Project: Subsurface potentials for storage and economic use in the North German Basin (TUNB*)

TUNB

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The first step to a 3D model of the North German Basin

The „Pilotregion“

Stephan Steuer

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Project: Subsurface potentials for storage and economic use in the North German Basin (TUNB)

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Overview:

- **TUNB: 3D-Model of the North German Basin**
  - Development of a structural 3D-model
  - Harmonized with the neighboring countries (NL, DK, PL)
  - Collaboration with the state geological survey organisations (GSO) of the north German federal states (SH, MV, BB, ST, NI)
  - The GSO are fully responsible for their part of the model

Legal foundation: §5 KSpG (Analyse und Bewertung der Potenziale für die dauerhafte Speicherung)

„BGR erarbeitet die für die Bewertung erforderlichen Grundlagen im Benehmen mit der jeweils zuständigen Landesbehörde.“

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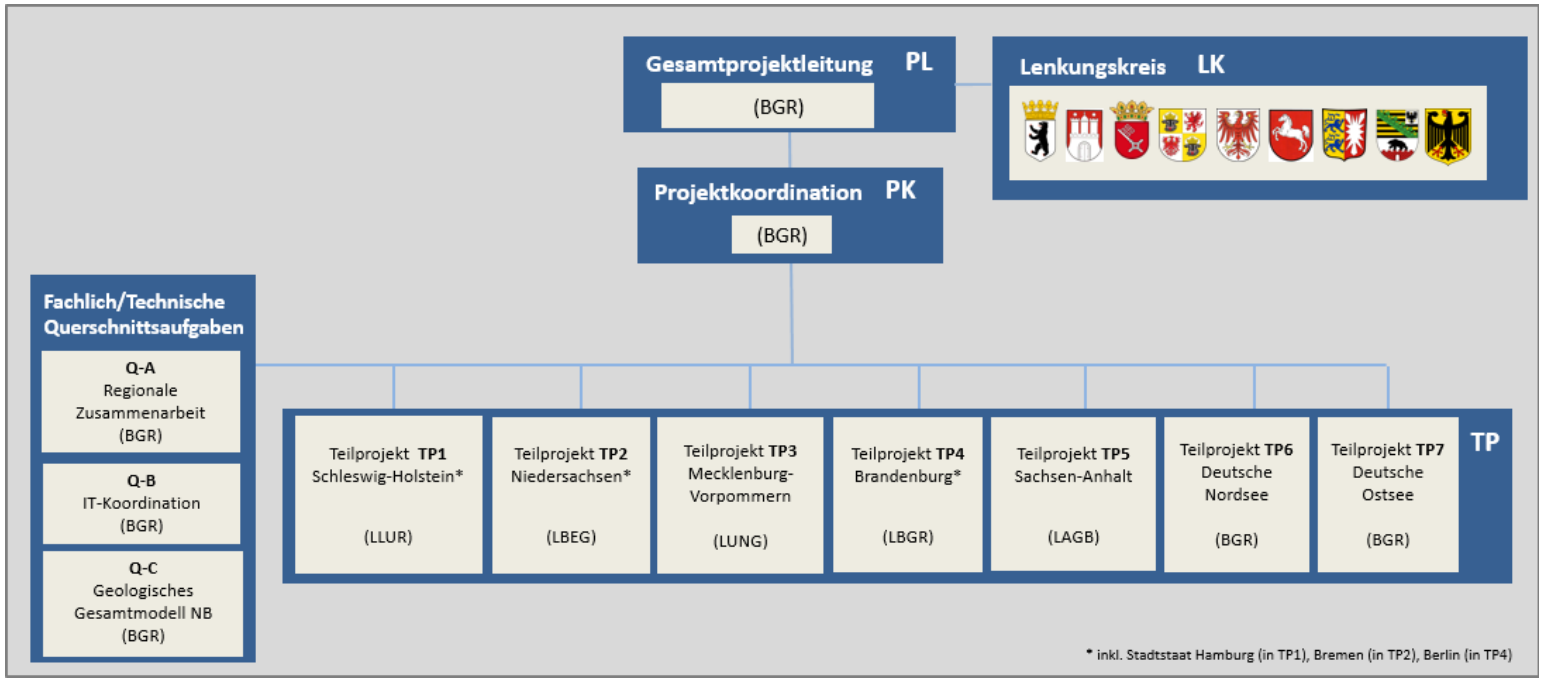
Struktur

- **Partner:** SGD von SH, HH, MV, NI, HB, BB, BE, ST, BGR
- **Laufzeit:** 6 Jahre (Beginn 01/2014 – 01/2016) bis Ende 2021



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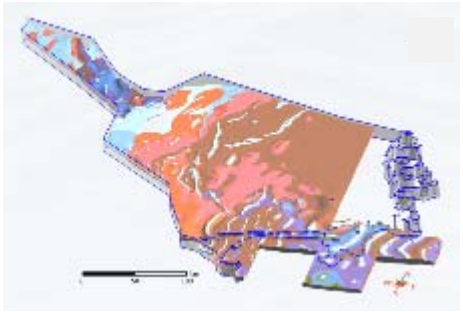
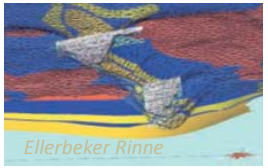
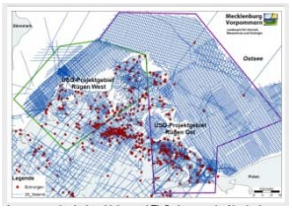
Existing 3D-Models:



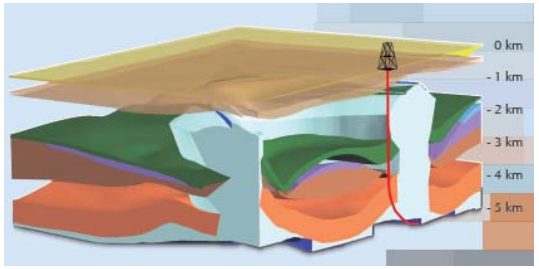
Source: BGR GPDN



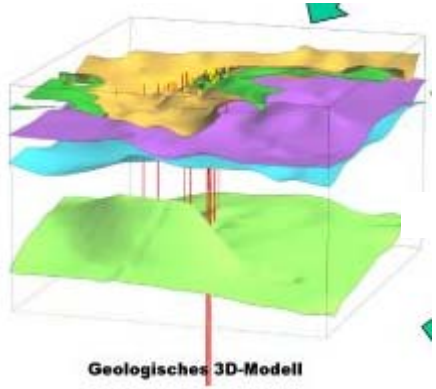
Source: Jahresbericht Landesamt für Natur und Umwelt des Landes Schleswig-Holstein 2006/07



Source: LUNG M-V



Source: LBEG *3D-Modell_2012-09.pdf*



Source: LBGR

Full state model – Partitial state model – No model

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Projekt TUNB - Challenges

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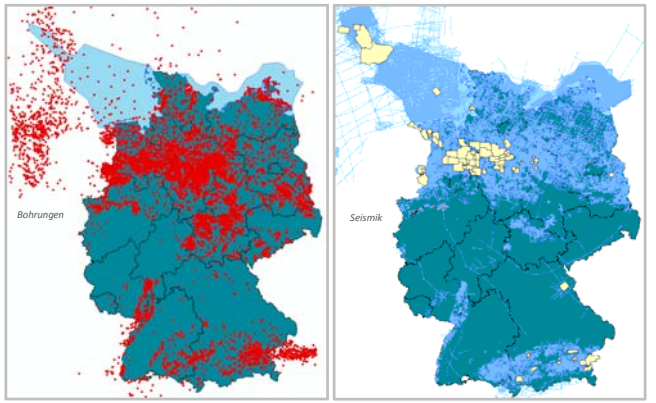
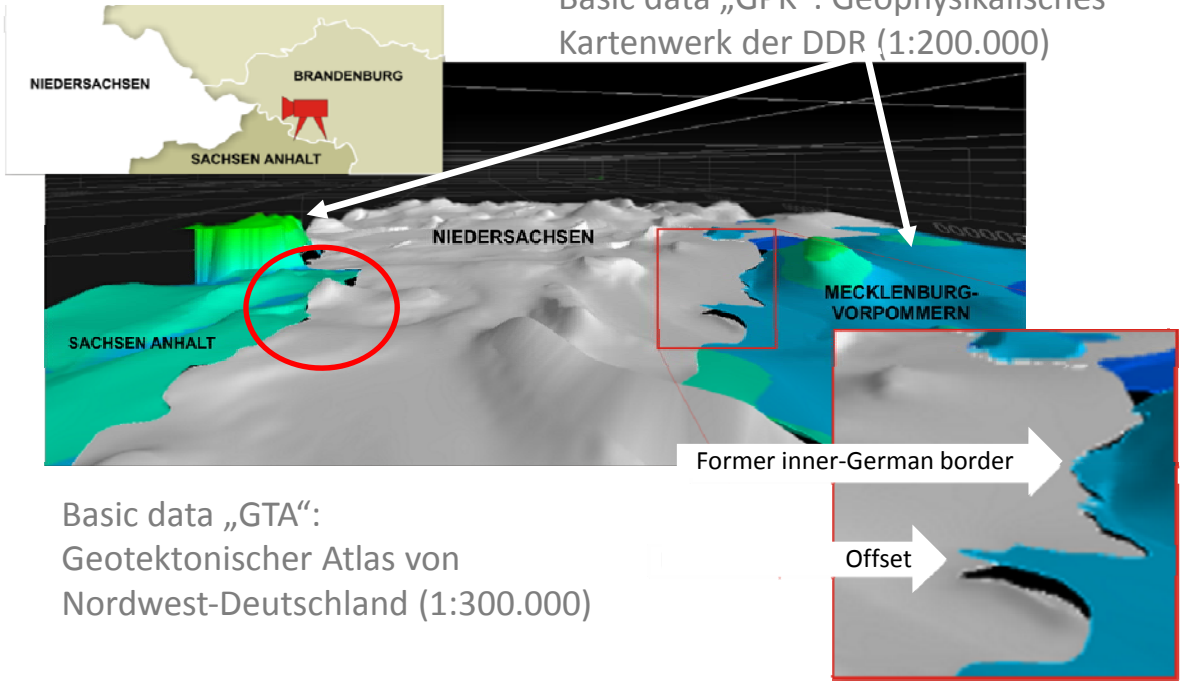
Different existing data:

- GPK: Mapping of seismic reflectors
- GTA: Fitting to stratigraphic markers
- Different velocity models
- Different structural interpretation
- Different stratigraphic assignment



Basic data „GPK“: Geophysikalisches Kartenwerk der DDR (1:200.000)



Basic data „GTA“:
Geotektonischer Atlas von Nordwest-Deutschland (1:300.000)

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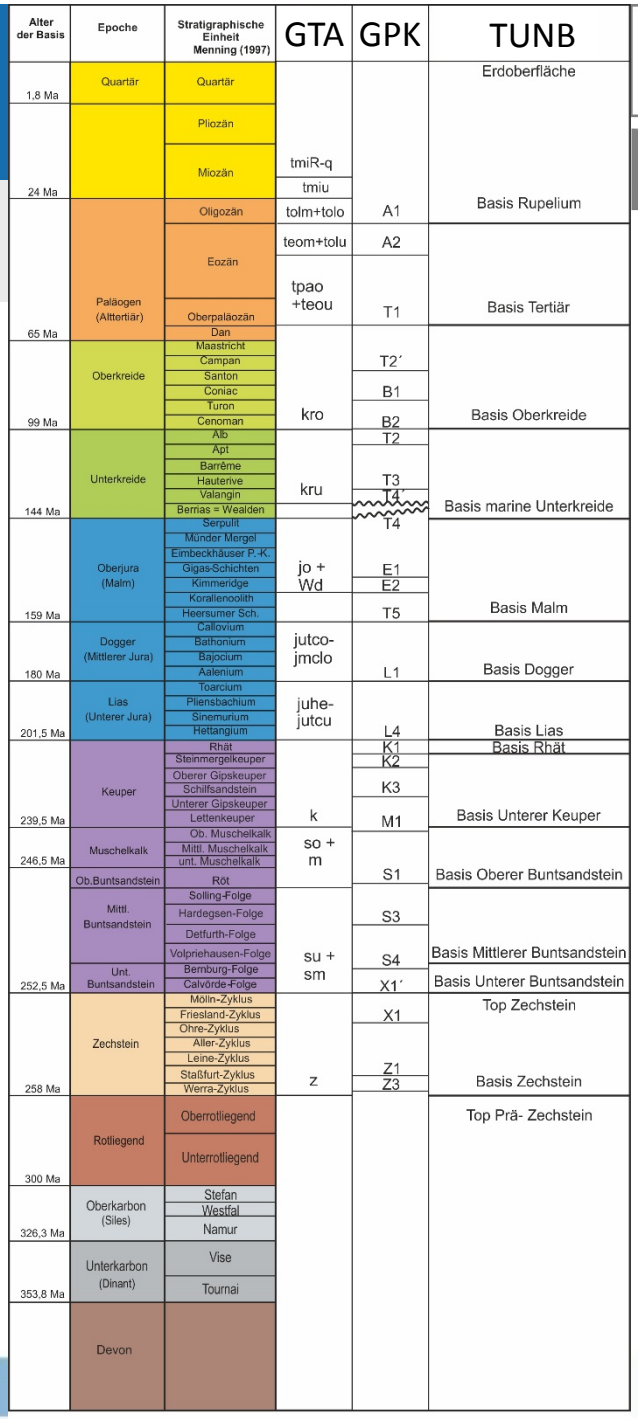
Necessary adjustments:

- Definition of 13 horizons
- Compilation of existing stratigraphic definitions/information for every horizon by every GSO
- Harmonization of definitions for every modeled horizon
- Two additional horizons (13+2): „Top Zechstein“ und „Top Prä-Zechstein“
- One additional horizon „DEM“ (Earth´s surface)

Used software: GoCAD.



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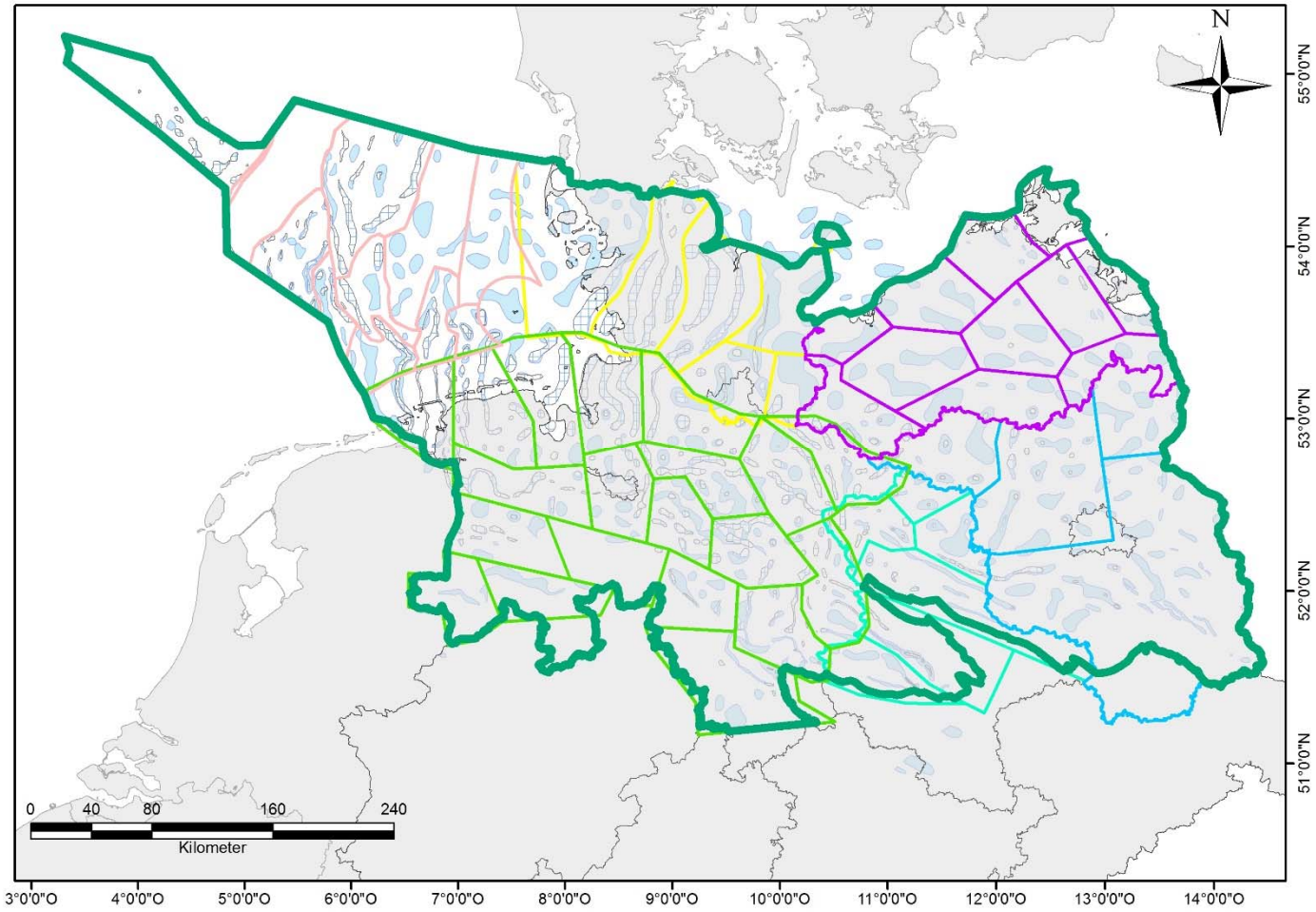
Division of the model into tiles

- Size and complexit
- Boundary of a tile
- Easier harmonizati
- Easier project mar



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Importance of harmonization:

- Different ways of fault modeling
- Position and dip of cross-border faults
- Depth and dip of horizons

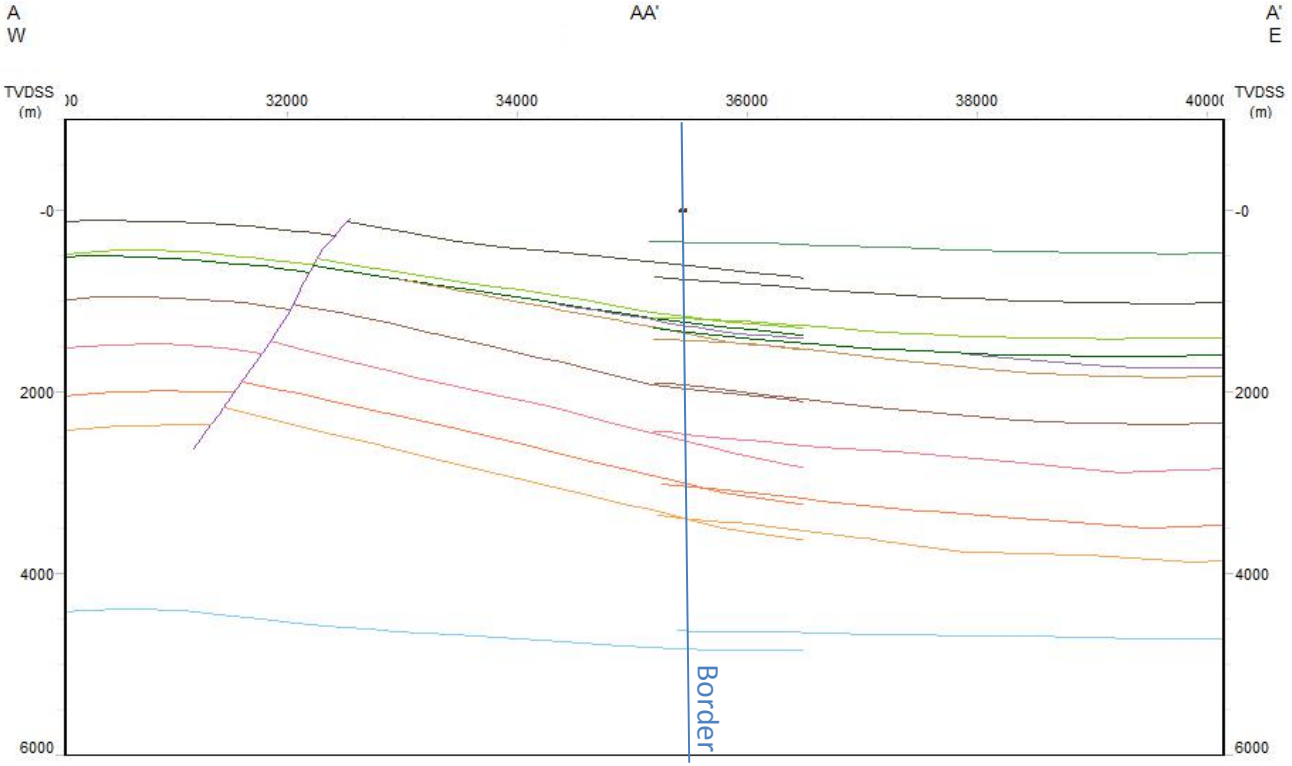

Figure from out-dated version of the model

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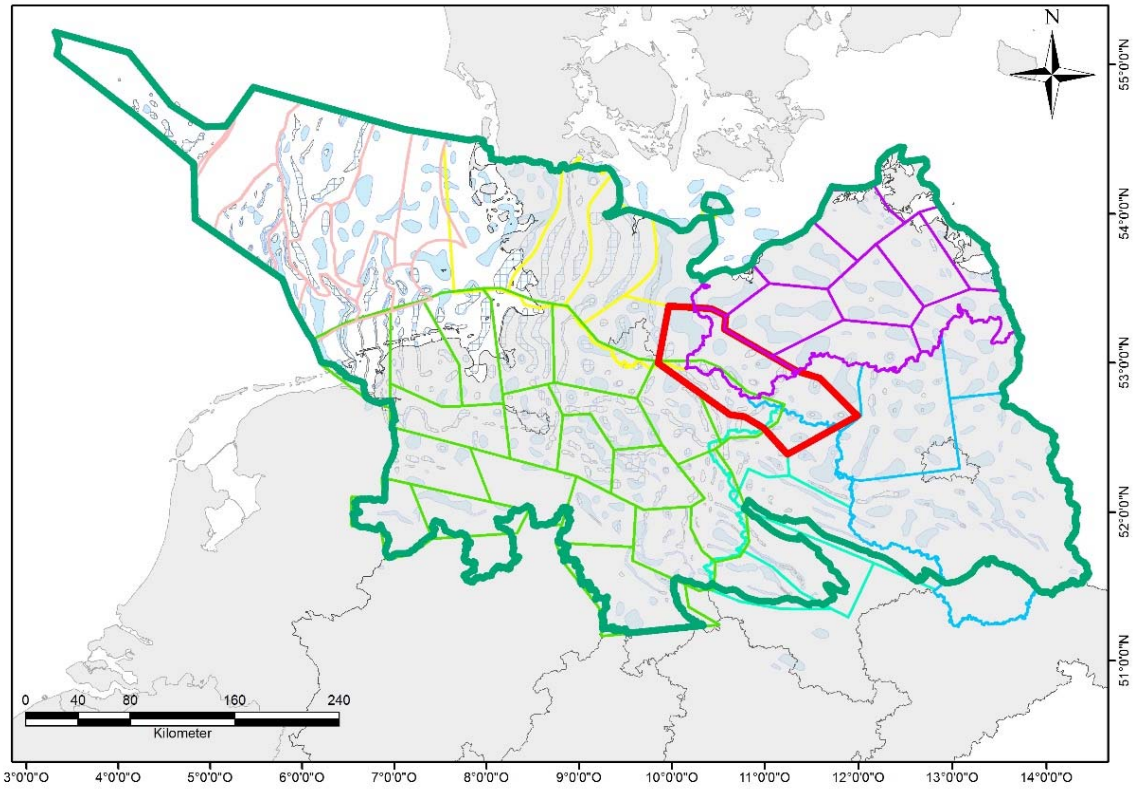
The „Pilotregion“:

- (relatively) small area
- Comprises areas of (almost) every GSO
- Located in the area of the former inner-German border

Areal extend:
150 km x 50 km
(7.800 km²)

The model comprises:
- 16 horizons
- 24 Salt-diapirs
- ca. 200 faults

Modeling in 2016



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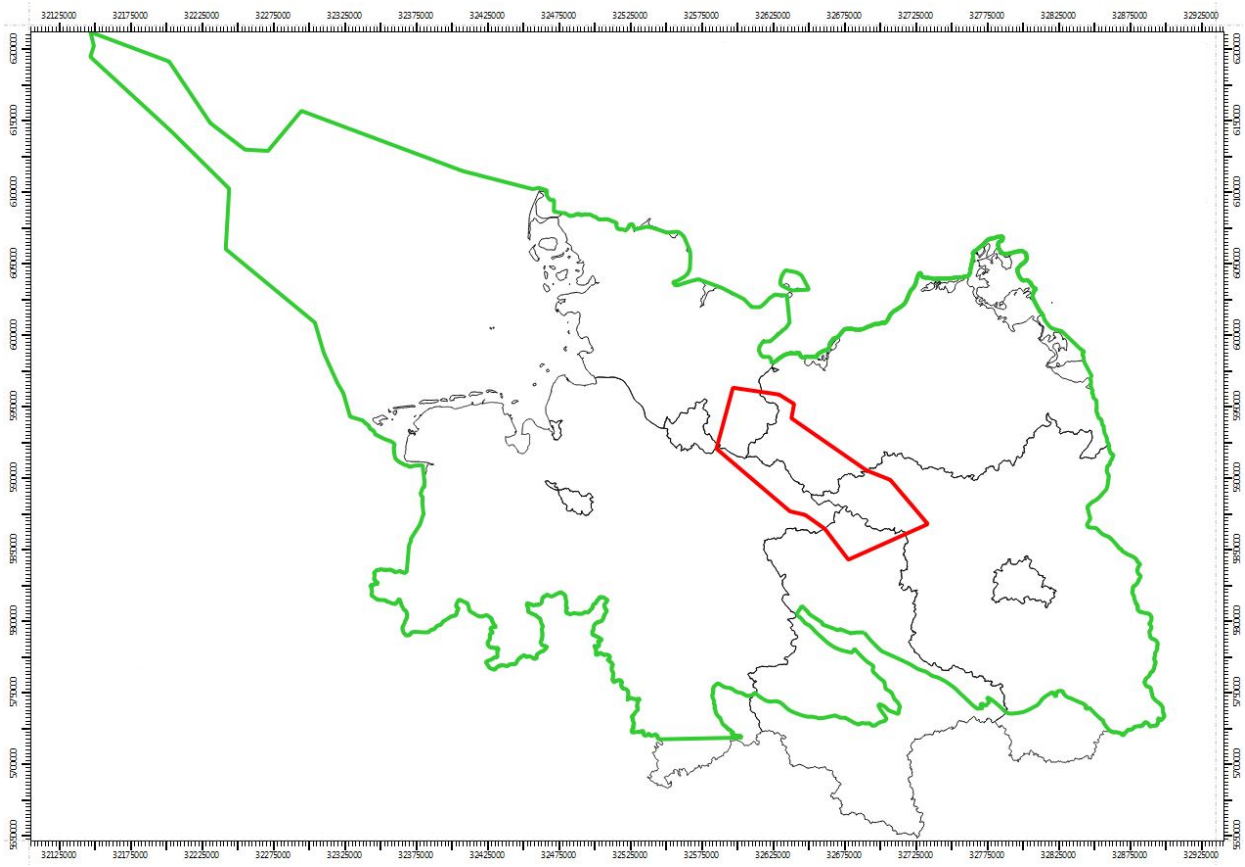
The „Pilotregion“:



Pilotregion comprises:

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Modeling in 2016

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Project TUNB - The „Pilotregion“

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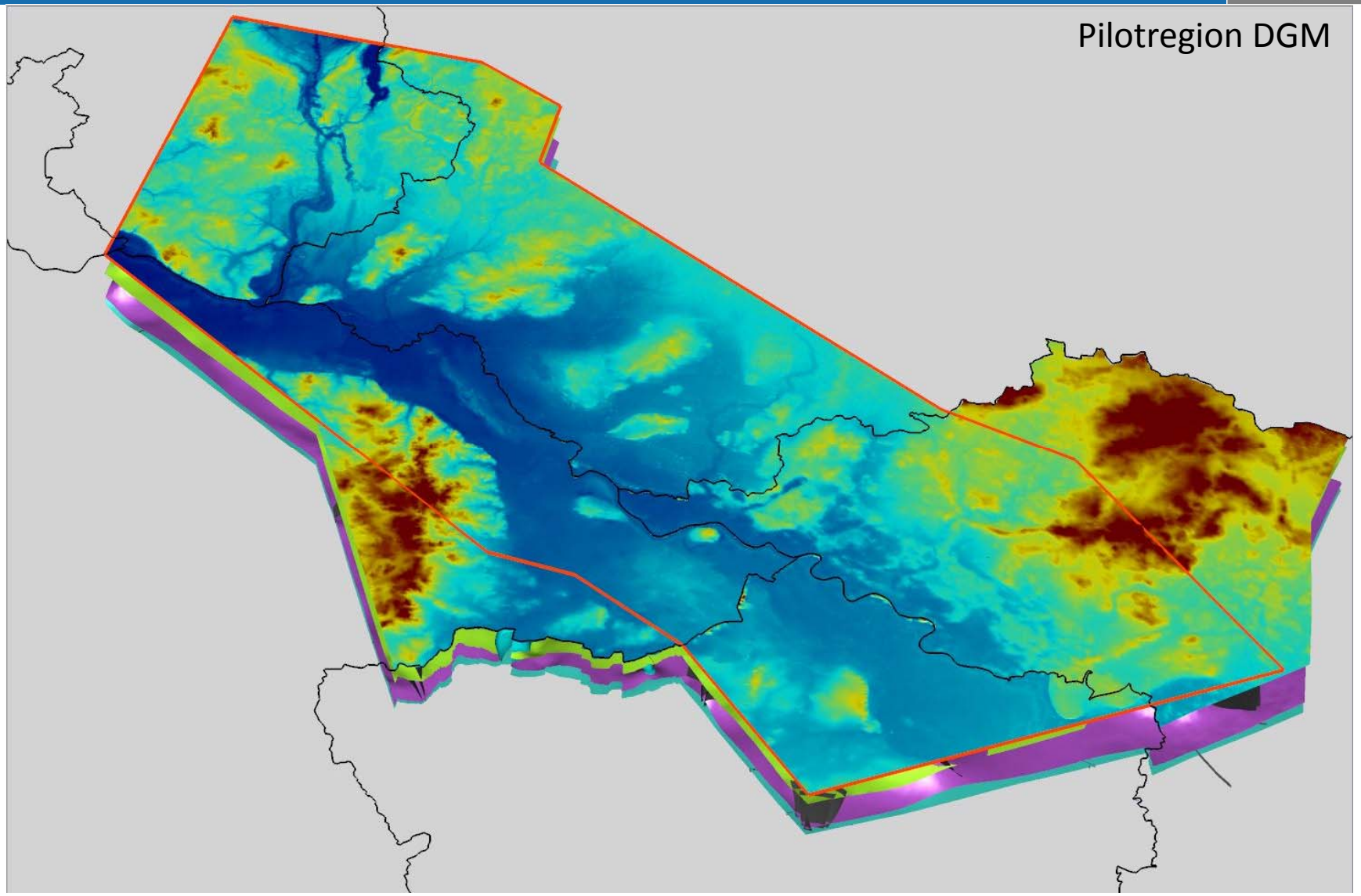

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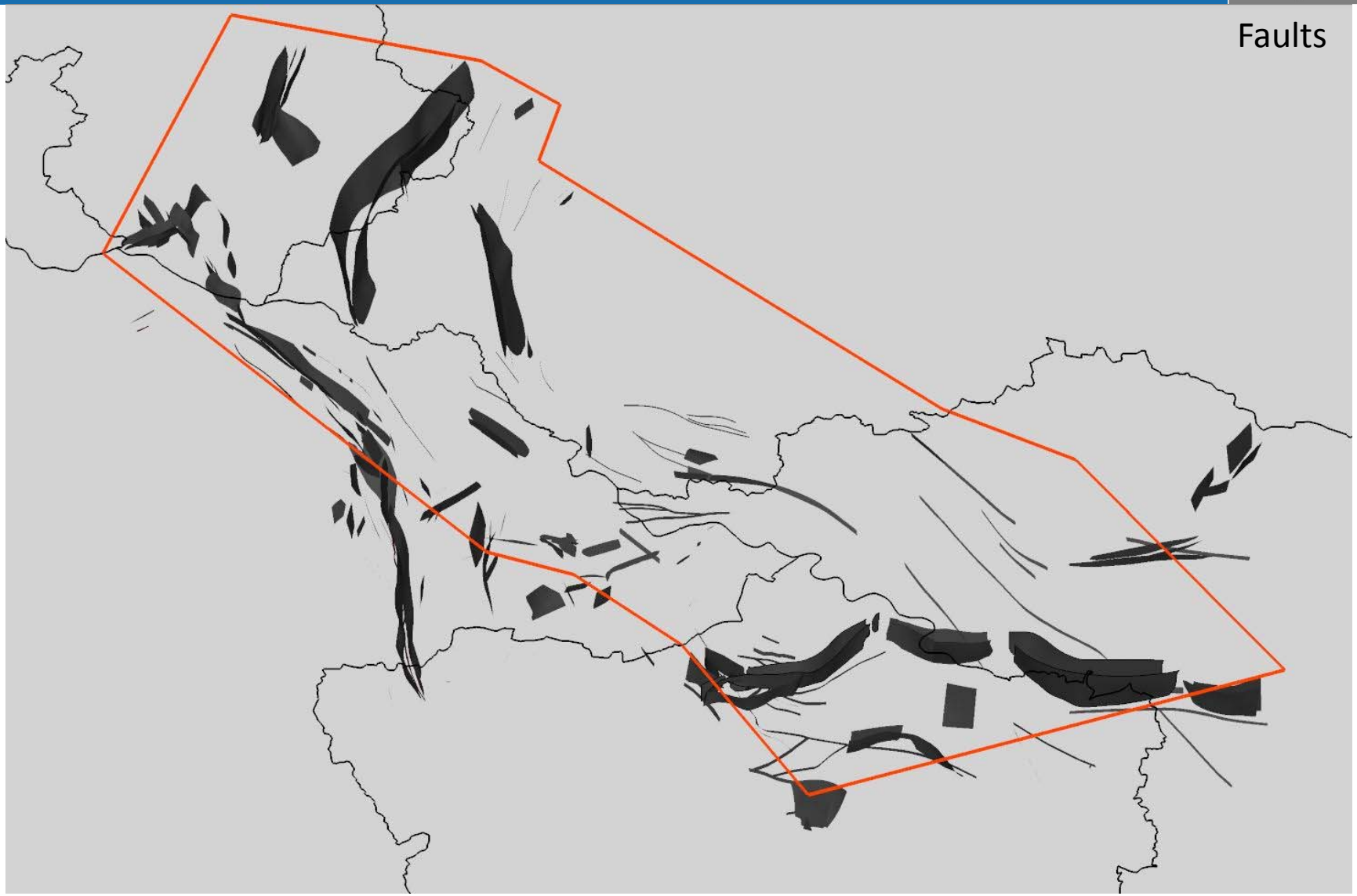

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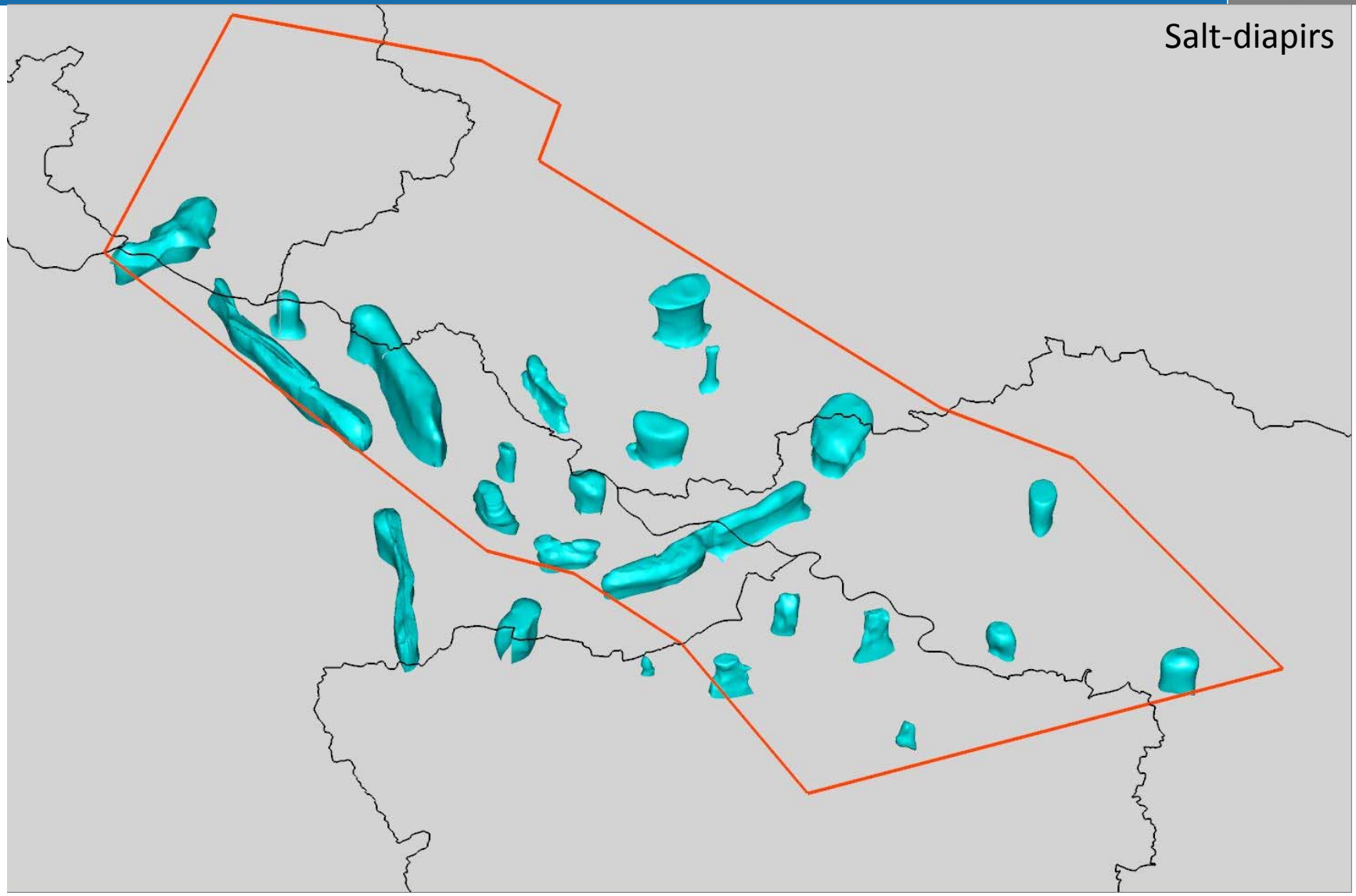

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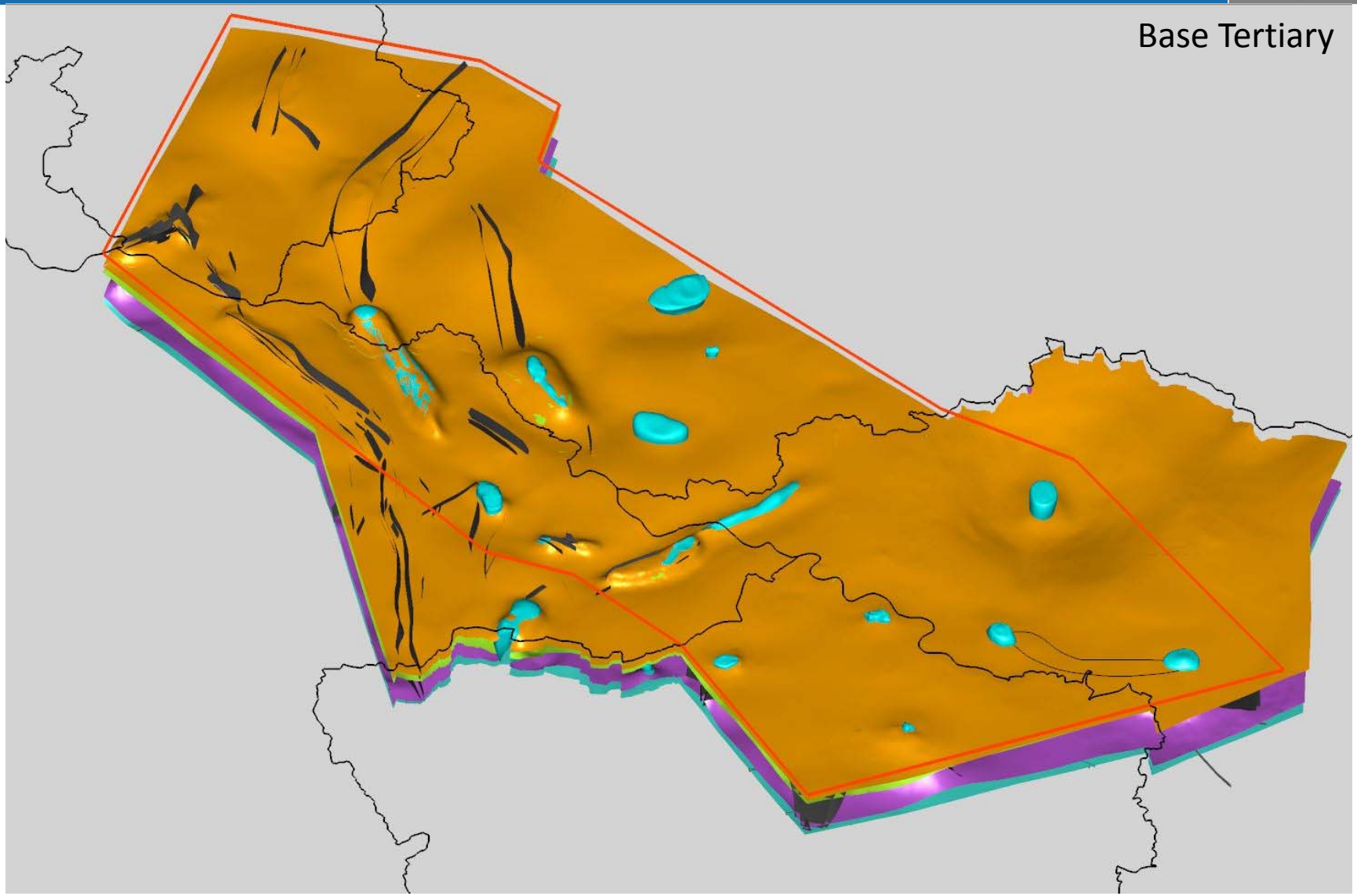

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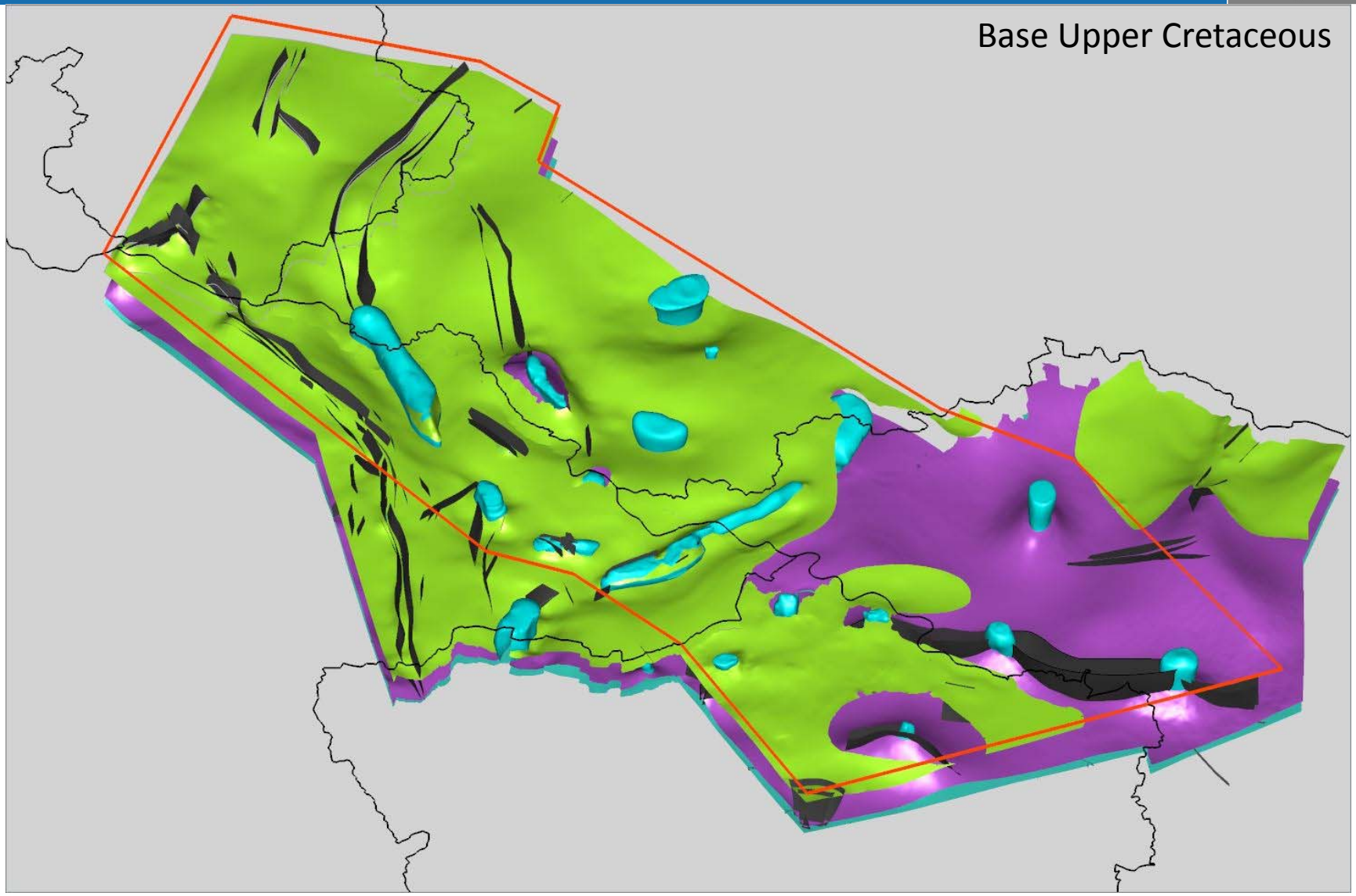

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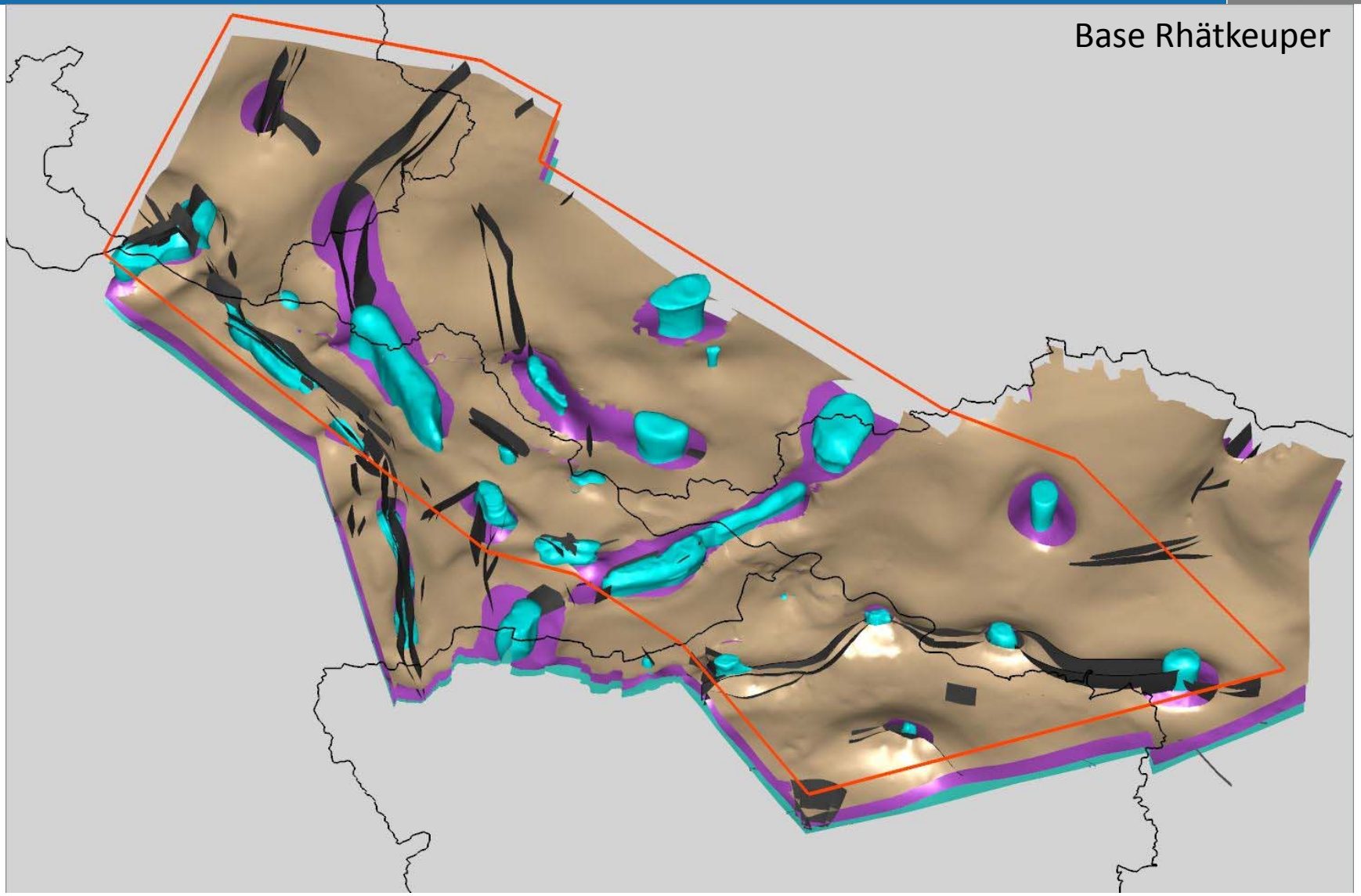

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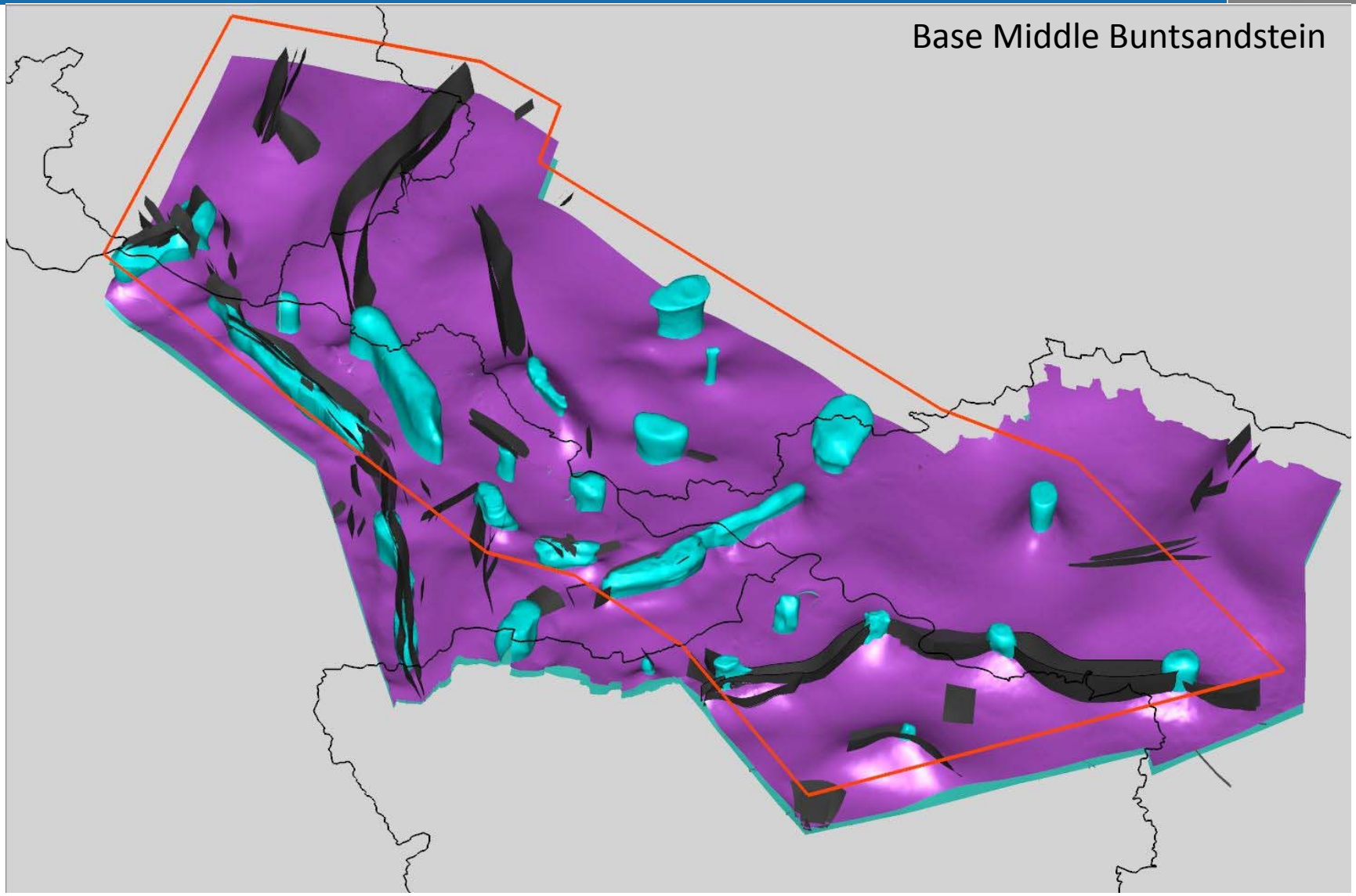

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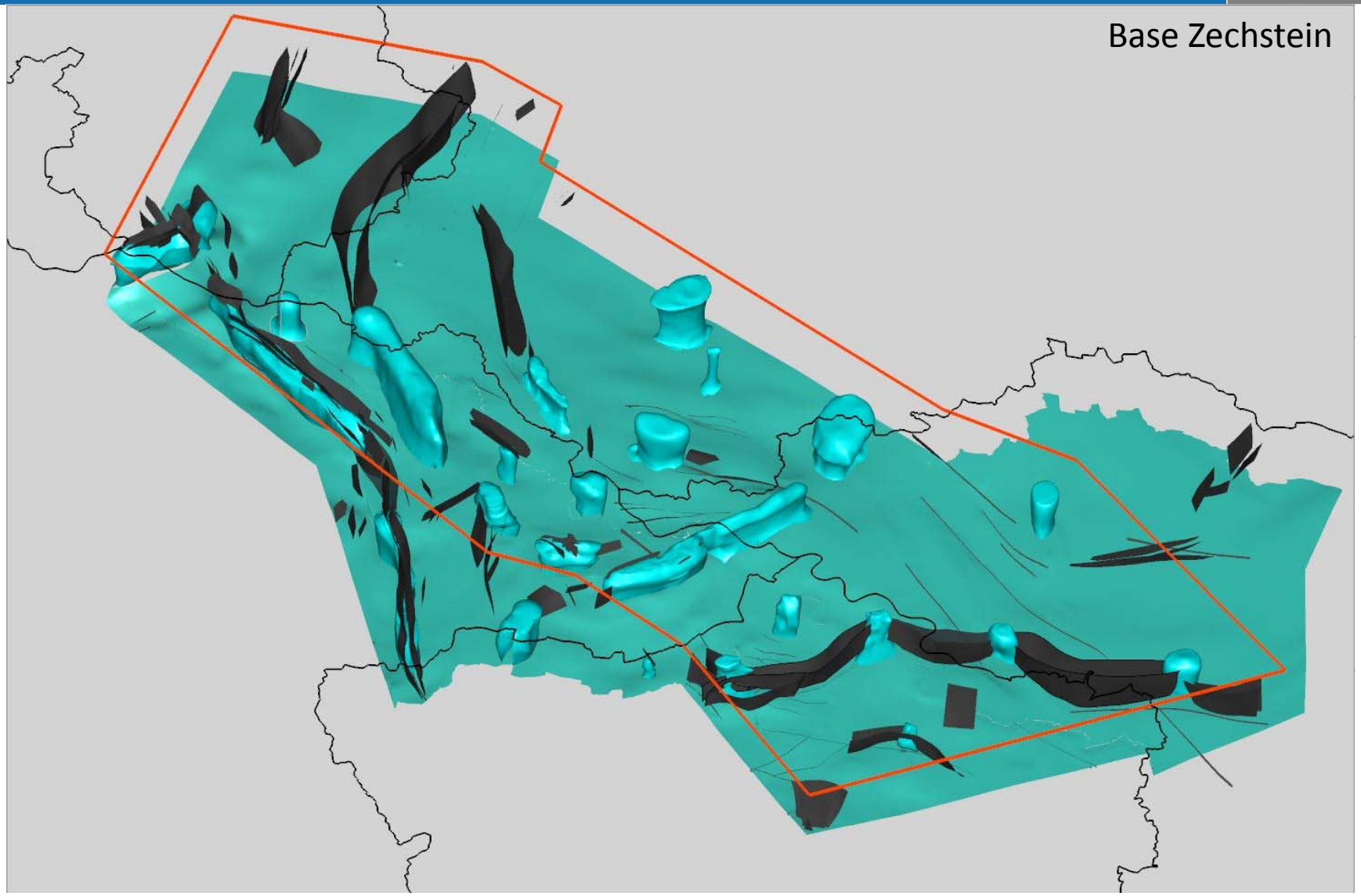

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Project TUNB - The future

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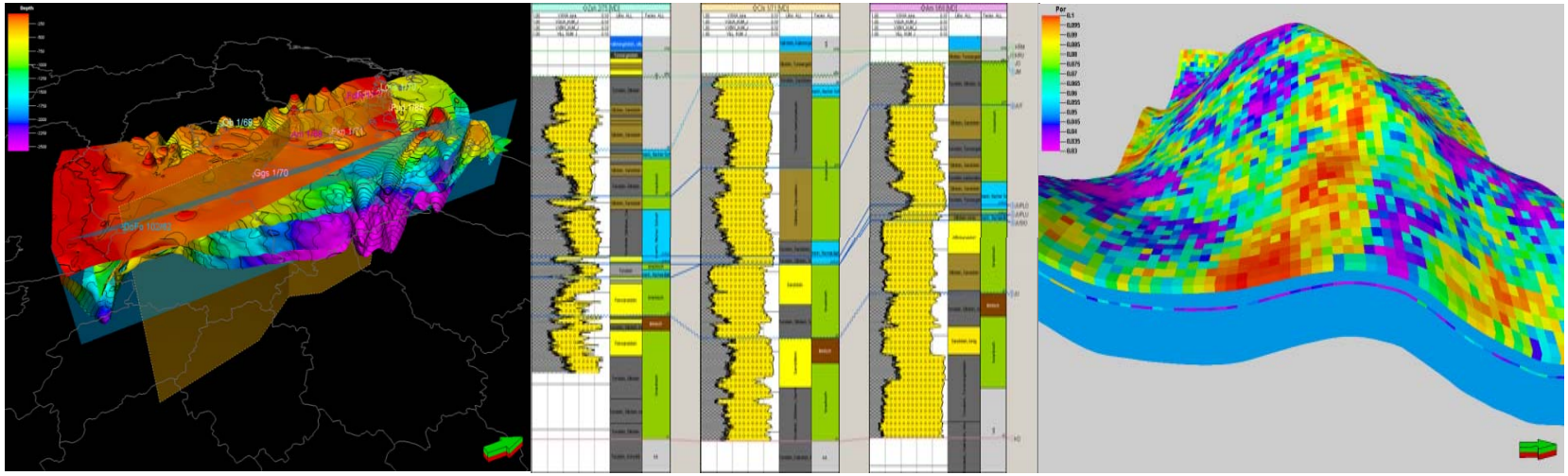
Outlook: …6 years are a quite short time…

- Pilotregion: ~7.800 km², 24 Diapirs, ~200 Faults
- Full model: 170.000 km², >>100 Diapirs, ??? Faults
- Pilot-area represents ~5% of the full final model
- Pilotregion can be used to test further modeling (Volume- / Property-modeling)



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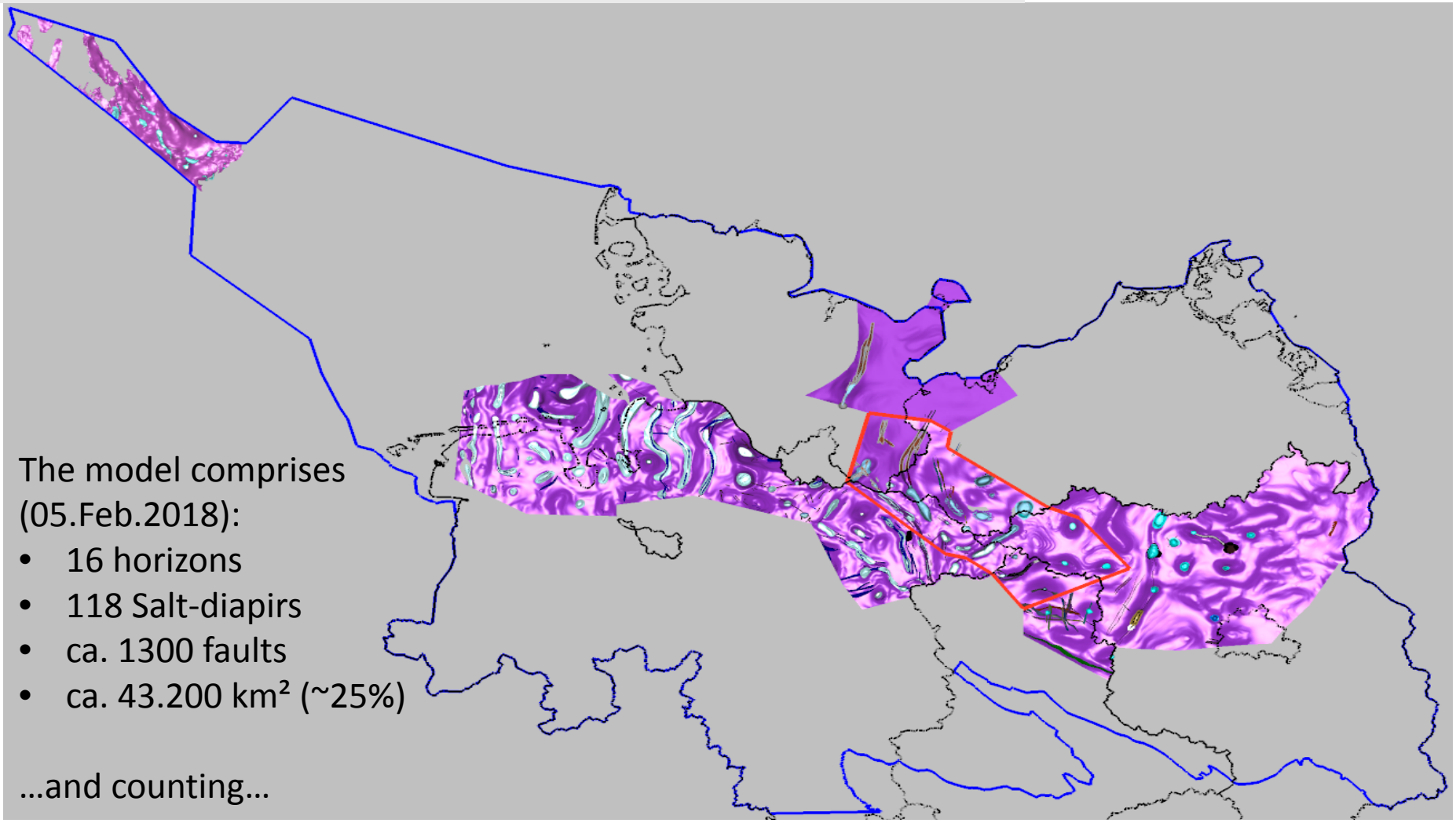
Where are we now?



The model comprises (05.Feb.2018):

- 16 horizons
- 118 Salt-diapirs
- ca. 1300 faults
- ca. 43.200 km² (~25%)

…and counting…

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Thank you for your attention

3D model of the “Entenschnabel” (German North Sea) in Minecraft. Realized together with BGS

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Thank you for your attention

3D model of caverns in a salt structure in Minecraft.