LBr-1 – a CO_2 storage pilot project with CO_2-EOR in the Czech Republic

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LBr-1 storage pilot project overview

Depleted hydrocarbon field in the Czech part of the Vienna Basin, produced mainly in the 1960s

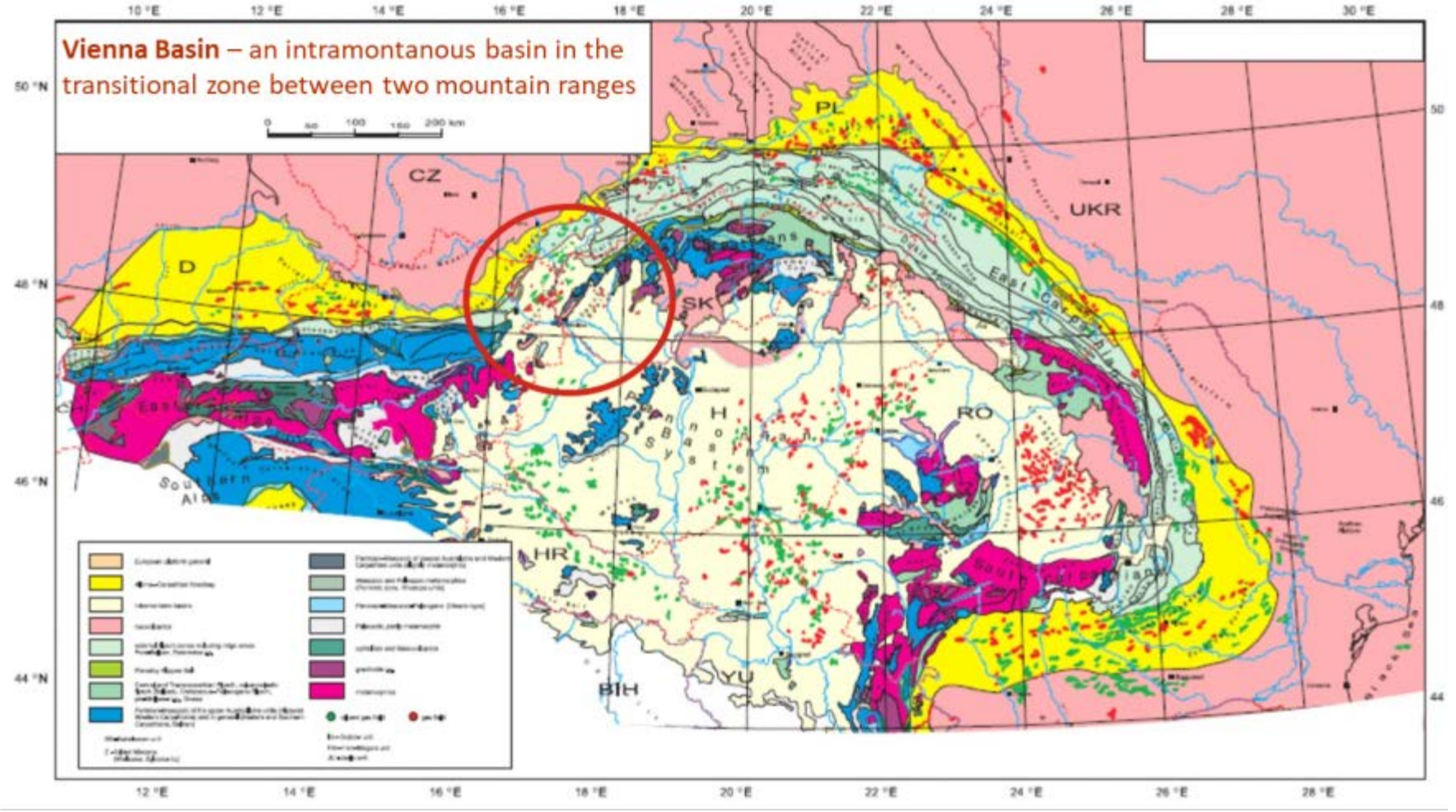
Tertiary **sandstones** at ca. 1100 m depth

Project development:

- Phase 1 – REPP-CO2 project funded by Norway Grants (2015-2016) – site characterisation and screening, 3D model of storage complex, dynamic simulations, risk assessment, monitoring plan
- Phase 2 – ENOS project – small steps forward
- Phase 3 – next round of Norway Grants(?), Horizon 2020 (?)

LBr-1 location

LBr-1 geological position



General overview and distribution of oil and gas fields in the Circum Carpathian Region of Central Europe. (Golonka & Picha, 2006)

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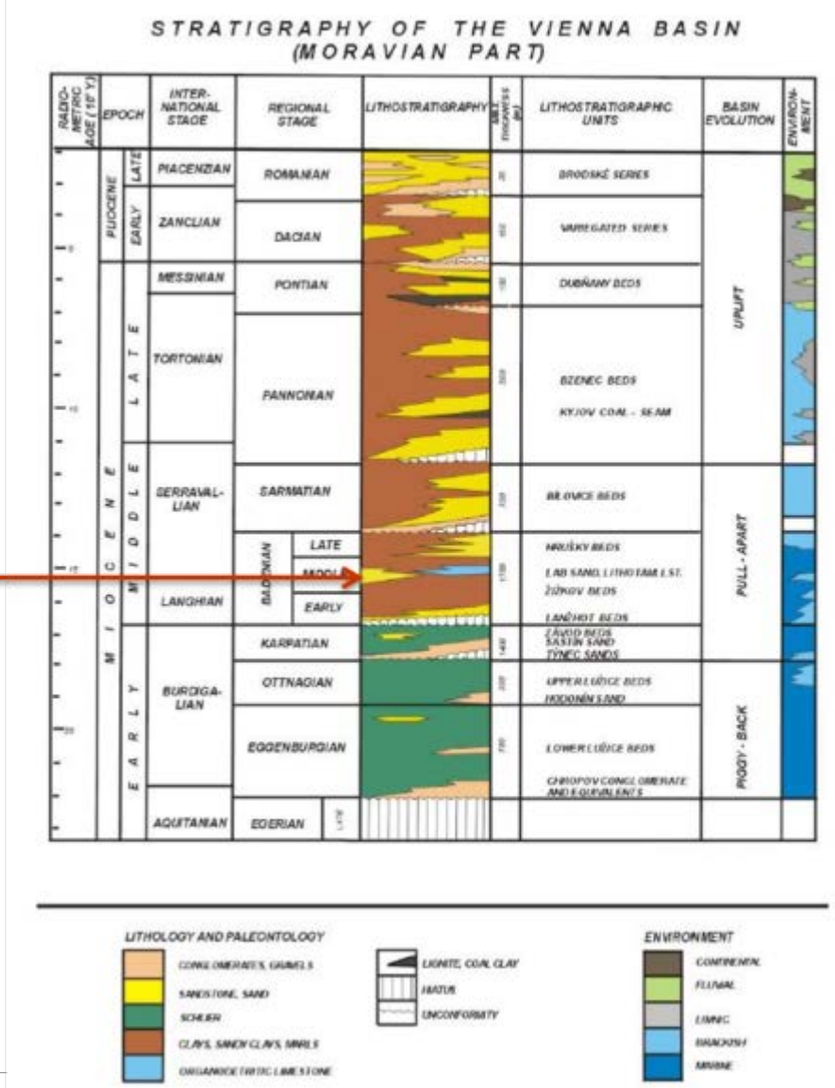
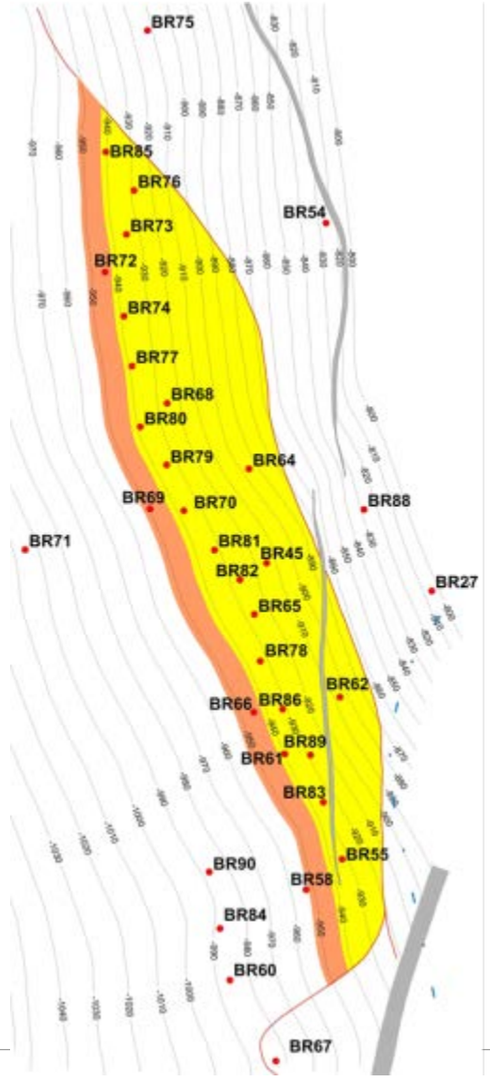
LBr-1 stratigraphic and tectonic positions

LBr-1 oil field





Top of Lab Horizon

Fault

Pinch-out boundary

Gas zone

Oil zone

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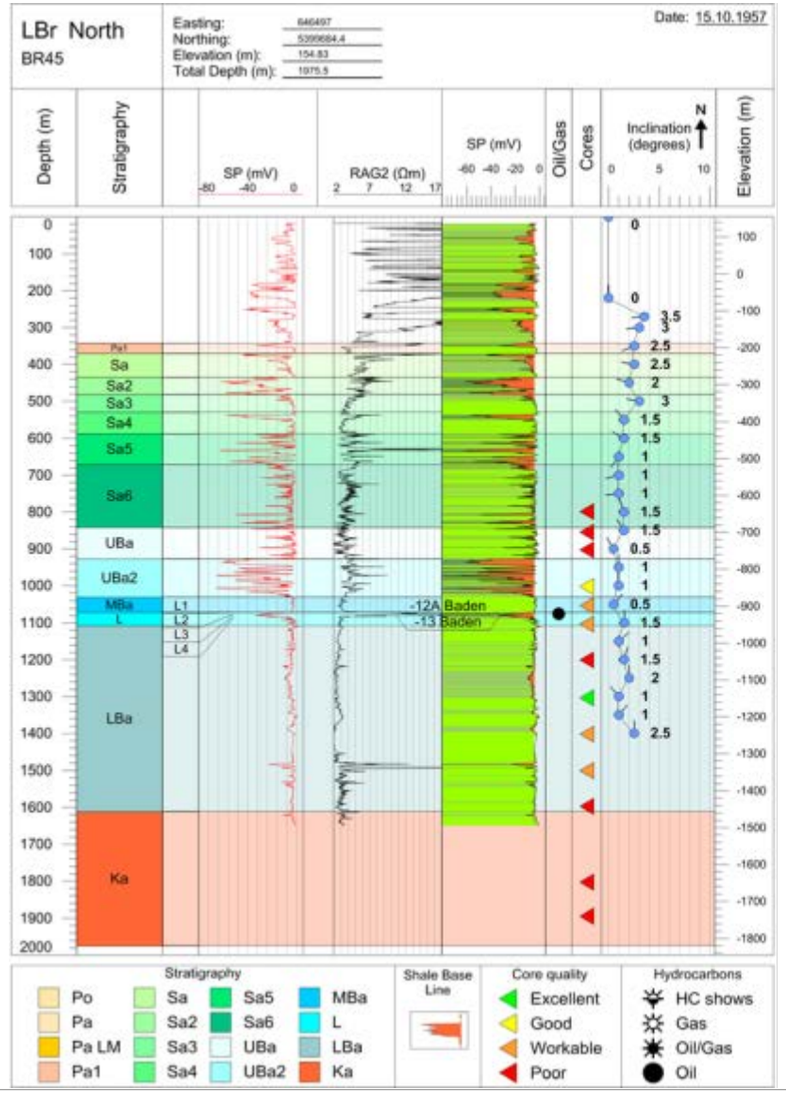
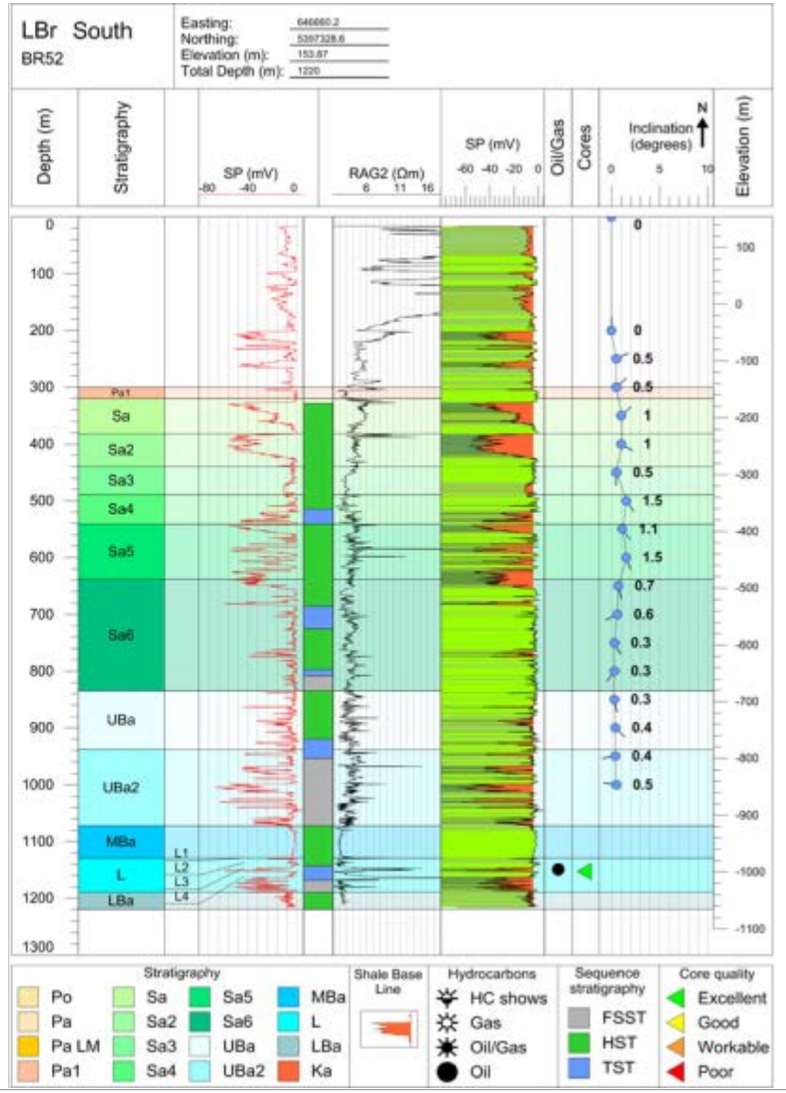
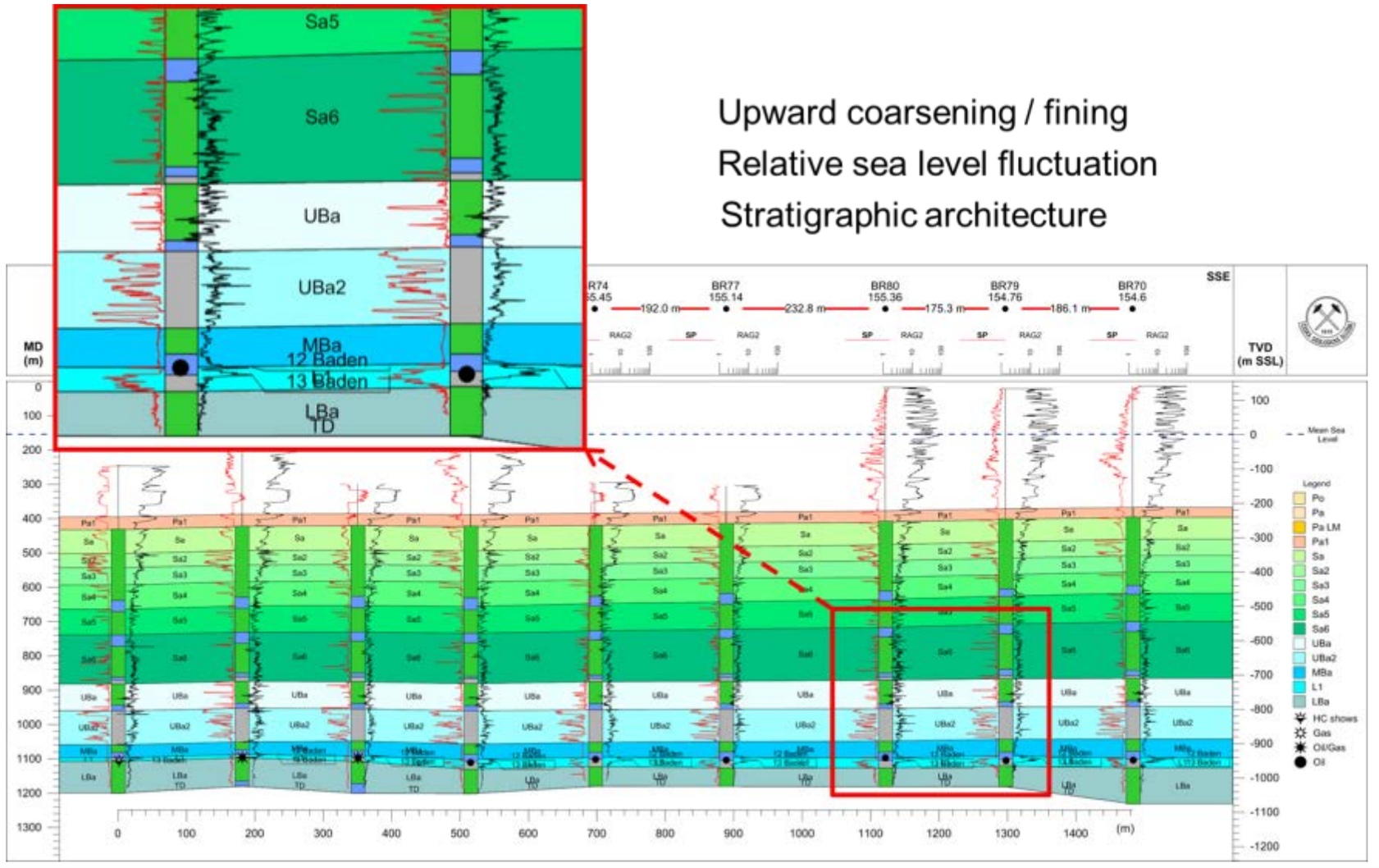
LBr-1 archive cores

New visualisation and interpretation of well and well-log data

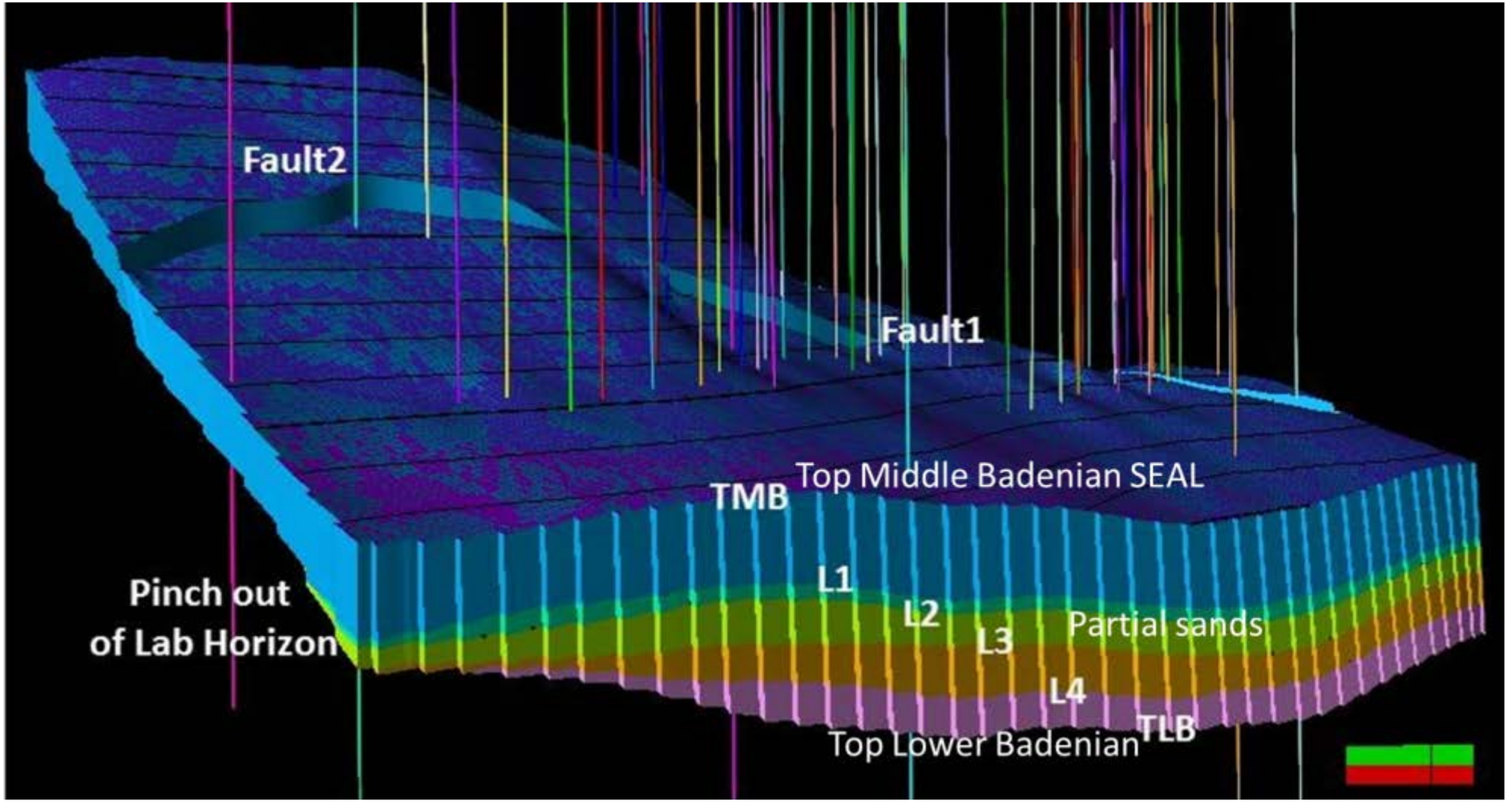




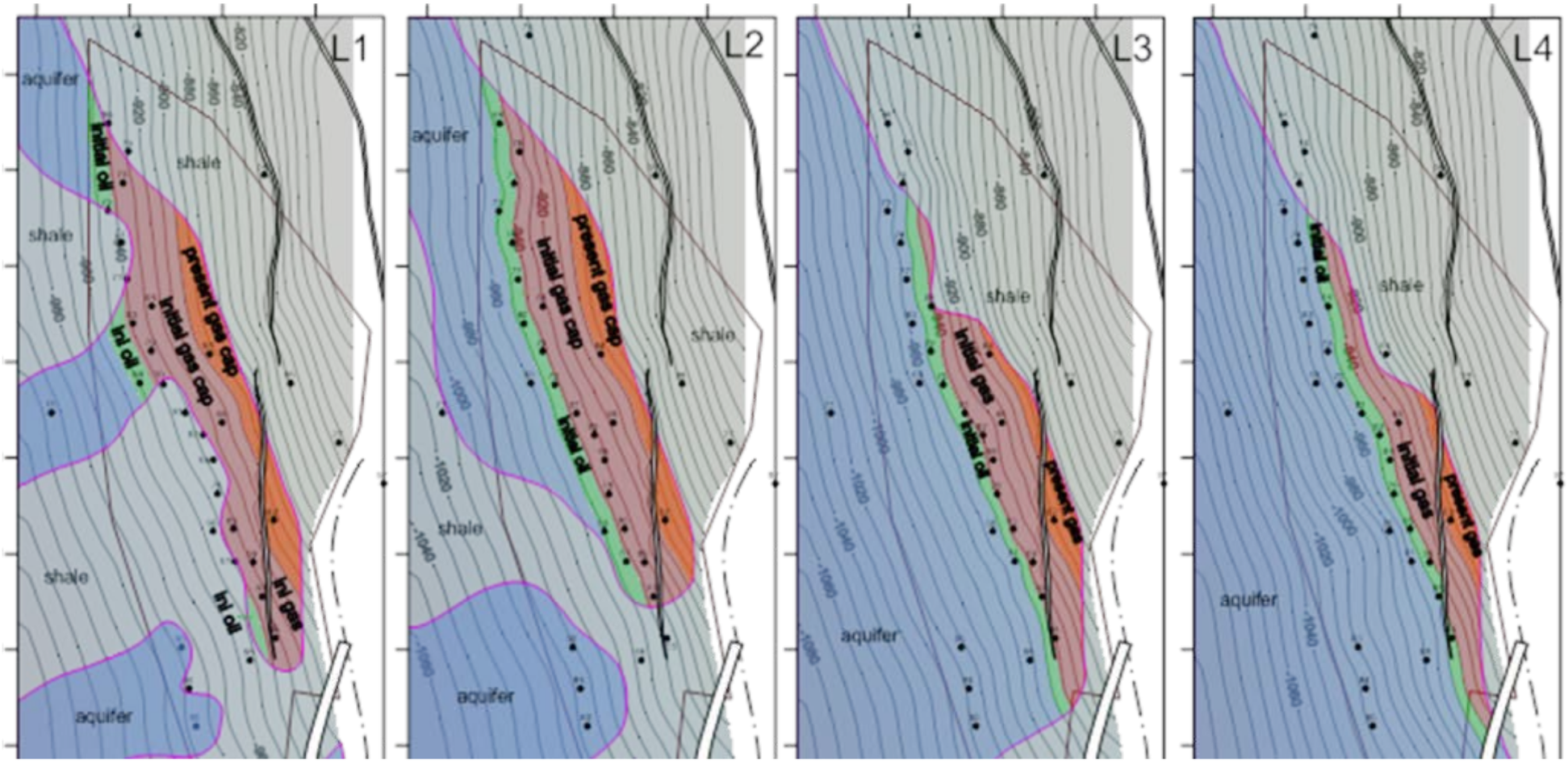
New sequence stratigraphy



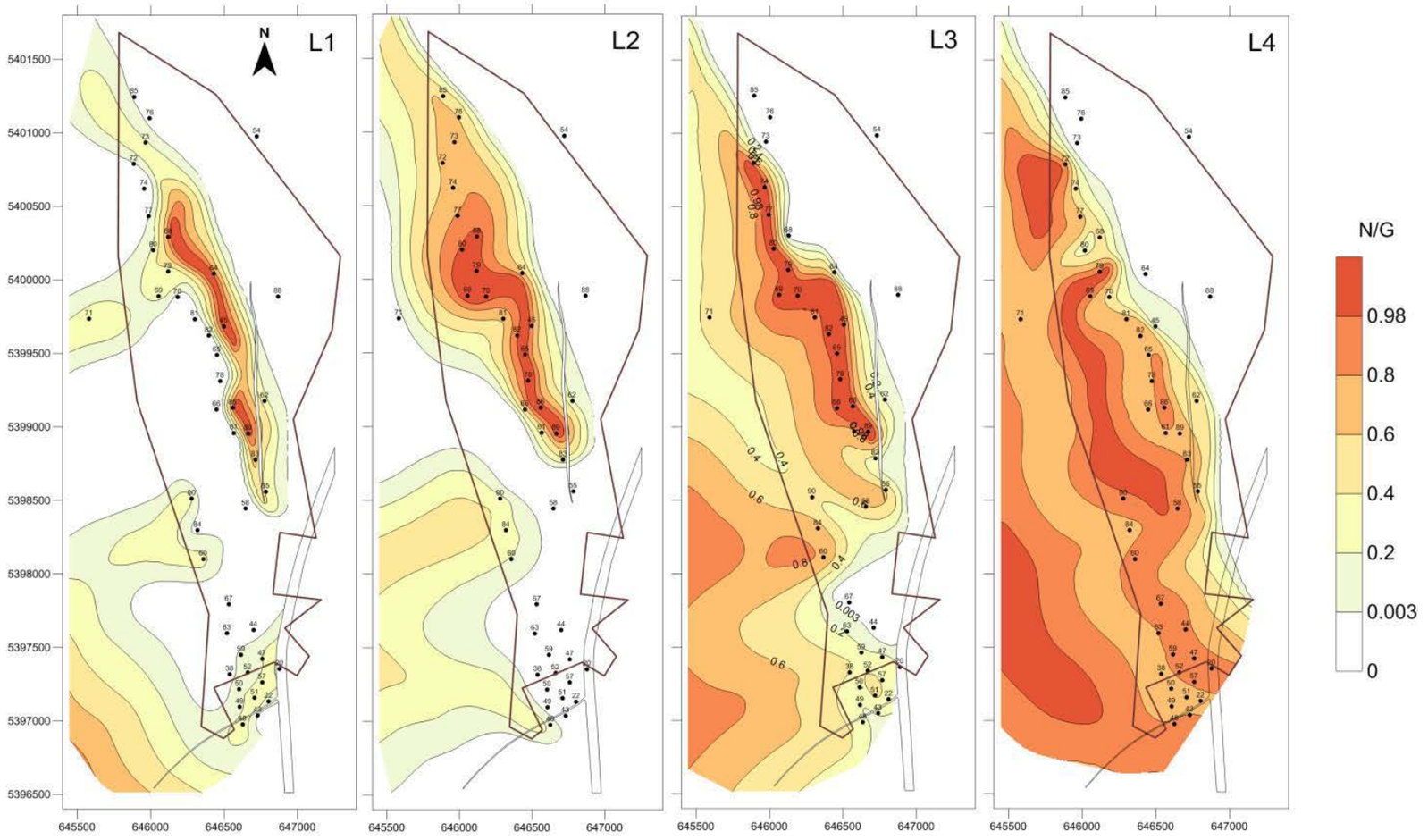
3D static geological model



Structural contour maps - top of the 4 partial sand horizons of the Lab reservoir



Net-to-Gross maps of the 4 partial sand horizons of the Lab reservoir



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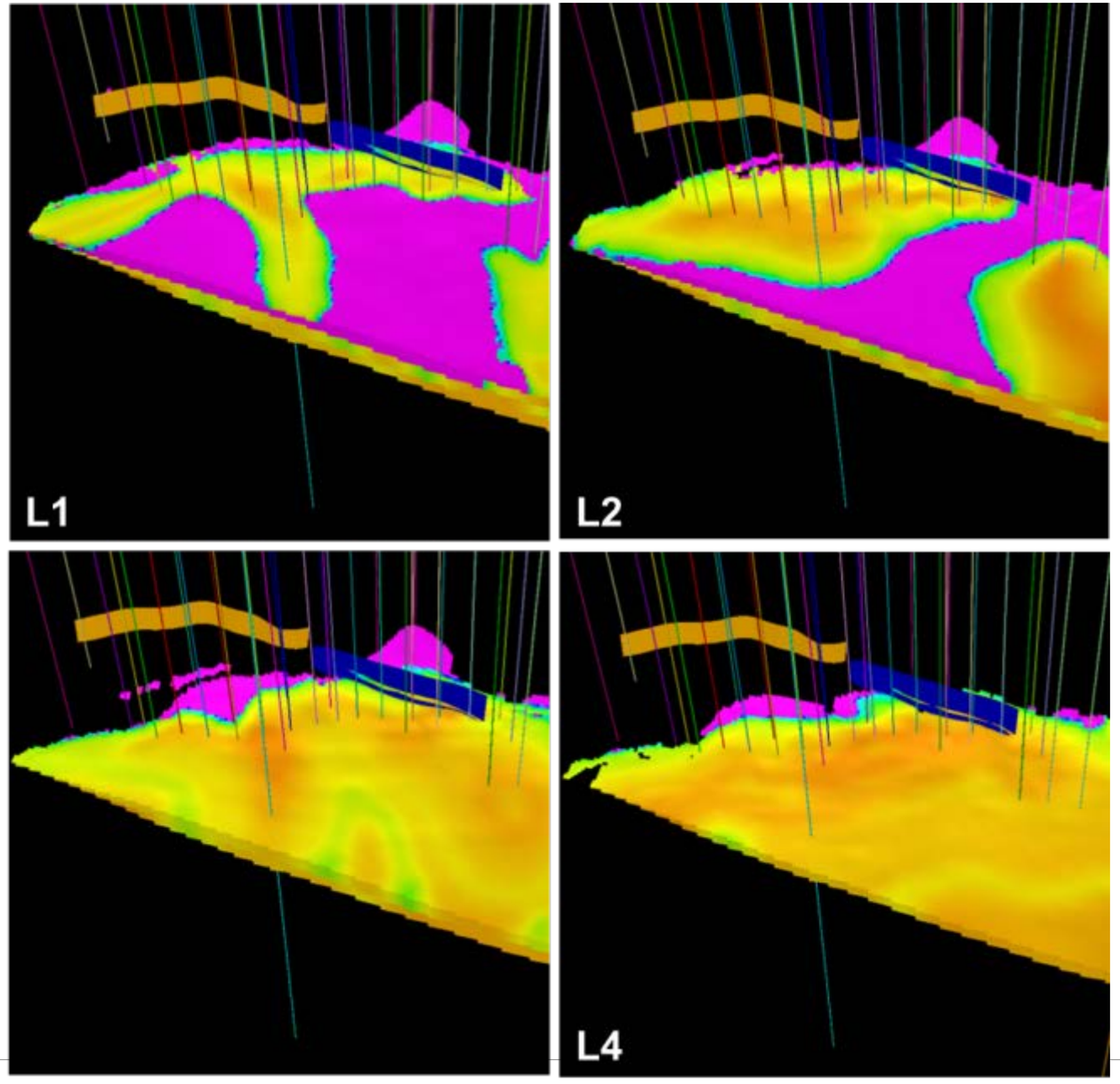
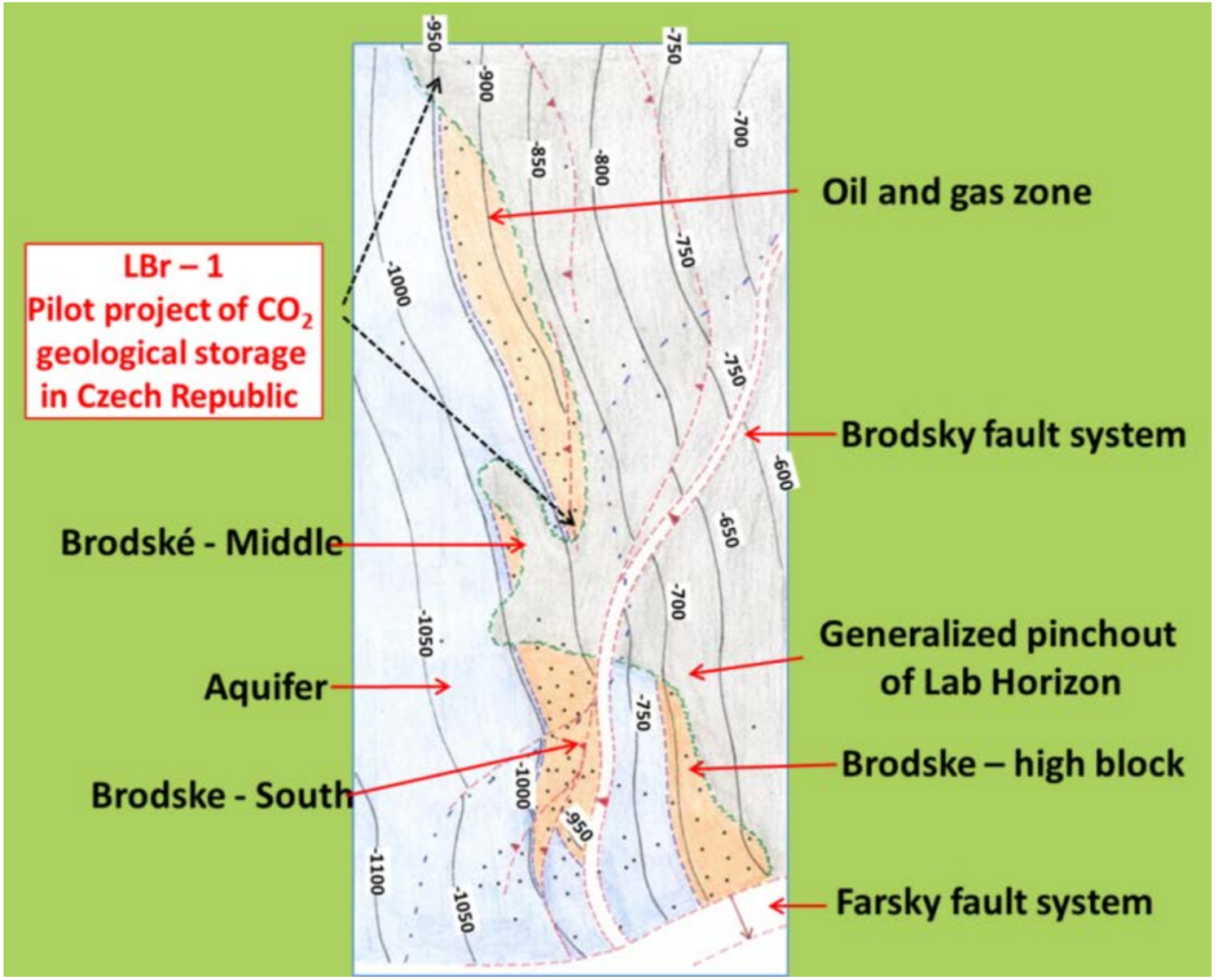
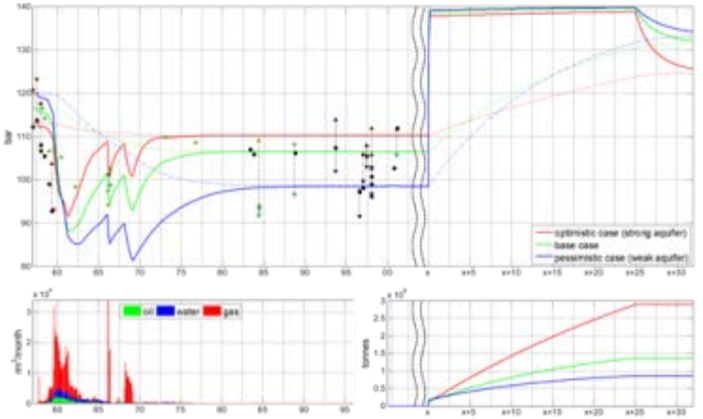
3D model – permeability distribution in the 4 partial sand horizons of the Láb reservoir



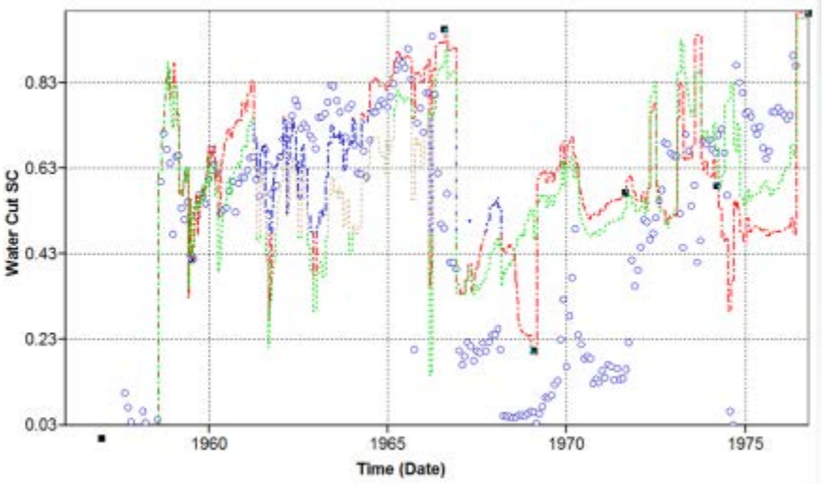
LBr-1 position in relationship to neighbouring structures



Dynamic modelling

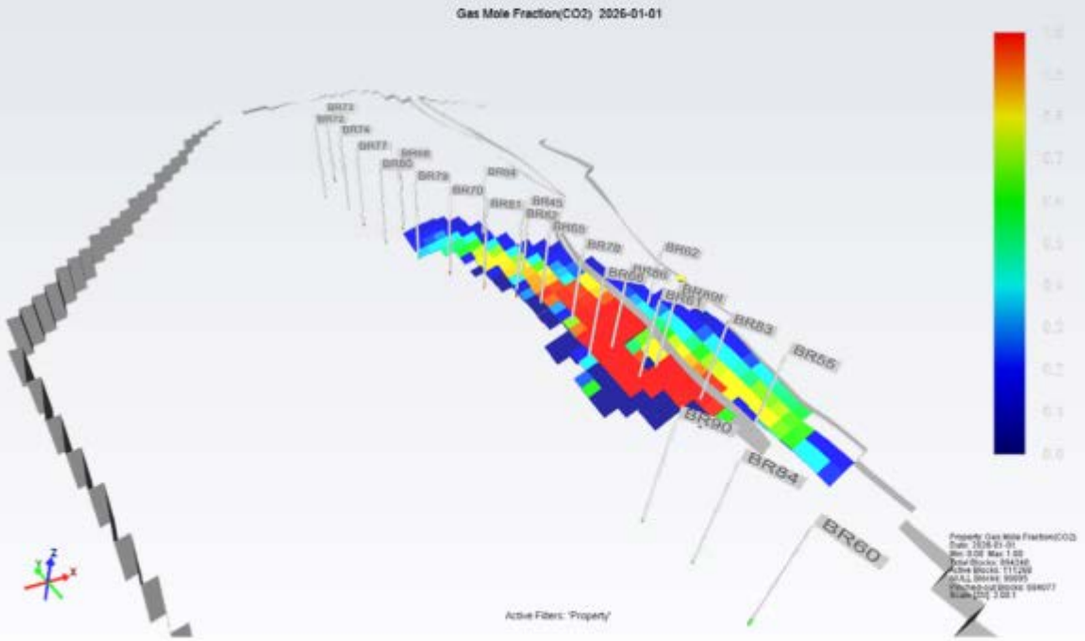


- Material balance study
- Preparation of simulation model – upscaling and adjustment of the 3D static reservoir model; stochastic approach used for distribution of reservoir properties
- History matching
- Numerical modelling of CO2 injection scenarios:
  - Pilot storage case (70,000 tons of CO2)
  - Full storage case (up to 950,000 t CO2)
  - EOR case (additional oil recovery 26,000 t, 63 kt CO2)
  - Combined case – CO2 storage pilot followed by CO2-EOR and storage



Pilot storage case

- 2020-2026, 70 000 tons: 17 600 sm^3/day
- No injection issues expected, pressure increase is small and local



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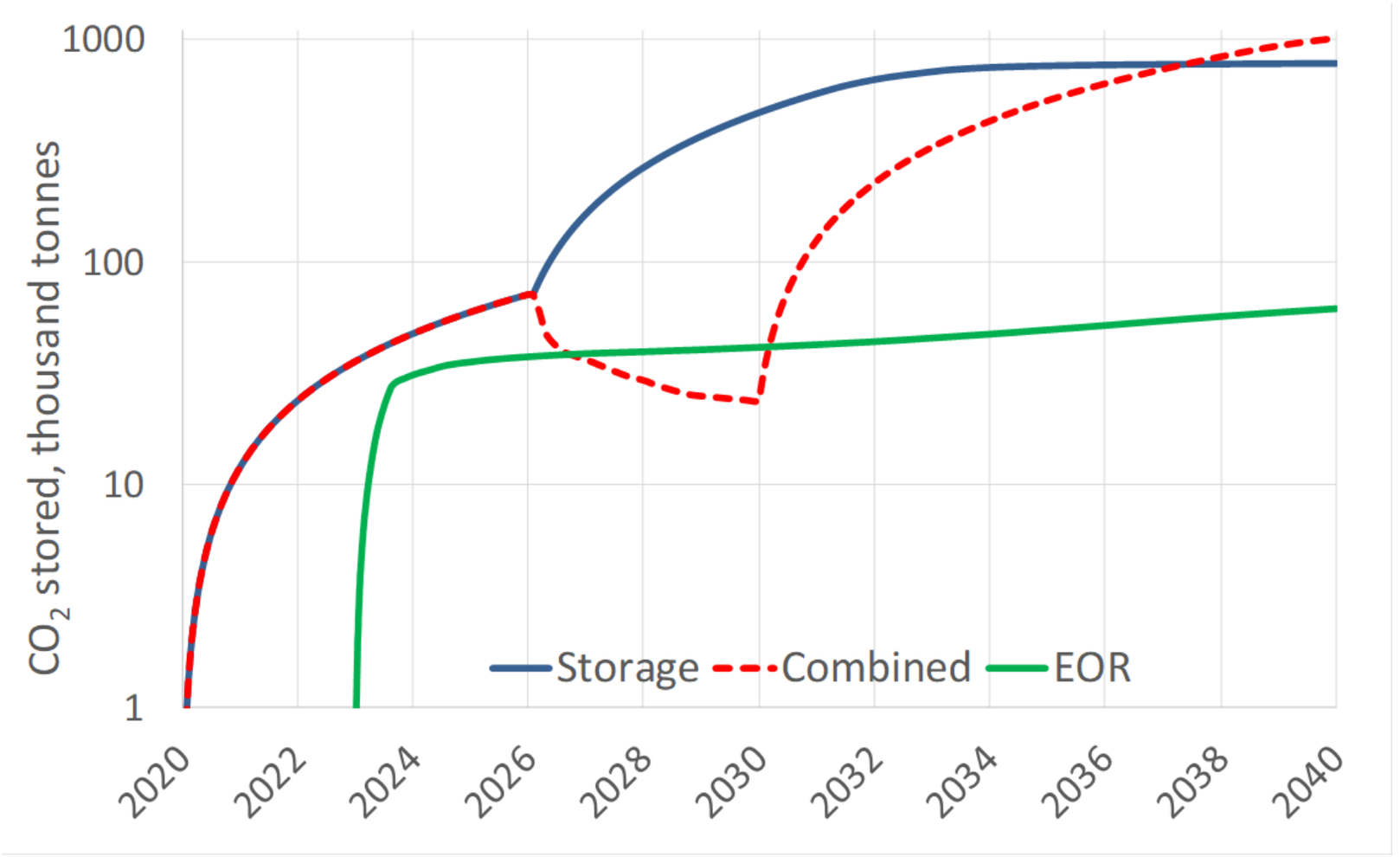
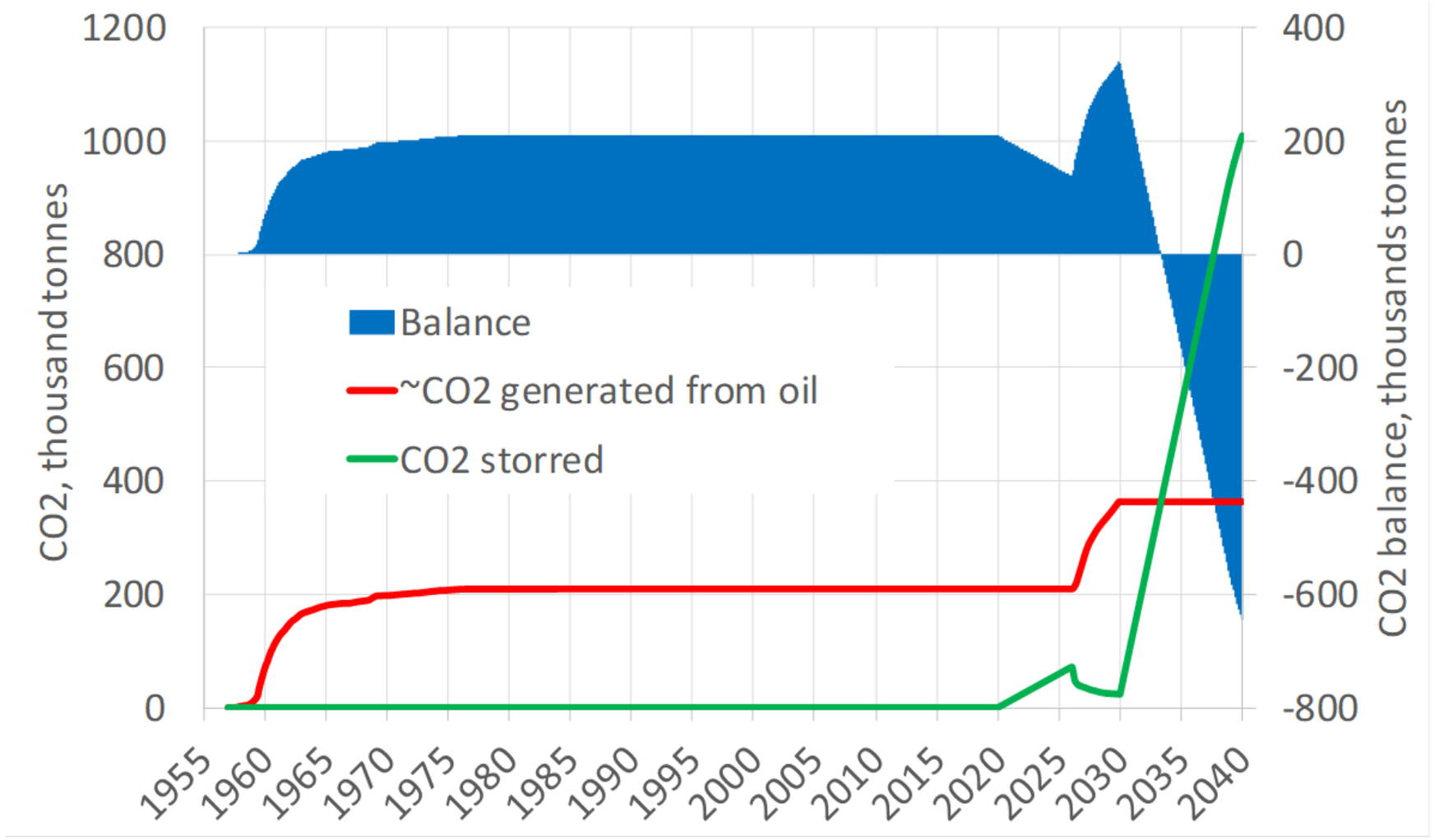
Comparison of scenarios – volumes of stored CO2



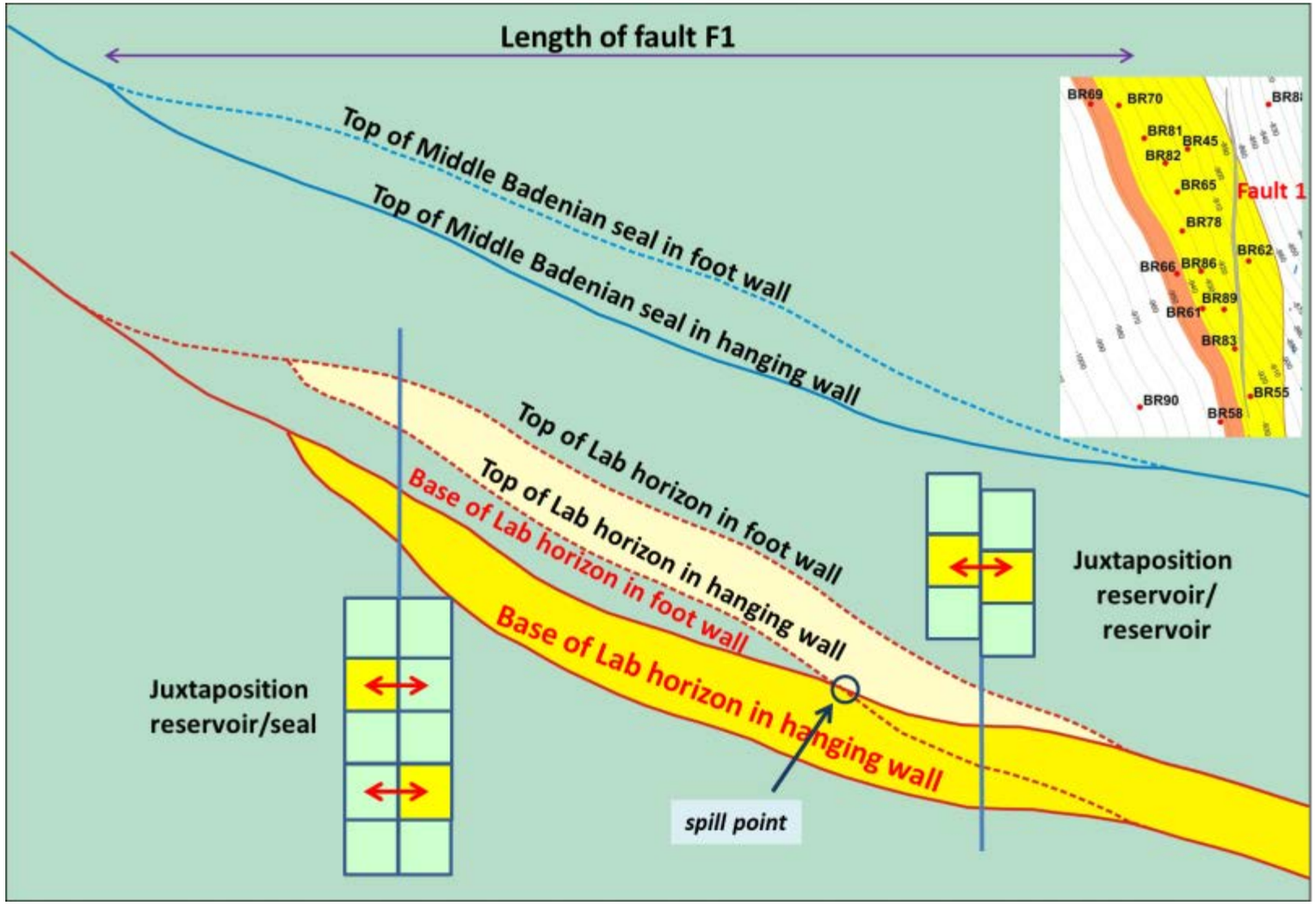
CO2 balance – combined case



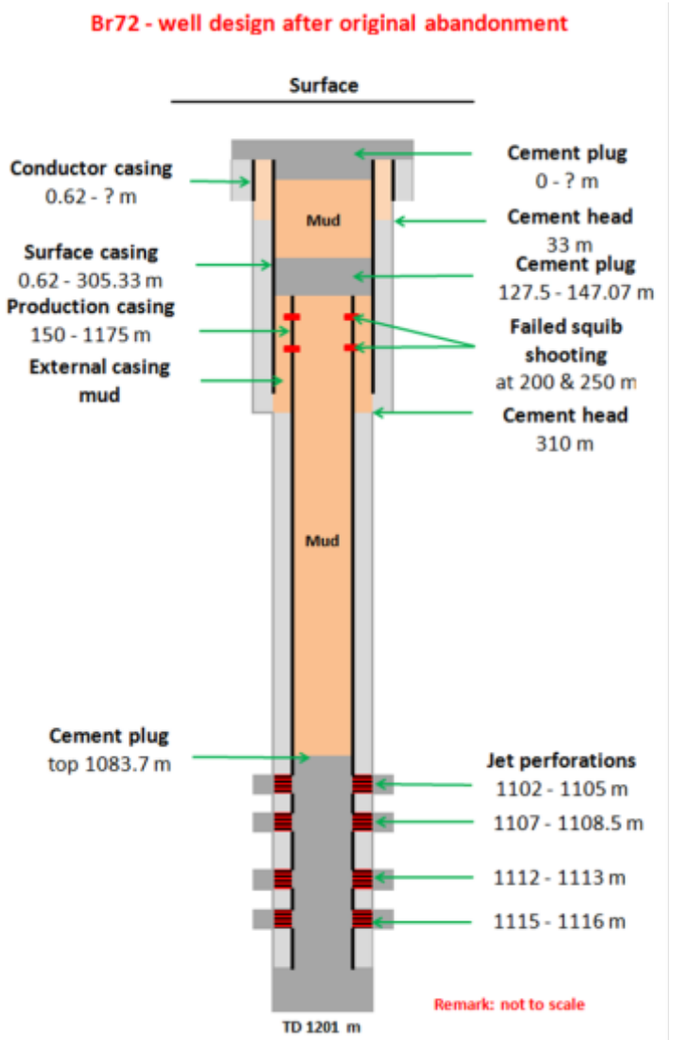
LBr-1 related work in ENOS project

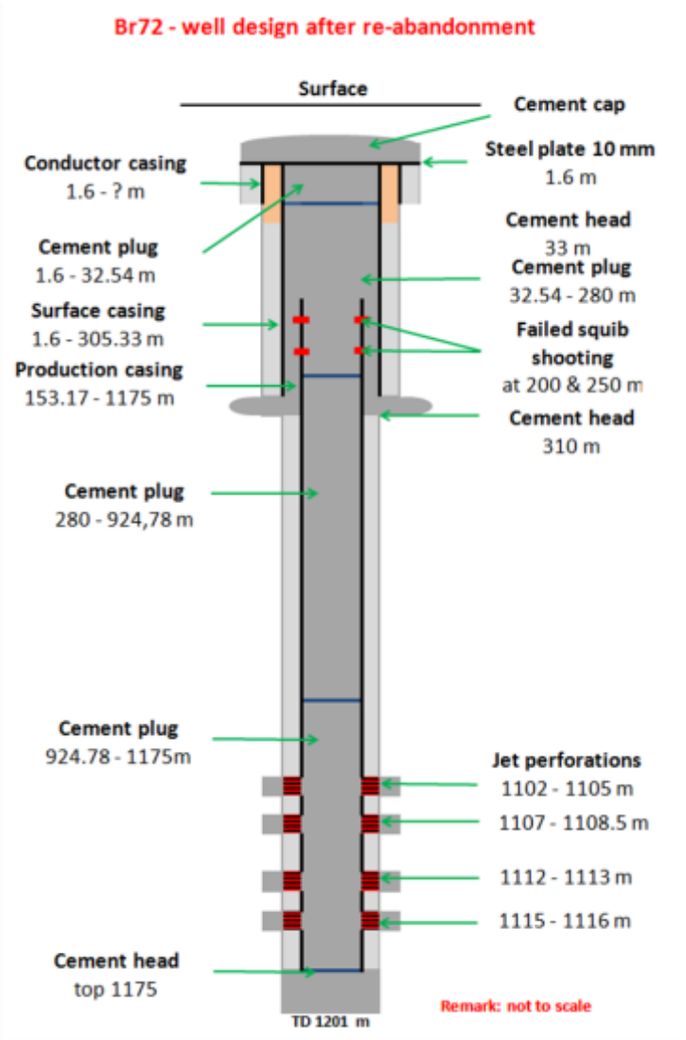
- detailed risk analysis of faults and legacy boreholes
- simulations of possible leakage (threatening potable groundwater)
- scenarios combining storage with EOR
- trans-boundary issues (CZ-SK)
- EOR potential of the Vienna Basin (CZ-SK-AT)

Fault anaylsis – Allan diagrams

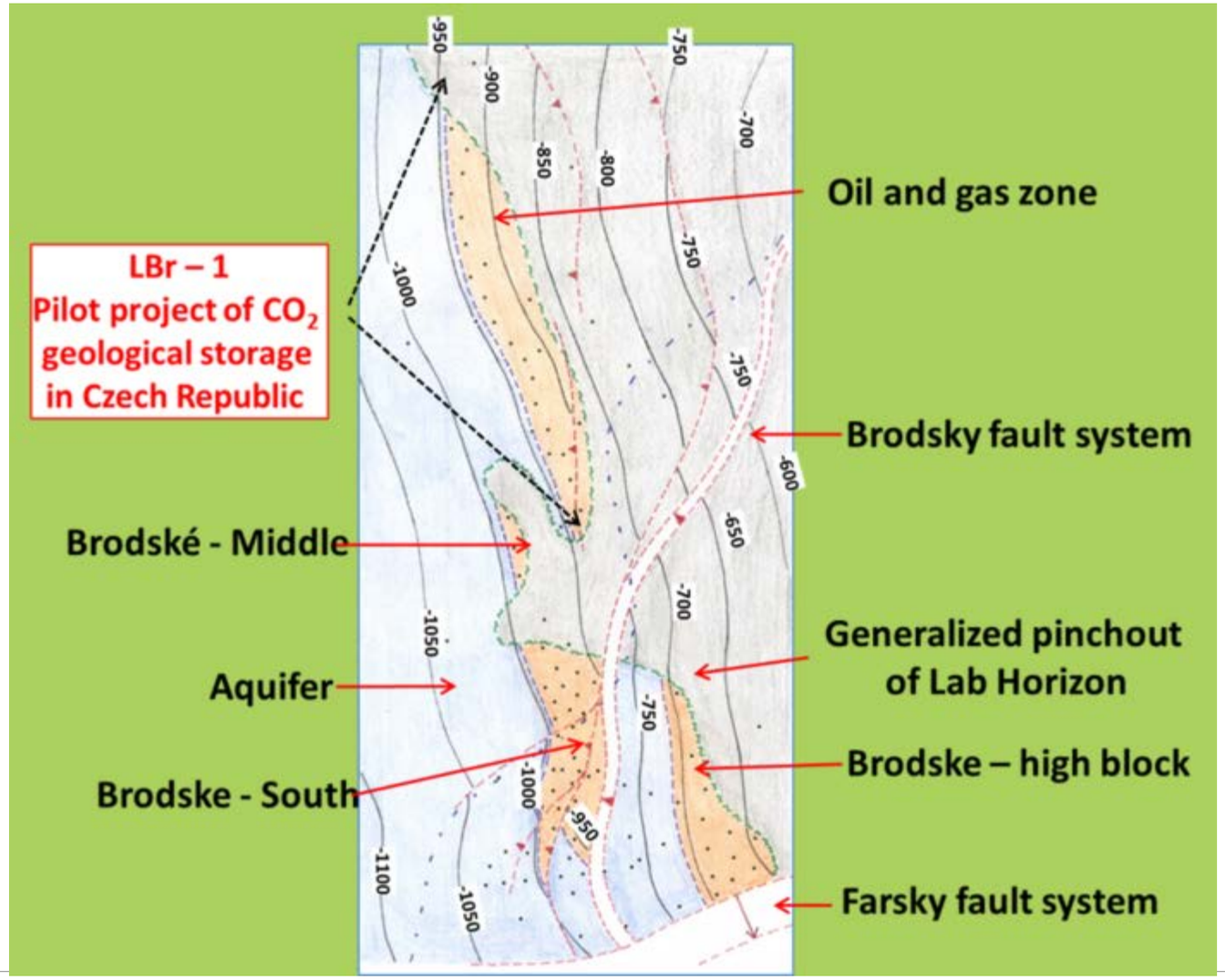


Assessment of well abandonment quality





Trans-boundary issues



Vienna Basin HC fields – possible regional CO2-EOR case

Czech Rebuplic
Bc – Břeclav
Ho – Hodonín
Hr – Hrušky
Jo - Josefov
Ko – Kostice
La – Lanžhot
Ld – Ladná
Le – Lednice
Lu – Lužice
LBr – 1 Lanžhot-Brodské
Mu – Mutěnice
MZ – Moravský Žižkov
Pd – Poddvorov
Pk – Podívín
Po – Poštorná
Pr – Prušánky
Rk – Ratíškovice
Va – Vacenovice
VB – Velké Bílovice
Vr – Vracov
T – Týnec

Main fault systems:
1 – Schrattenberg
2 – Steinberg
3 – Lanzhot-Hrusky
4 – Hodonin-Gbely
5 – Farsky
6 – Brodsky

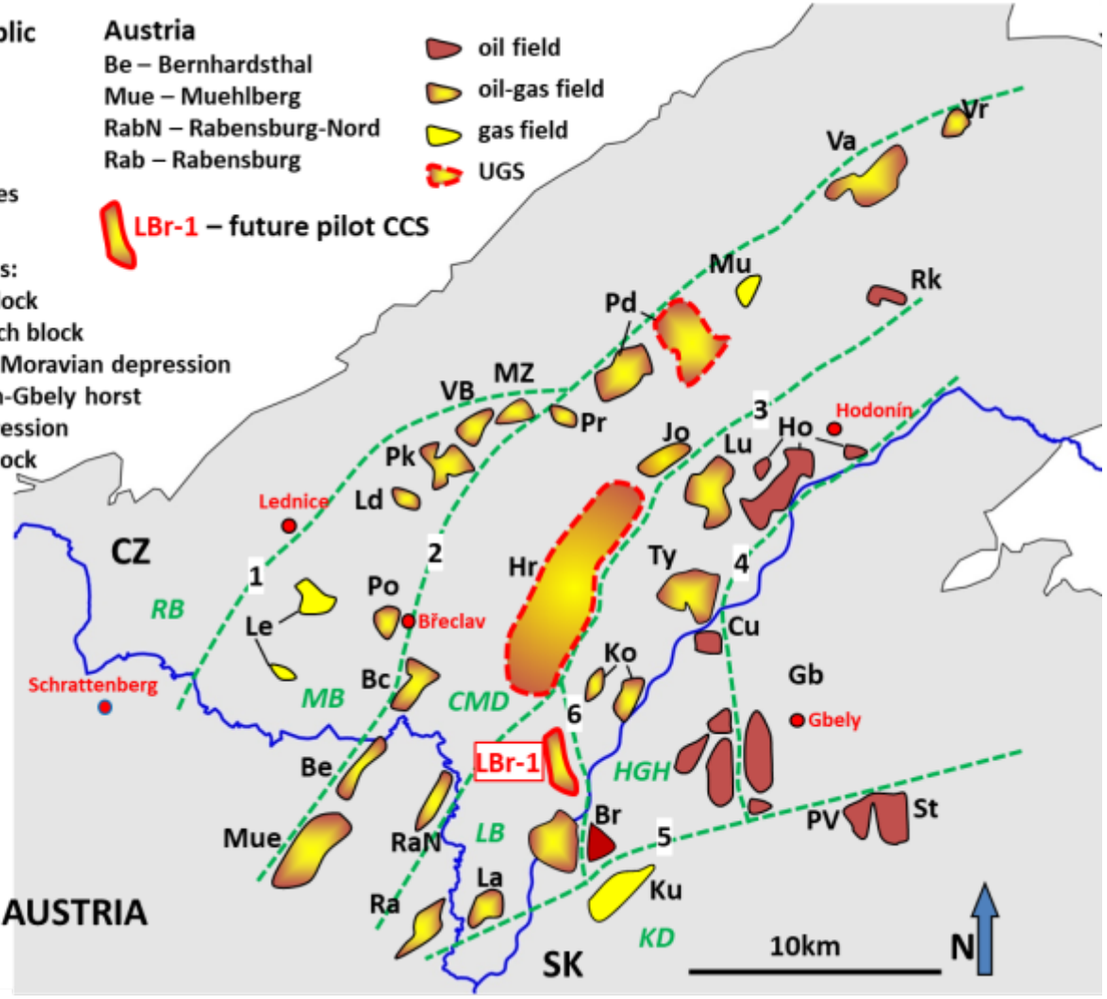
Slovak Republic
Br – Brodské
Cu – Cunín
Gb – Gbely
Ku – Kúty
PV – Petrova Ves
St – Štefanov

Main structures:
RB – Rakvice block
MB – Mistelbach block
CMD – Central Moravian depression
HGH – Hodonin-Gbely horst
KD – Kuty depression
LB – Lanzhot block

Austria
Be – Bernhardsthal
Mue – Muehlberg
RabN – Rabensburg-Nord
Rab – Rabensburg

LBr-1 – future pilot CCS

oil field
oil-gas field
gas field
UGS



Lessons learned so far

LBr-1 is a promising structure for a CO2 storage pilot, providing an opportunity for CO2-EOR at the same time, with regional upscaling potential

„Digging“ for information from old archive data is time consuming and requires specific „local“ knowledge but results can be excellent

Supplementary site investigation is necessary, especially to get fresh cores for geomechanical and geochemical experiments and allow in-situ borehole tests (stress field, permeability)

Local conditions need to be taken into account for choice of monitoring methods (high seismic noise level, periodical flooding, etc.)

CO2 source is an issue - a promising nearby CO2 source revealed (95.5 % purity) – 240 th. t/yr released into the atmosphere

Further steps towards project deployment will need stronger support by national government and industry

ENOS

Enabling Onshore CO_2 Storage

www.enos-project.eu

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