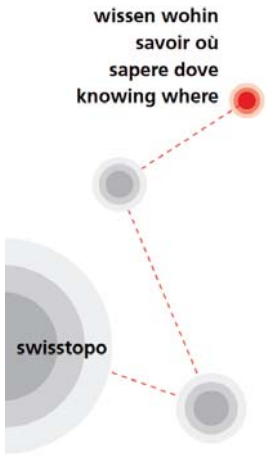
Schweizerische Eidgenossenschaft
Confédération suisse
Confederazione Svizzera
Confederaziun svizra

Bundesamt für Landestopografie swisstopo



Collaborative 3D modeling: Hidden Pitfalls - A case study from Switzerland

Robin Allenbach

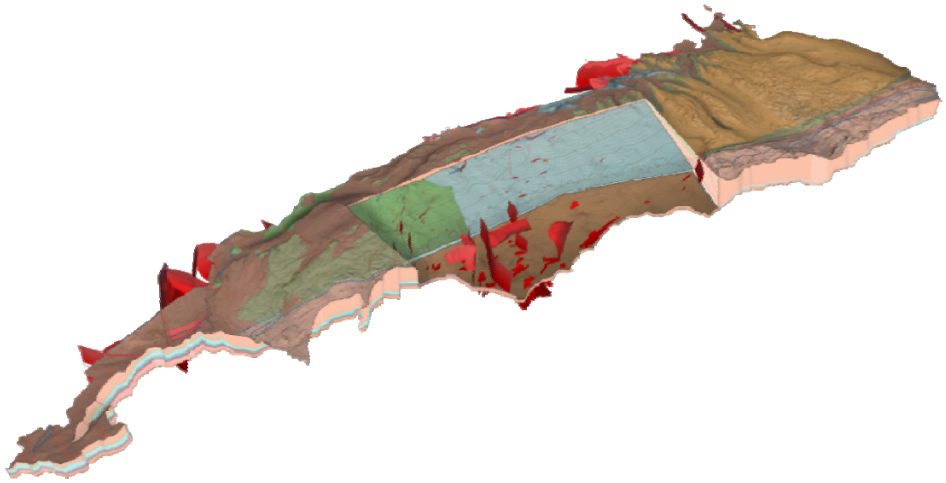
Roland Baumberger

Lance Reynolds

22.02.2018

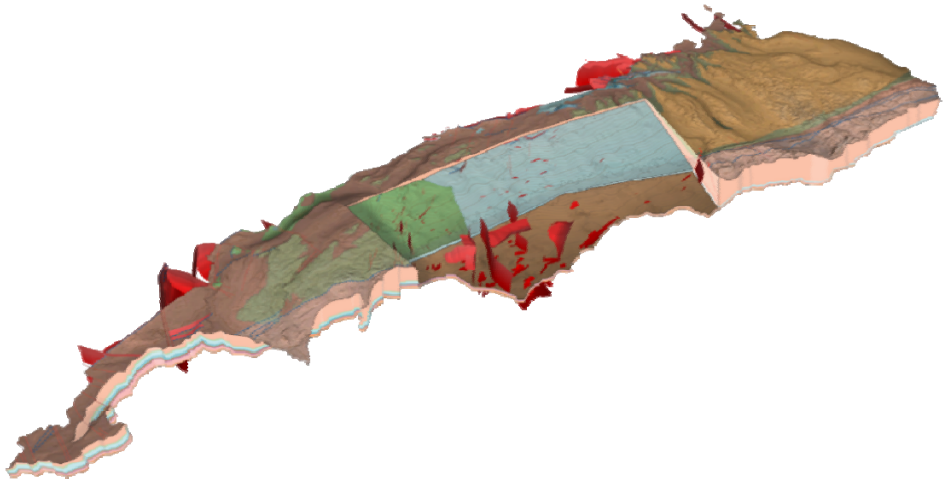
GeoMol Switzerland

- A 3D geological model with…
- …600+ faults…
- …12 stratigraphic marker horizons…
- …6 modelling areas and partners with different deadlines…
- …5 shared boundaries.

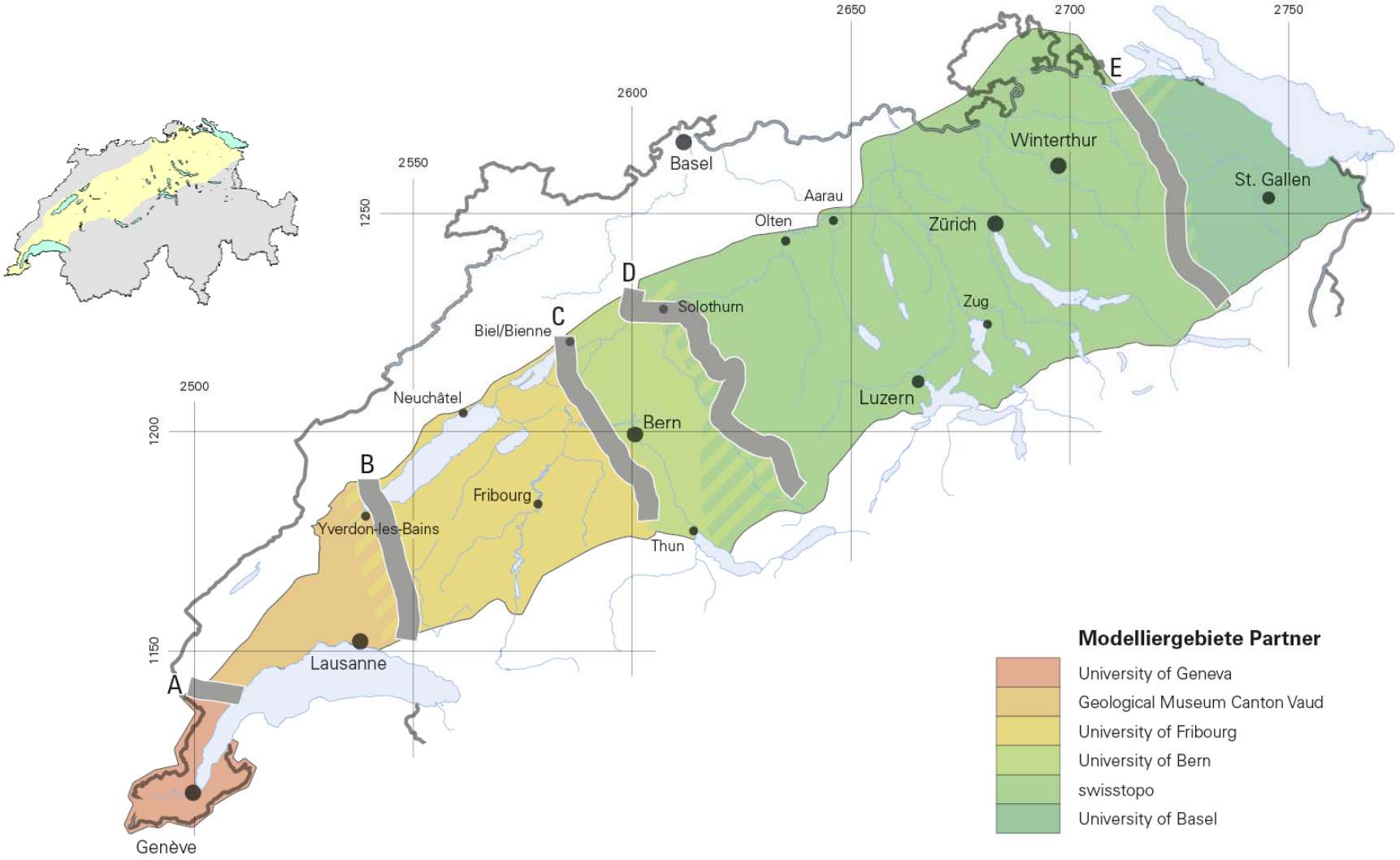


GeoMol Switzerland

- ✓ Meetings
- ✓ Data harmonization
- ✓ Minimum requirements for deliverables
- ✓ QA checklists

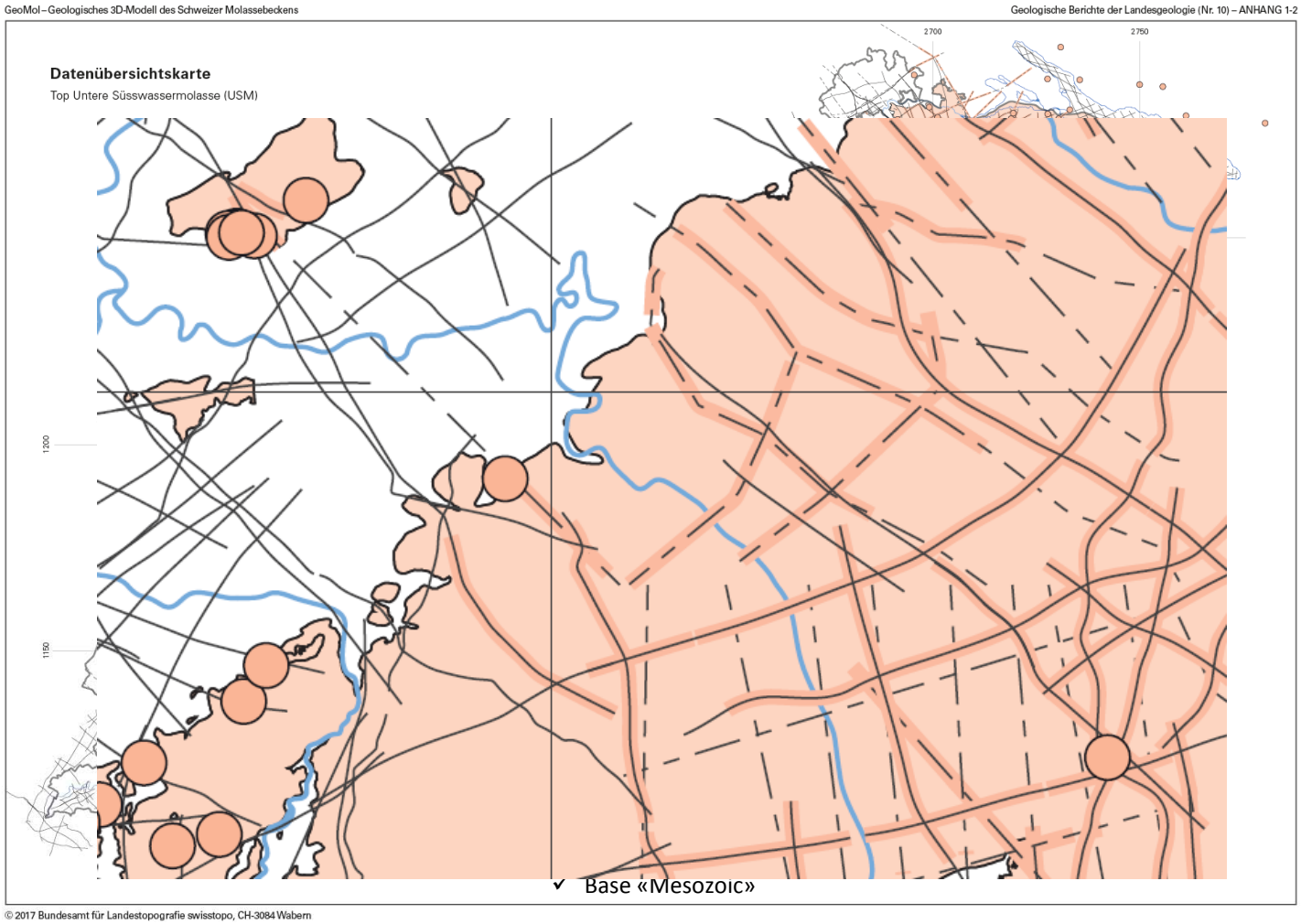


Modelling areas

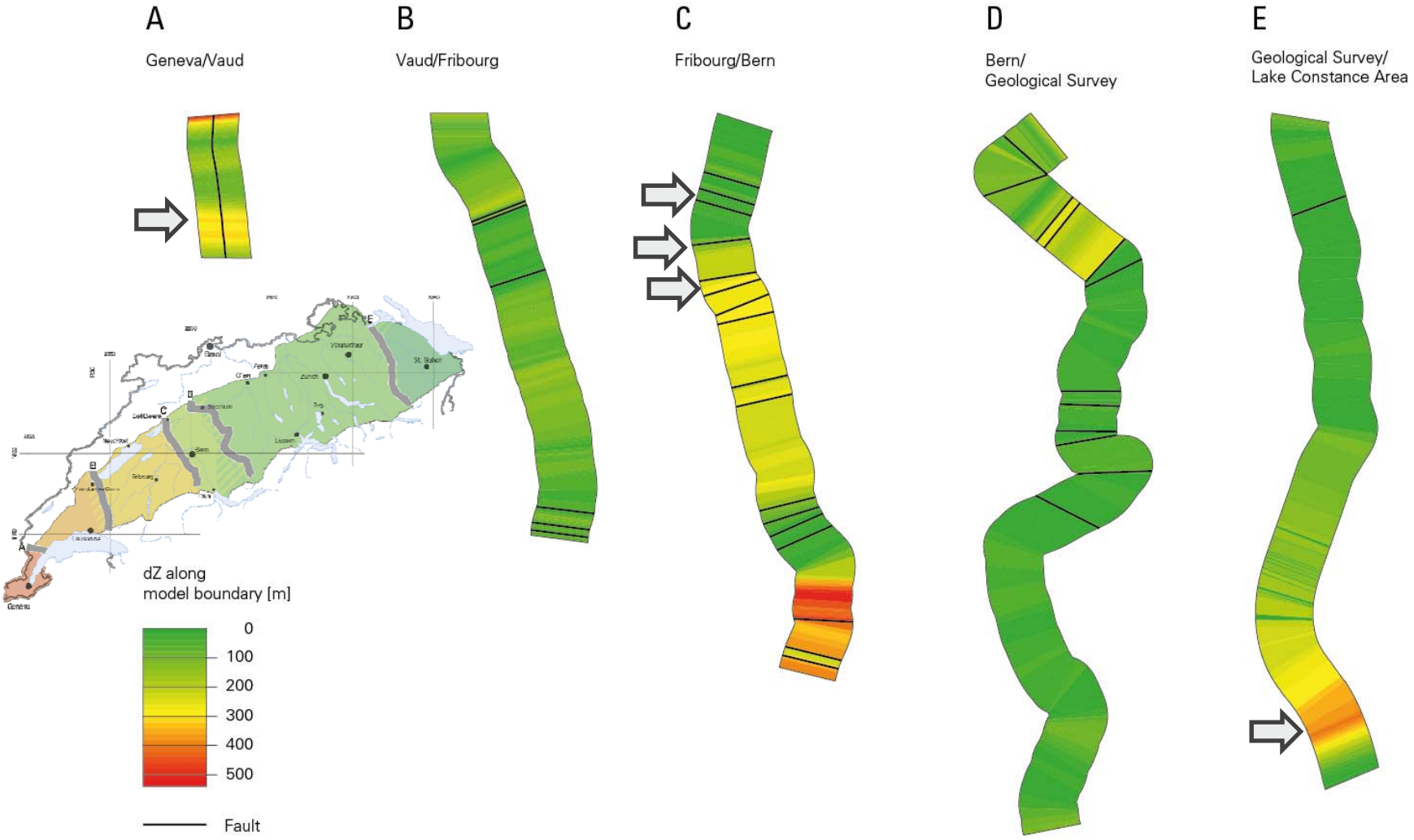


Federal Office of Topography swisstopo
Geological data

Data coverage maps



Join Boundaries – dZs (Top Dogger)



Some Reasons for Differences

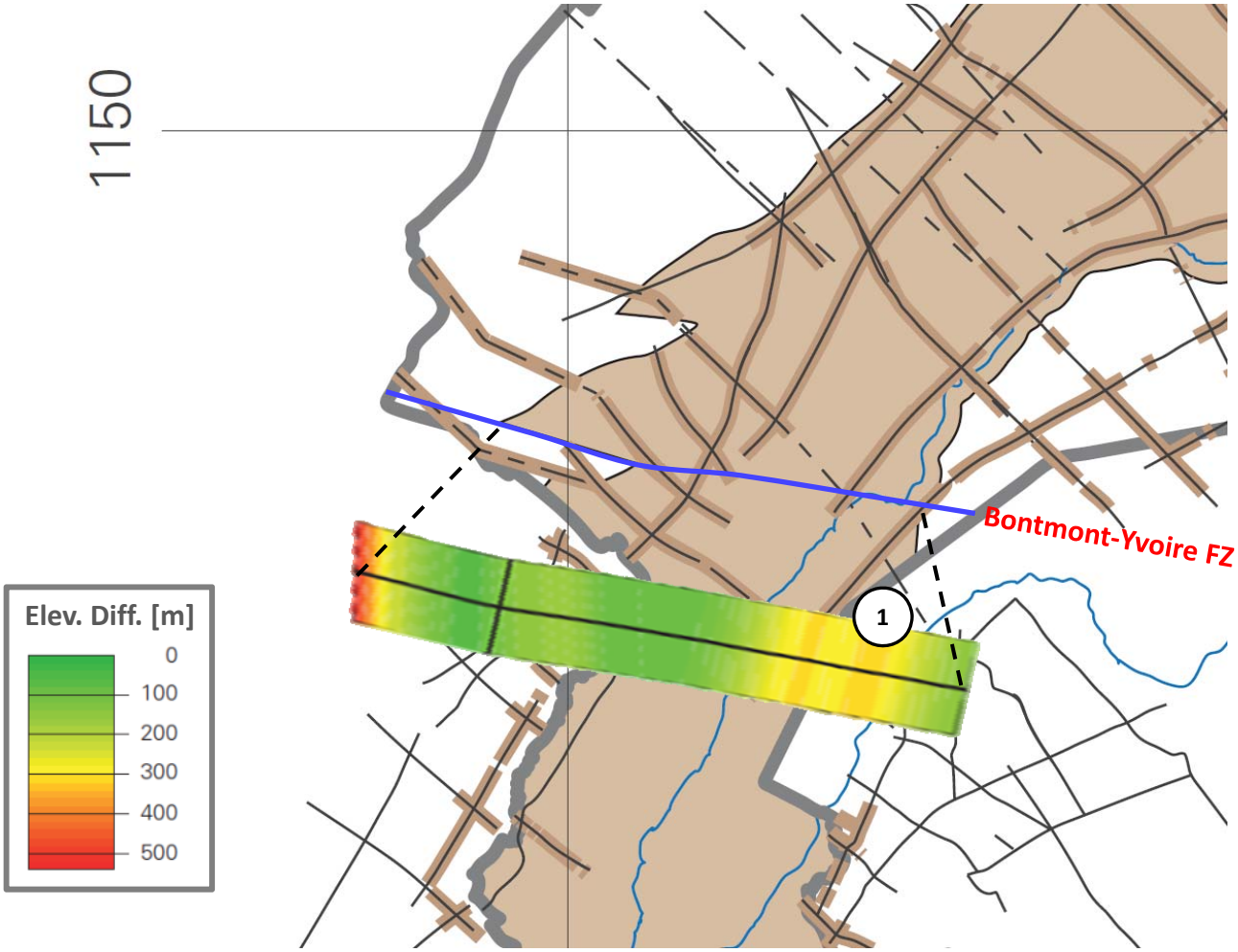
Difference Type
Data type, distribution, quality or degree of correlation (tie-in) across the AOI
Geological concepts
Different interpretations (horizons & faults in seismics, wells etc.)
Presence/absence of a geological structures along the JB
Extent of a geological structure
Degree of modelling detail

Difference Type
Surface generation methodology (gridding algorithm, parameters, resolution, smoothing)
Include/exclude faulted horizon offsets
Presence/absence of deep wells along JB
Choice of wells for the well-tie
Include/Exclude surface mapping in the modelling process
Different velocity models

Note: geological structure = e.g. fault, anticline/syncline etc.

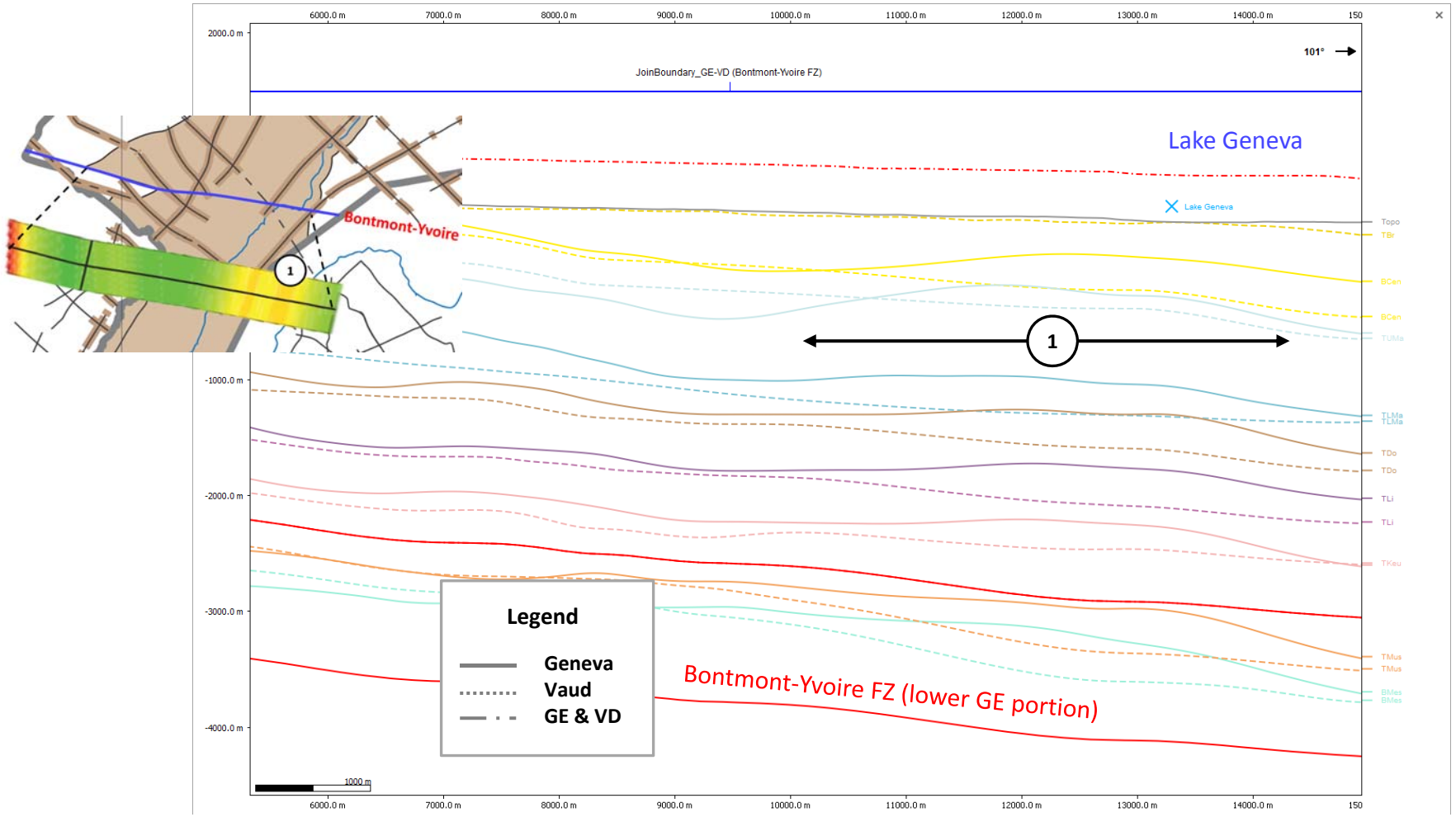
Analysis

Join Boundary A – DCM and dZ (TDo)



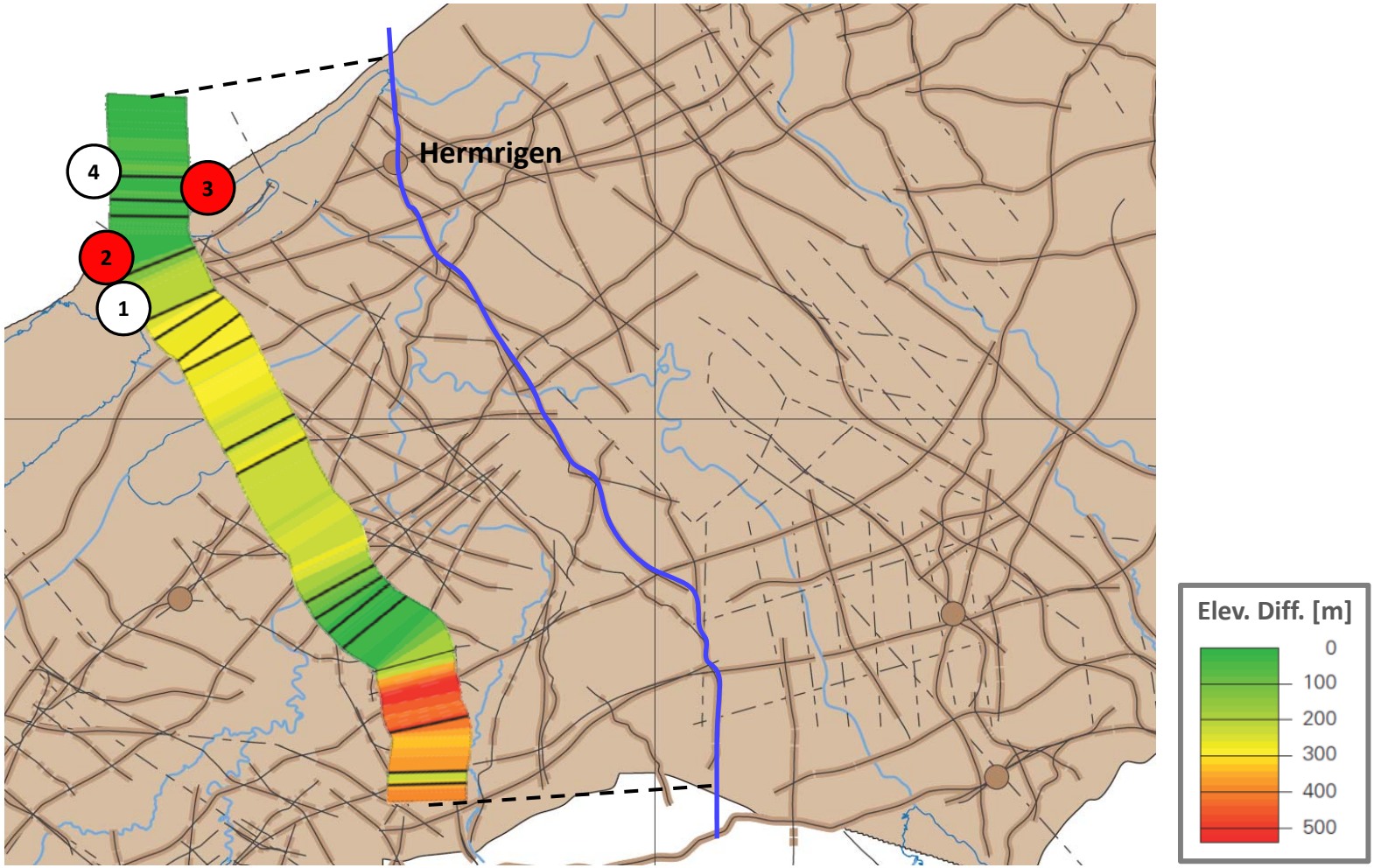
Analysis

Join Boundary A



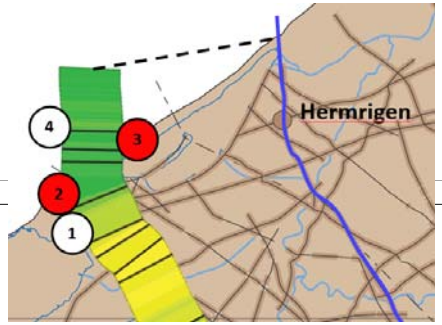
Analysis

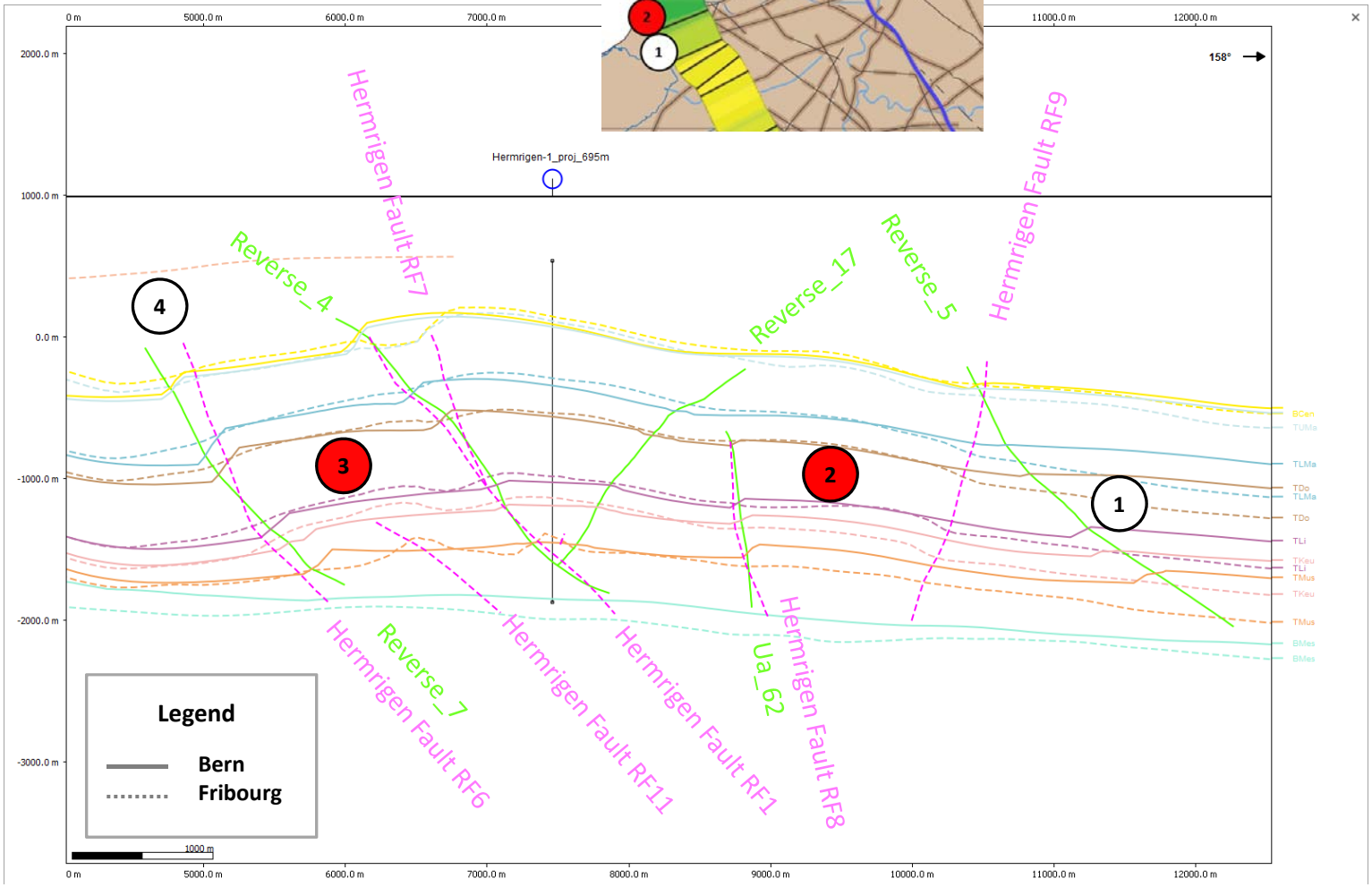
Join Boundary C – DCM and dZ (TDo)



Analysis

Join Boundary C

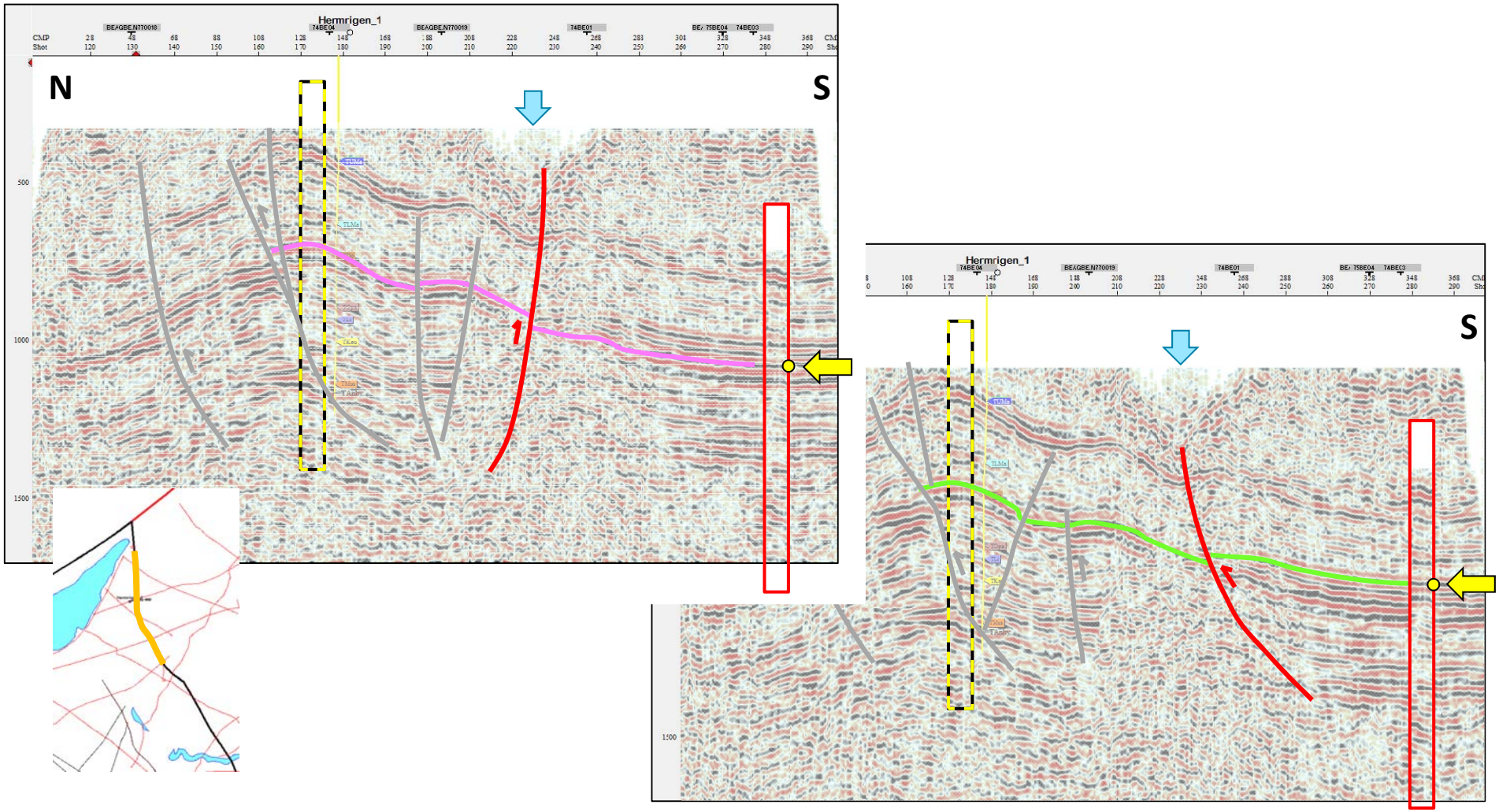




Analysis

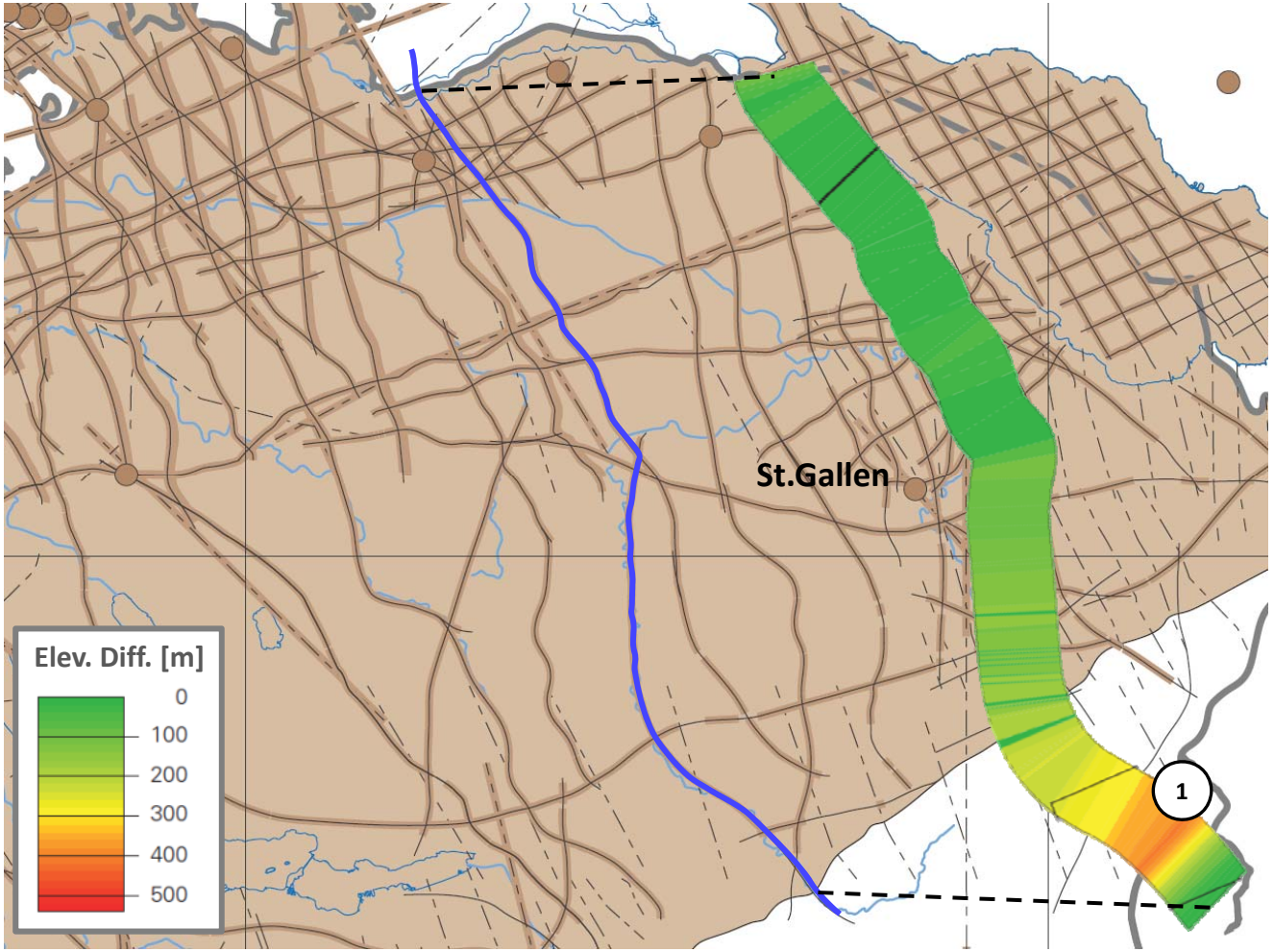
FR-BE Join Boundary

Obs. 1 - 4: Geological concepts and seismic interpretation



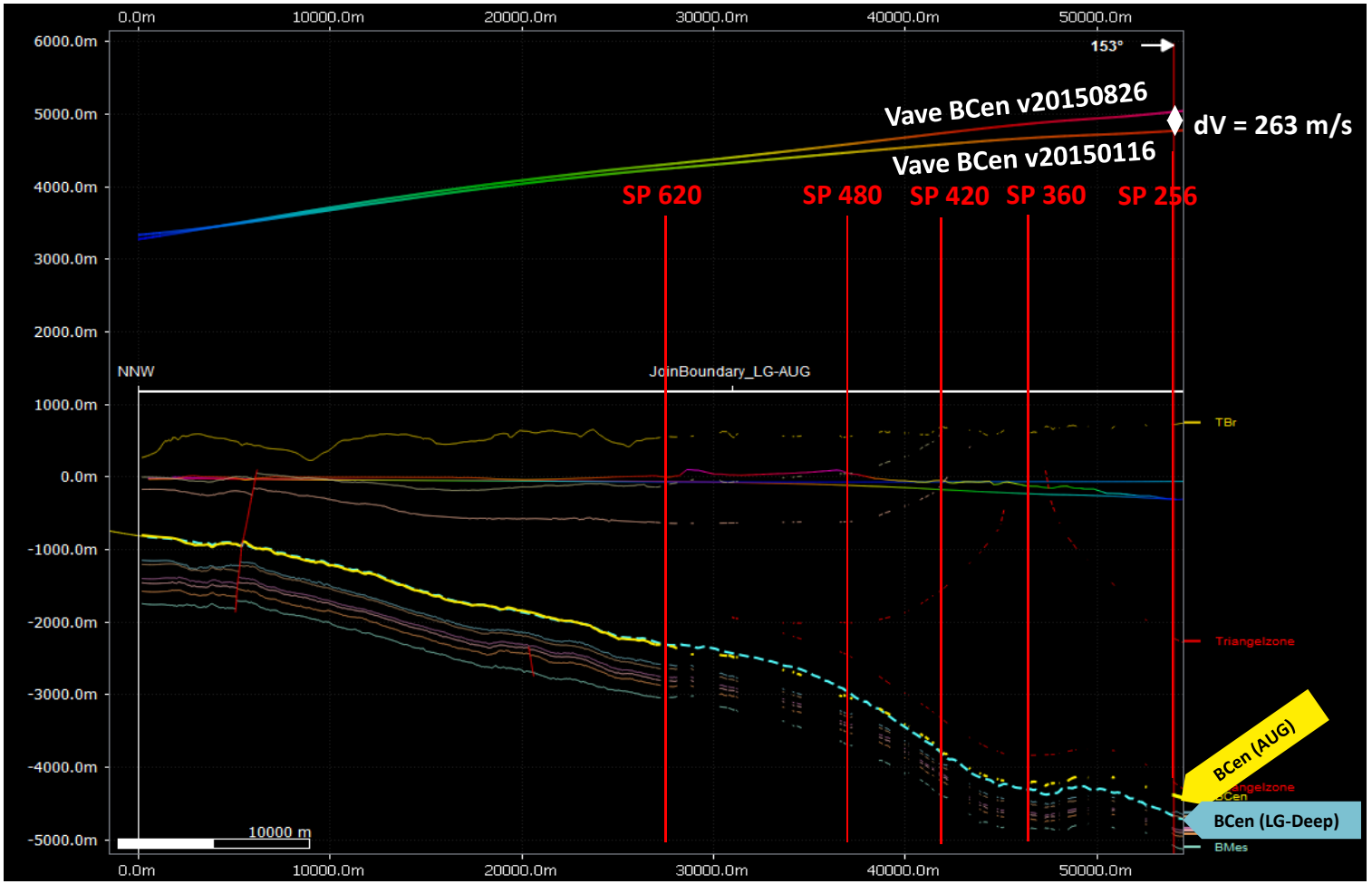
Analysis

Join Boundary E – DCM and dZ (TDo)



Analysis

- Different velocity models and seismic interpretations



Lessons Learned

General Comments:

- The majority of issues observed in this analysis relate to the **inconsistent modelling of fault zones** (and associated horizon offsets) across boundaries
- High levels of cross-boundary **interaction resulted in fewer** inconsistencies along boundaries.

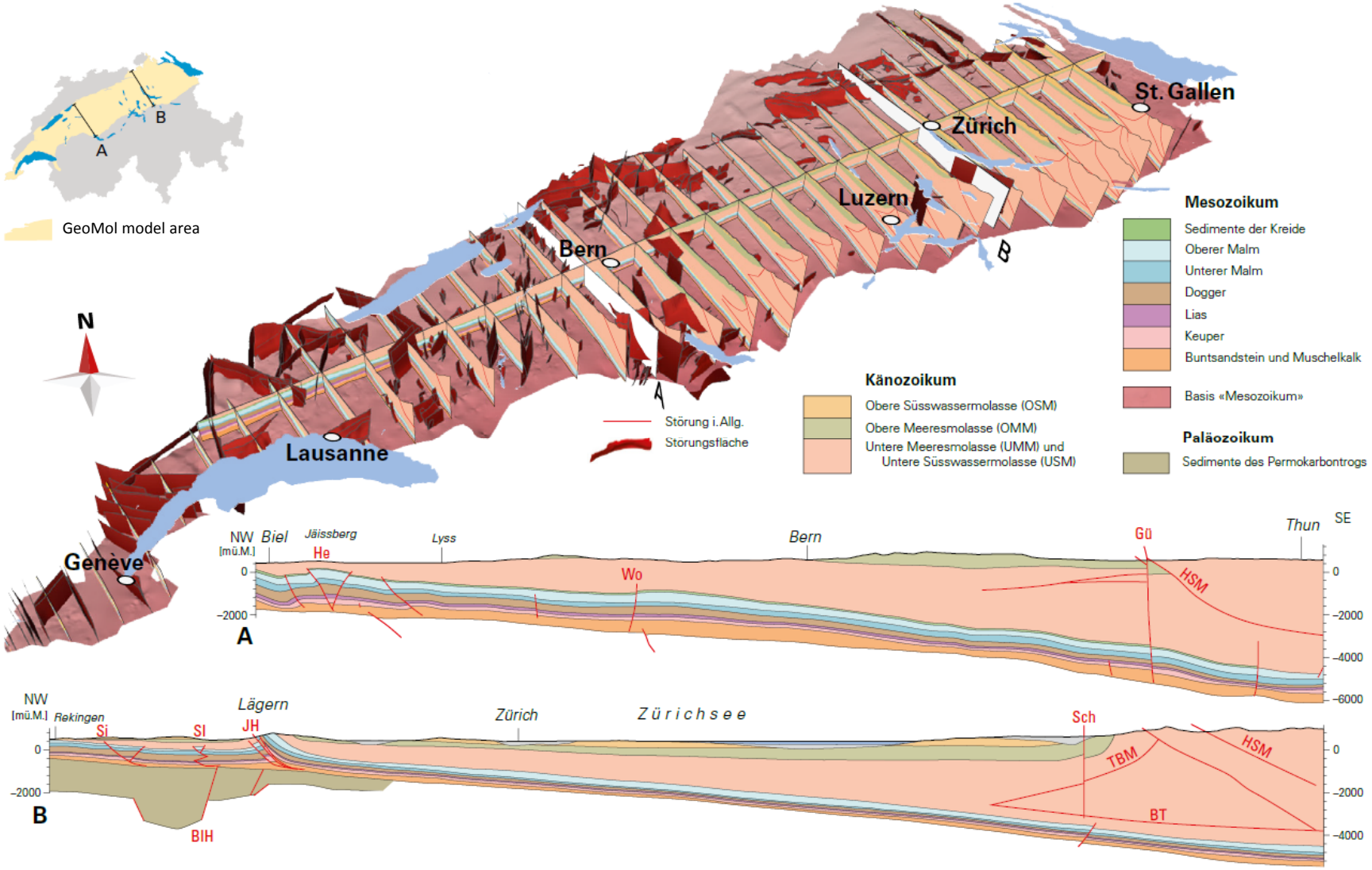
Technical (scenario: multiple model regions and project partners):

- **Geological concepts** need to be agreed upon before interpretation & modelling commences
- Mixed data sets need additional work for **cleanup and harmonization**
- If possible, the use of **different velocity models should be avoided**
- Effort needs to be put into **harmonizing fault structures** during all modelling phases. Focus on: TWT interpretation, Depth interpretation; fault orientation, vertical and horizontal extents, horizon offsets.

Project management:

- A detailed **minimum "harmonized geology" criteria** list for the output model would reduces the amount of adjustments when combining models
- All involved partners need to have the **same deadlines.**

GeoMol 17


A
B
GeoMol model area
N
St. Gallen
Zürich
Luzern
Bern
Lausanne
Genève
Störung i.Allg.
Störungsfläche
Mesozoikum
Sedimente der Kreide
Oberer Malm
Unterer Malm
Dogger
Lias
Keuper
Buntsandstein und Muschelkalk
Basis «Mesozoikum»
Paläozoikum
Sedimente des Permokarbontrogs
Känozoikum
Obere Süsswassermolasse (OSM)
Obere Meeresmolasse (OMM)
Untere Meeresmolasse (UMM) und
Untere Süsswassermolasse (USM)
NW
[mü.M.]
Biel
Jäissberg
Lyss
Bern
Thun
SE
He
Wo
Gü
HSM
0
-2000
-4000
-6000
A
NW
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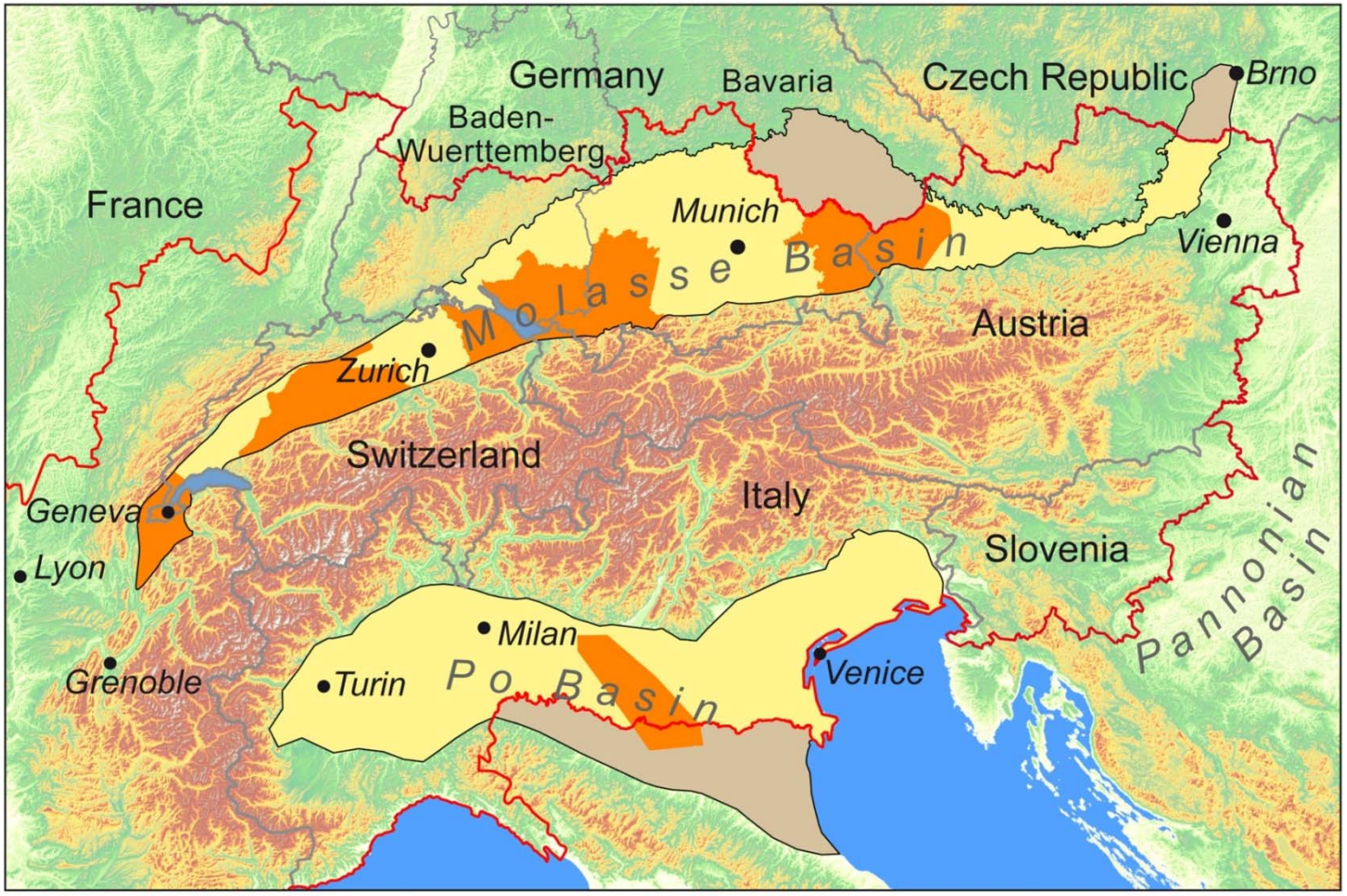
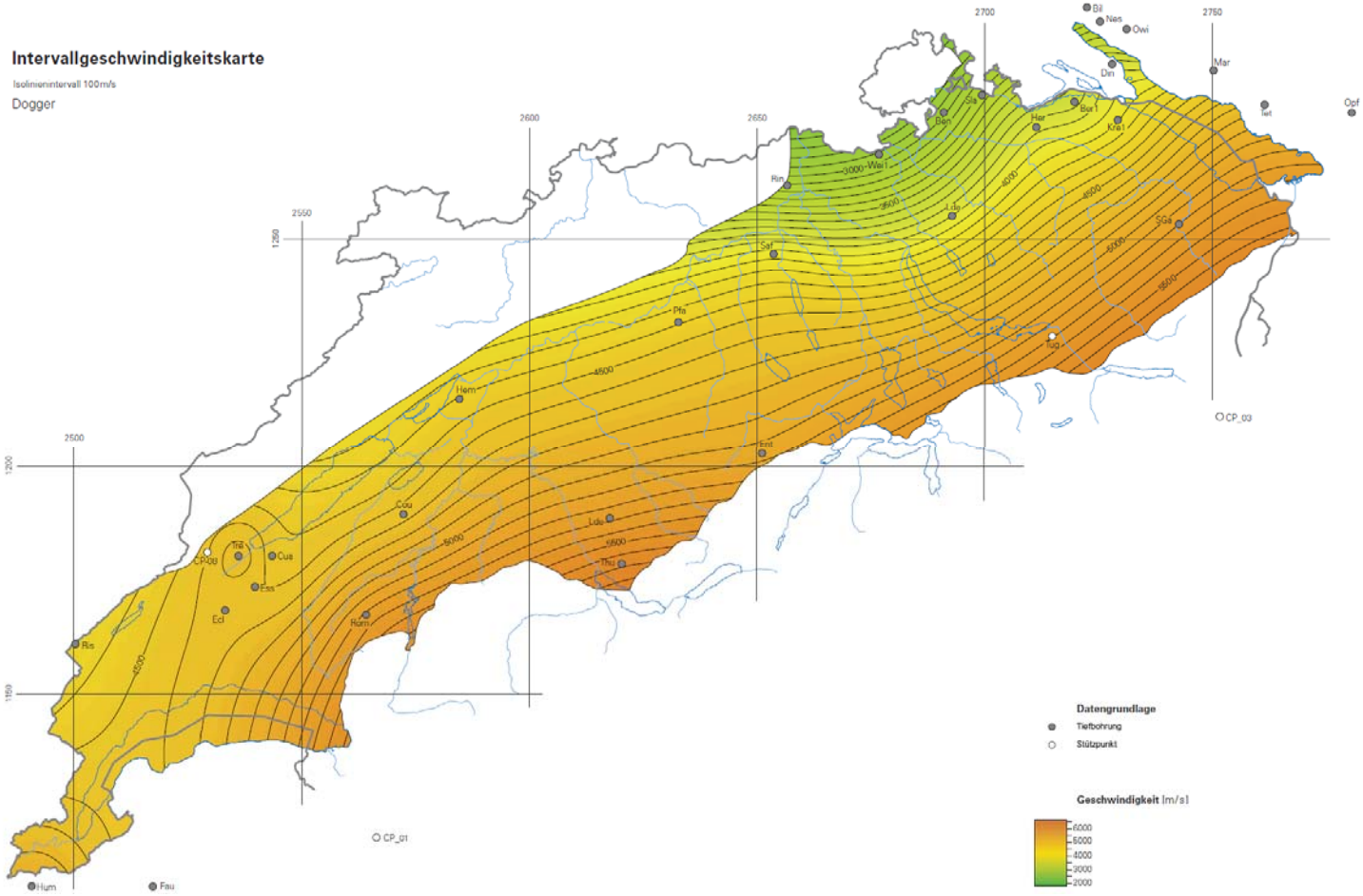
Rekingen
Si
SI
JH
Lägern
Zürich
Z ü r i c h s e e
Sch
TBM
HSM
BT
BIH
B

[end]

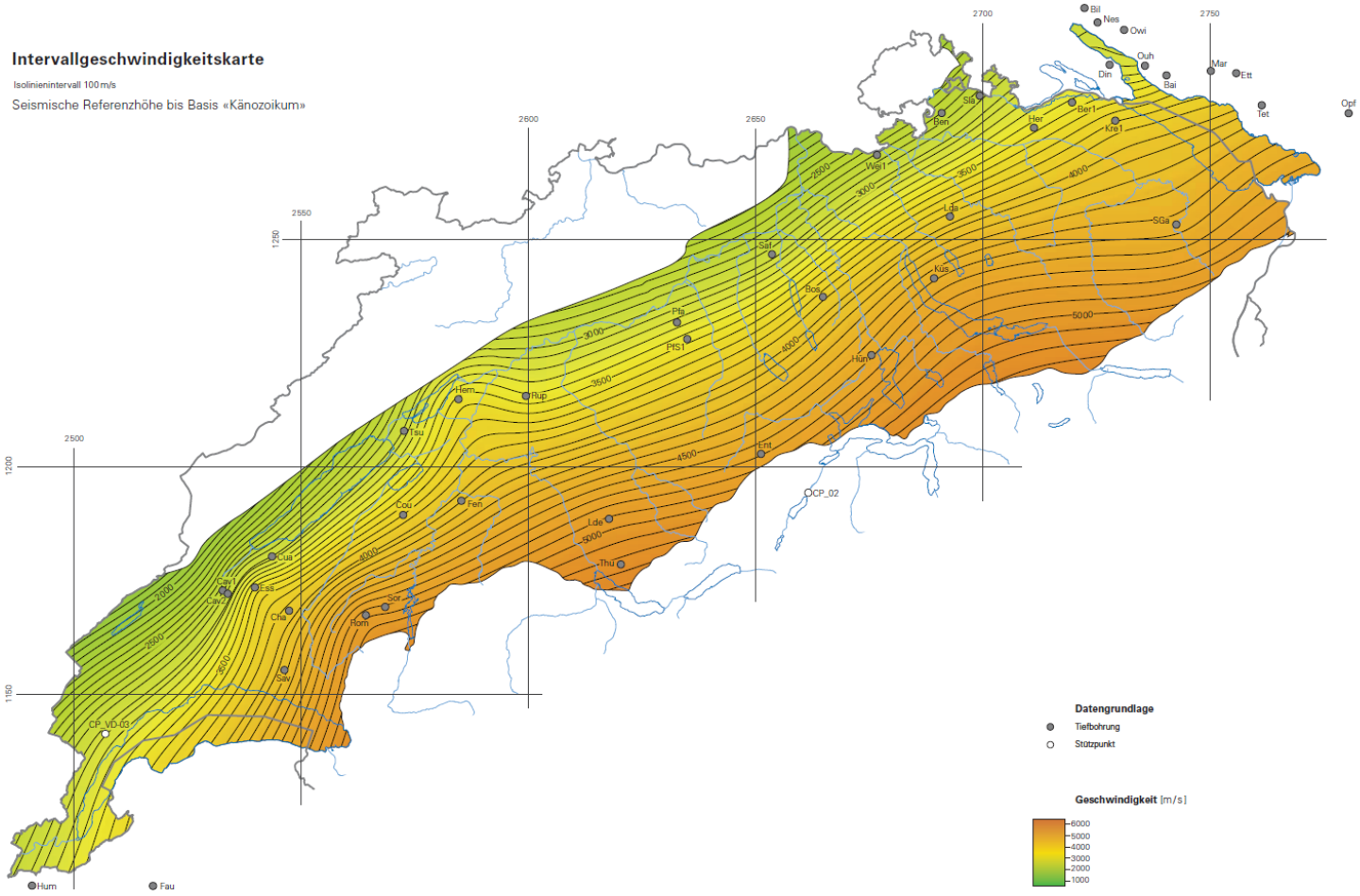
Background GeoMol EU



V_{int} Dogger

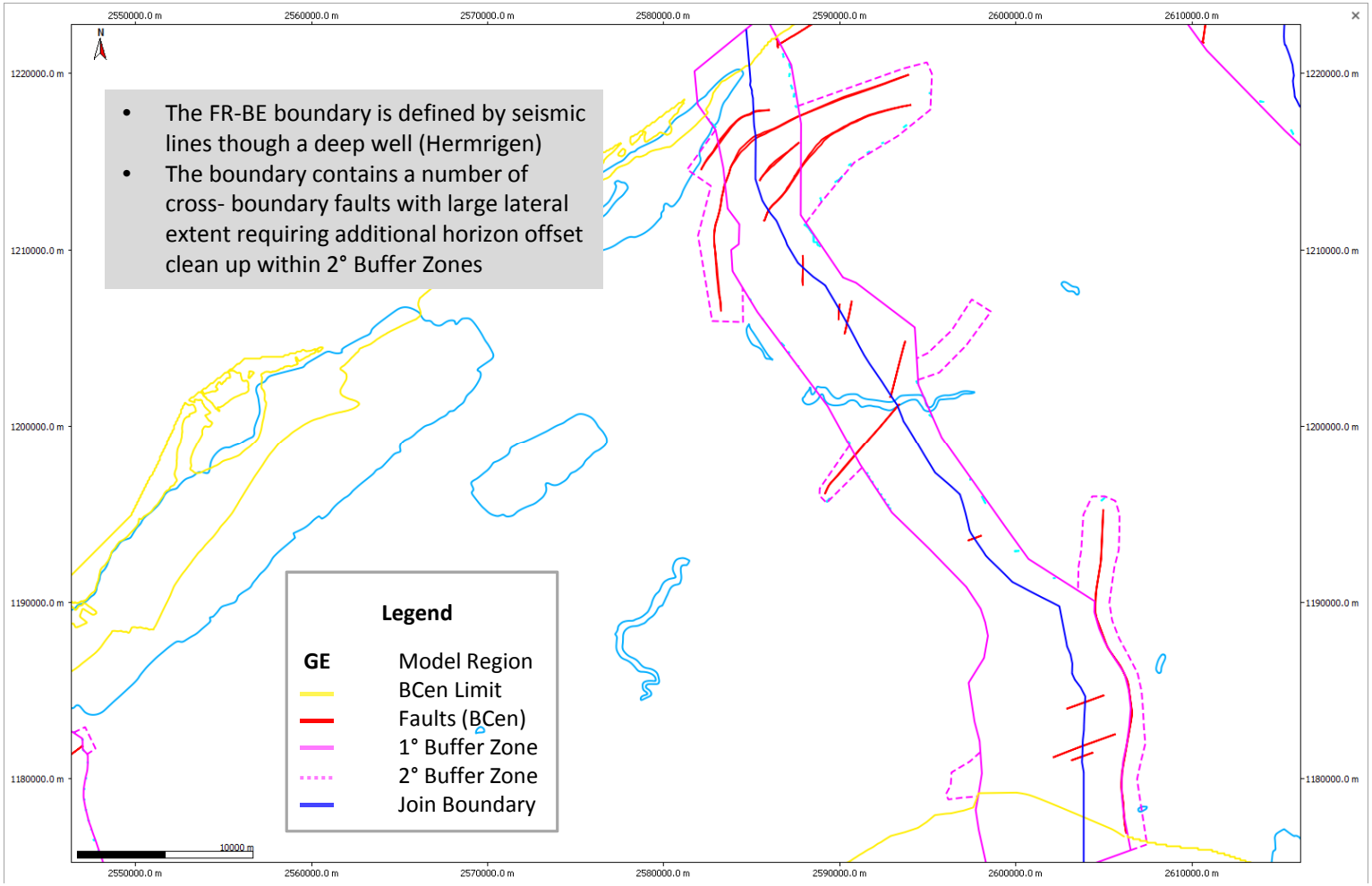

Intervallgeschwindigkeitskarte
Isolinienintervall 100m/s
Dogger
Datengrundlage
Tiefbohrung
Stützpunkt
Geschwindigkeit [m/s]
6000
5000
4000
3000
2000

V_{int} Cenozoic



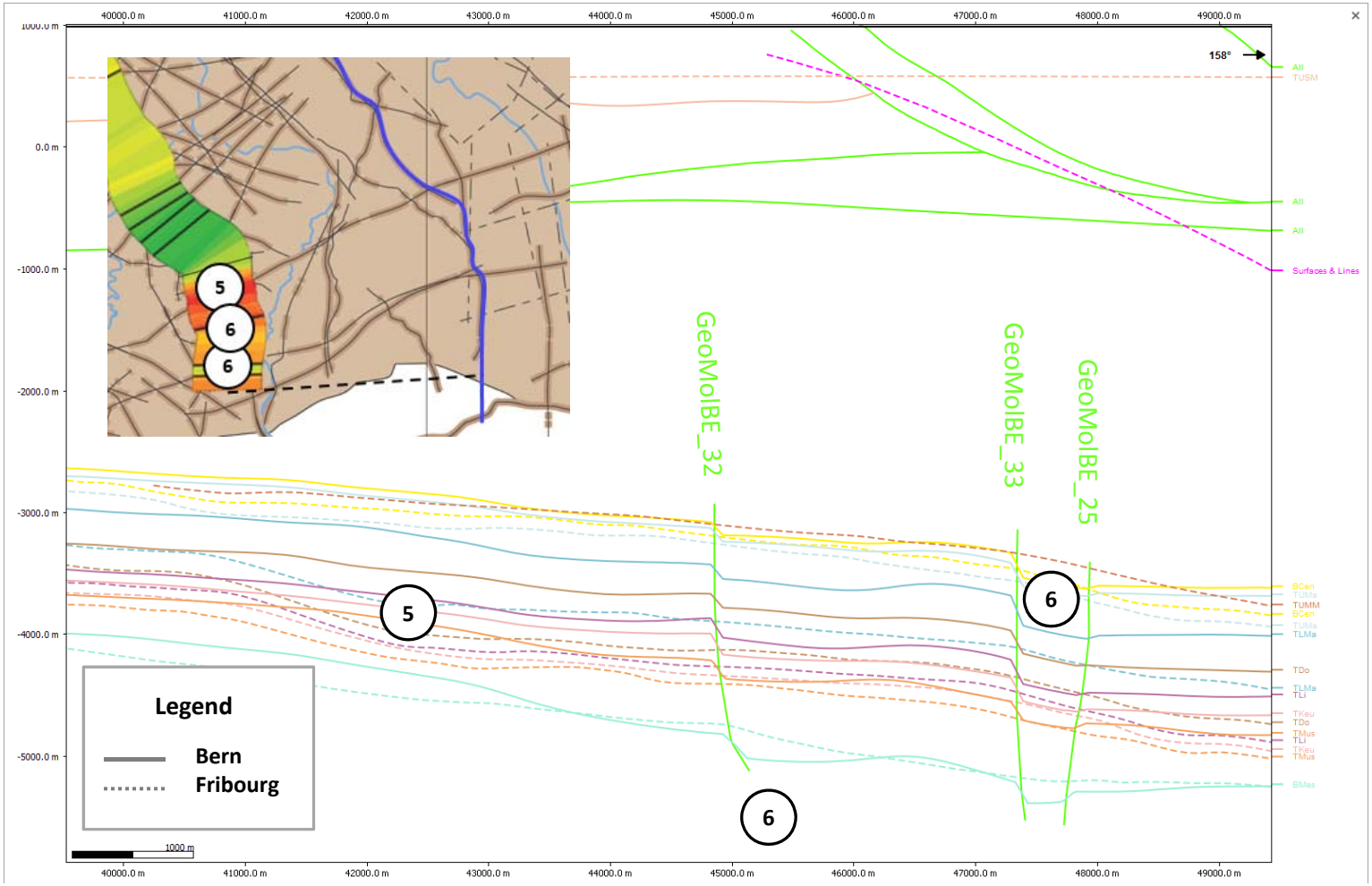
Analysis

FR-BE Join Boundary



Analysis

FR-BE Join Boundary



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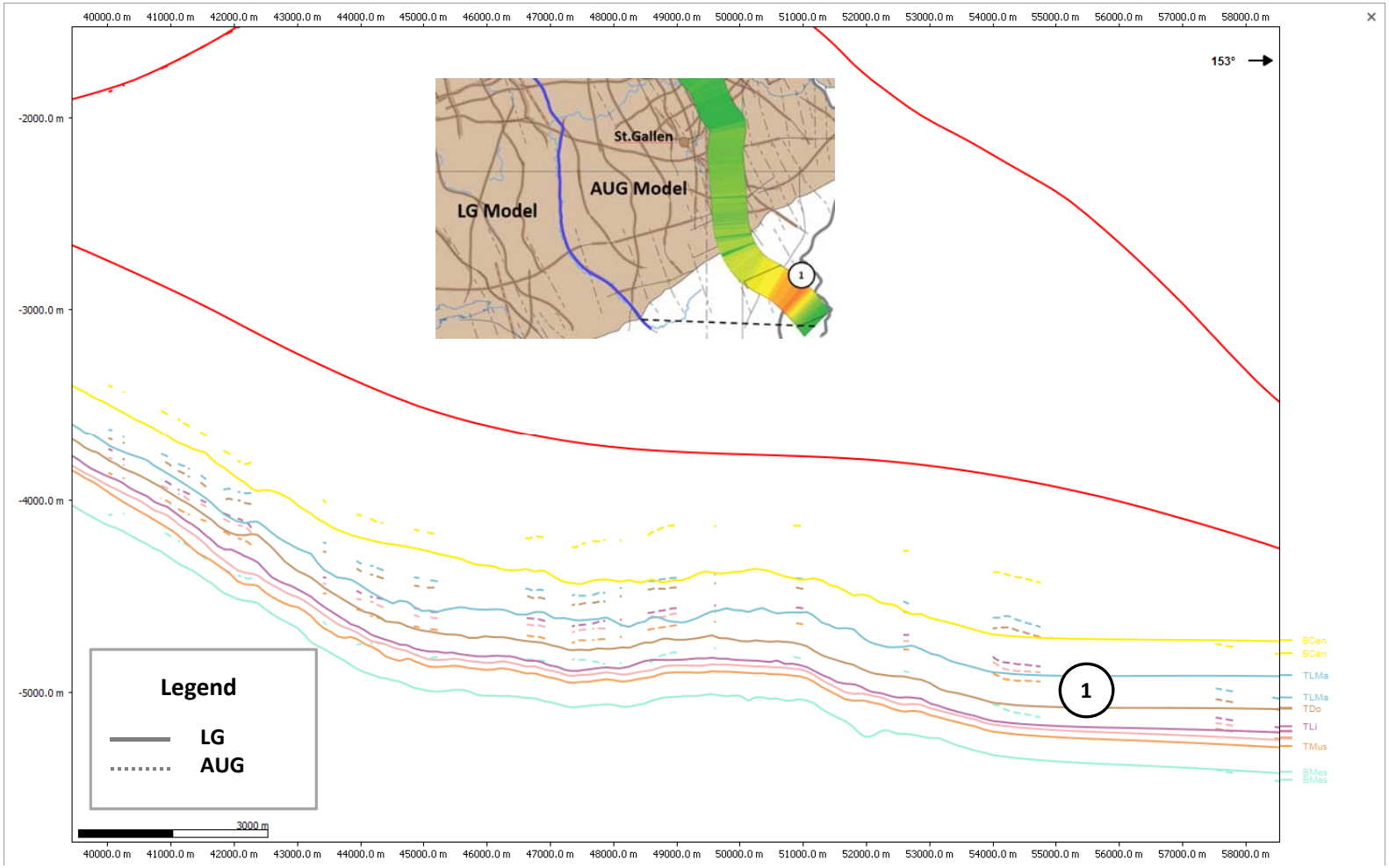
Analysis

LG-AUG Join Boundary



Analysis

LG-AUG Join Boundary