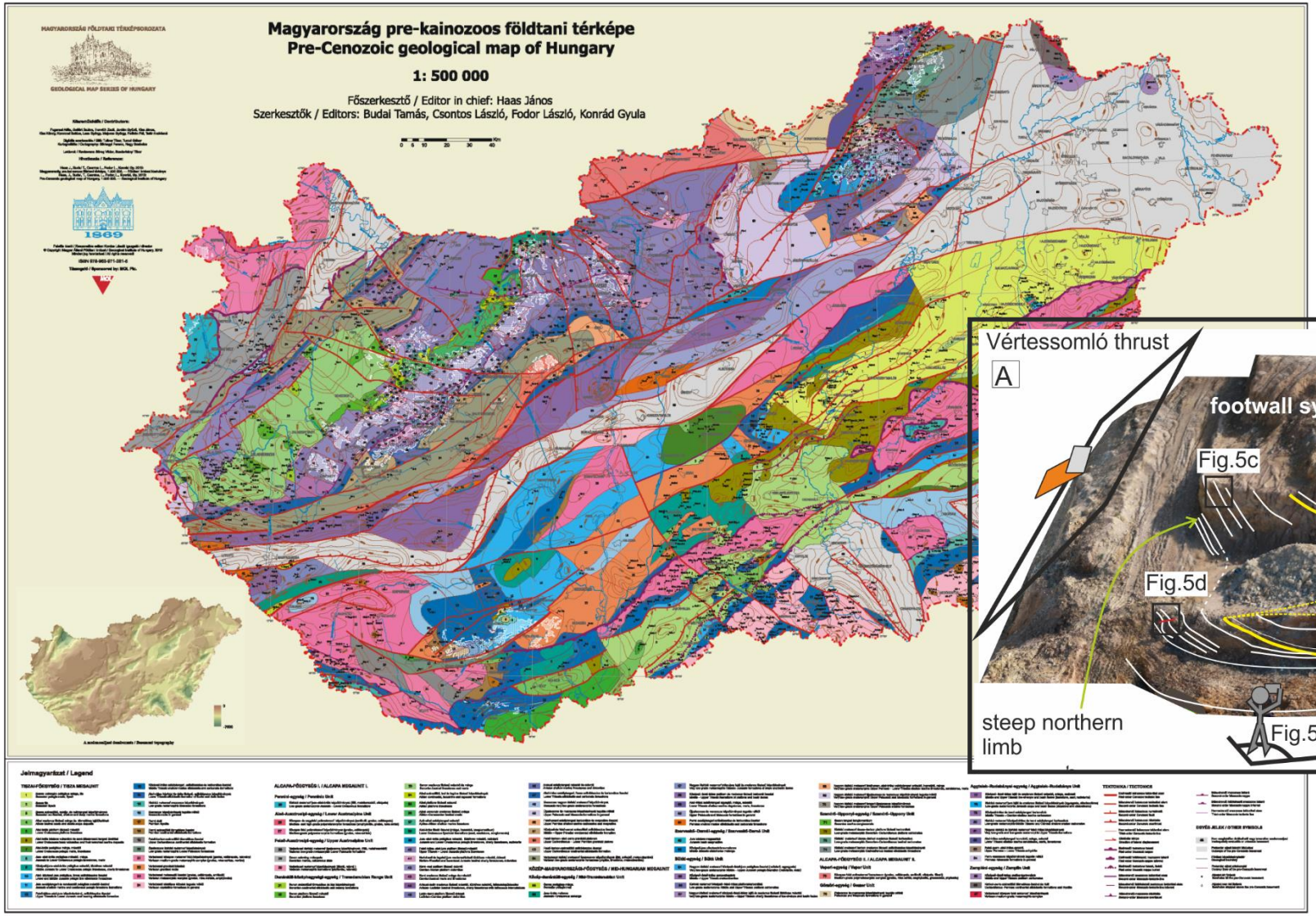


3D modell of the Hungarian part of the Danube Basin

https://map.hugeo.hu/3d_foldtan/

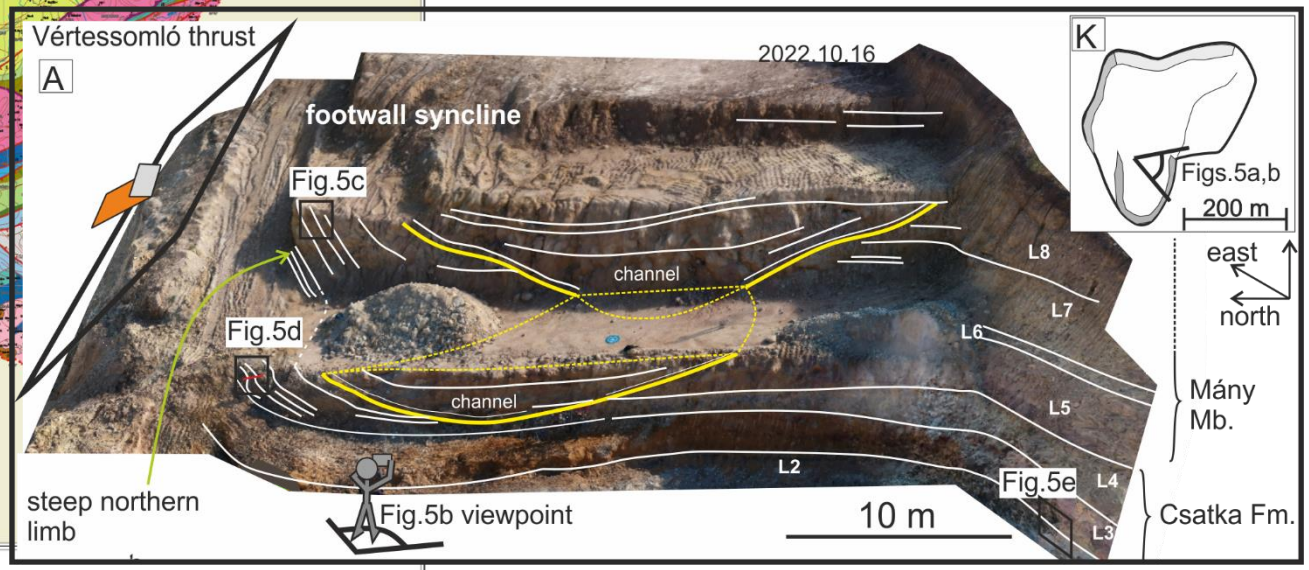
Future plans

3D model of the Pre-Neogene basement



Haas et al. 2010

- Understanding the geometry and kinematics of „Alpine" folds and thrust
- Surface analogies, Geological mapping, Photogrammetry



Interpreted 3D modell of a key-outcrop near Zsámbék

ICELAND

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Náttúrufræðistofnun

7th European Meeting on 3D Geological Modeling
Country Update – Iceland

María Helga Guðmundsdóttir, Natural Science Institute of Iceland

maria.h.gudmundsdottir@natt.is

Institutions involved in 3D geological modeling in Iceland

Public-sector institutions

- Natural Science Institute of Iceland
- Iceland GeoSurvey (ÍSOR)

Universities

- Reykjavík University
- University of Iceland

No national-level 3D geomodeling initiatives

Project-based work in individual research groups or labs, often focused on geothermal resources

Ongoing work

Iceland GeoSurvey (ÍSOR)

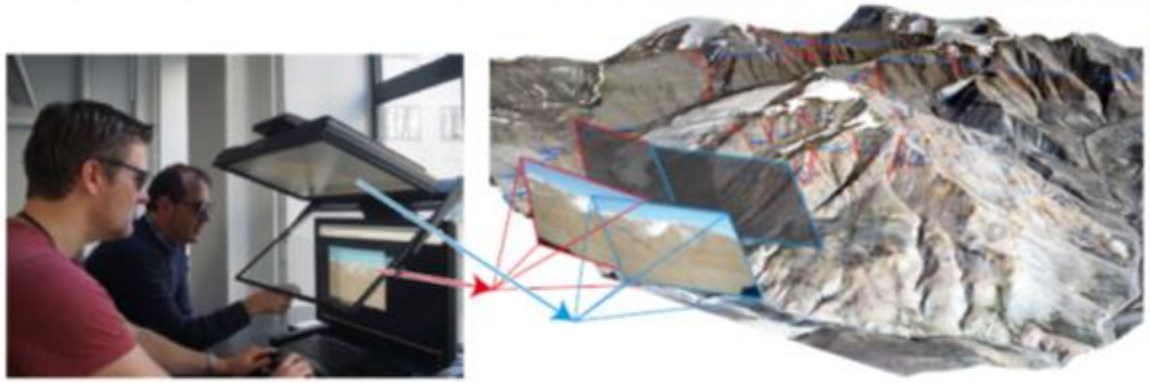
- 3D geological modeling of geothermal areas
- Geophysical data (resistance, seismic) processed in 3D

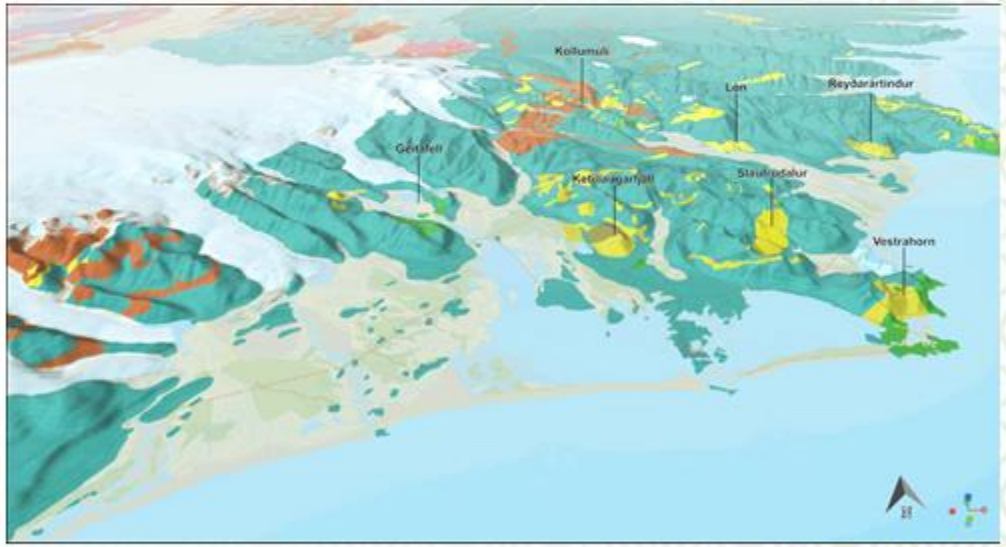
Reykjavík University

- Reservoir simulations & 3D modeling using Leapfrog Energy (Juliet Newson & students)

Natural Science Institute of Iceland

- Photogrammetry Lab – aerial imagery, 3D surface models for geological mapping and 3D visualization (3D Stereo Blend, Lime Virtual Outcrops)
- Drill Core Library – major push for infrastructure development; untapped resource for 3D modeling





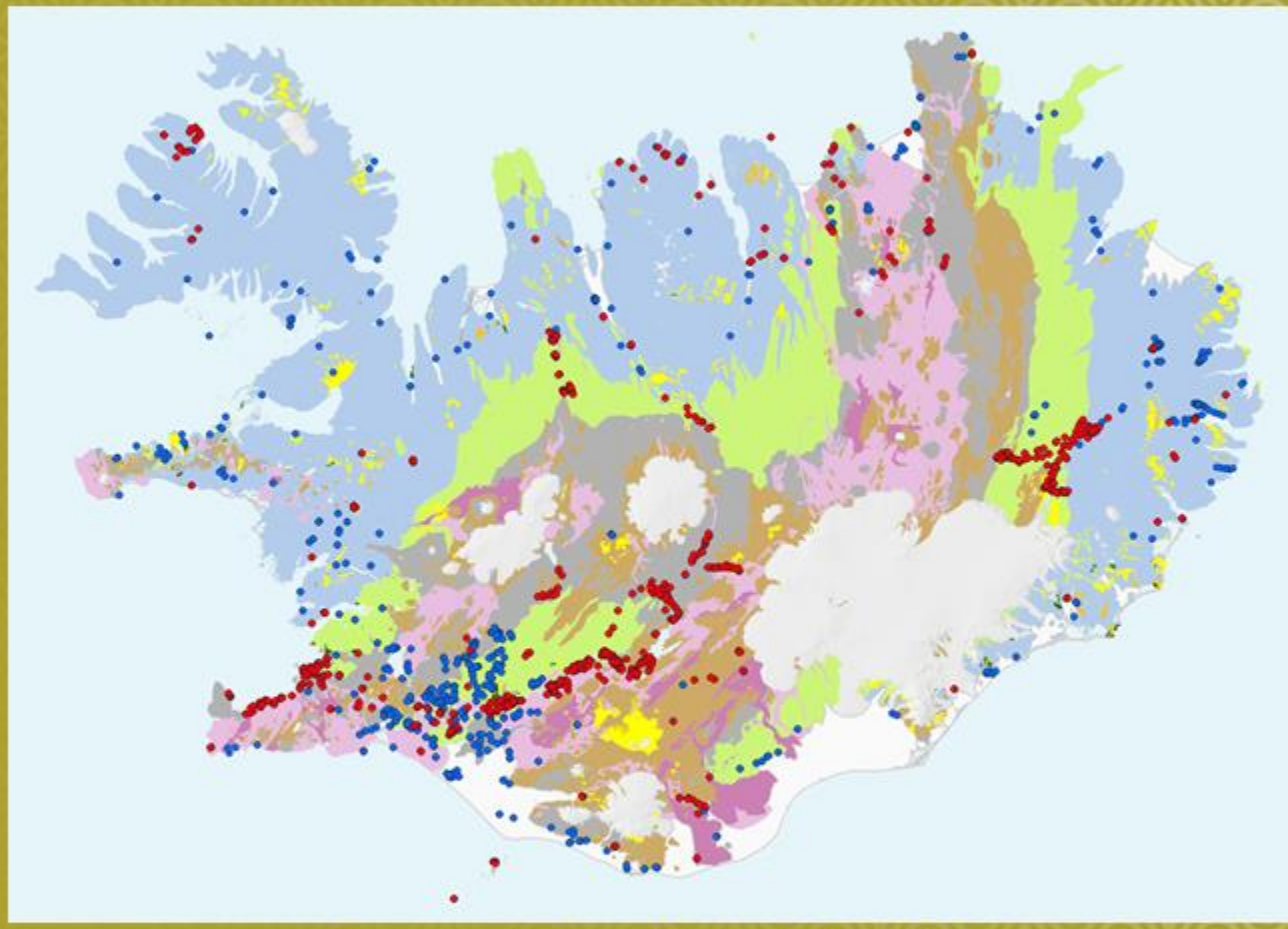
Future prospects

Increased engagement with sister institutions in Europe

Increased collaboration among agencies and research groups in Iceland

Core library as basis for regional/national-scale 3D modeling

Incorporation of 3D modeling into geological mapping initiative



Base map: Geology of Iceland, 1:600.000
Red: drill core Blue: cuttings

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Rialtas na hÉireann
Government of Ireland

Geological Survey
Suirbhéireacht Gheolaíochta
Ireland | Éireann

Ireland update

Beatriz Mozo Lopez

Quaternary Geotechnical unit

Achievements

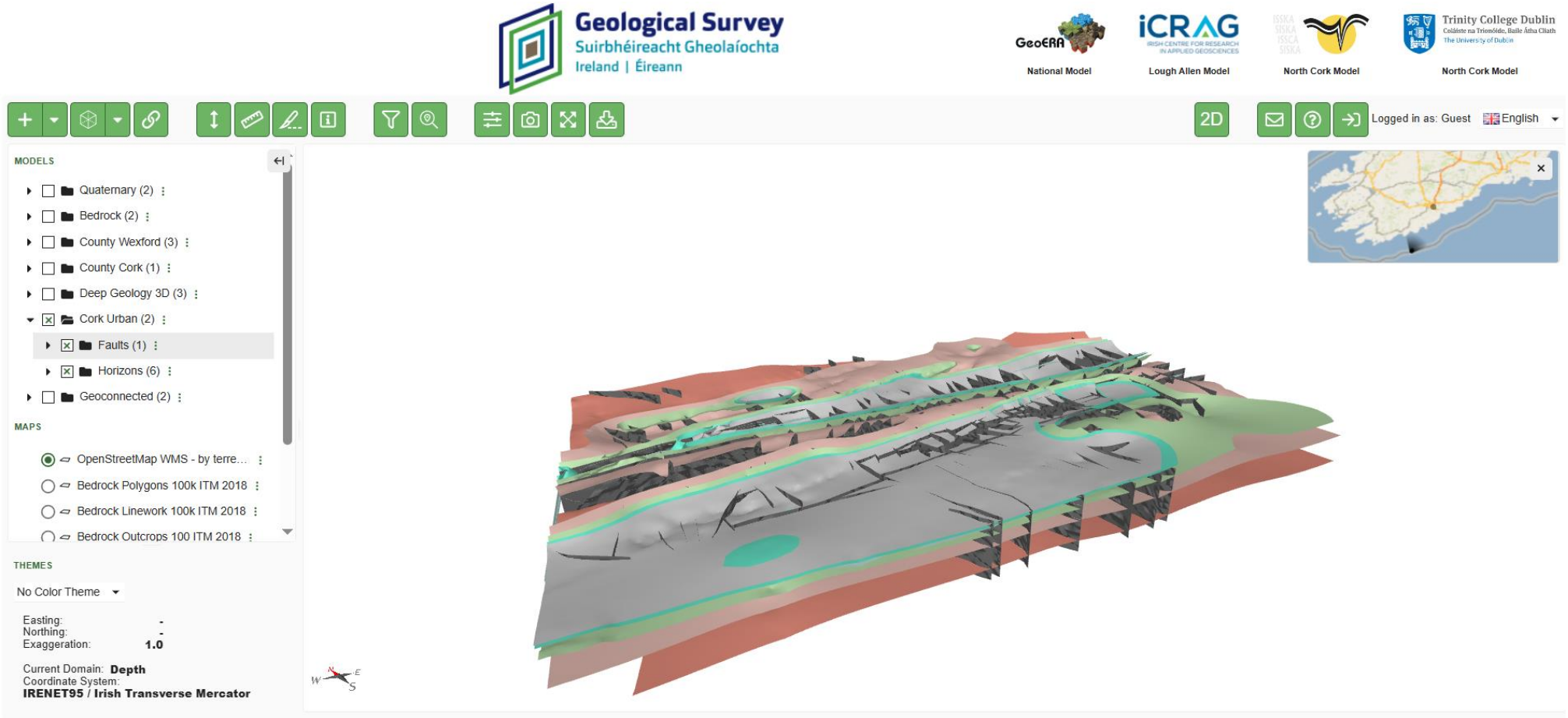
National bedrock model for GeoConnectd³d GEOERA project

Achievements

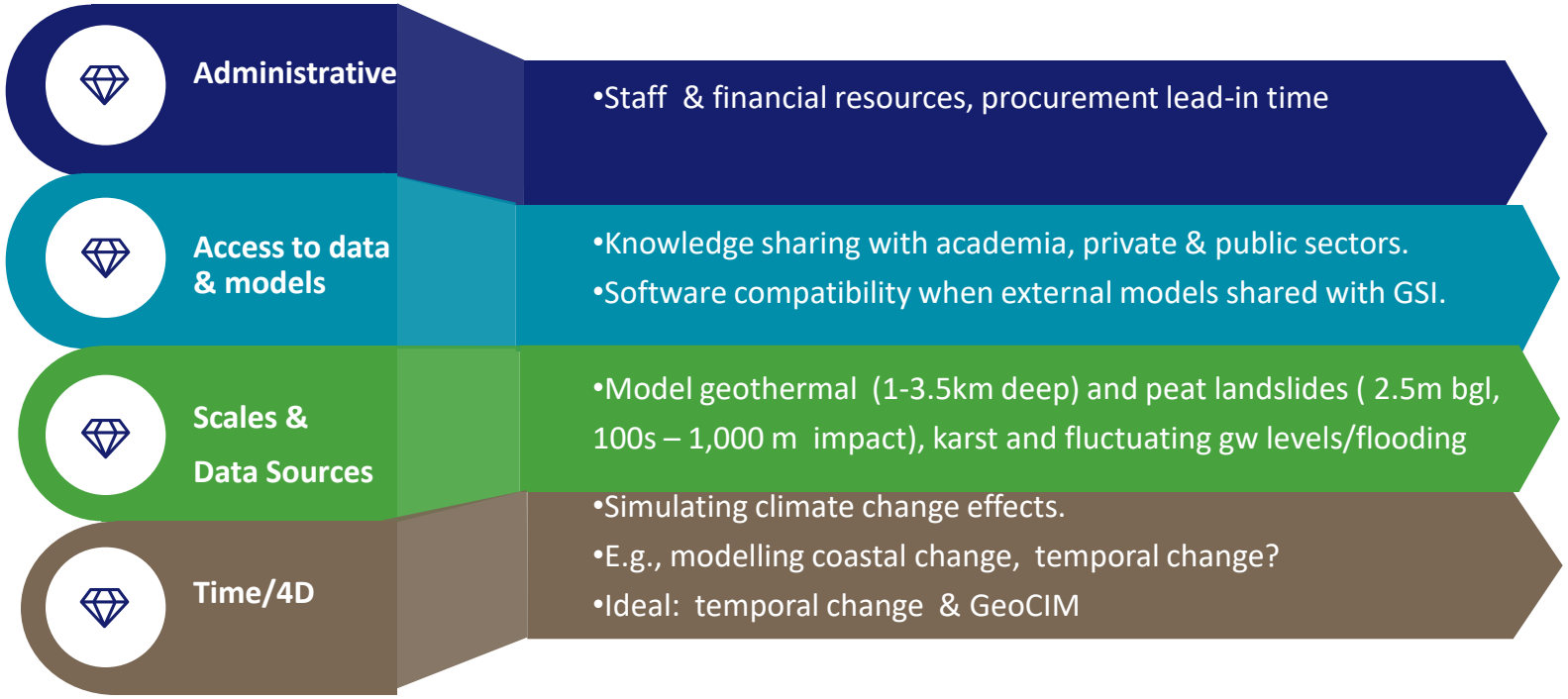
Deep 3D bedrock model of northeast half of Ireland

Achievements

Bedrock Geology of the Cork Geourban area



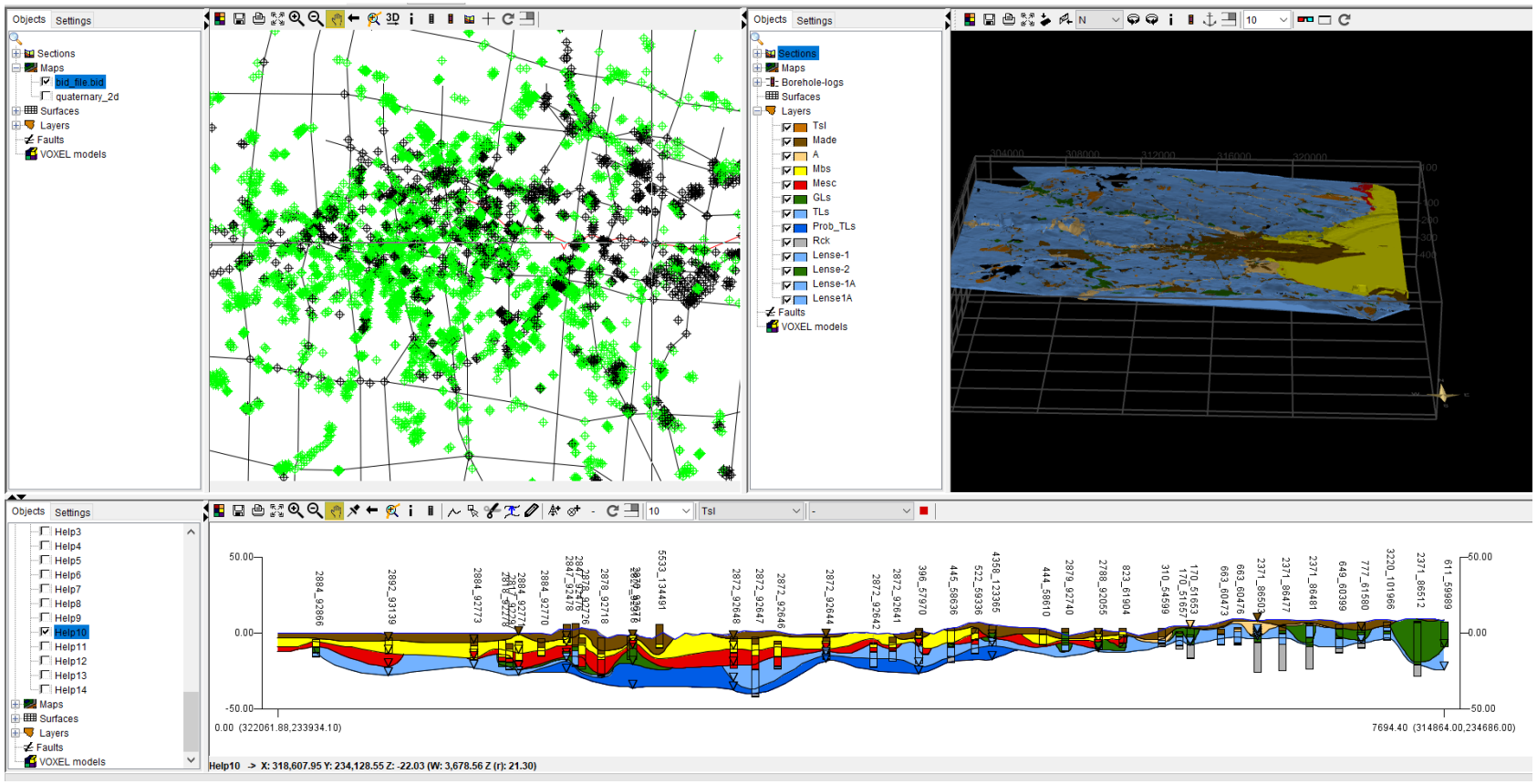
Challenges


Administrative
•Staff & financial resources, procurement lead-in time
Access to data & models
•Knowledge sharing with academia, private & public sectors.
•Software compatibility when external models shared with GSI.
Scales & Data Sources
•Model geothermal (1-3.5km deep) and peat landslides (2.5m bgl, 100s – 1,000 m impact), karst and fluctuating gw levels/flooding
Time/4D
•Simulating climate change effects.
•E.g., modelling coastal change, temporal change?
•Ideal: temporal change & GeoCIM

Future

Development of an engineering geology map on a pilot area in Dublin:

- Review and update of the Quaternary 3D model in the chosen pilot area
- Addition of new data
- Parameterization of layers



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ISPRA
Istituto Superiore per la Protezione e la Ricerca Ambientale

Sistema Nazionale per la Protezione dell'Ambiente

3D modeling activities overview
Country update - Italy

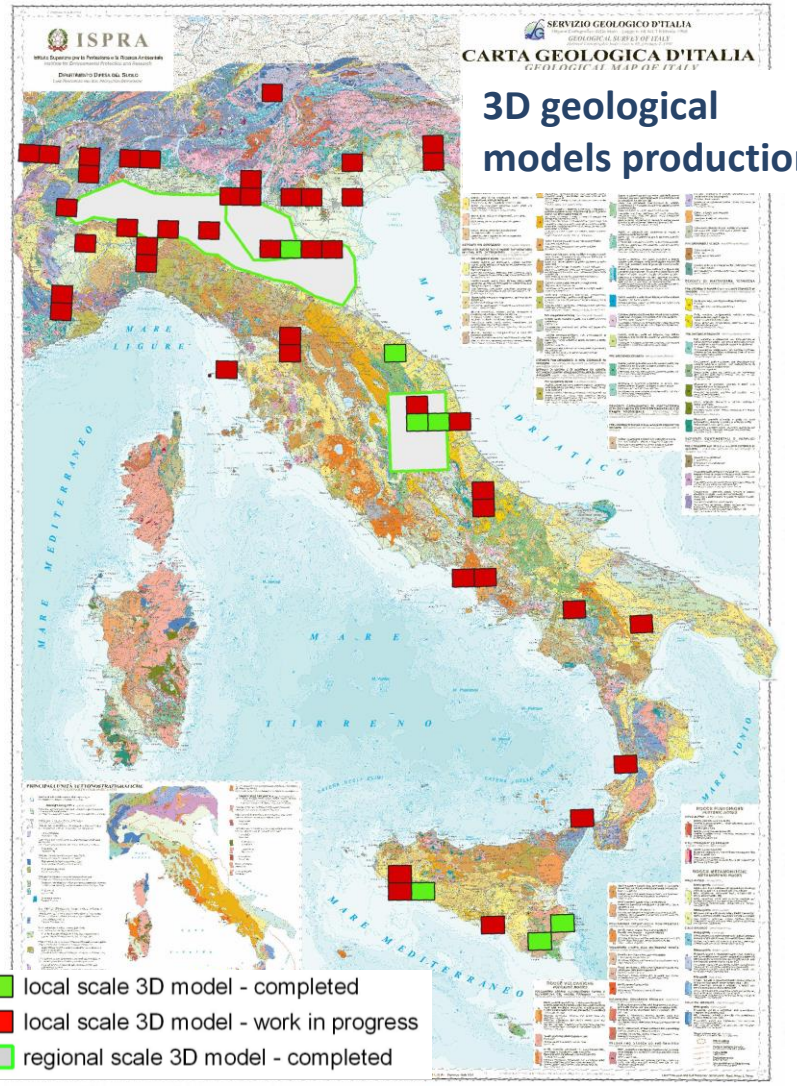
CHIARA D'AMBROGI & PATRIZIO PETRICCA

Servizio Geologico d'Italia – ISPRA

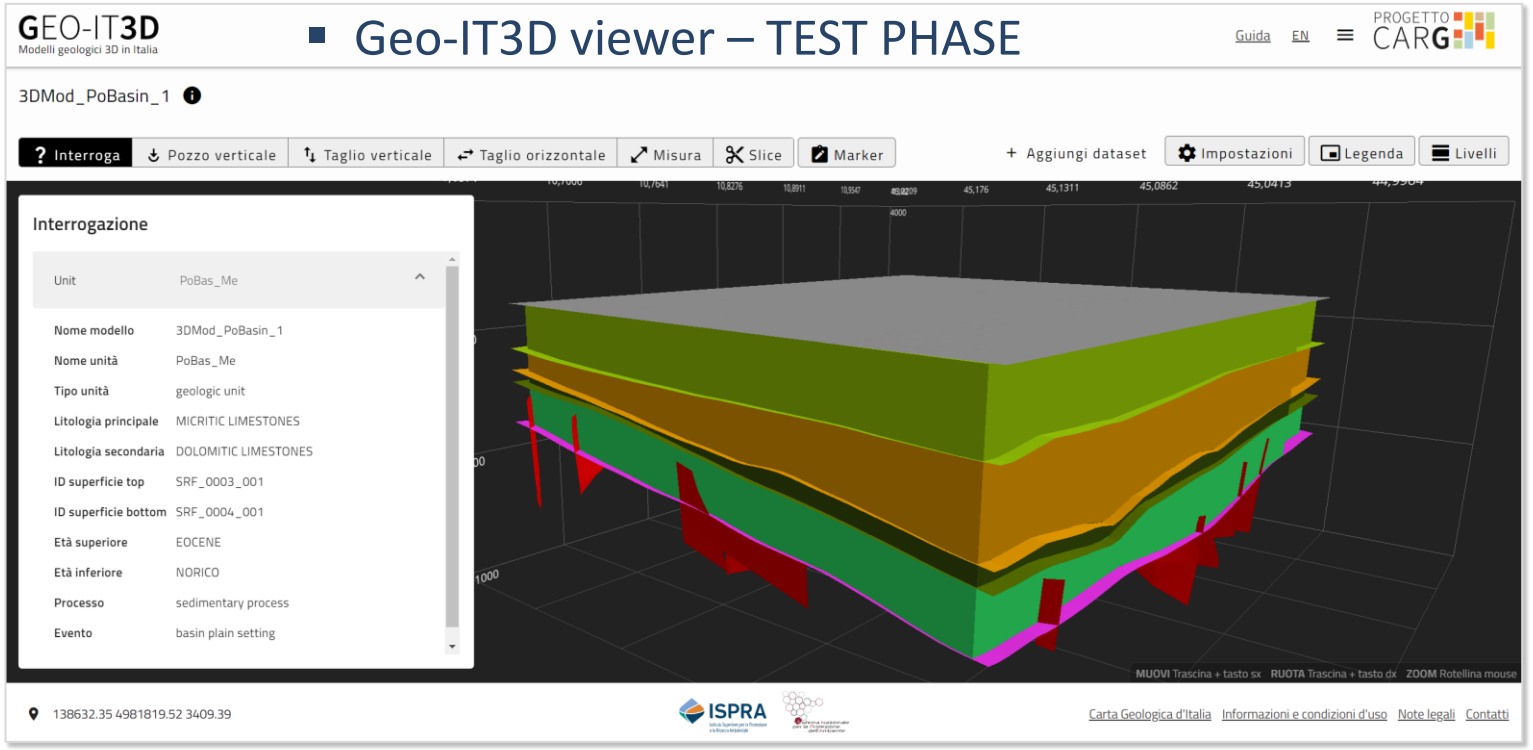
STEPS FORWARDS (AFTER 2023 COUNTRY UPDATE)

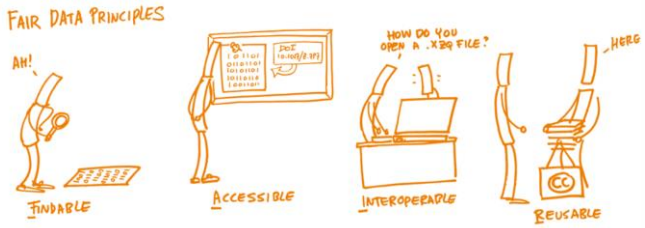
- Increasing 3D geological model production and dissemination

Oral presentation
Friday, 12th April



- Geo-IT3D viewer – TEST PHASE





- Improving FAIRness of geological subsurface information

FUTURE ACTIVITIES (2025-2027)

Poster session
Wednesday, 9th April

- Promoting open-source tools and automation
- Promoting construction of geological 3D models for applicative purposes
- Looking for (new more extended) standards
- Geo-IT3D Viewer update
- Enlarging collaboration between Regional GSOs and scientific community in the framework of European and National Research Infrastructure initiatives

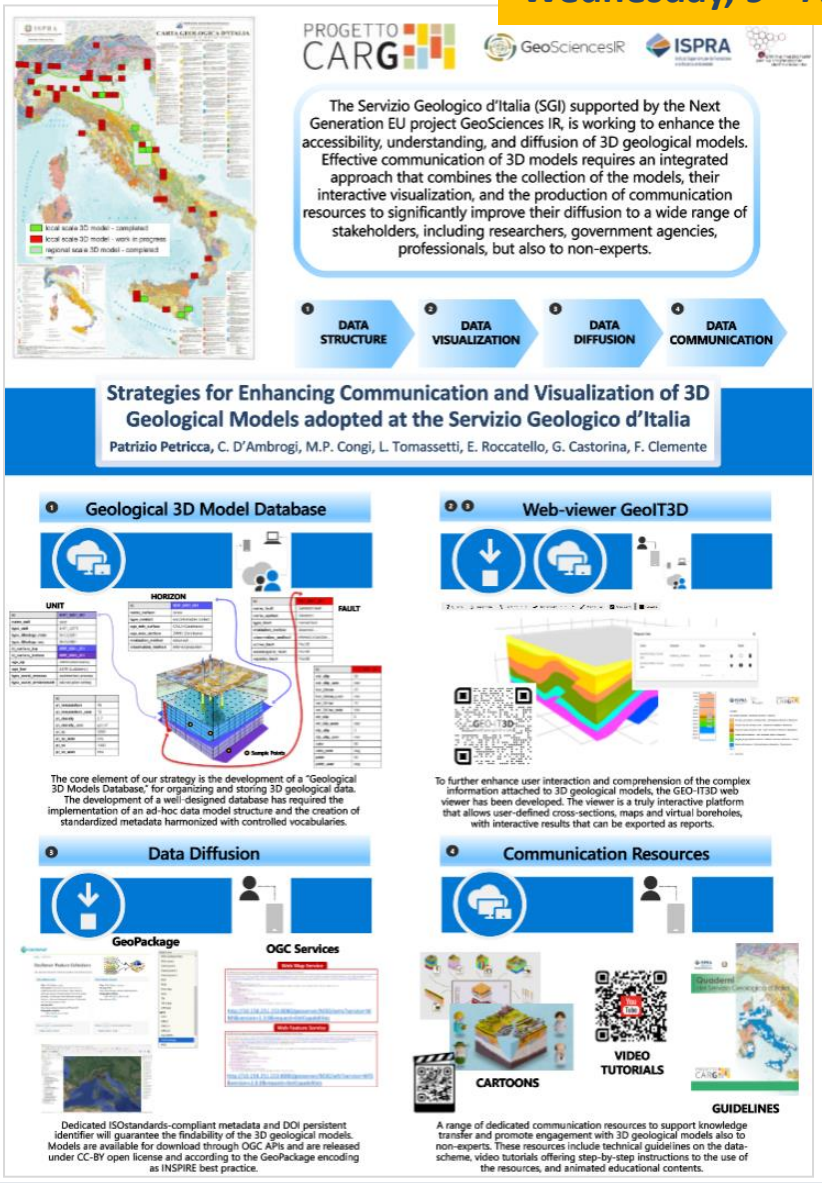
GeoSciencesIR
A Research Infrastructure for the Italian Network of Geological Surveys

MEET
MONITORING EARTH'S EVOLUTION AND TECTONICS

EGDI

EPOS
Geological Information and Modeling

- Stake-holders consultation for emerging needs and standards



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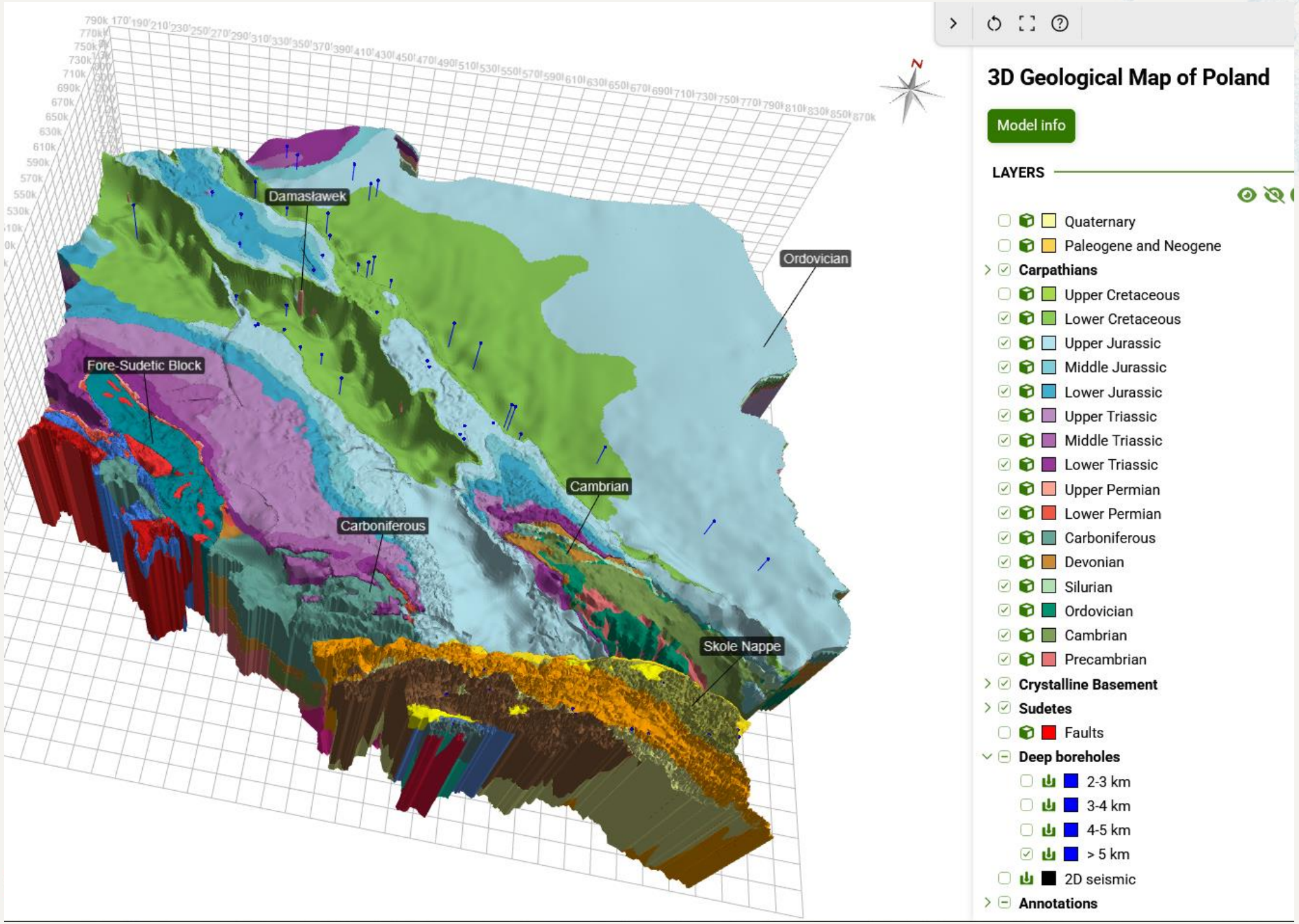
Country update: Poland



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National Research Institute

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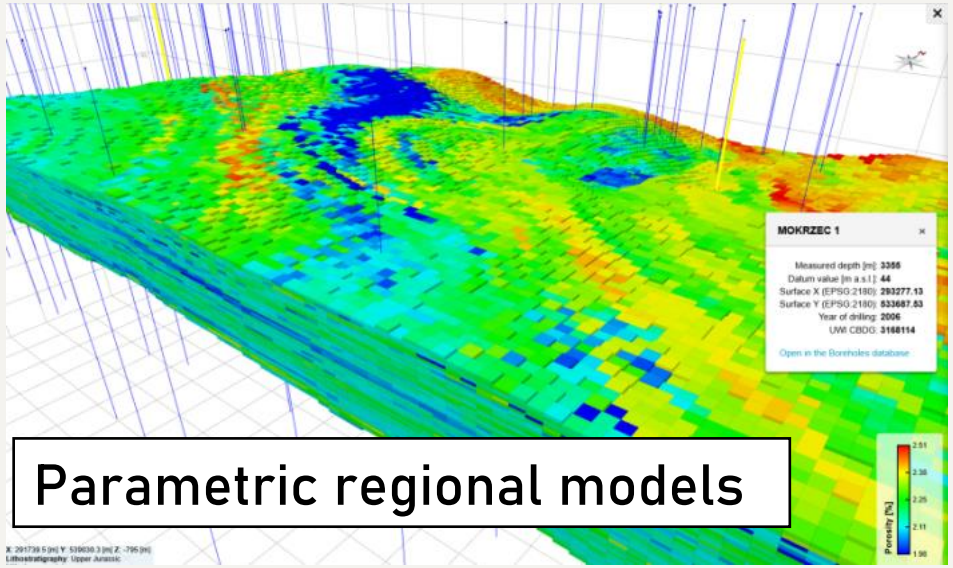
What's in for the Present?



Parametric regional models

Integrating vast amounts of data

CRMs and other resources

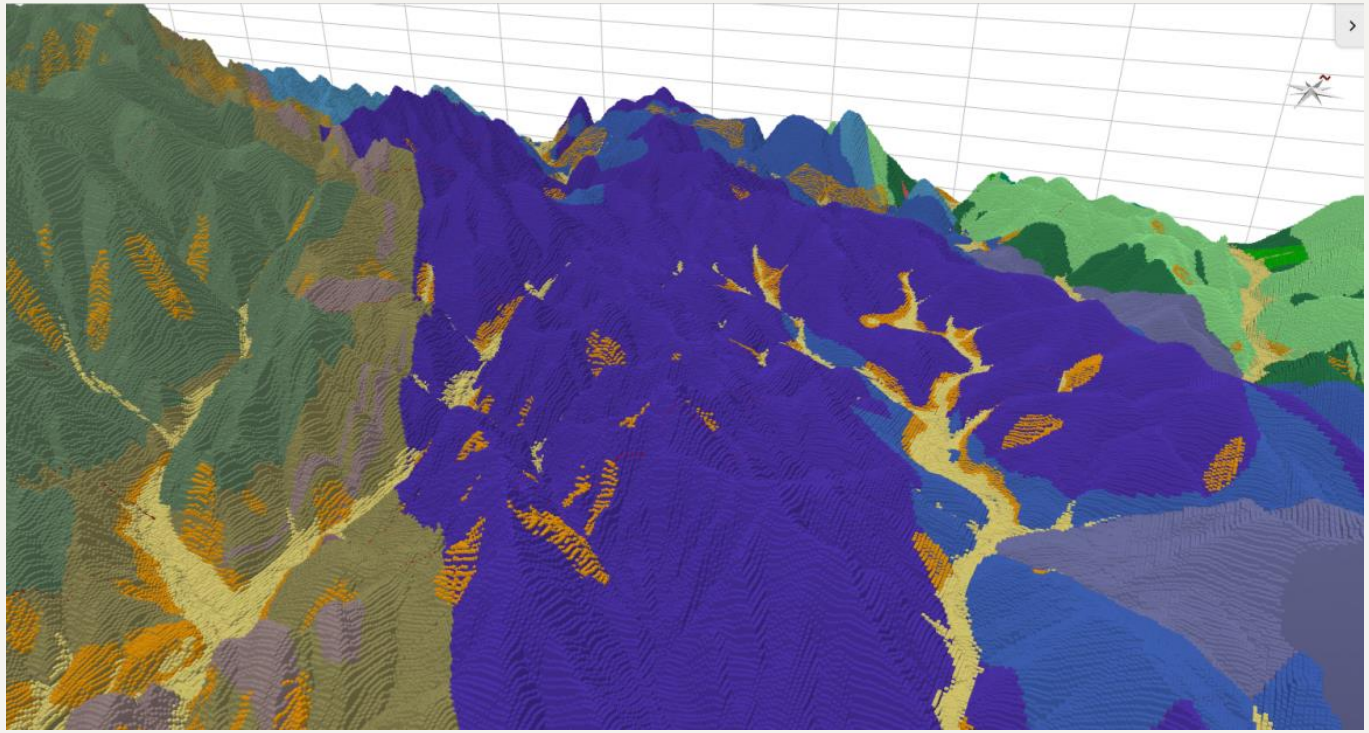
Shallow & deep geothermics

Hydrogeology

Geological engineering

Modelling at multiple scales

Innovating communication & visualisation for stakeholder engagement



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National Research Institute
pgi.gov.pl

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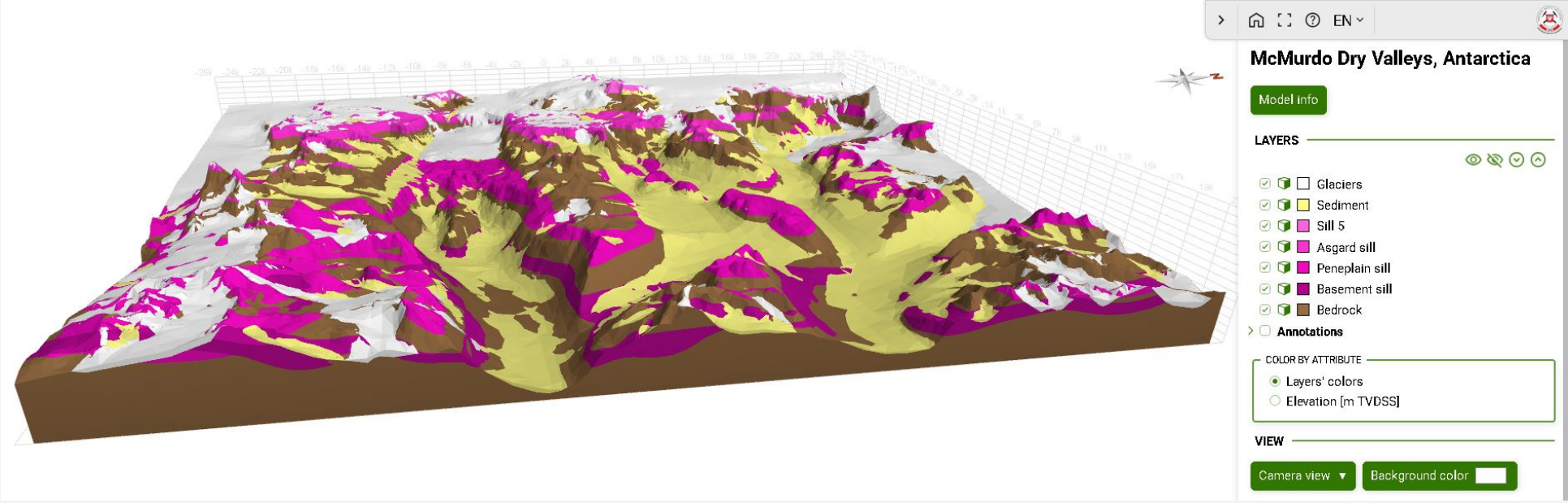
Warsaw

What's in for the Future?

- Mapping parametric grid of near-surface key urban and industrial areas
- Post-coal mining districts: risk mitigation and infrastructure re-use
- Supporting geohazard assessment
- **Coastal erosion control in 4D**
- **Bringing 3D parametric grid to stakeholders**
- Balancing & validation
- Automation & AI
- Uncertainties



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Country update - ROMANIA

Anca-Marina Vijdea

Geological Institute of Romania (IGR)

7th European Meeting on 3D Geological Modelling, Warsaw, 8-11 April 2025
Polish Geological Institute – National Research Institute

Past attempts in 3D Modelling at IGR

At local scale

For geophysics:

- with in-house developed programs for seismic tomography applied for the safe operation of salt underground mines (around 2008-2011)
- with GeoModeller (Intrepid Geophysics Australia) for gravity and magnetic 3D modelling

For geology:

- with GSI3D (Geological Surveying and Investigation in 3 Dimensions – BGS) – mainly tests
- with GOCAD (MiraGeoscience) for modelling Beius Basin and the batholith in Bihor Mts. (Western Carpathian Mts.) – CHPM 2030 project

Present situation

- Awareness of the progresses made by other geological surveys

- Causes of fall behind:
  - ➢ Dissipated structure of geoscience activity spread amongst at least 6 national institutes (5 belonging to the former Ministry of Research, 1 to the Romanian Academy), and a governmental authority in charge with mining permits and licenses

→ Overlapping
Insufficient funds
Competition instead of cooperation

  - ➢ Periodical changing of responsible Ministries (every 10 years swinging between the Ministry of Research and Ministry of Education)
  - ➢ Coupled with years of institutional bad management and lack of long-term strategy

→ Waste of funds
Licenses lost

Future Plans for 3D Modelling

Identified needs:

- Training
- Comparing various software for more informed acquisition
- Organizing the existent data (drills) which can serve as input for 3D modelling

Near-future plan:

Presently IGR is partner in a nationally-funded project for monitoring the subsidence produced in 2024 at Slanic Prahova, an area with salt exploitation since XVII-th century, located in a complex tectonics geology (molasse). The region has been affected in time by numerous land deformations, some of them periodically reactivated. Nowadays two blocks of flats and other houses in the locality are endangered by the subsidence which created a hole of 30 m depth. The solution adopted so far (injecting huge quantities of concrete in the subsoil void) proved ineffective.

In the area 5 drills are proposed and 3D modelling of detailed geological and geophysical data (micro-gravimetry, electrometry, seismics) is necessary in order to correctly identify the cause of the created voids and then to propose appropriate measures.

Thank you for the attention

anca.vijdea@igr.ro

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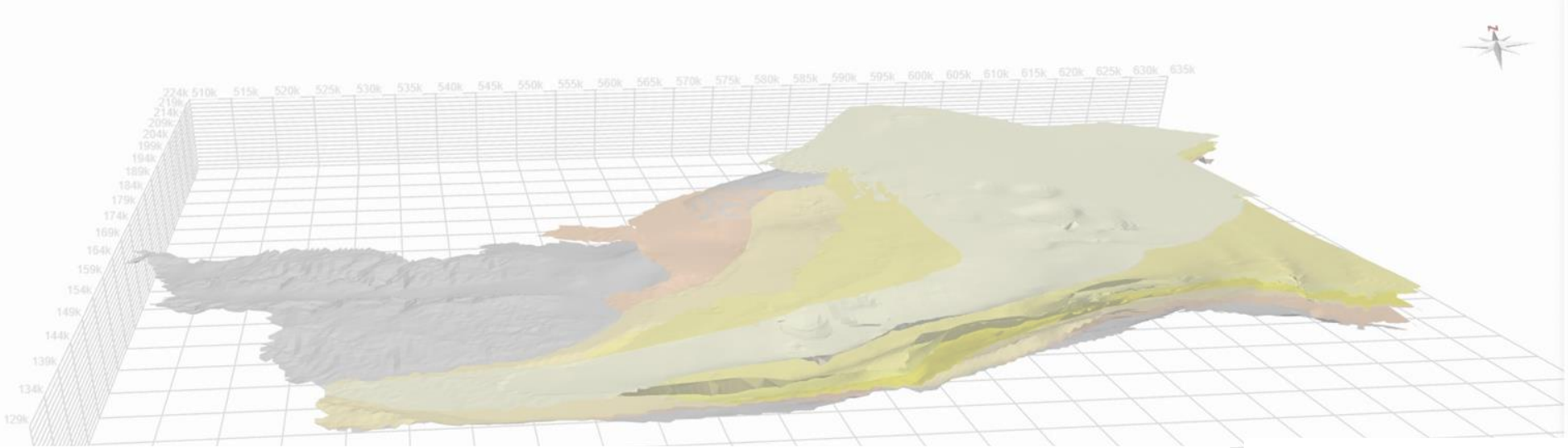
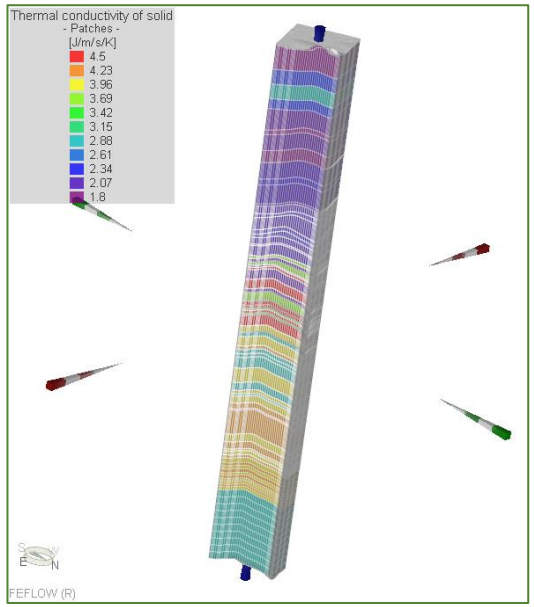
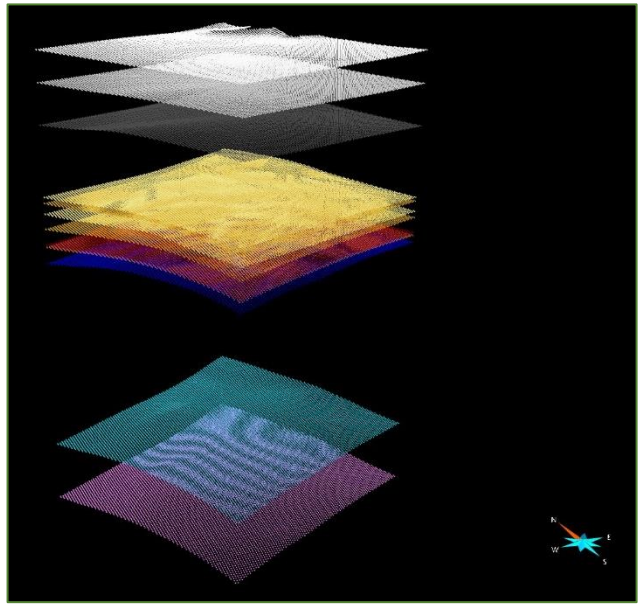


GeoZS
Geološki zavod Slovenije

7th European Meeting on 3D Geological Modelling
Country update – Slovenija (GeoZS)

dr. David Gerčar & dr. Ana Novak

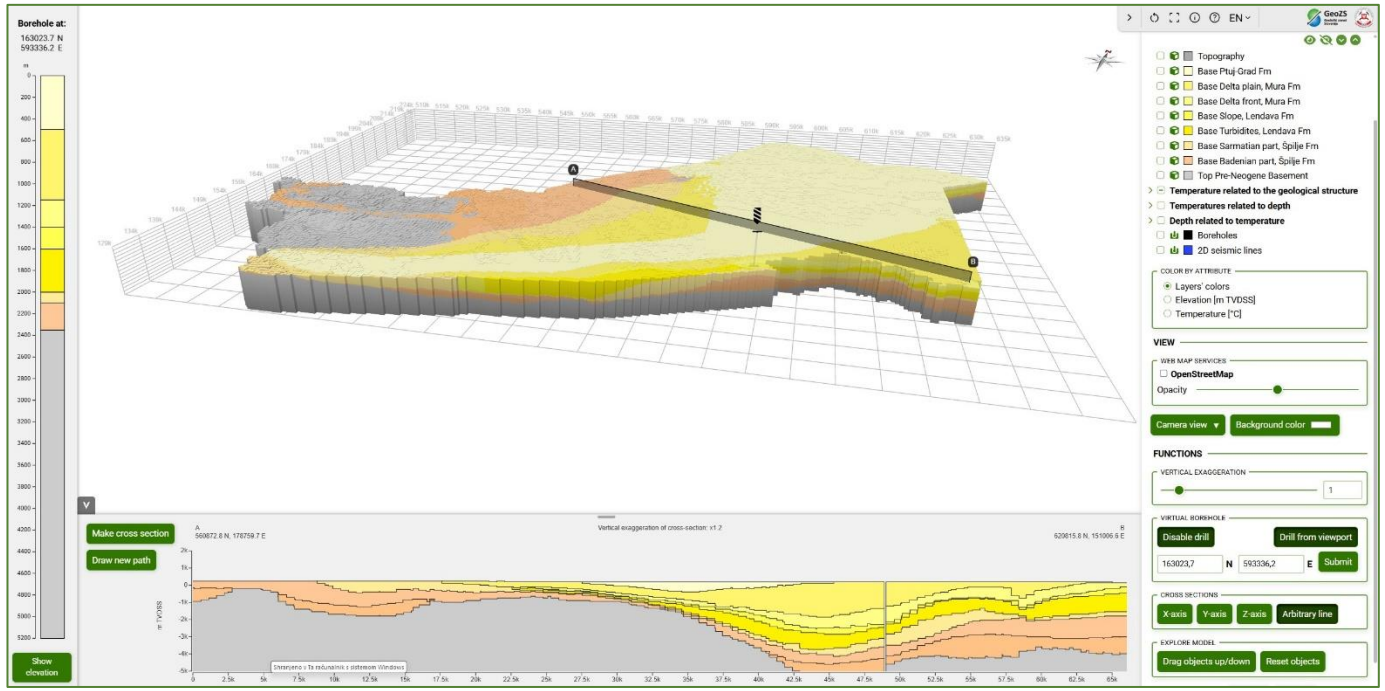




What happened since København?

- Research group for Geothermal Energy
  - Department for Hydrogeology
  - Department for Regional Geology
  - Geological Information Center

- We applied for an internal R&D project (twice)
  - Development of 3D geological modelling at GeoZS



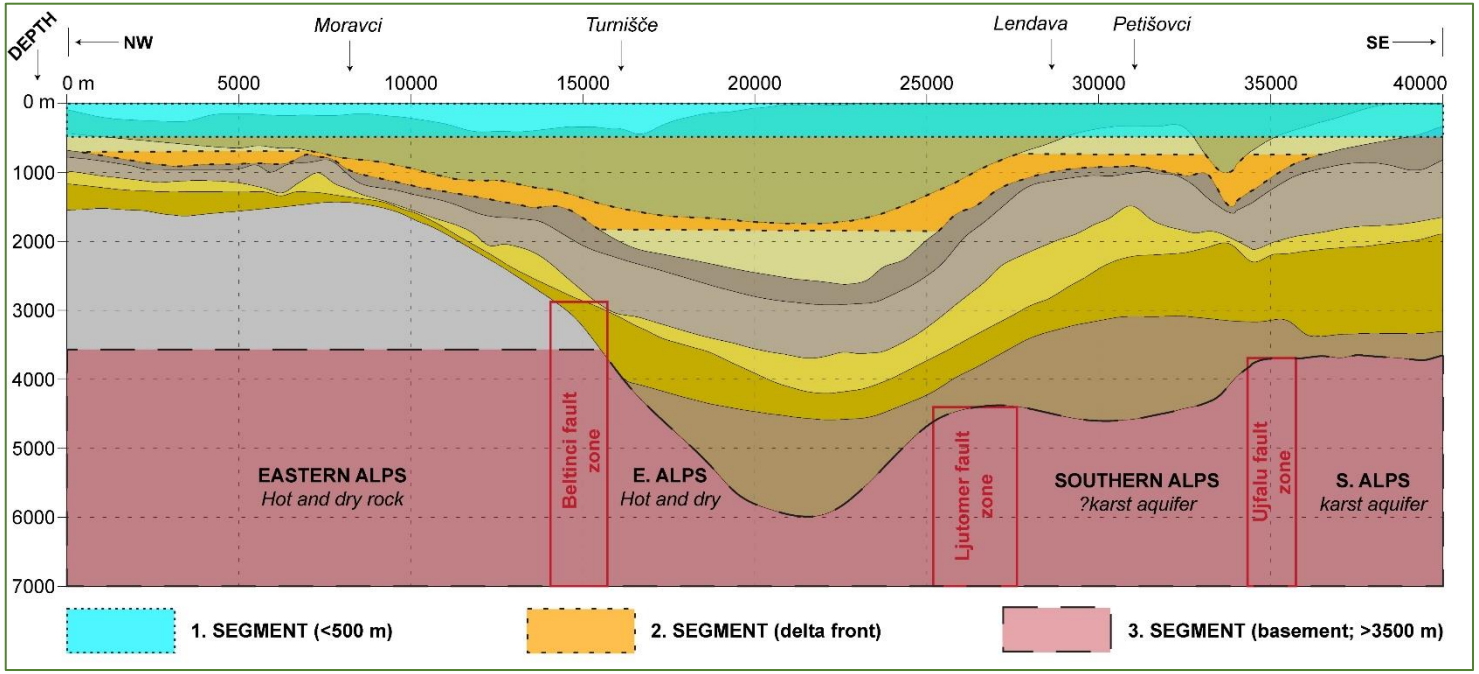
https://geo3d.pgi.gov.pl/Slovenia/index.html

Our future goals?

- Geomodelling and Geothermal Energy – fluid-reinjection studies and heat-transfer dynamic modelling
- Geomodelling and structural geology – PhD student
- Geomodelling and digital geological mapping – 3D geological model of a pilot area in the Alps

- GeoDatabase (interoperable digital system to support researchers)

- **Geomodelling Task Force**



Important lessons

- colleagues didn't understand what a geological model is
- Good online 3D Viewer is worth it
- Investors, municipalities and civil protection need us
  - **but** we need to learn how to cater them

7th European Meeting on 3D Geological Modelling

Warsaw, Poland

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NATIONAL FUND FOR ENVIRONMENTAL PROTECTION AND WATER MANAGEMENT

Country update, Sweden

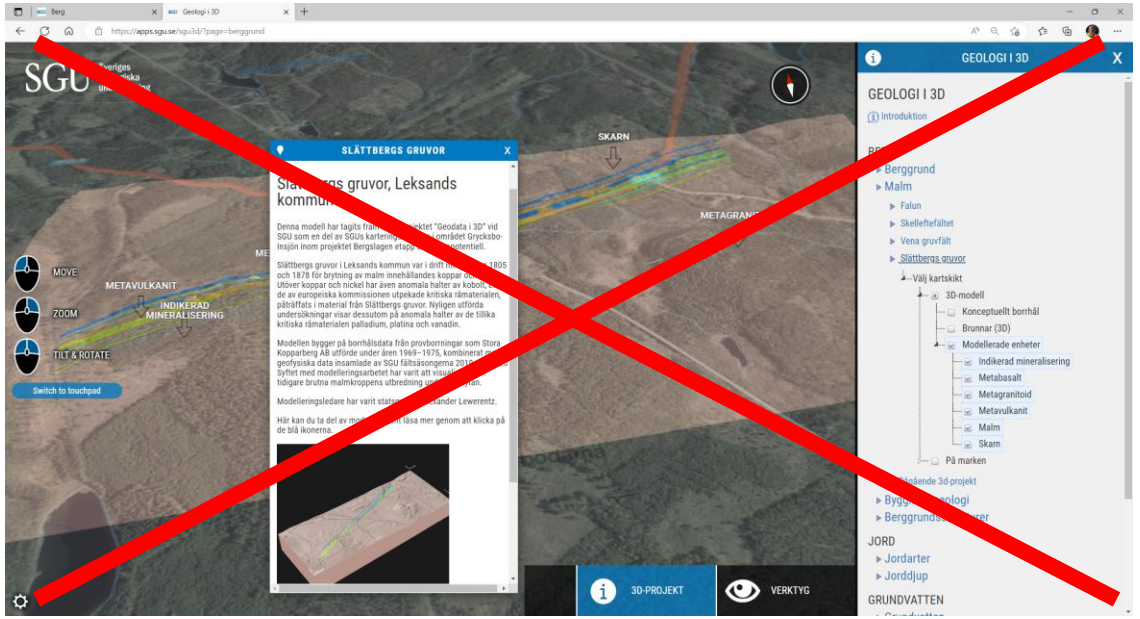
Access to SGU information

Web services at www.sgu.se

Our data is now free of charge – *GeoPackage, JSON, GeoJSON, CSV and TIFF*

- GeoLagret – access by order or download
- Map Viewer – information from databases
- Web Map Services (API, WMS) – access to databases in map viewers and mobile apps
- Archive – Drill logs etc.

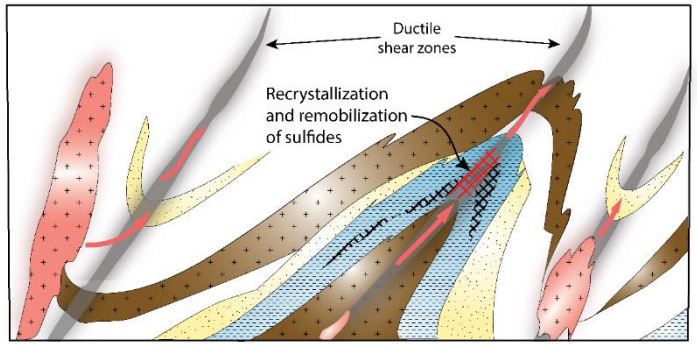
3D viewer recently removed!

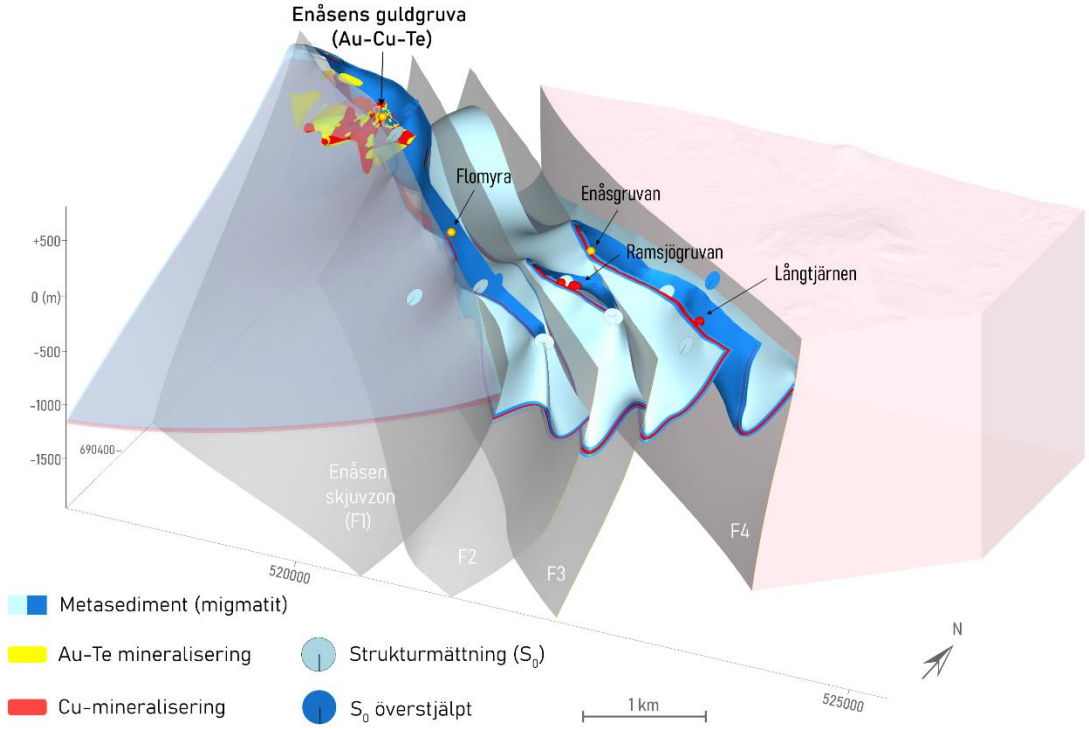


A ”3D-investigation”

Mineral resources and 3D

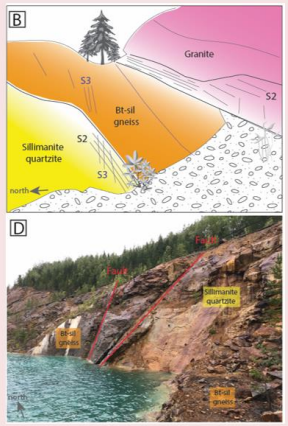
DATA & CONCEPT DRIVEN

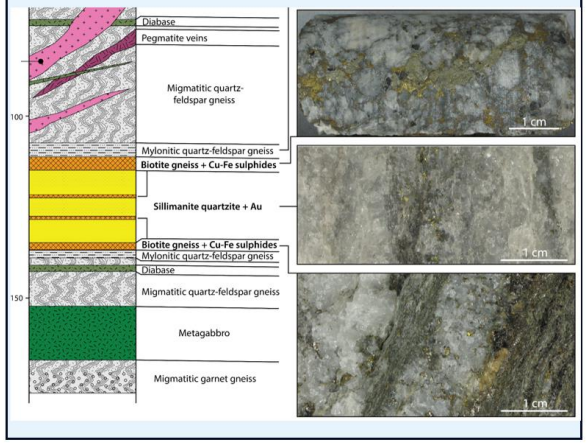


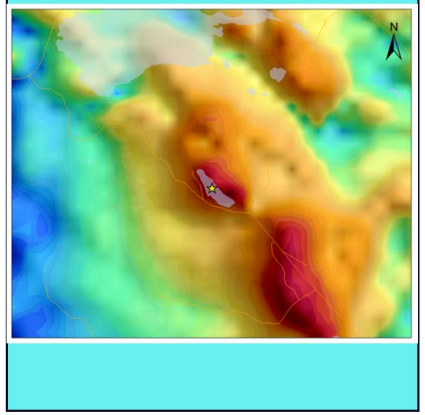


TOOLS: Leapfrog Geo

FIELDDATA + **DRILL DATA** + **GEOPHYSICS**



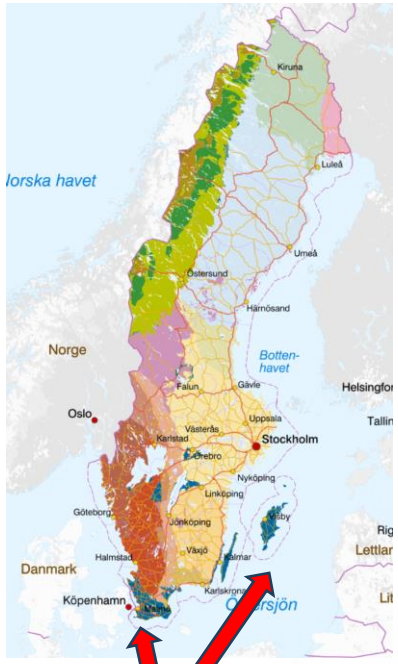




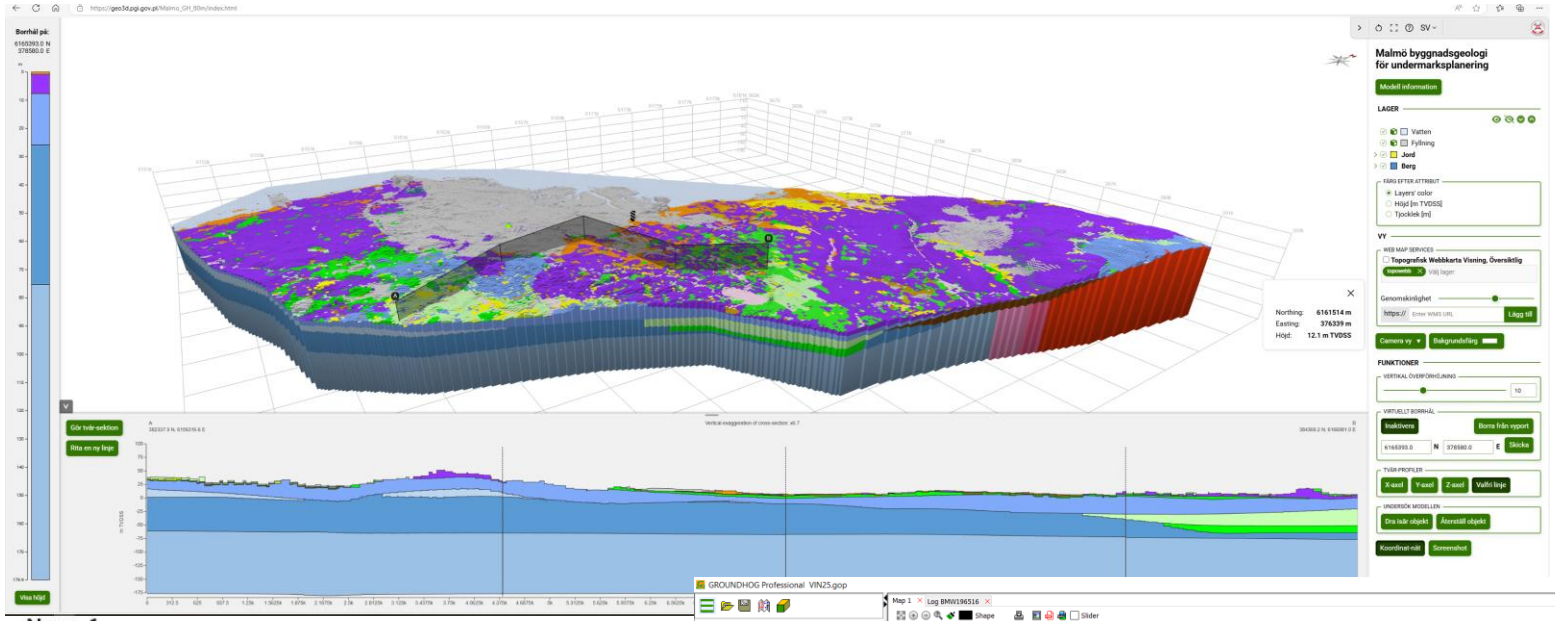
Mined for **gold (Au)** until 1991, but now interesting target for **copper (Cu)** and **tellurium (Te)**

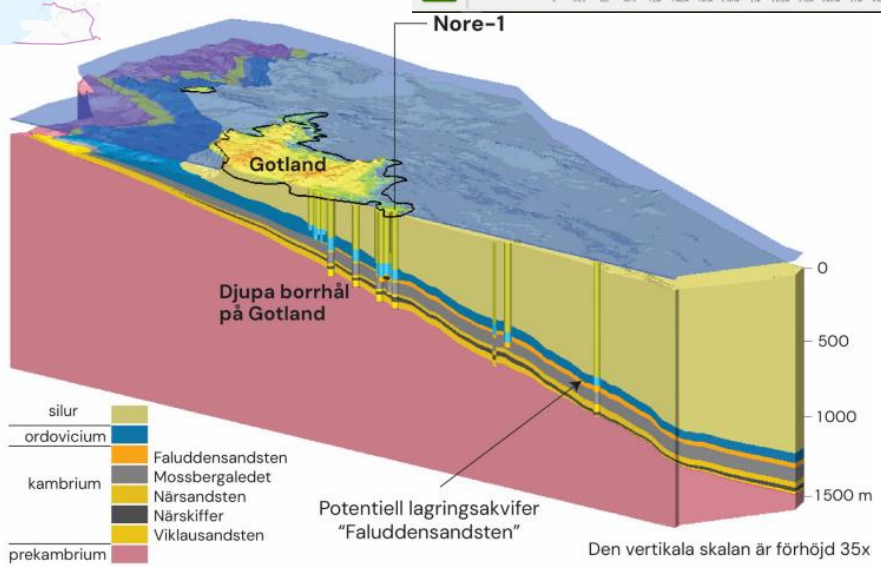
”Enjoy the 7th European Meeting on 3D Geological Modelling, and I hope to see you soon!”
Best wishes, Stefan

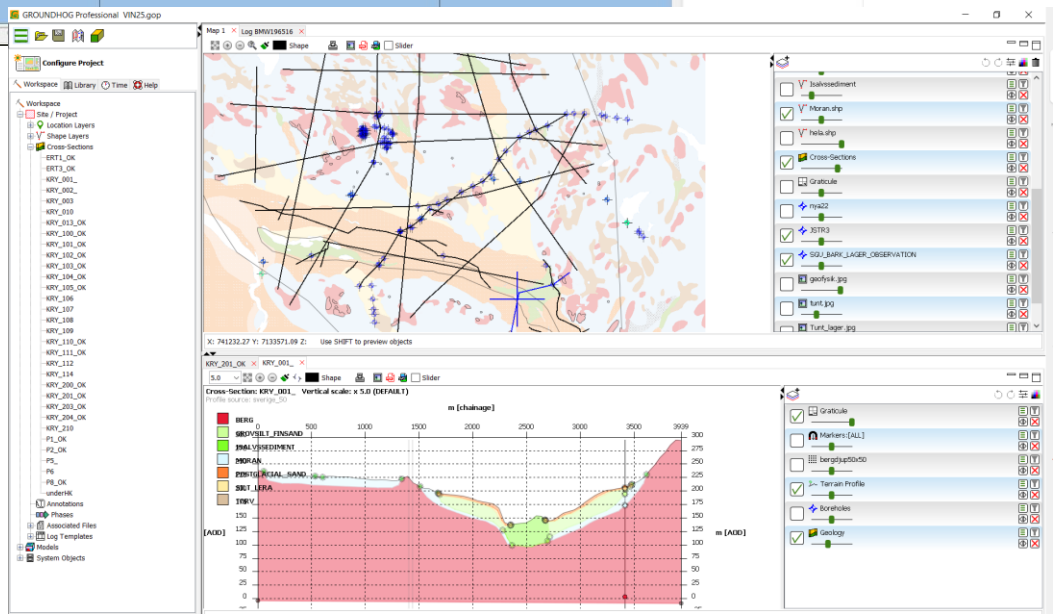
3D and Physical planning/infrastructure



CCS







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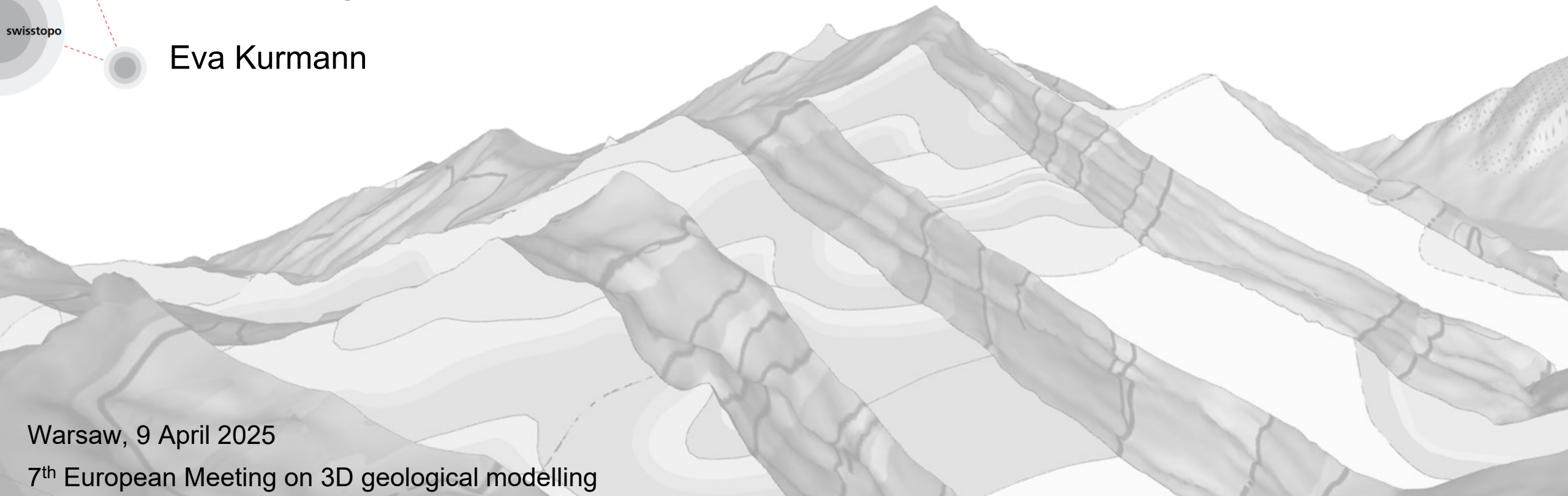
Schweizerische Eidgenossenschaft
Confédération suisse
Confederazione Svizzera
Confederaziun svizra

wissen wohin
savoir où
sapere dove
knowing where

swisstopo

Switzerland
Country Update

Eva Kurmann



Warsaw, 9 April 2025

7th European Meeting on 3D geological modelling

Action plan for the digitisation of the geological subsurface

Government mandate 2022 – 2030

Objectives

Standardised collection and **digitisation** of geological data

Accelerated production of **nationwide 2D & 3D geodata**

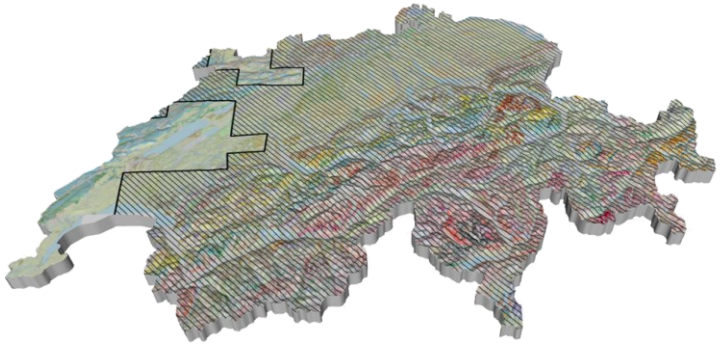
Central, public access to geodata

Vision 2030

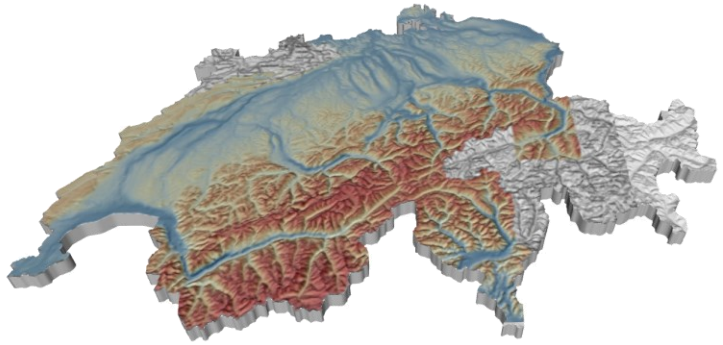
Geological data must be **up-to-date, reliable, sustainable and accessible**

Dynamic data use facilitates multiple applications and interdisciplinary combination

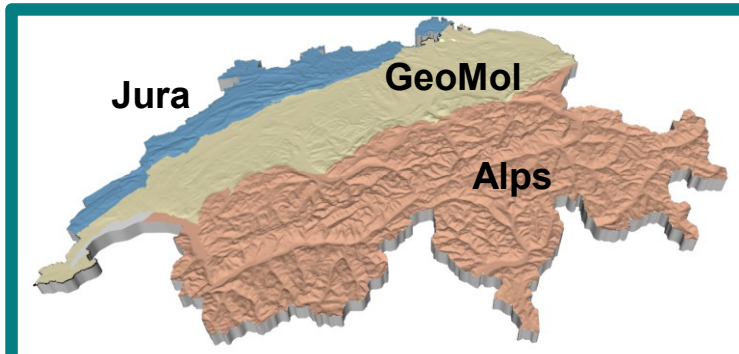
Digitisation improves **knowledge and understanding of the geological subsurface**



Harmonisation of the geological 2D vector data (1:25000)
continuous progress

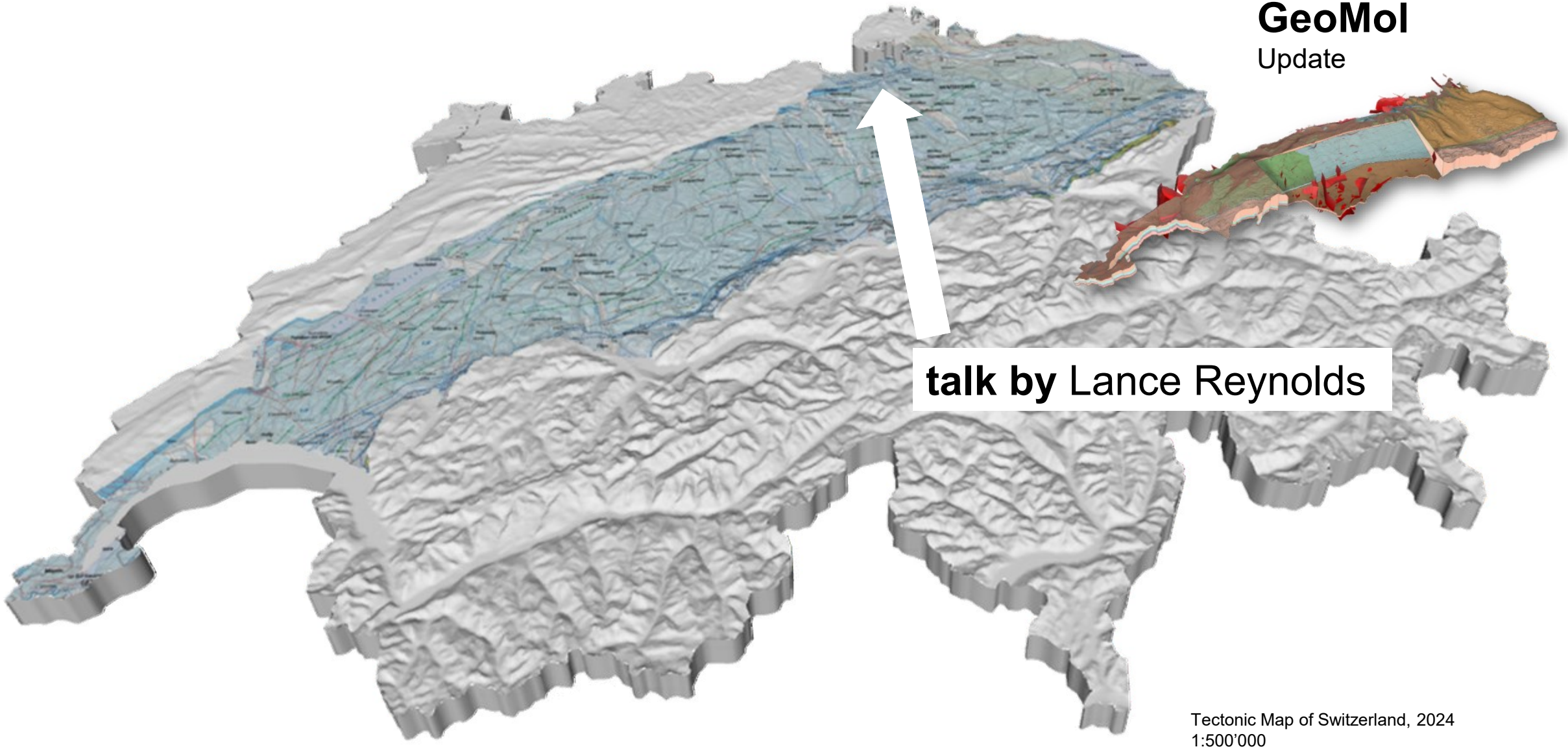


Updated top bedrock map
Regional scale 3D models unconsolidated sediments



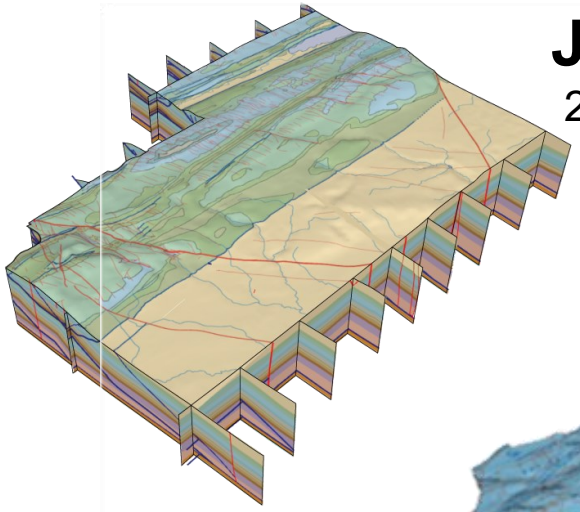
regional scale 3D model
Jura Mountains, Alps, Molasse Basin (update)
continuous progress

Production of nationwide 3D geological models



Tectonic Map of Switzerland, 2024
1:500’000

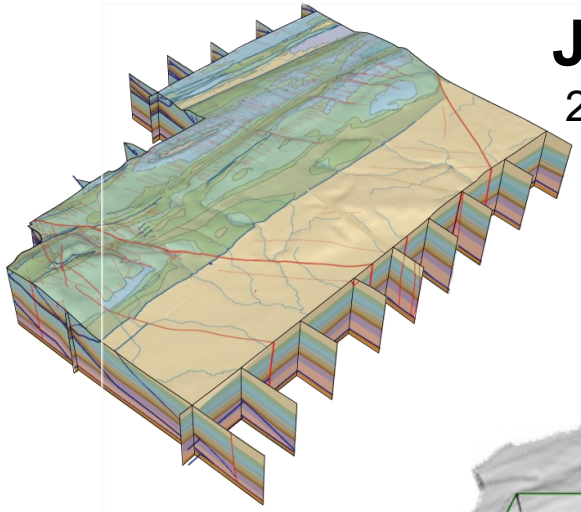
Production of nationwide 3D geological models



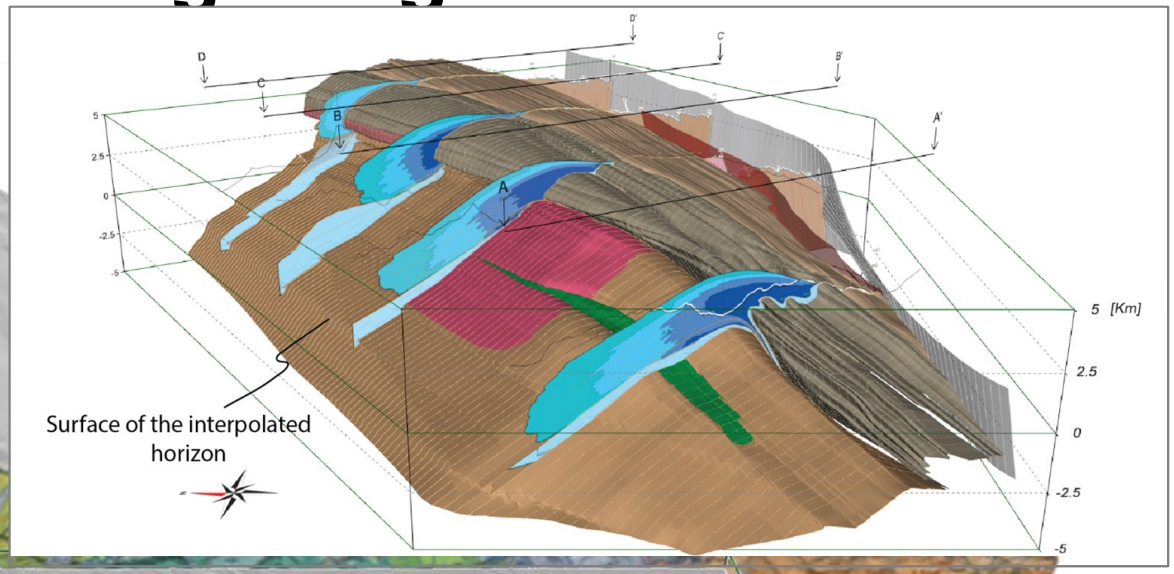
Jura3D
2022-2030

Tectonic Map of Switzerland, 2024
1:500’000

Production of nationwide 3D geological models



Jura3D
2022-2030



SwissAlps3D
2024–2030

Subalpine Molasse
In production

East Penninic
2026 - 2029

Austroalpine
2026 - 2030

Aar Massif 4D
Completed

Helvetic
In production

Prealps
In production

Lepontic
2025 - 2029

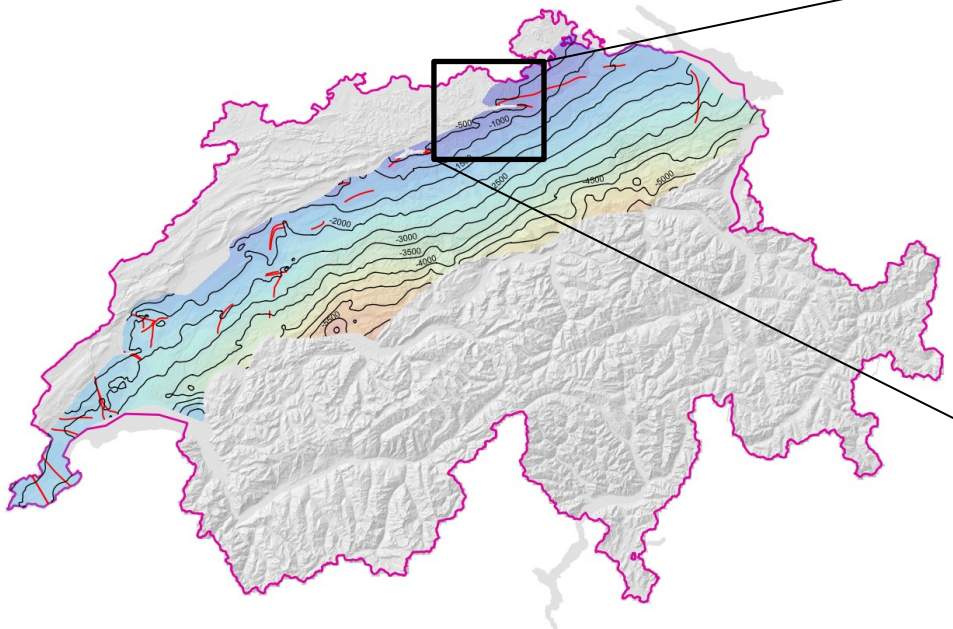
West Penninic
In production

South Alpine
2026 - 2030

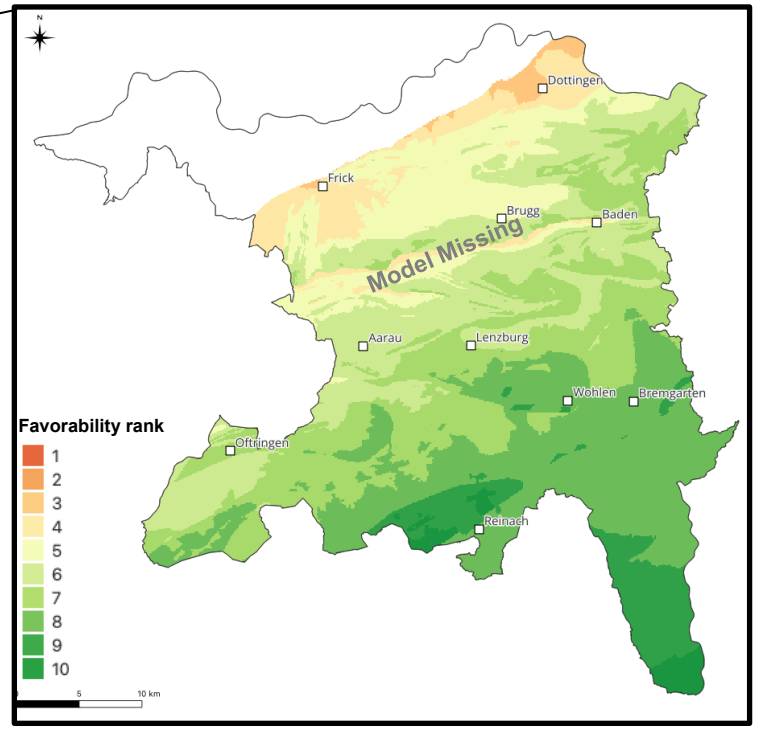
d 2024

Regional 3D Models: Key to Assessing Geoenergy Potential

- The newly formed process Georesources section at Swisstopo is tasked **with potenial analyses of geoenergy applications** (geothermal, CCS…) via «Play Fairway Analyses» (favorability maps)
- Across the Swiss Molasse Basin, GeoMol provides a very good first-order data basis (depth, structure & temperature of potential reservoirs)
- Elsewhere, such data are needed!

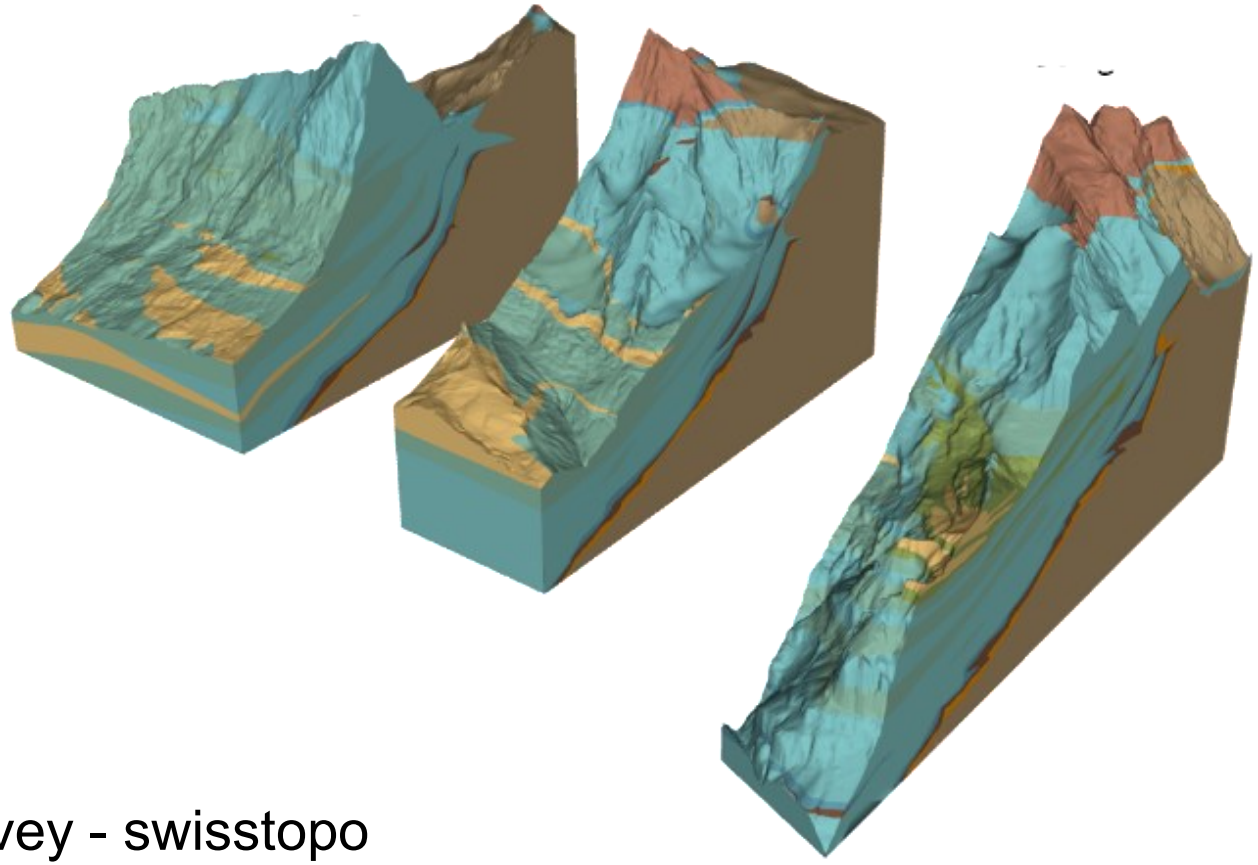


Depth Map of Top «Muschelkalk» (Switzerland's most extensive saline aquifer) as represented by the current GeoMol model



Local favorability mapping for hydrothermal usage in the Canton Aargau (northern part of the region not yet modelled)

Questions and answers



Contact
Eva Kurmann, Swiss Geological Survey - swisstopo
eva.kurmann@swisstopo.ch

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Warsaw, Poland

The Netherlands

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The Netherlands

Country update

Start presentation

TNO Geologische Dienst Nederland

3 min – 4 slides

Societal questions

Main driver
Value Chains
Time-to-market

Data

Modelling

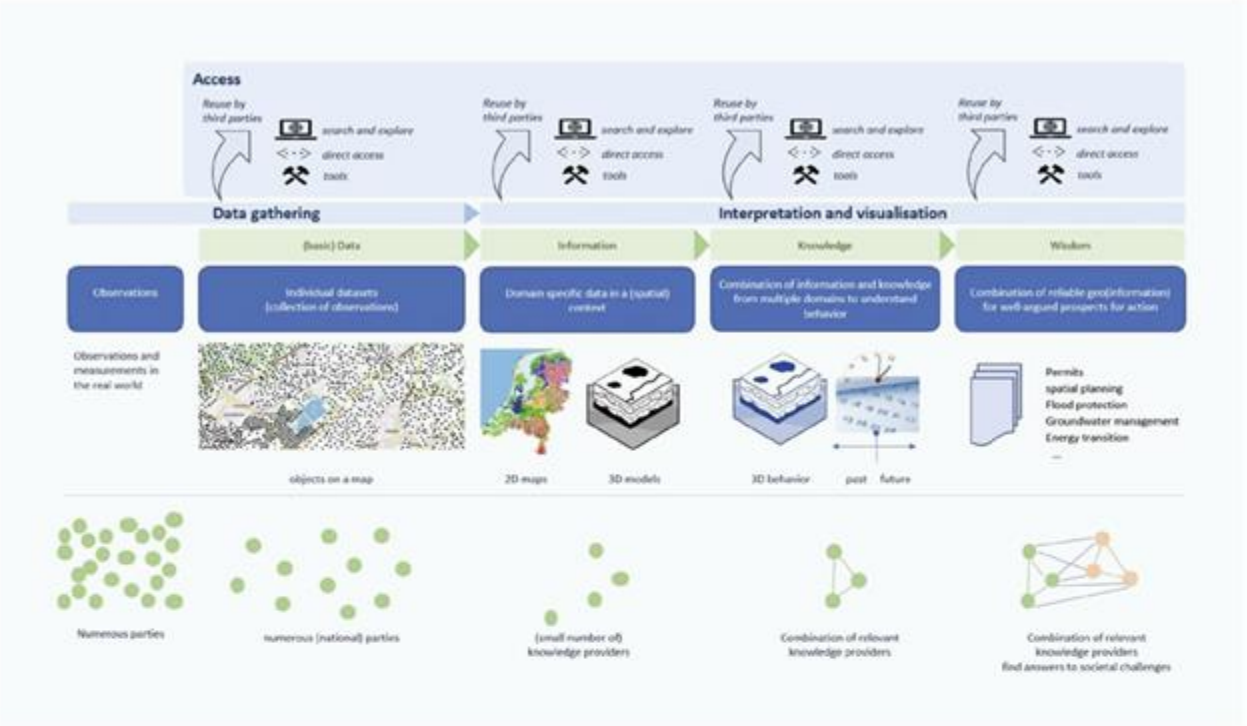
Dissemination

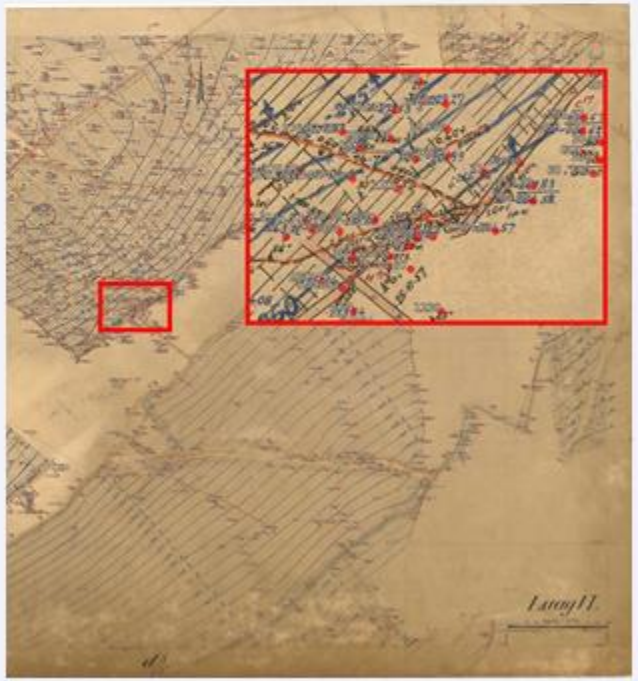
TNO Geologische Dienst Nederland

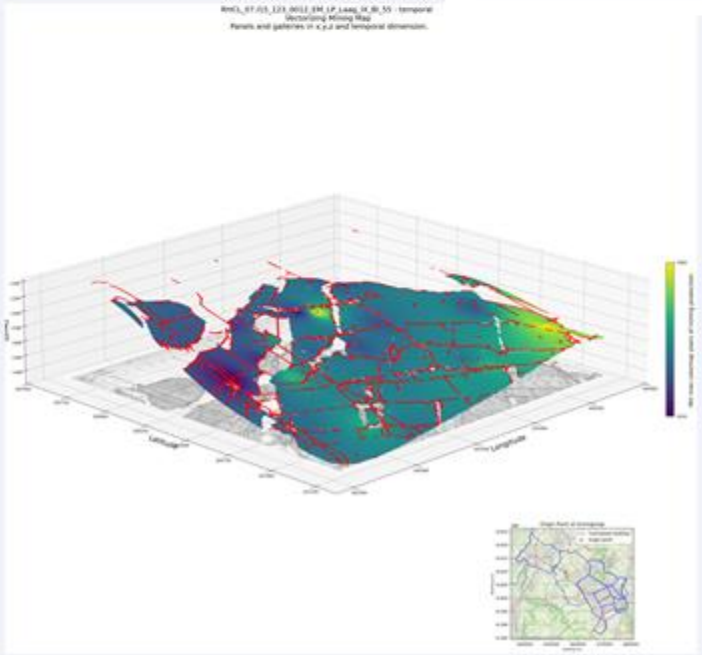
Outlook - Data

Data

- Raw data & Interpretations
- Applying ML techniques for data harvesting







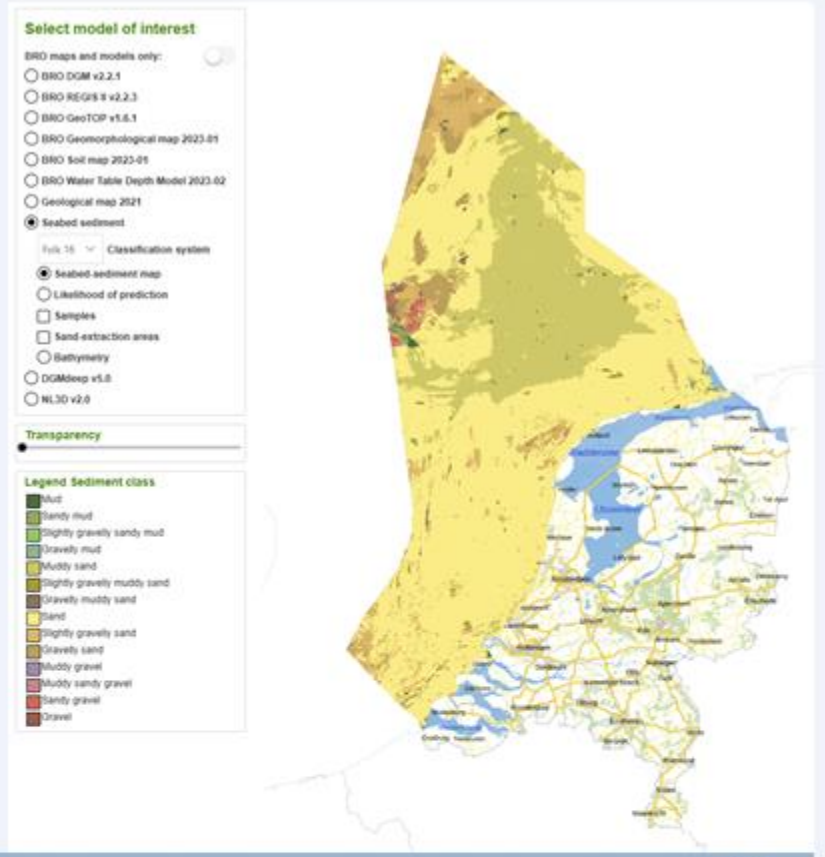
TNO Geologische Dienst Nederland

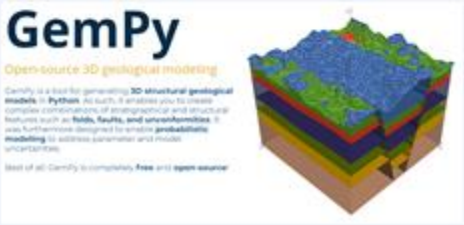
Outlook - Modelling

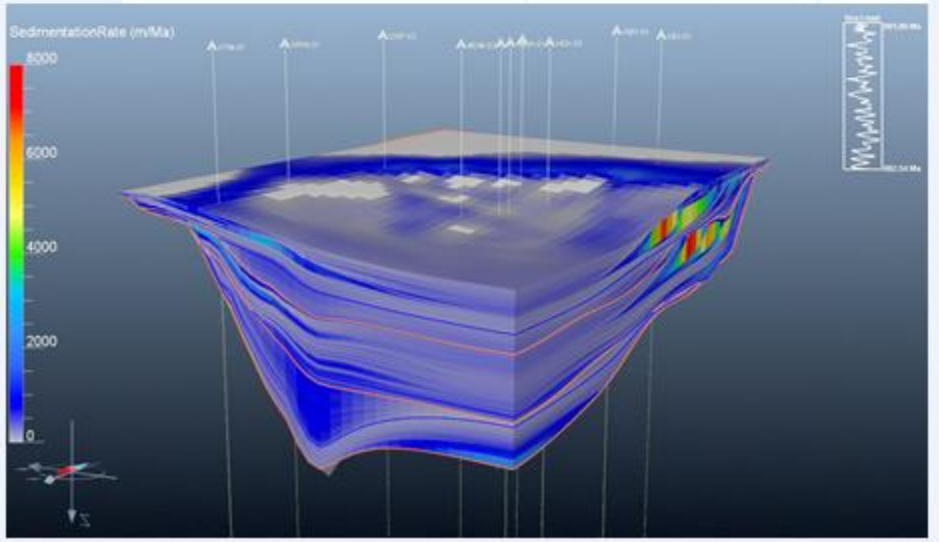
Data

Modelling

- Applying ML techniques for modelling
- Applying implicit modelling techniques







Outlook - Dissemination

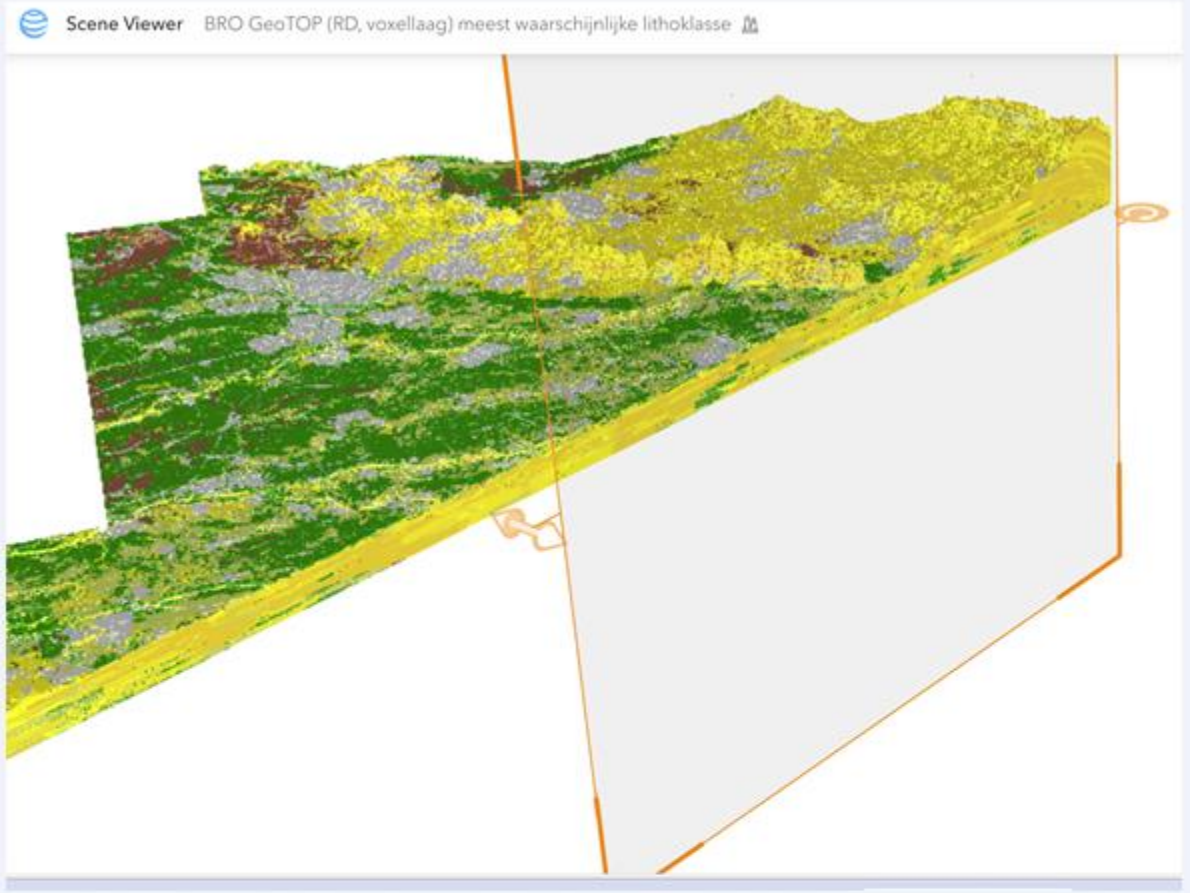
Data

Modelling

Dissemination

- Bridging the gap to users
- Value chains – creating connections

- creating value



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STEVE THORPE

Country Update from British Geological Survey

Update since last meeting

- New Science Strategy
- Investment in “Maps & Models”
- Focus on urban, quaternary, 3D software

BGS STRATEGIC PILLAR

Maps and Models for the 21st Century

Recognition that our geological maps need updating – risk

This needs resourcing and investment – staff and solutions

Result – over 70 new staff employed and a clear focus on stakeholders and prioritised project areas

Focussed Project Areas

Geothermal

- Using old hydrocarbon models to understand thermal targets
- Developing new models in under explored area

Tunnelling

- Development of new pump storage sites on the Great Glen
- Working collaboration with industry to build models to help de-risk the builds

Urban

- Stakeholder-driven
- Current focus is on coal field cites with complex glacial deposits
- Linking energy with geological mapping

Groundwater

- Stakeholder-driven
- Focusing on principle aquifers and the challenges presented by climate change

3D Software

• Renewed focus on methods/techniques • Gap analysis • Diversifying software portfolio
• Investment in training

Summary

- BGS is a very positive place with investment in new staff bringing life to the organisation.
- New “Maps and Models” strategic pillar will bring further external income as we improve what we can do and show that BGS science is now much stronger.
- A clear focus on our stakeholders will bring us closer to the people using our data.
- Our 3D modelling techniques will benefit from a more diverse choice of software to suit the modelling situation.

7th ← USA European Meeting on 3D Geological Modelling

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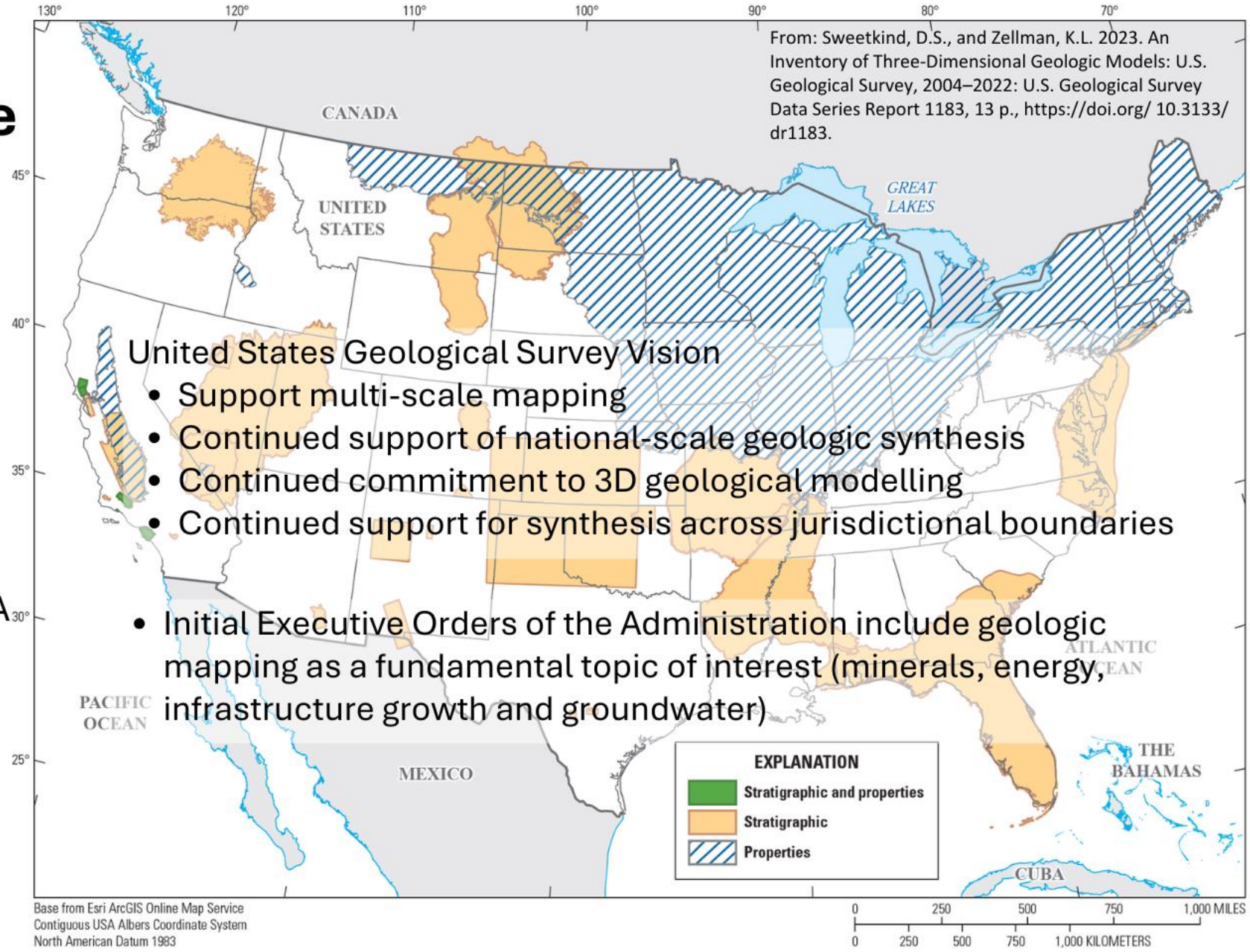
United States Update 3D Geological Modelling

Jason Thomason
Illinois State Geological Survey, USA



Prairie Research Institute
UNIVERSITY OF ILLINOIS URBANA-CHAMPAIGN

Great Lakes Geologic Mapping Coalition (GLGMC)

within the USGS National Cooperative Geologic Mapping Program (NCGMP)

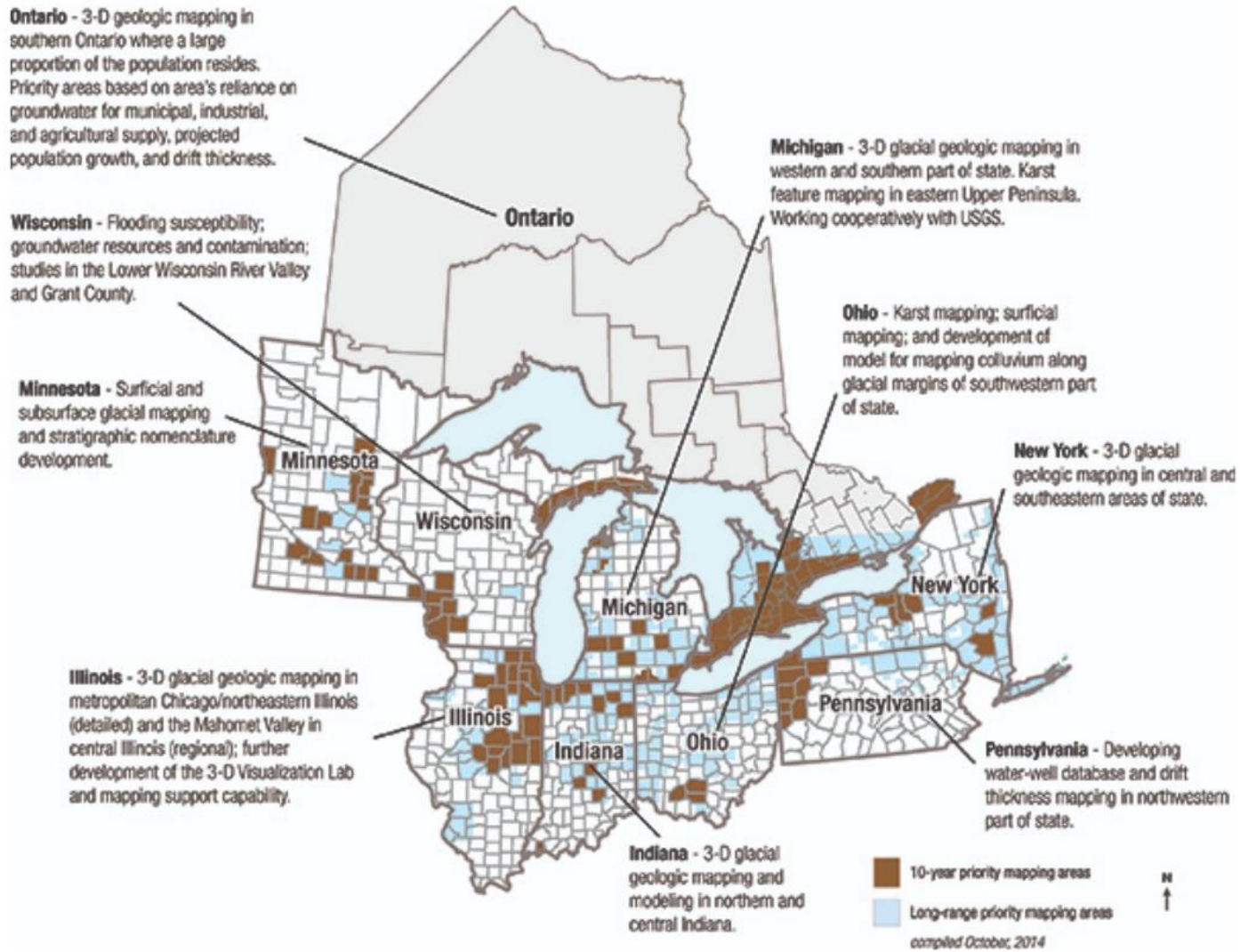
Collaboration of 8 State Geological Surveys and 1 Canadian Provincial Survey

Initiative:

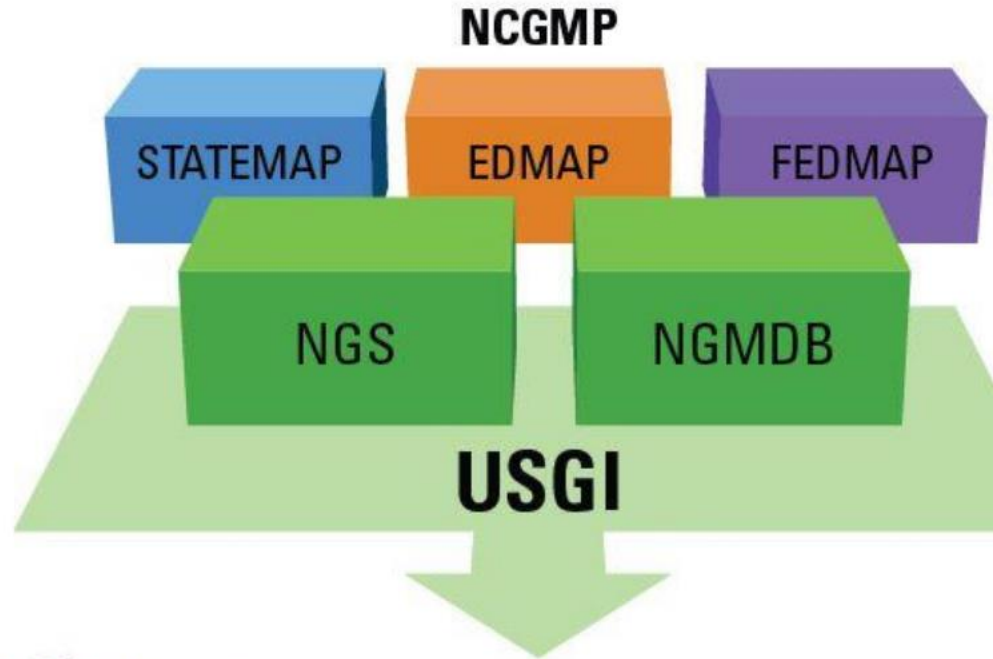
- 3D modelling of glaciated, Great Lakes regions of the United States

Timeline:

- 1999-present
- Funded through USGS NCGMP
- Individual surveys funded $80,000-$100,000 annually



(National Cooperative Geologic Mapping Program)



FEDMAP

Federal USGS mapping projects
Hazards, risk, energy, economy
Regional 3D geologic modelling

STATEMAP

Funding to State Geo Surveys since 1993
Traditionally 2D geologic mapping
Database standardization
Recently introducing 3D components

EDMAP

1996-present
Small grants for student-centered geologic mapping

Increasing 3D initiatives in the United States!!

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