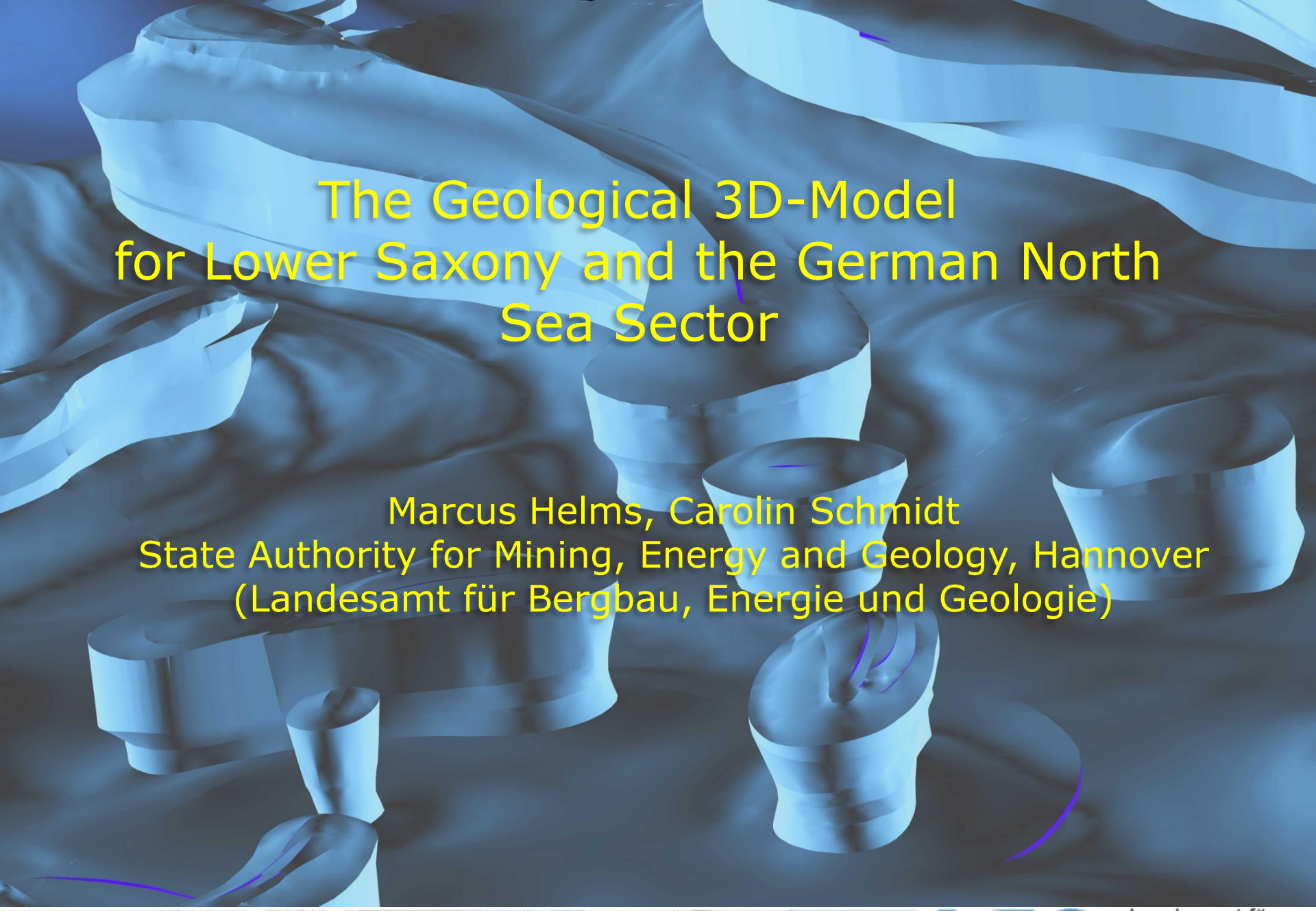
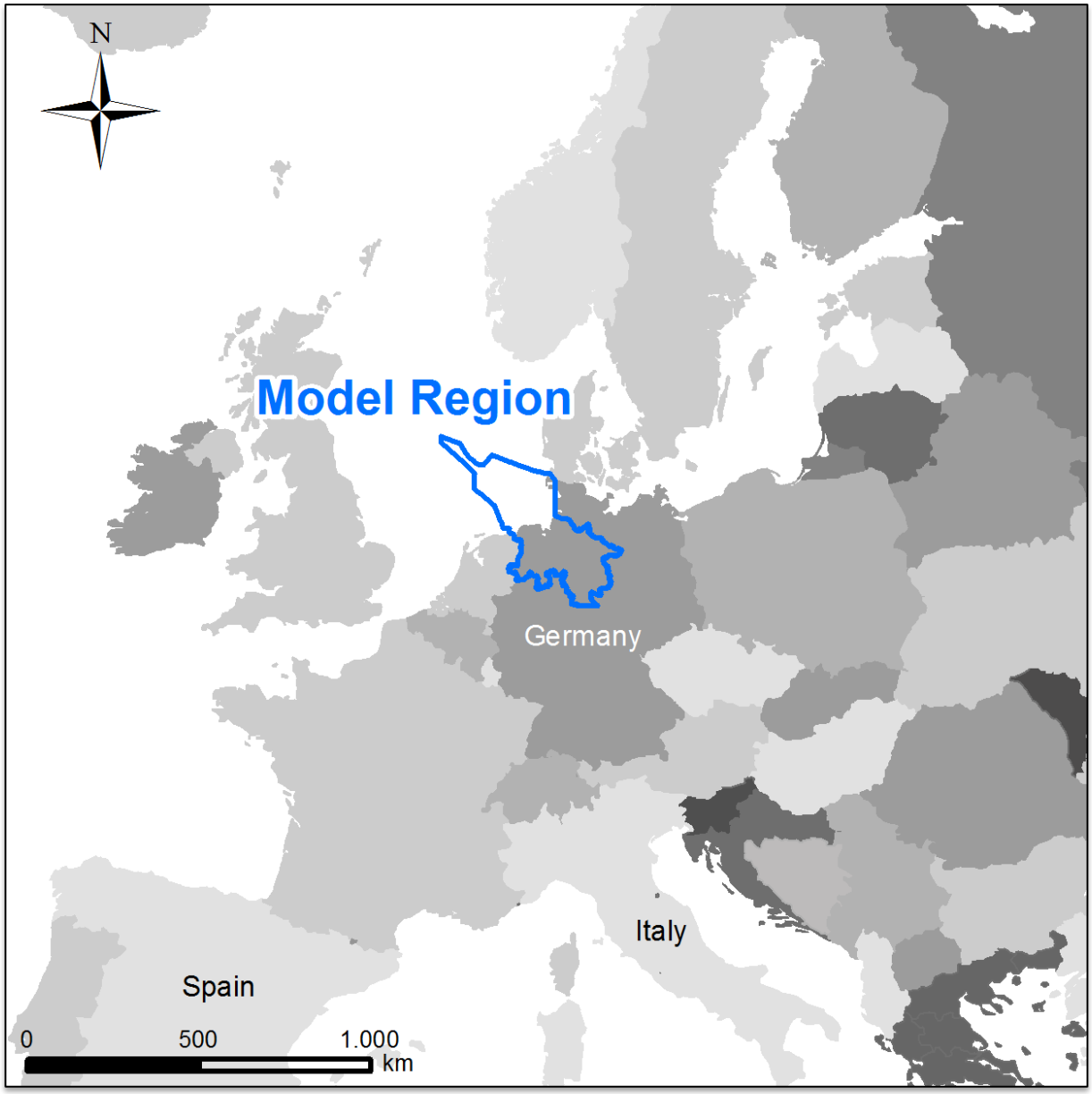


The Geological 3D-Model for Lower Saxony and the German North Sea Sector

Marcus Helms, Carolin Schmidt
State Authority for Mining, Energy and Geology, Hannover
(Landesamt für Bergbau, Energie und Geologie)

LBEG
Landesamt für Bergbau, Energie und Geologie

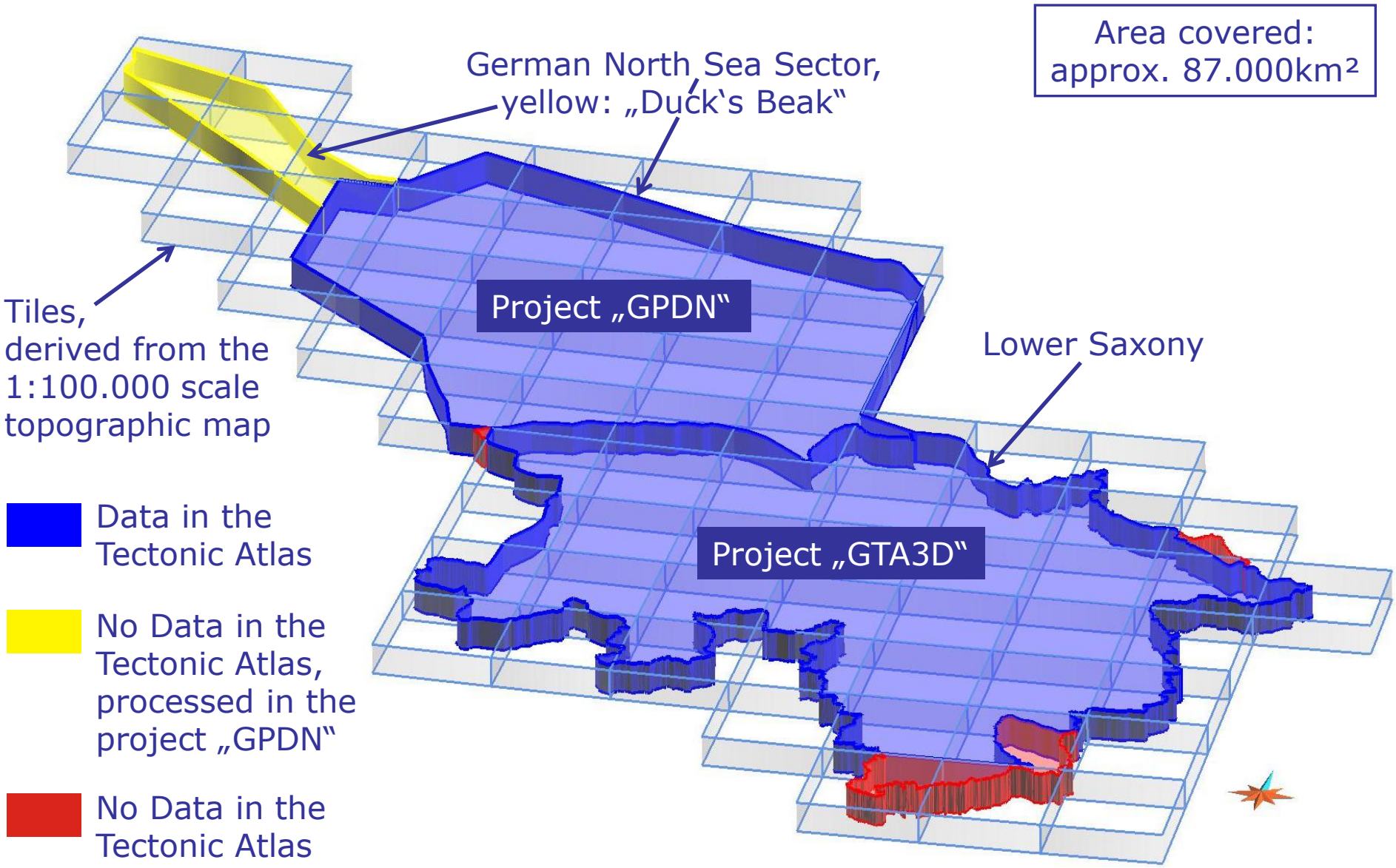
1 General Conditions

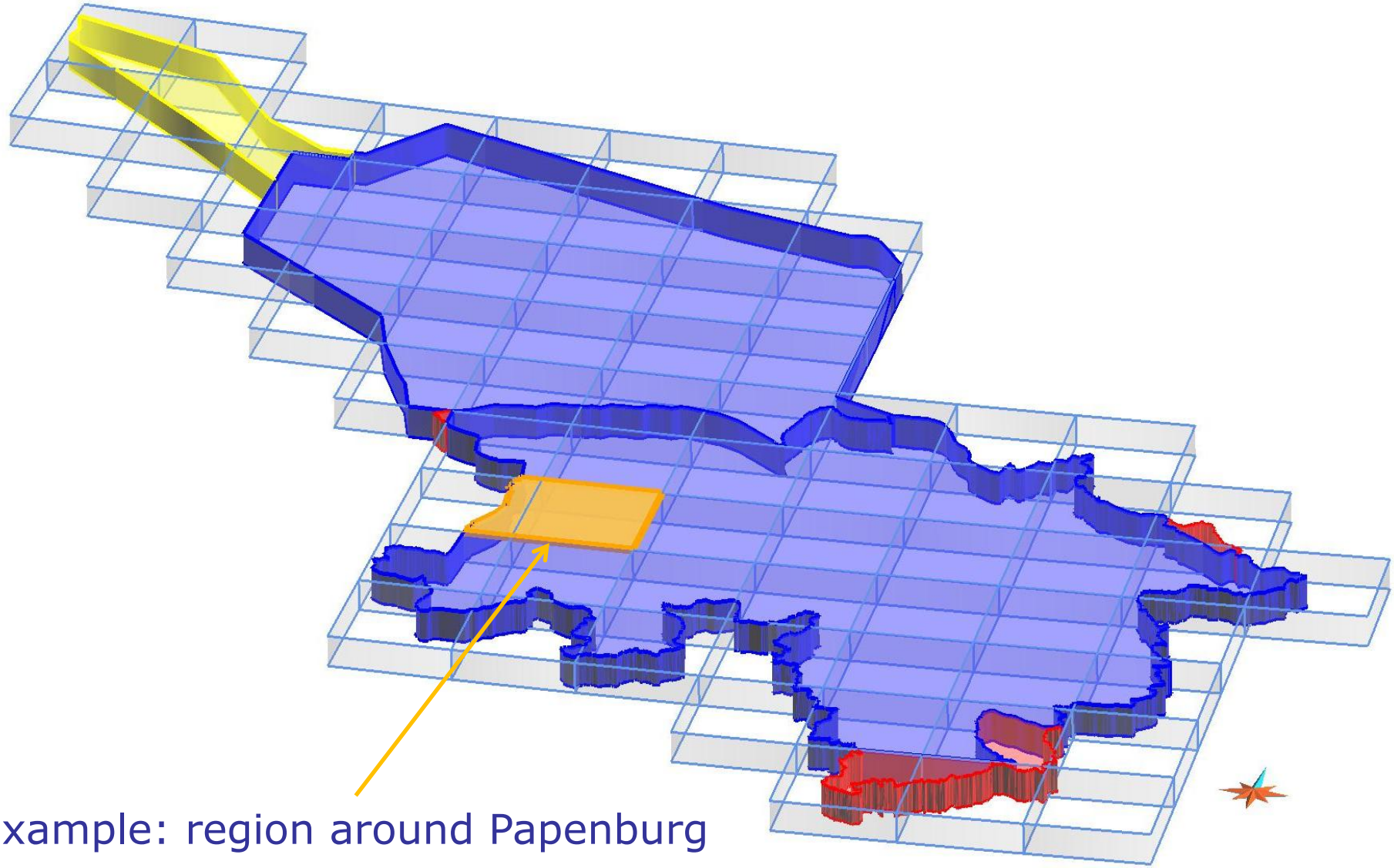


Tectonic Atlas of Northwest Germany and the German North Sea Sector

Geologisches Jahrbuch, Reihe A, Heft 153

1 General Conditions

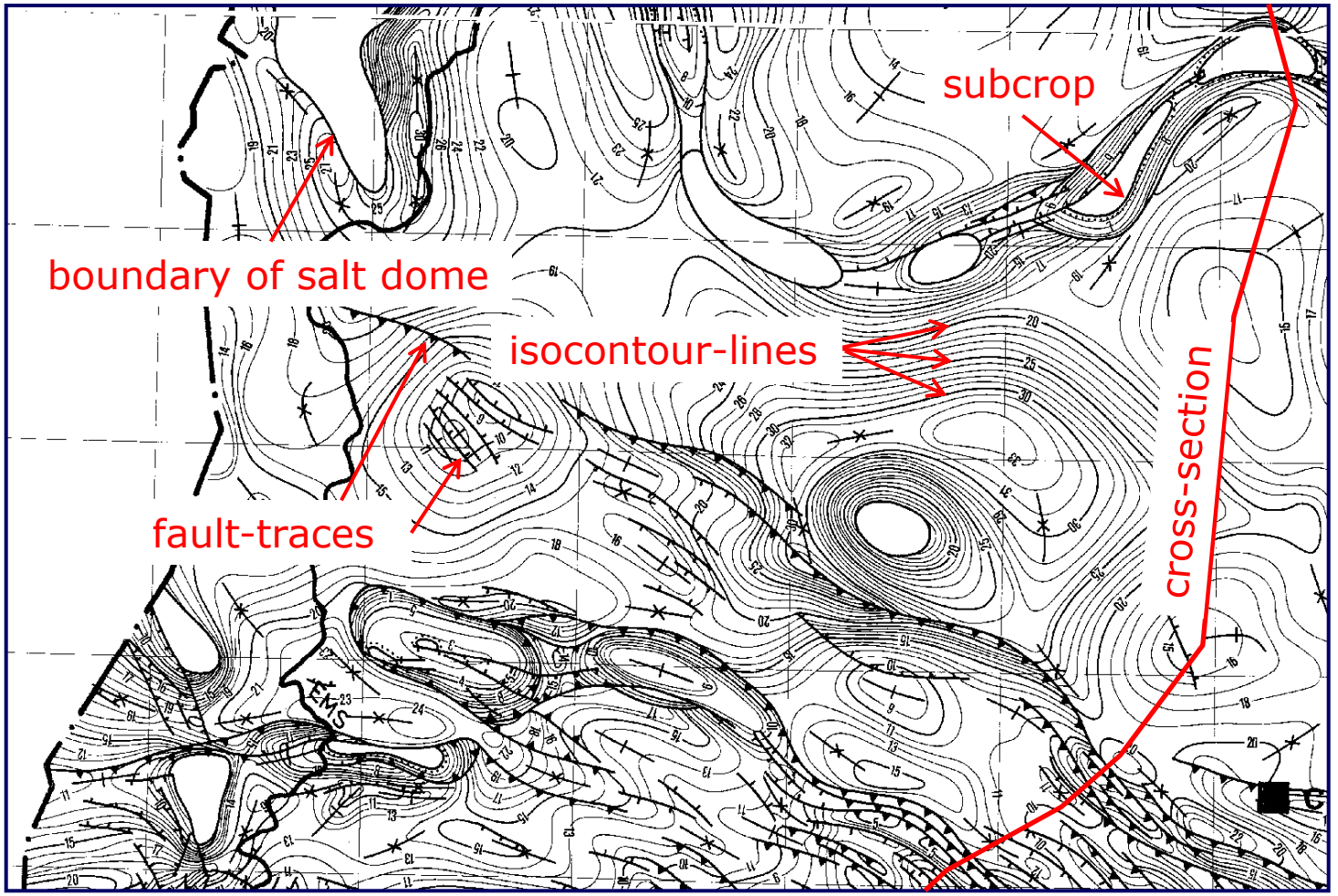


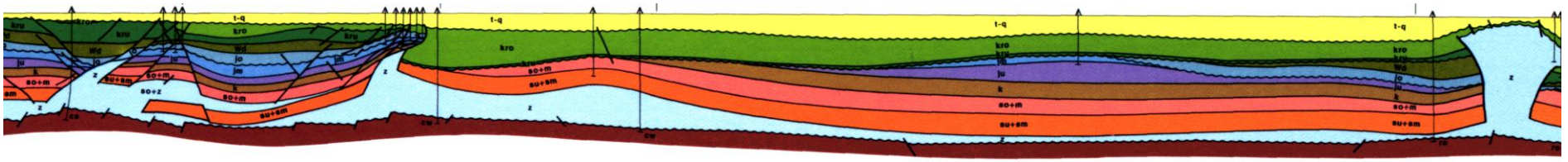


Example: region around Papenburg

2 Data Set

- Middle Miocene
- Lower Miocene
- Middle Oligocene
- Middle Eocene
- Base Tertiary
- Upper Cretaceous
- **Marine Lower Cretaceous**
- Upper Jurassic + Wealden
- Middle Jurassic
- Lower Jurassic
- Keuper
- Upper Buntsandstein
- Lower Buntsandstein
- Zechstein





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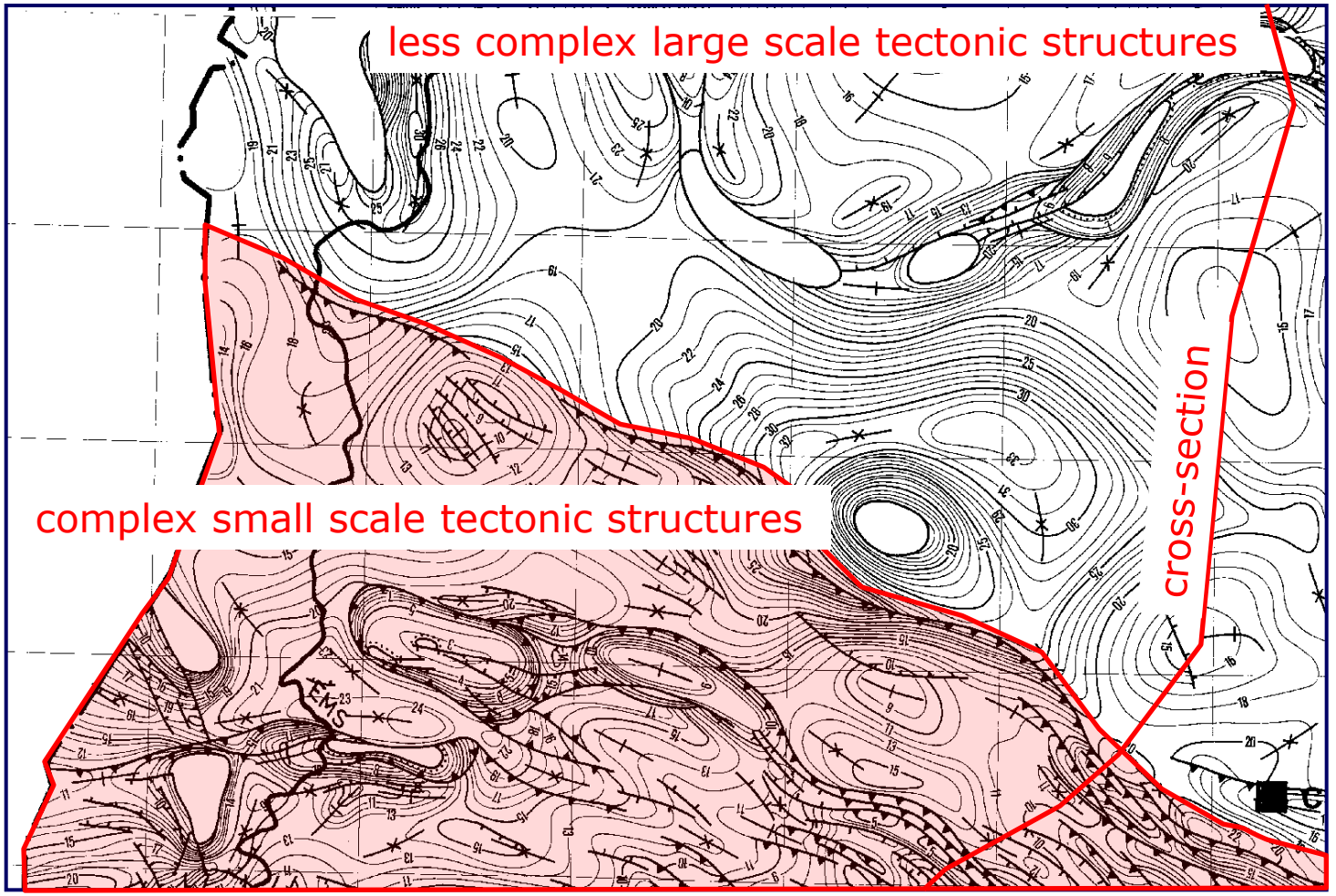
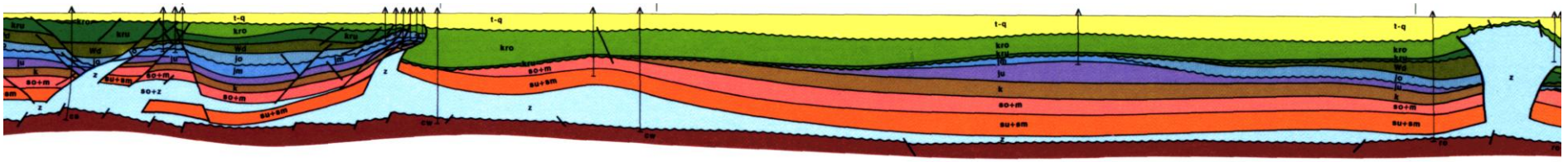
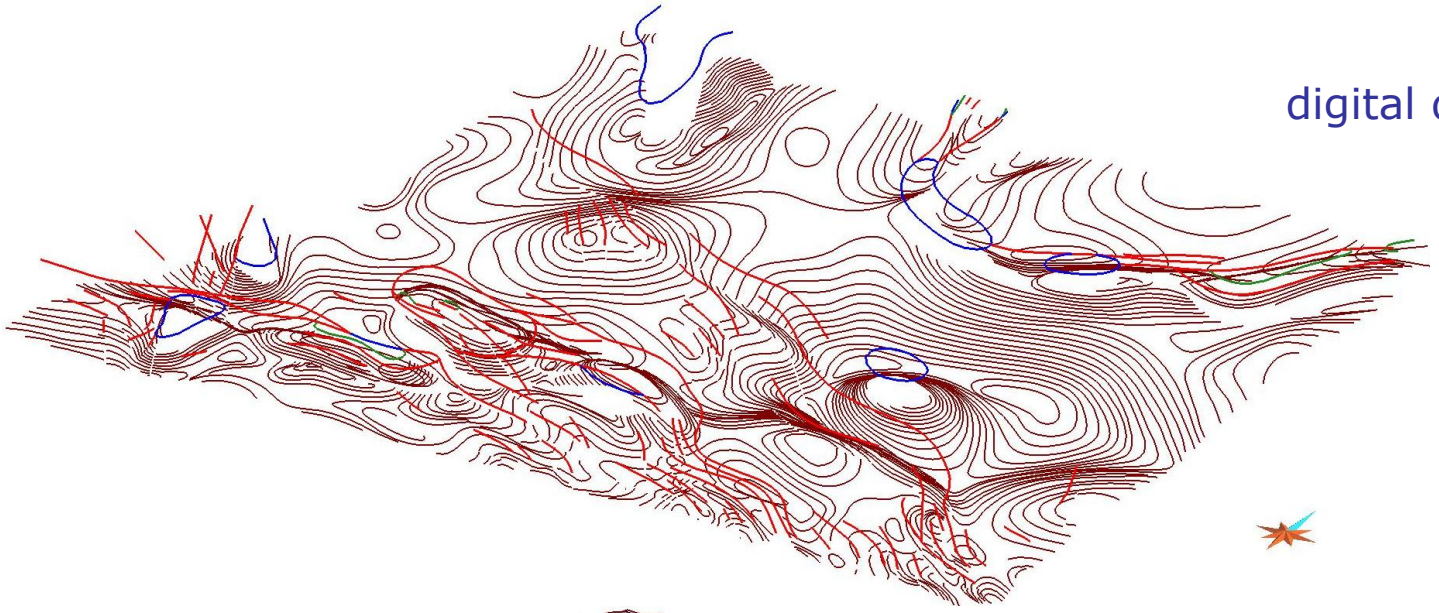
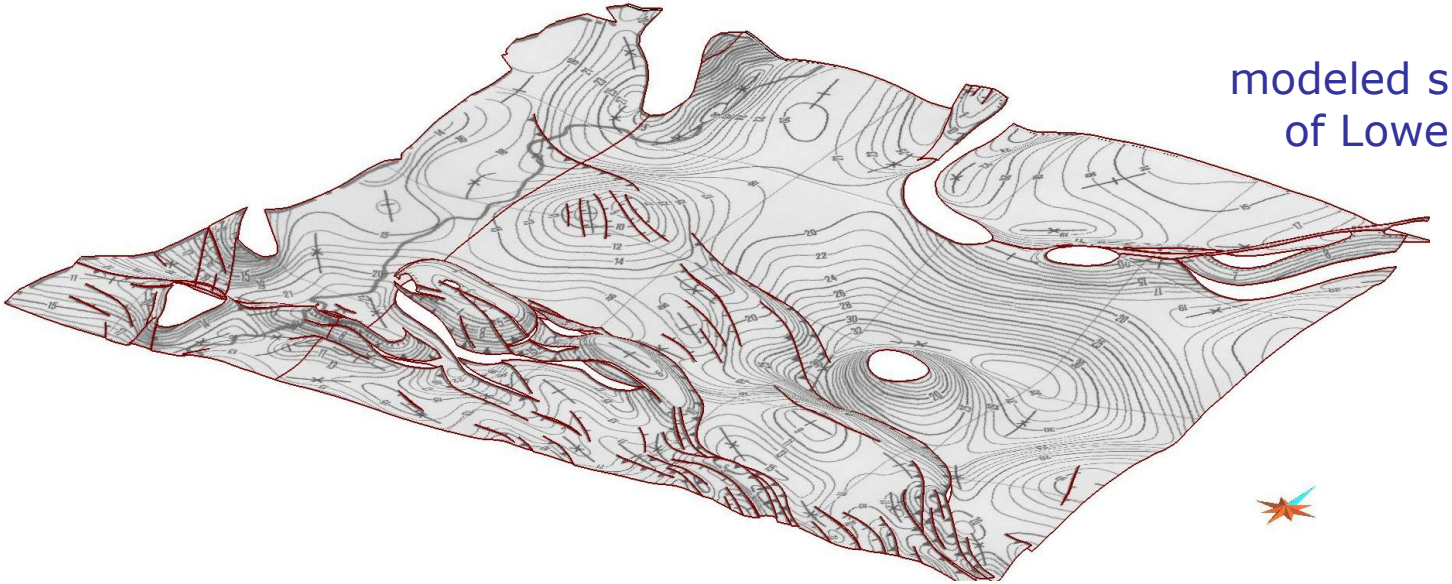




3 Surface Modeling of Horizon Bases



digital data for the base of Lower Cretacous in 3-dimensional view



modeled surface for the base of Lower Cretacous true to the original map

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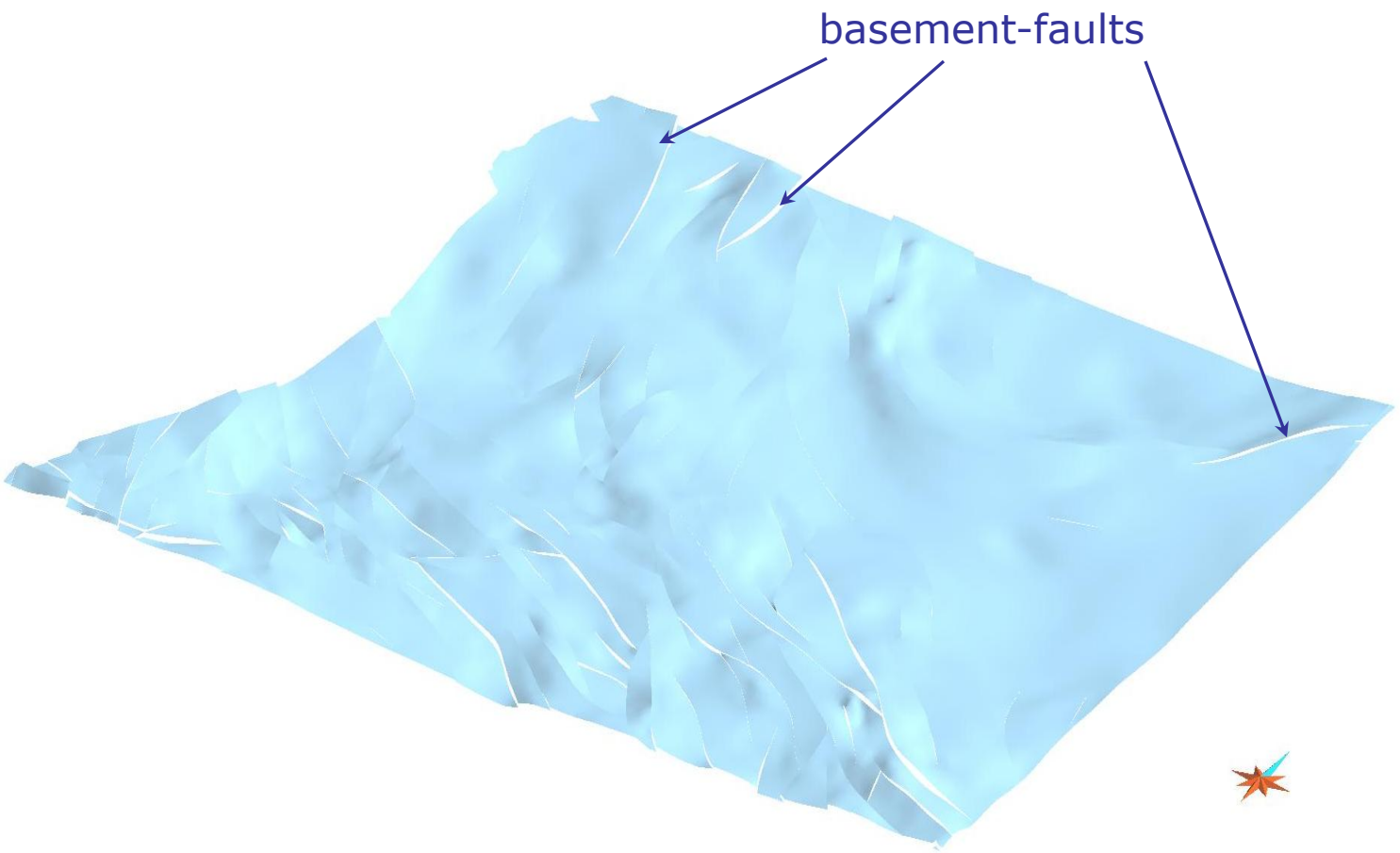

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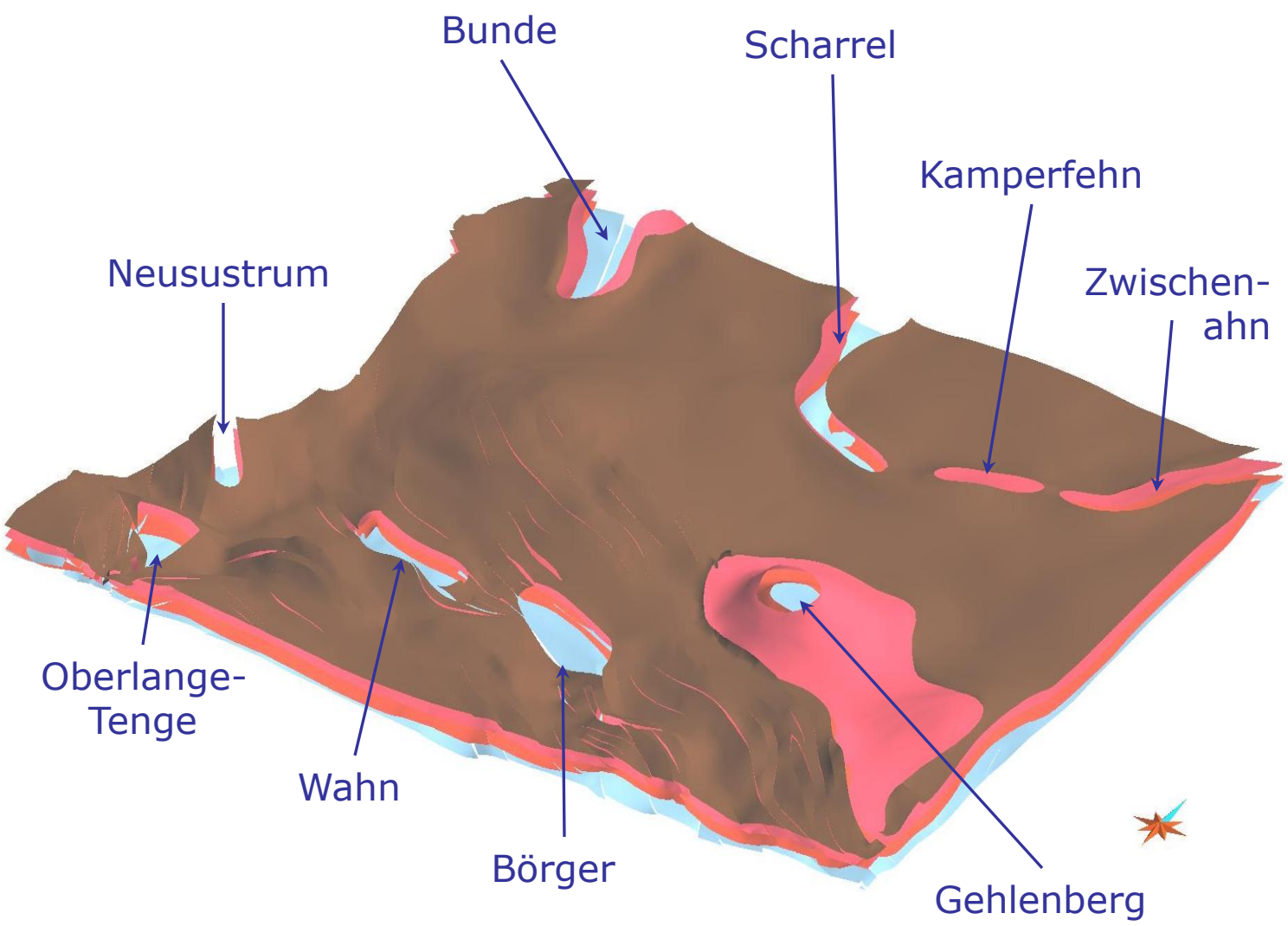

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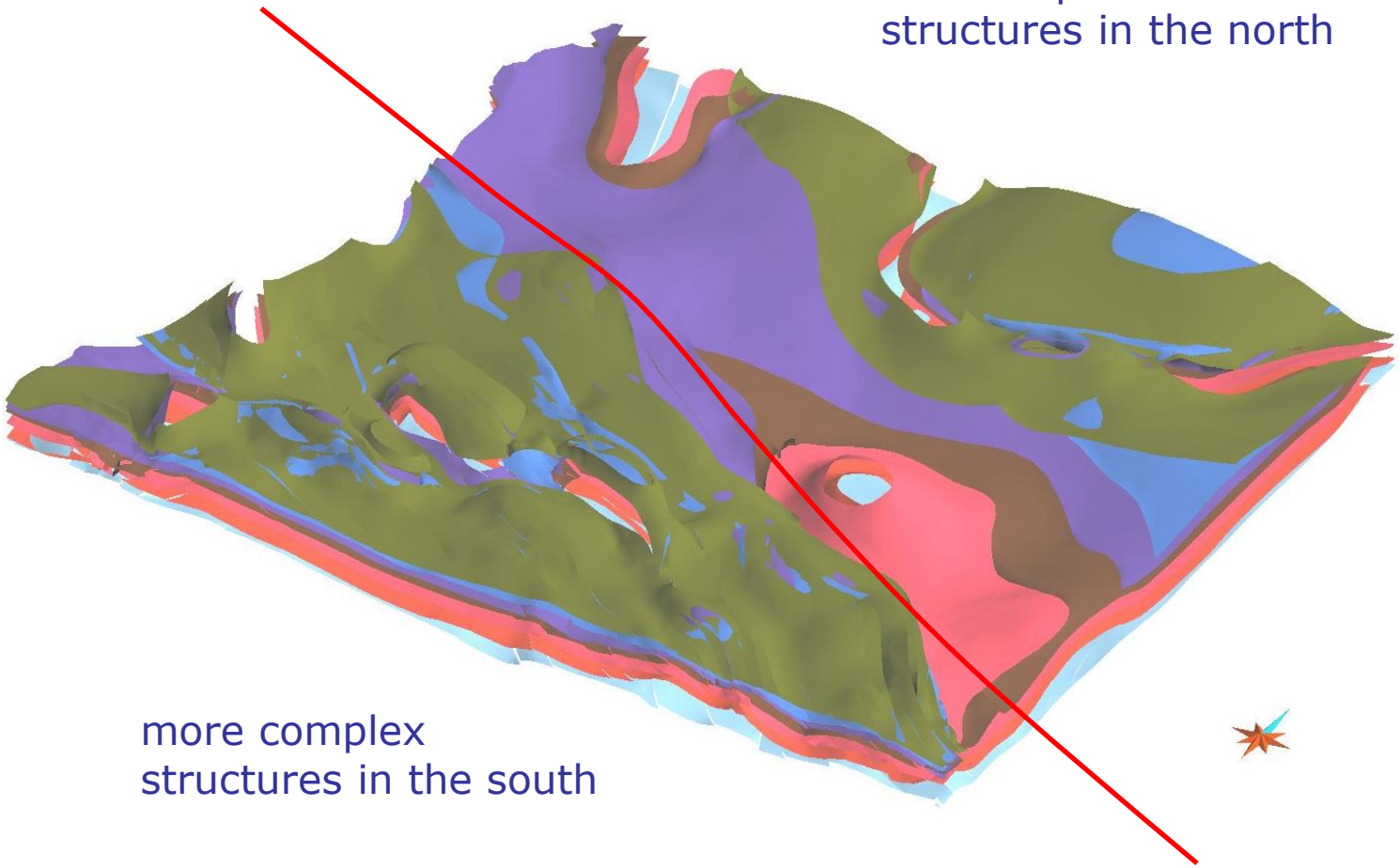

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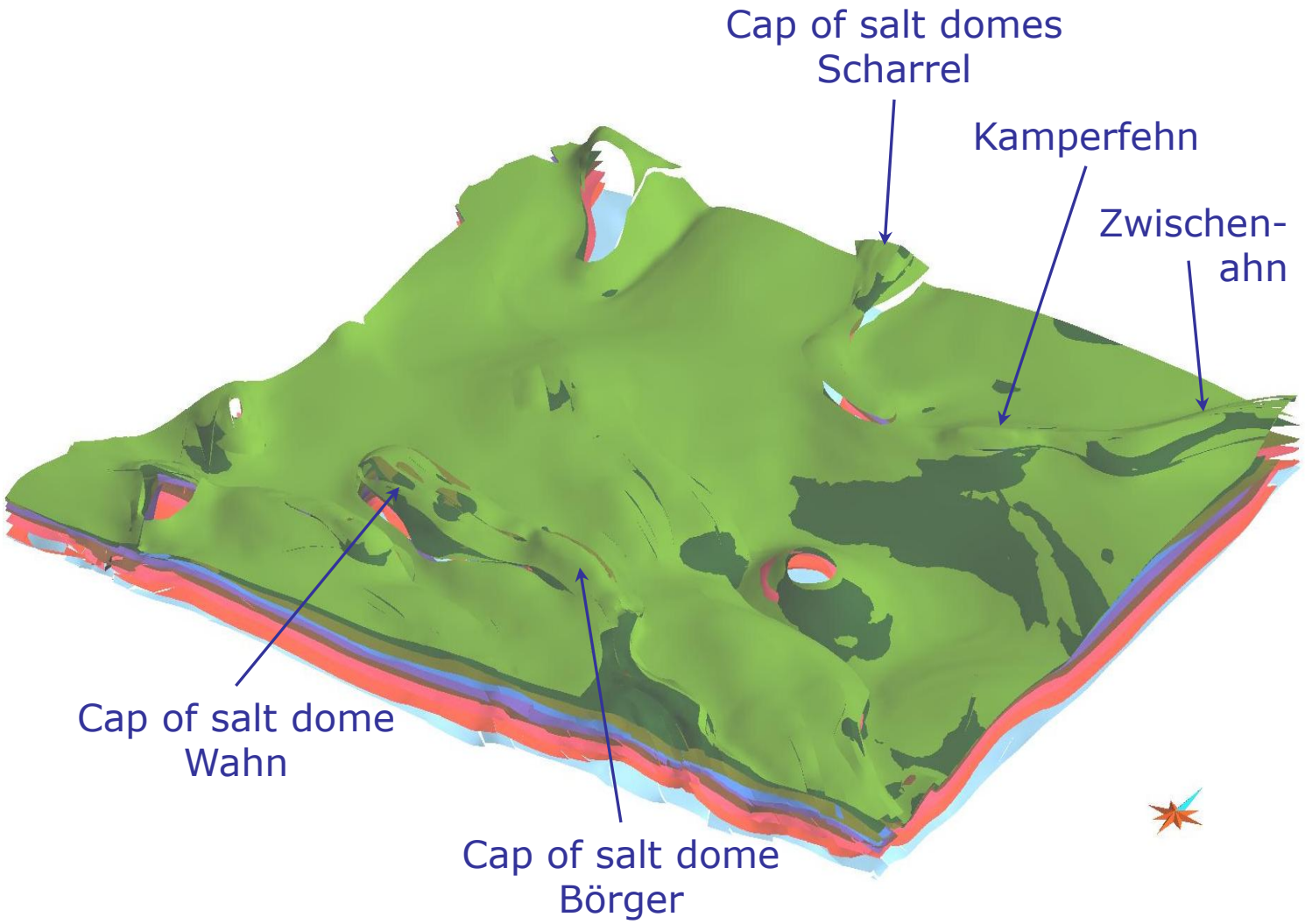

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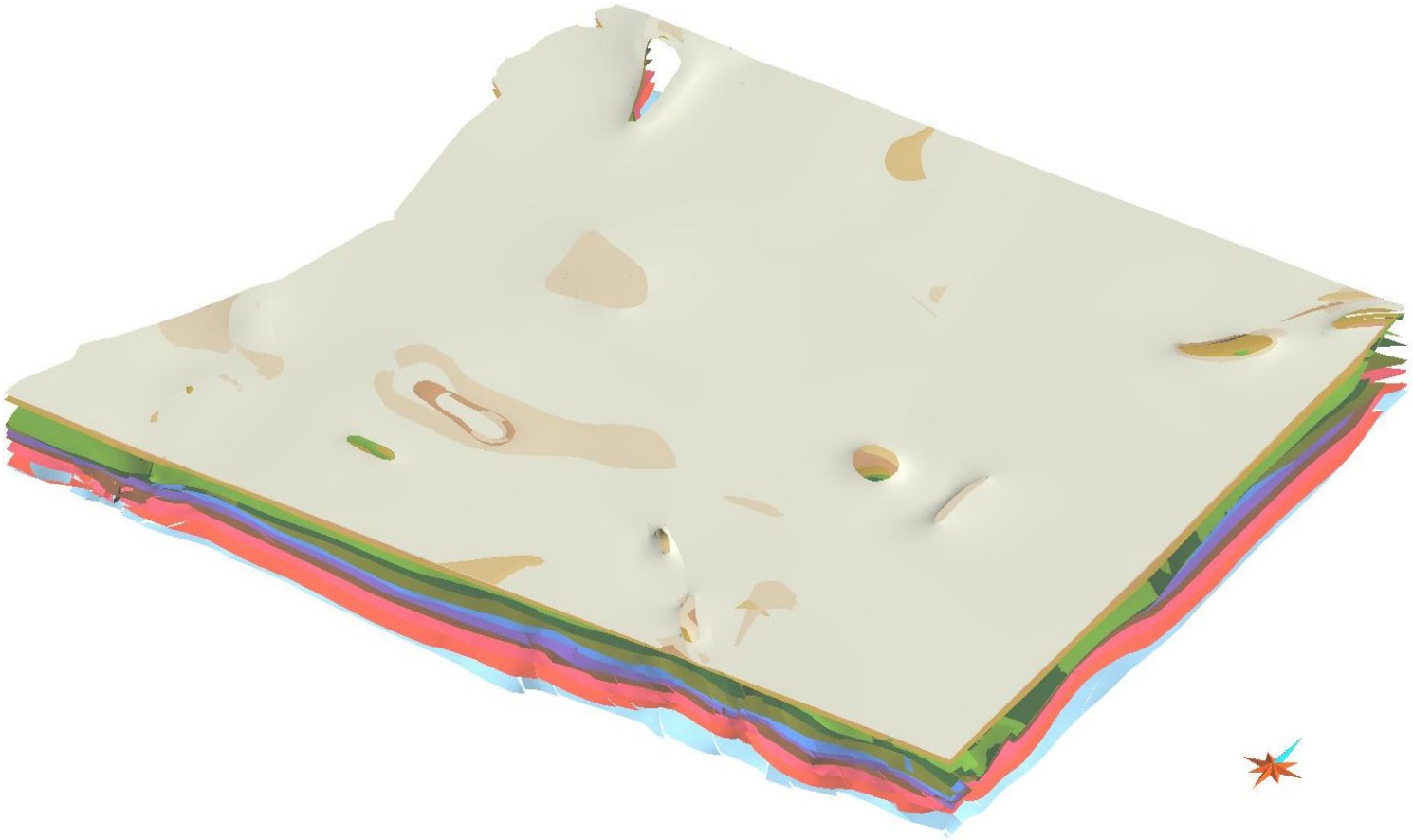
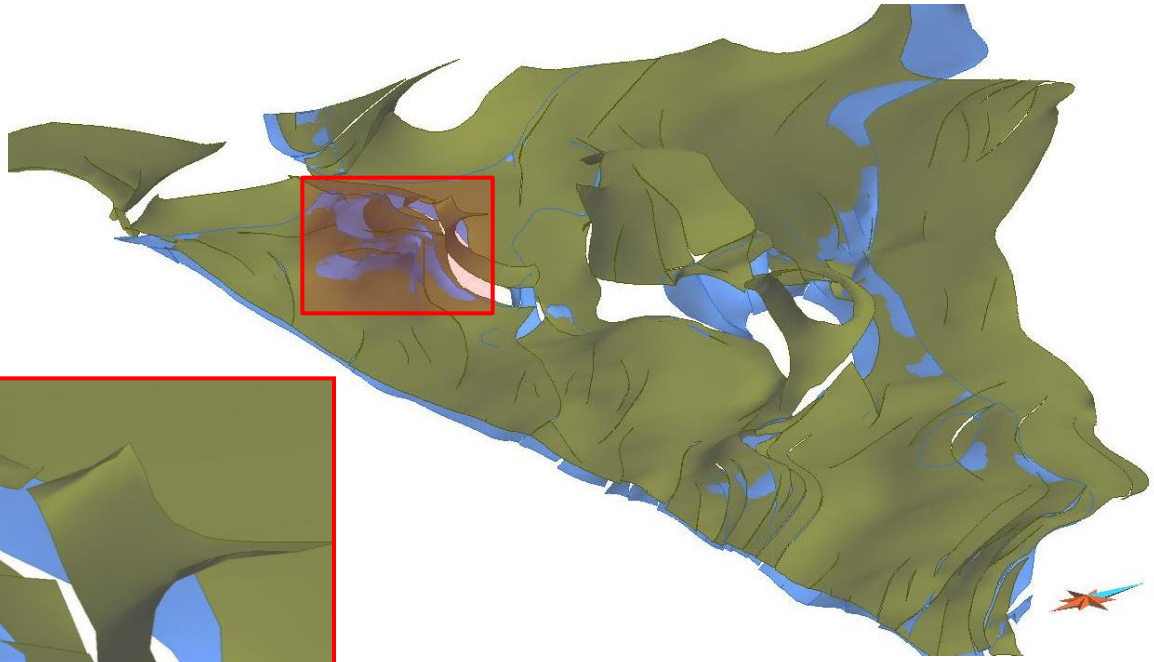
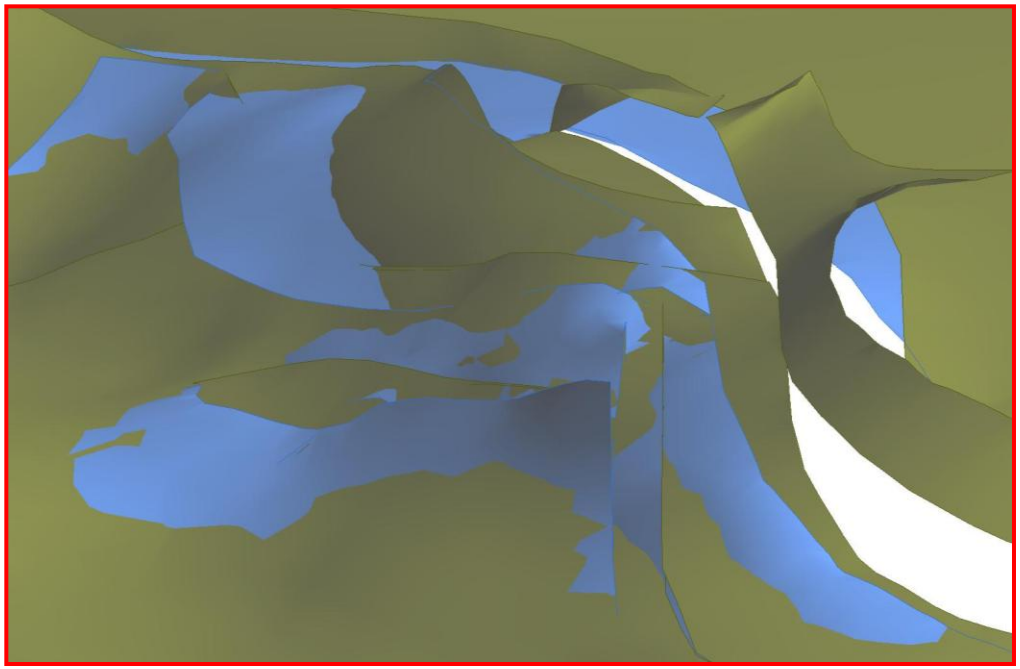
3d-surface-model of the horizon bases in the region around Papenburg true to the structural contour maps in the Tectonic Atlas



3.2 Treatment of Data Inconsistencies

base surface of Middle Jurassic (blue) and Upper Jurassic + Wealden (green) in a tectonically complex structured area

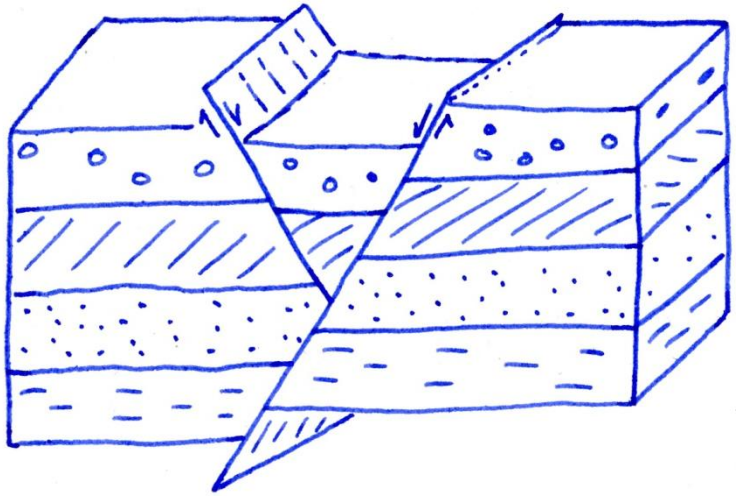




<u>left:</u>
detail of a complex fault-system showing geometrically inconsistent intersections of horizon surfaces

data inconsistencies are not revised during the first step of modeling

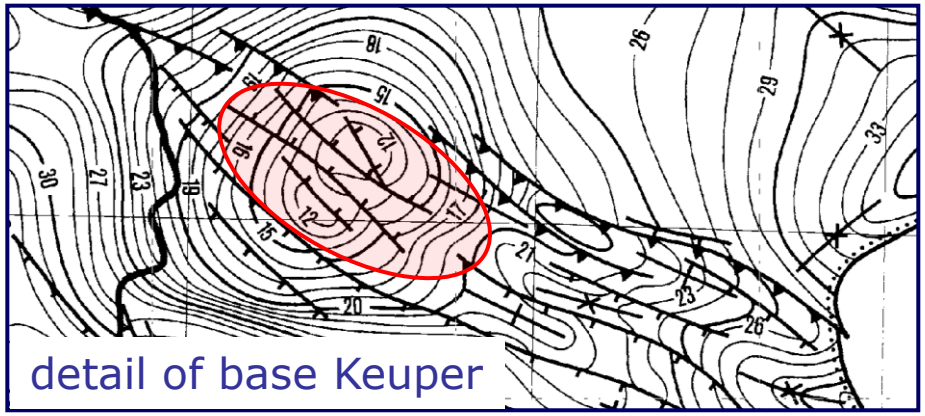
3.1 Treatment of Faults



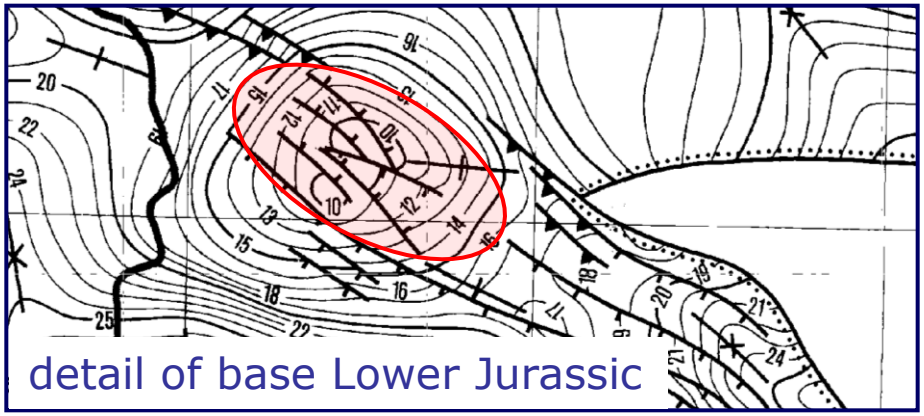
left:
exemplaric sketch of fault surfaces in a 3-dimensional view

faults are characterised by **azimuth** and **dip** as well as **horizontal** and **vertical displacement** of the horizons along the fault

below:
graphical representation of faults in the Tectonic Atlas as **traces** on the horizon bases

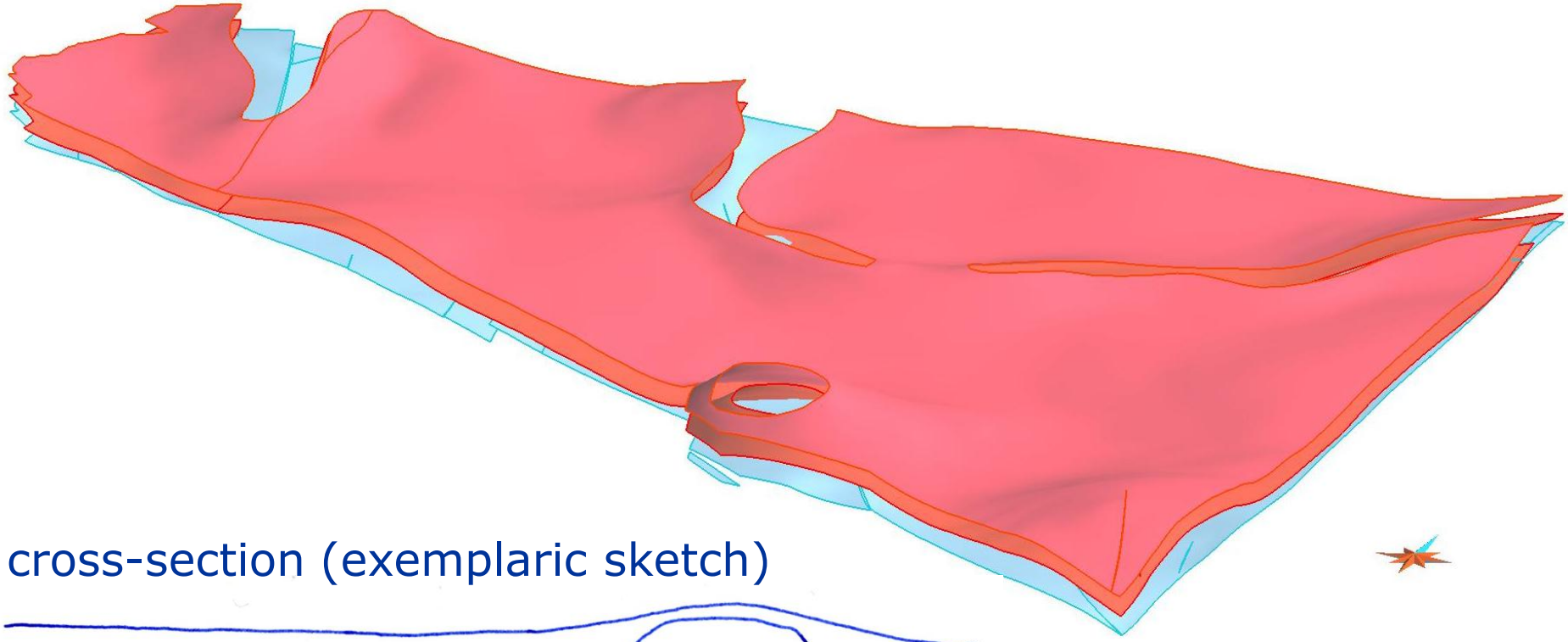


detail of base Keuper

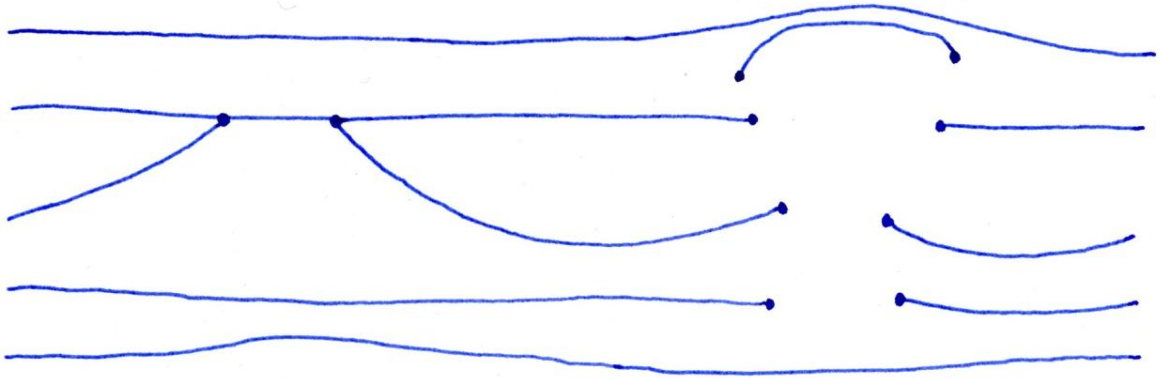


detail of base Lower Jurassic

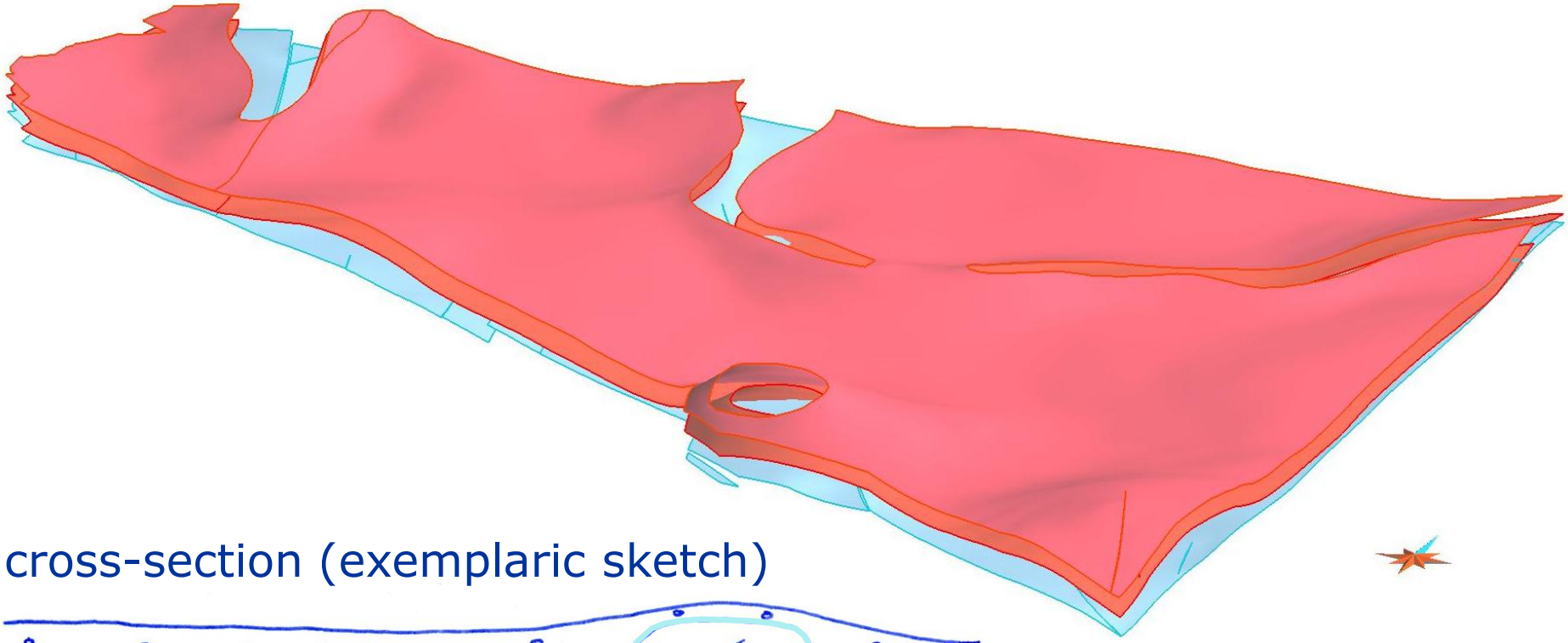
fault traces are treated independently for each horizon by building vertical displacements for each single fault trace without trans-horizontal correlation



cross-section (exemplaric sketch)



Construction of Enveloping Surfaces



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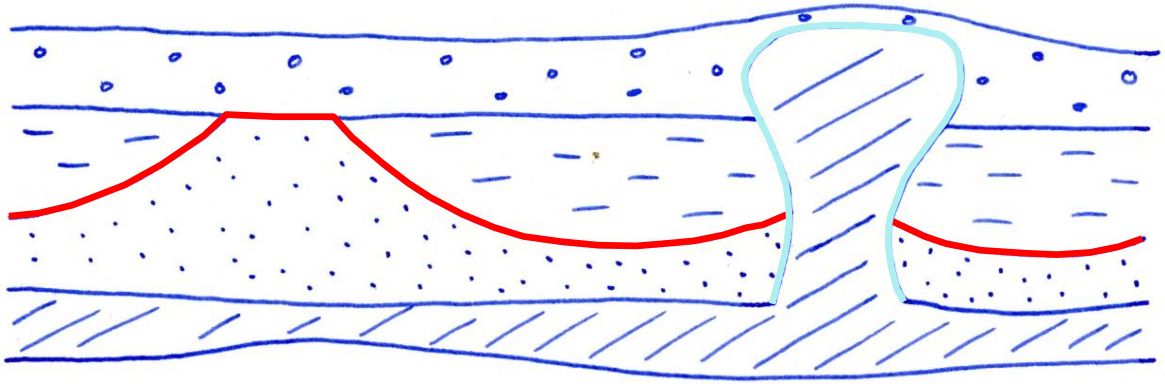
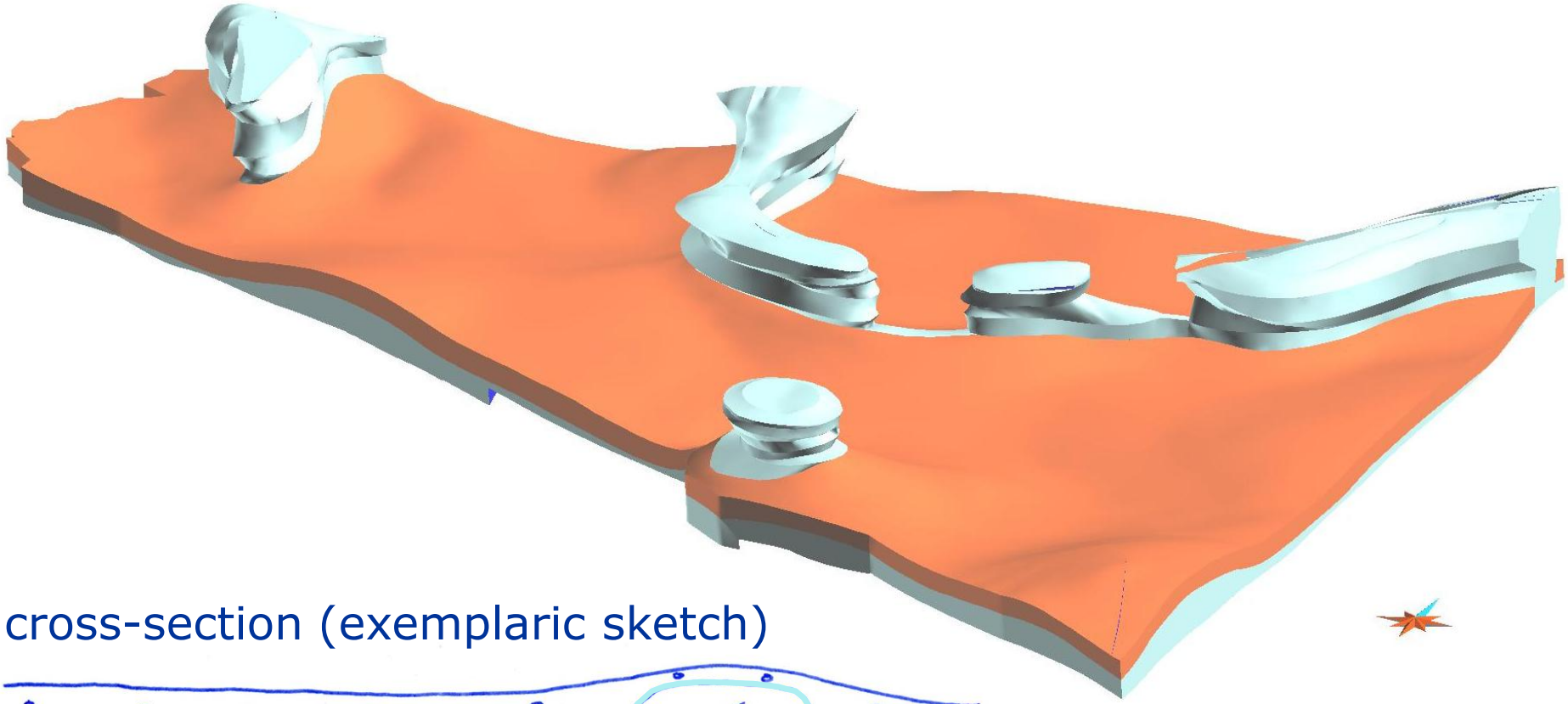


top-surfaces:
derived from mutual cut of base-surfaces of overlying horizons

salt dome envelopes:
derived from connection of salt dome boundaries and corresponding salt dome caps

Construction of Enveloping Surfaces



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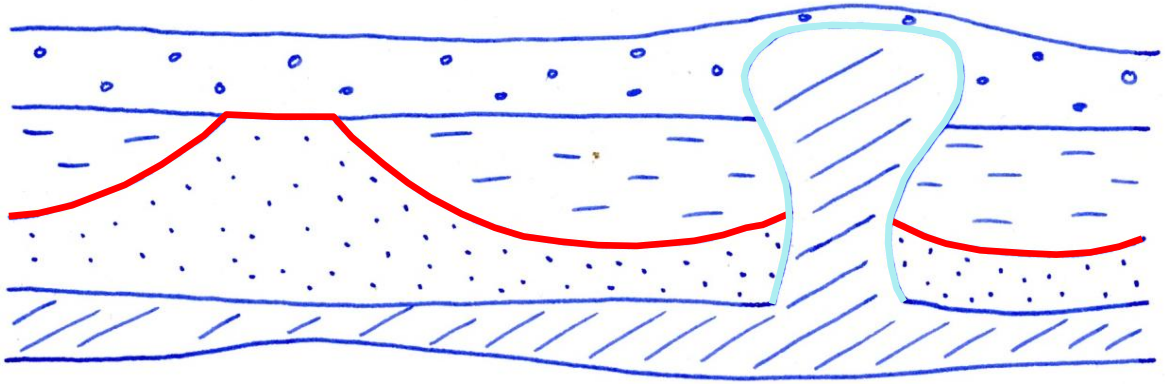

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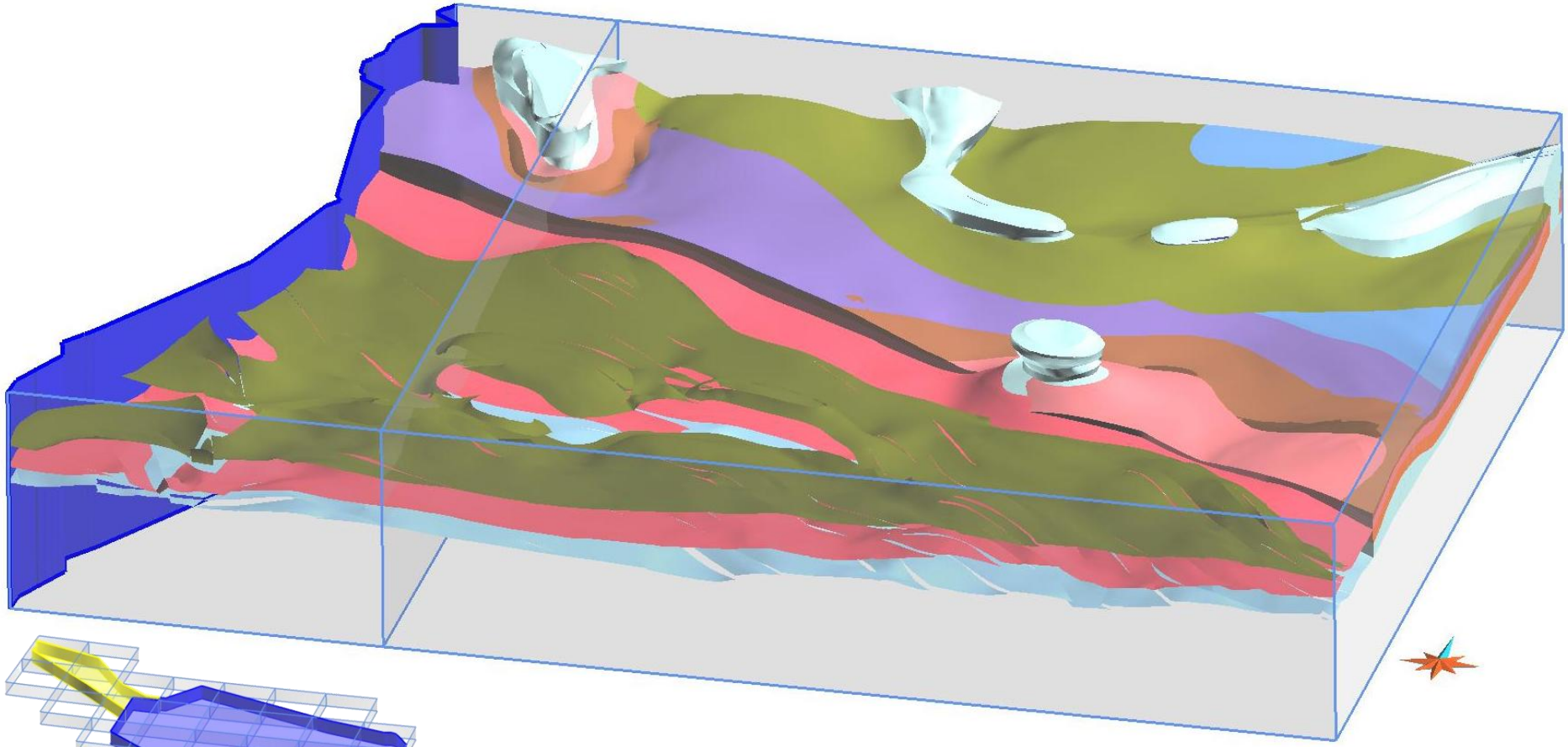
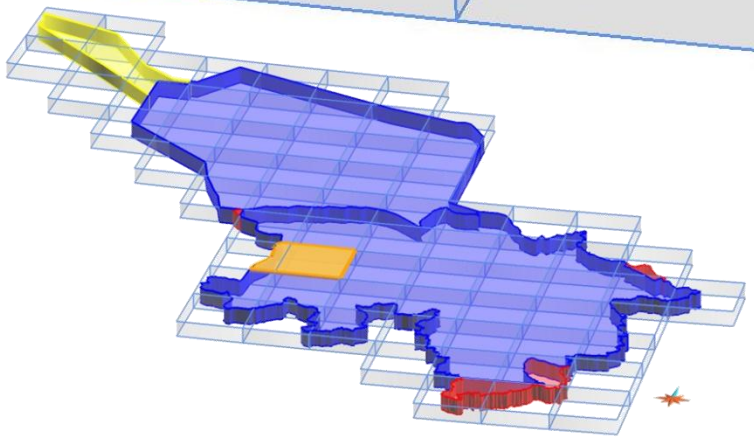
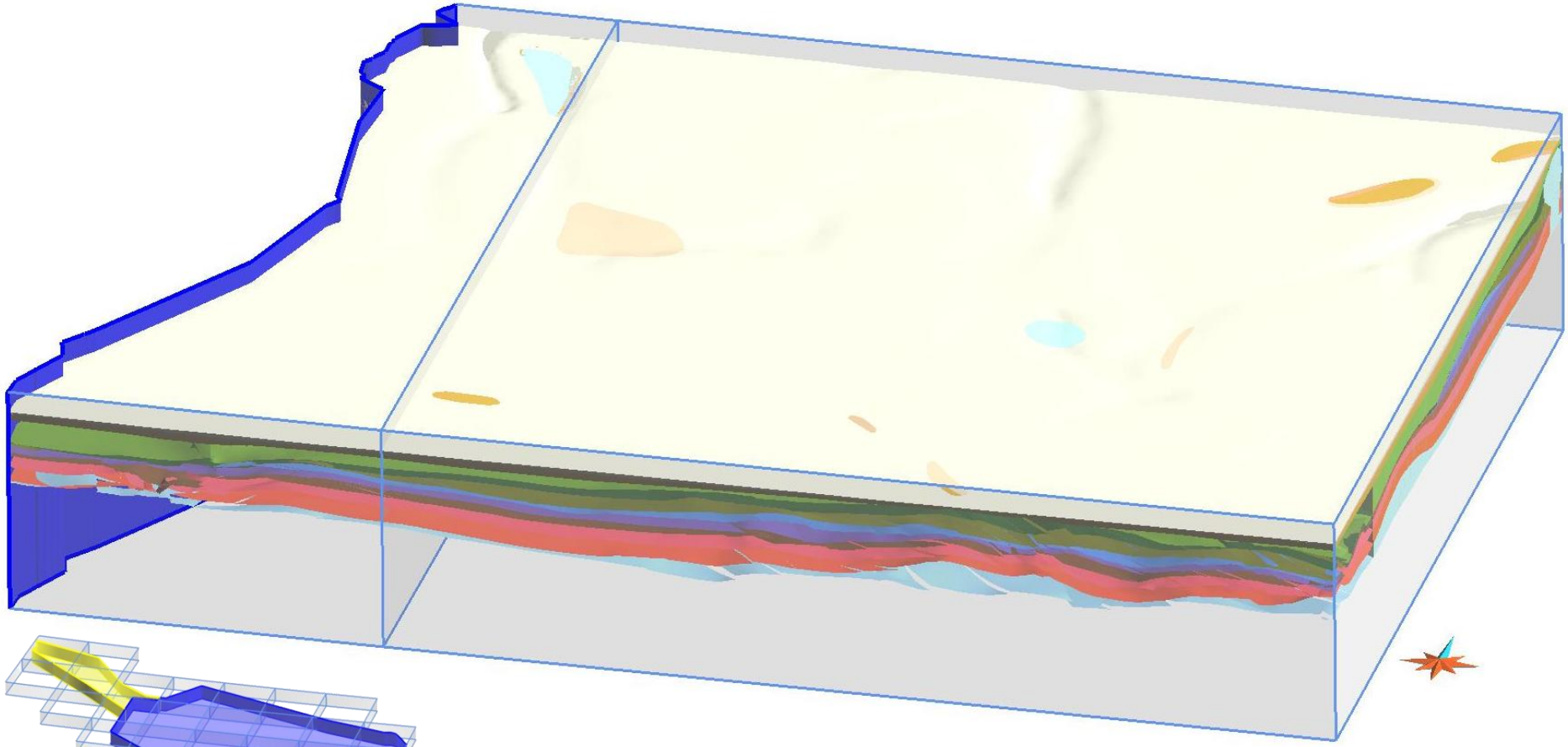
5 Composition of the 3D-Model

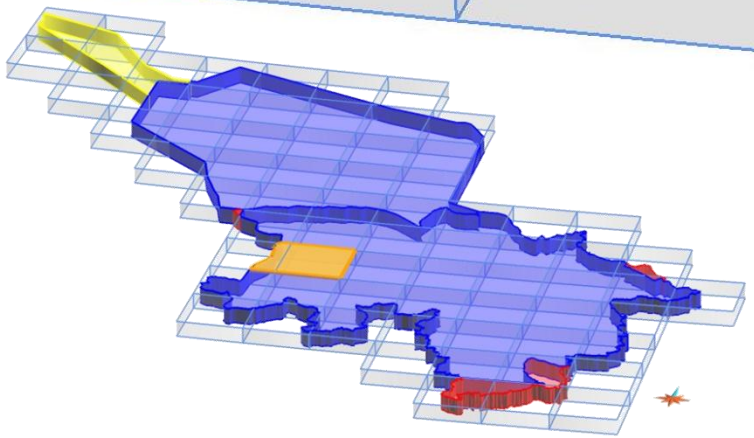




in some regions the final 3d-model consists of surfaces representing the horizon bases, and in other regions the 3d-model shows enveloping surfaces giving a boundary-representation of the geological bodies

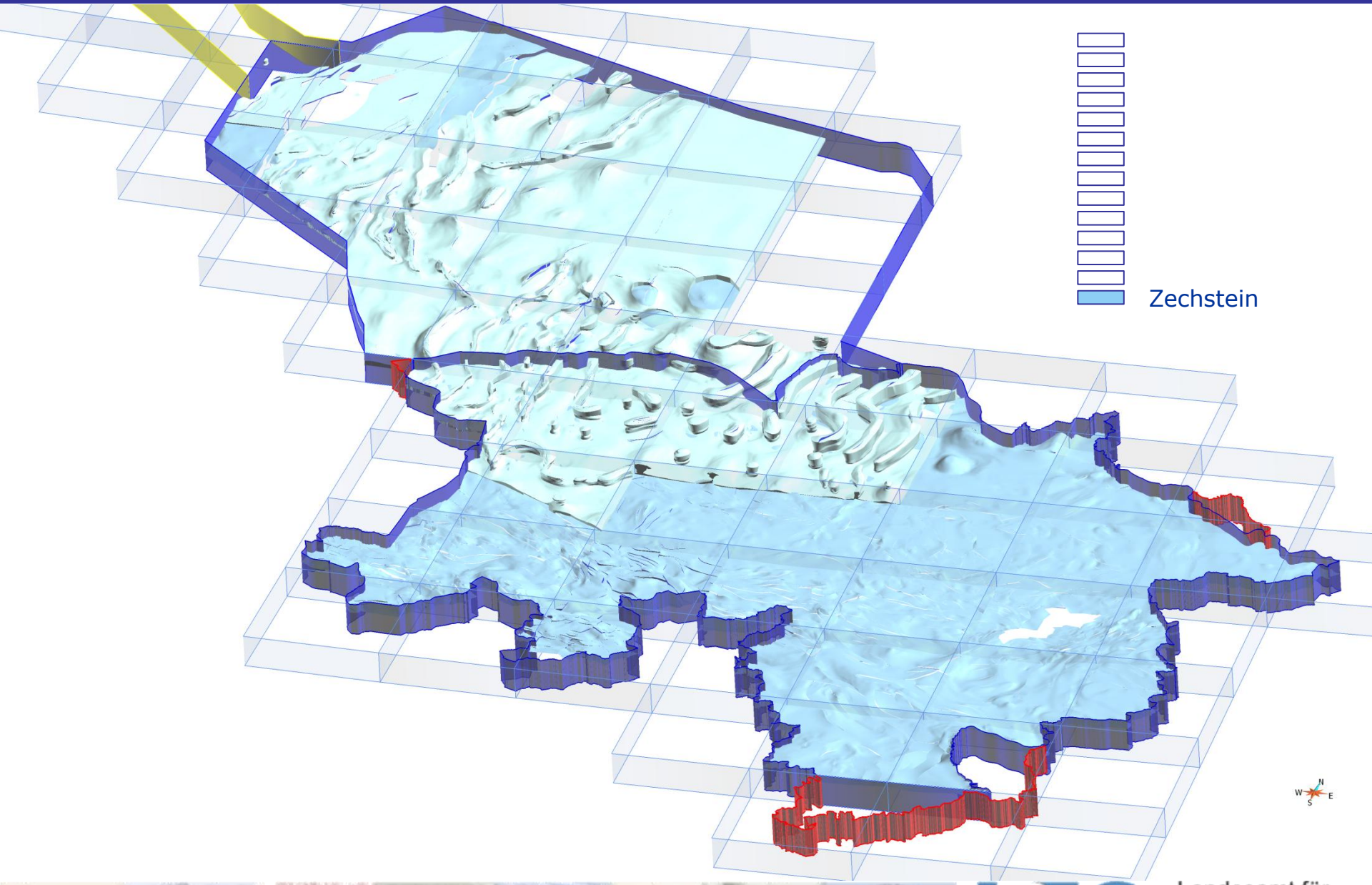
Composition of the 3D-Model





complete 3d-model in the region around Papenburg

6 Available 3D-Model



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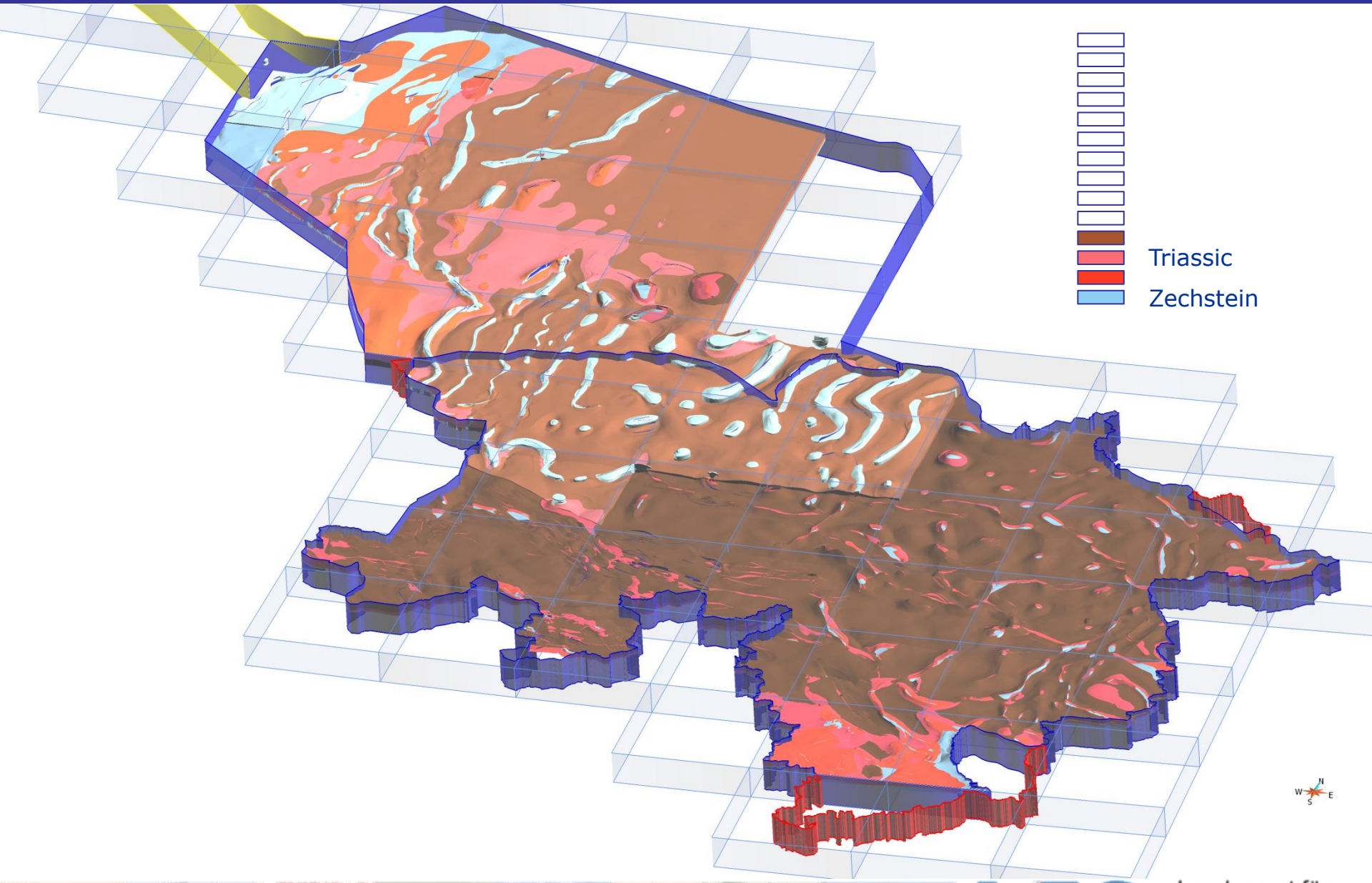

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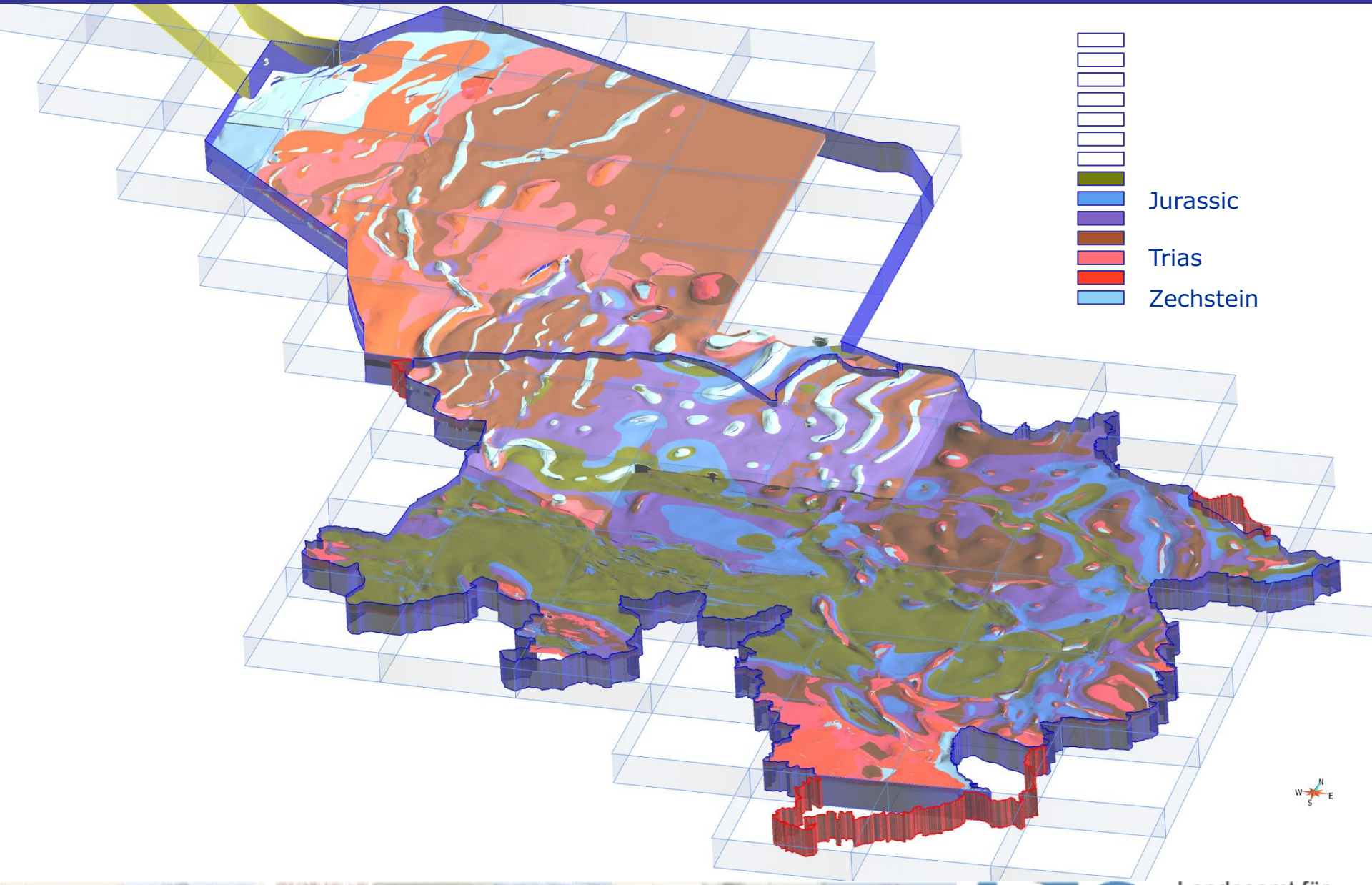

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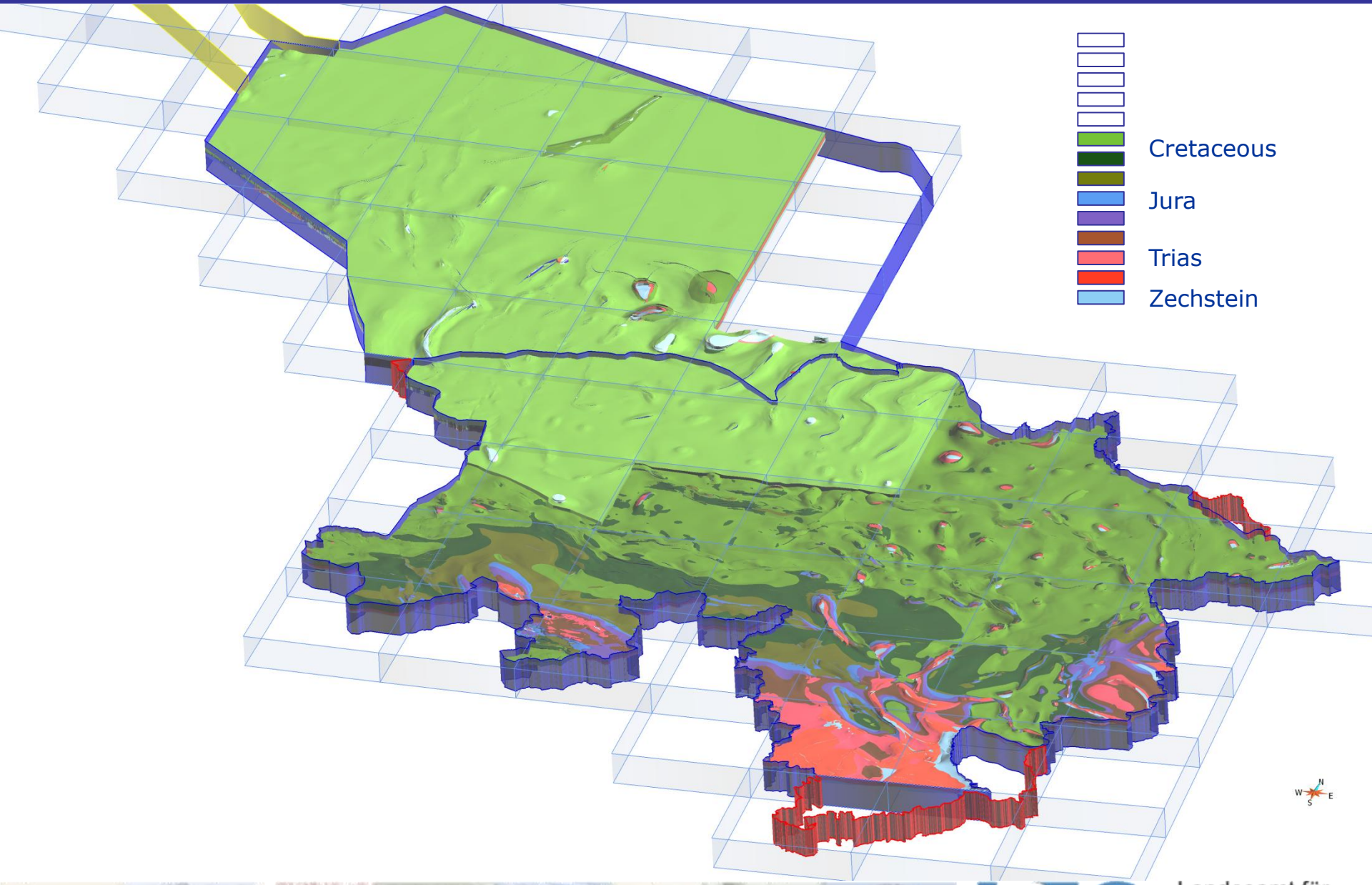

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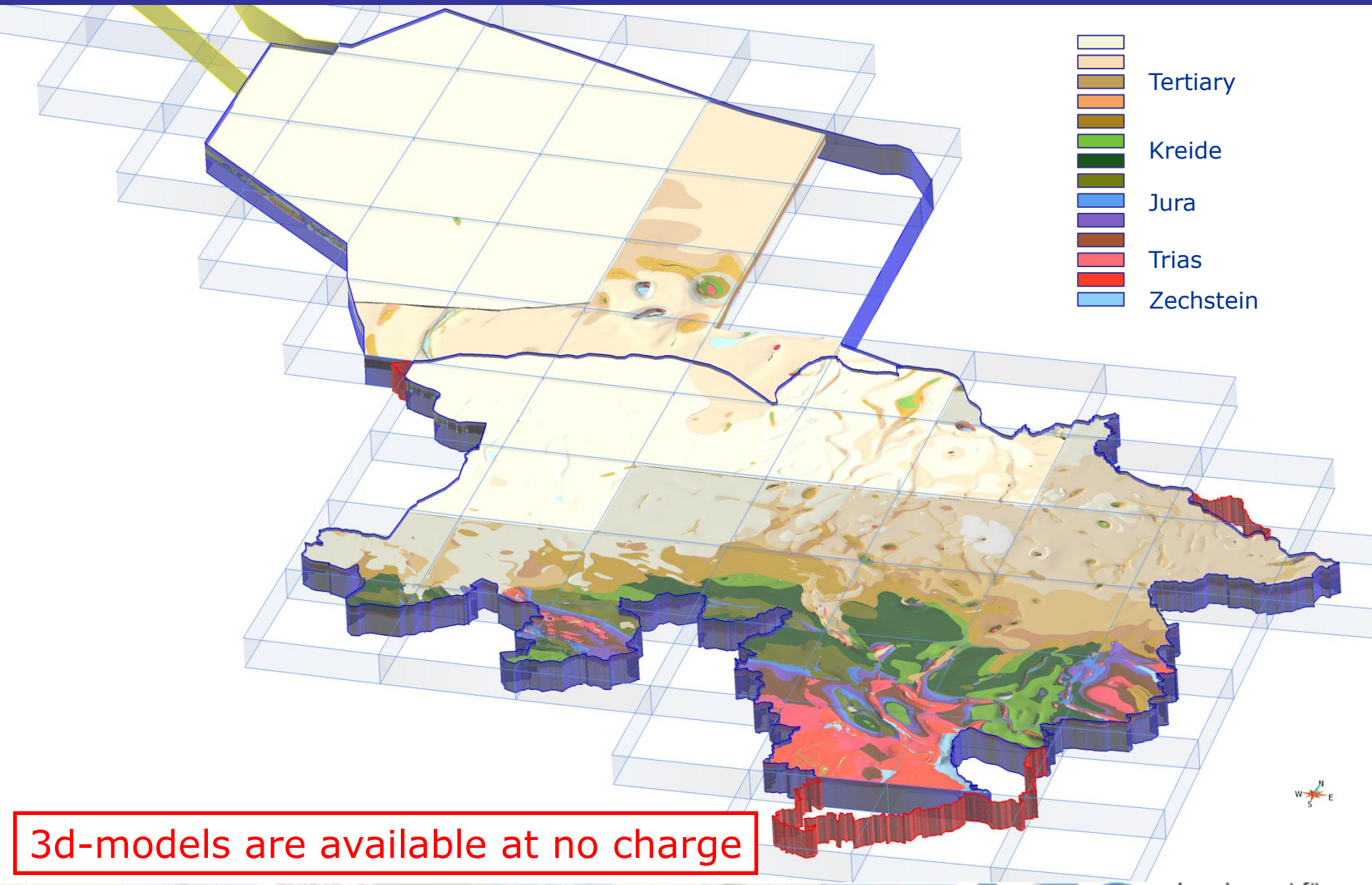

3d-models are available at no charge

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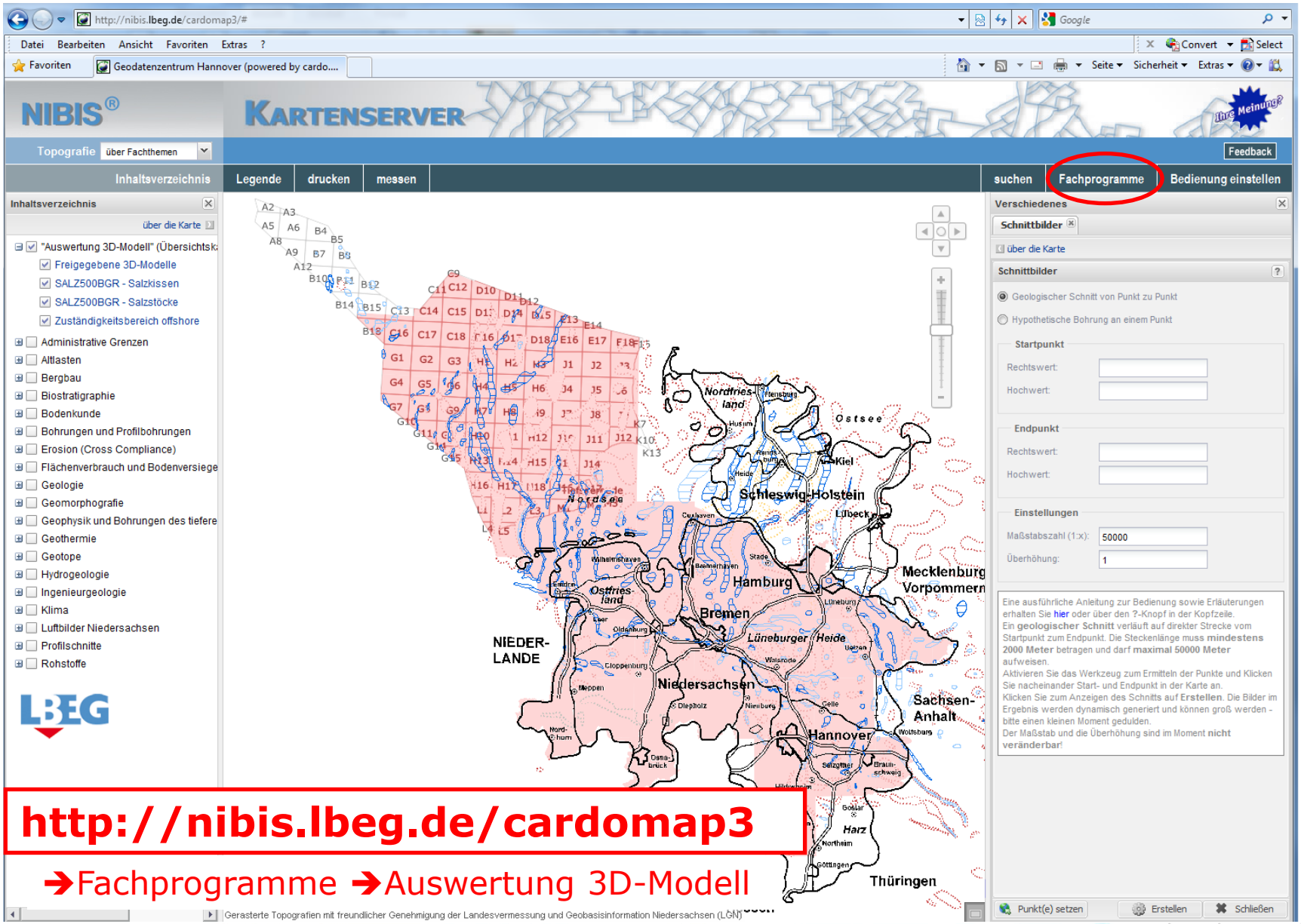
7 Generation of Cross-Sections via Internet



http://nibis.lbeg.de/cardomap3

➔Fachprogramme ➔Auswertung 3D-Modell

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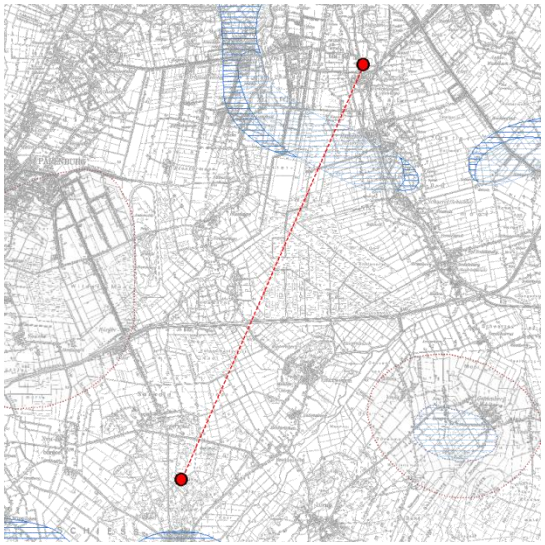
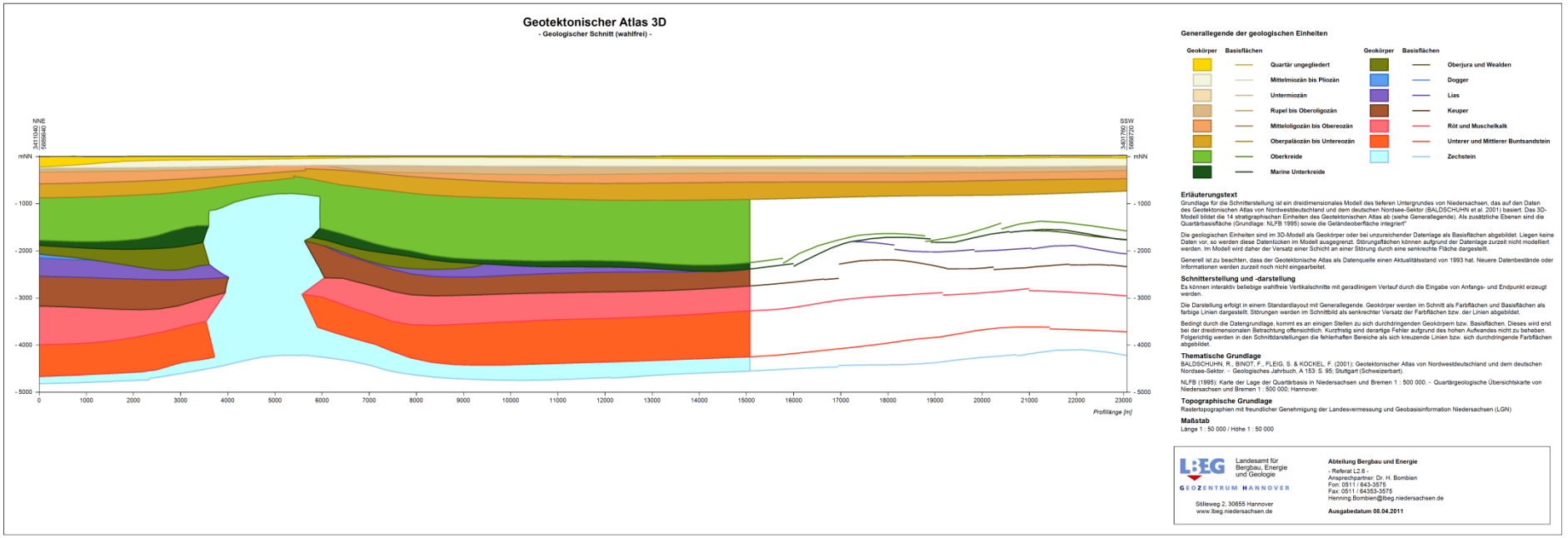


left: topographic map showing the trace of the cross-section

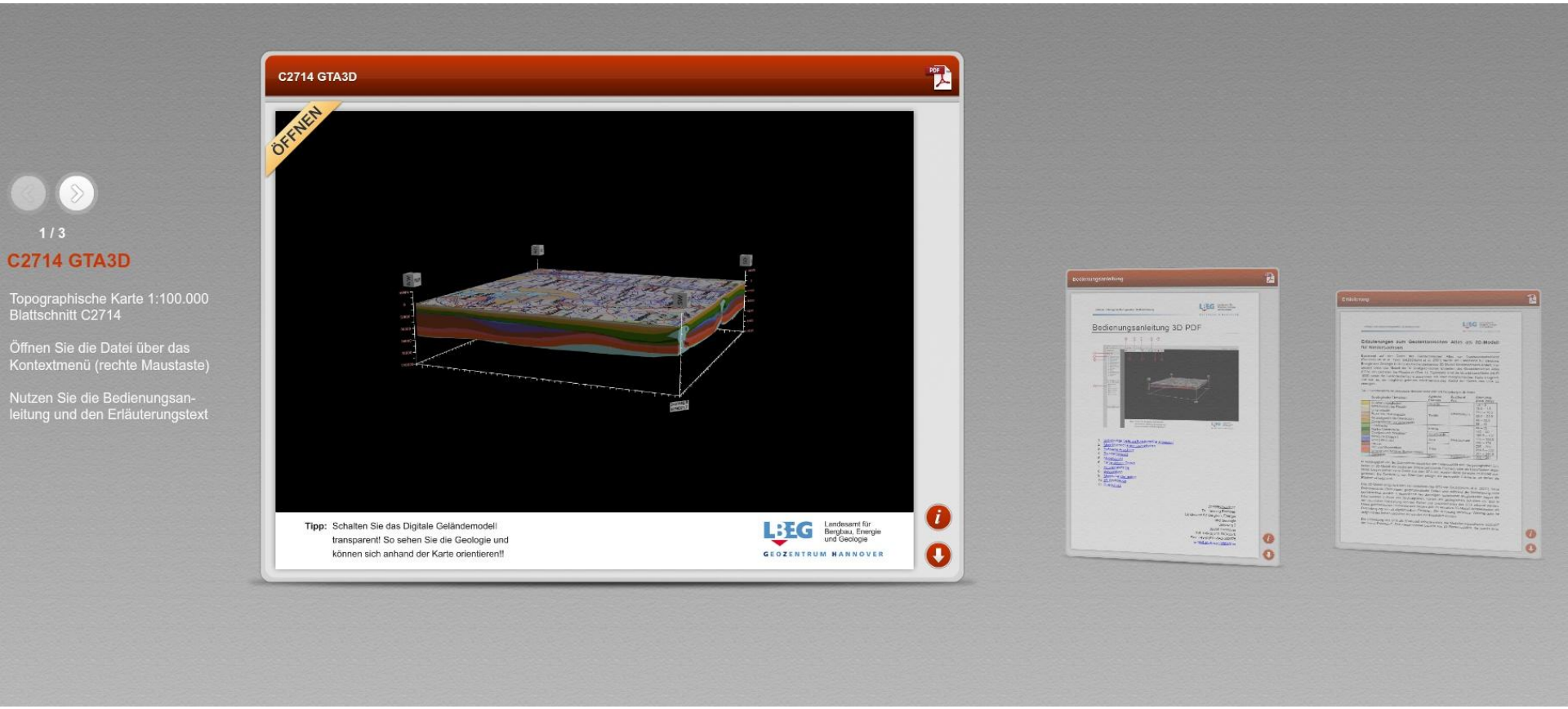
below: geological cross-section through the 3d-model resulting from the Tectonic Atlas

free download of map and cross-section



Landesamt für Bergbau, Energie und Geologie

7 Presentation of the Model as 3DPDF (Prototype)



Watch out on our Website:

free download of the Model as 3DPDF-file in the course of 2012

Thank you very much for your attention.