CO2 SPICER

CO_2 Storage Pilot In a CarbonatE Reservoir

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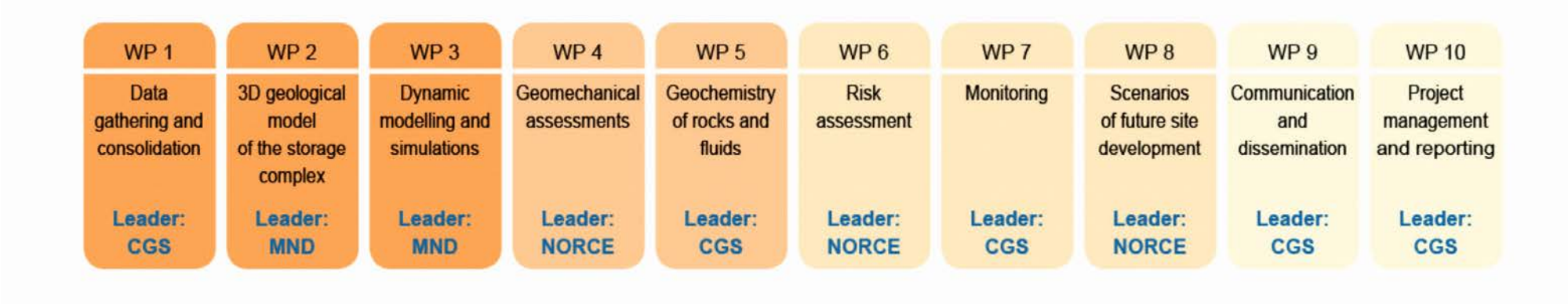
Žarošice Field - Slopes of Bohemian Massif - The Czech Republic

Project Consortium Members

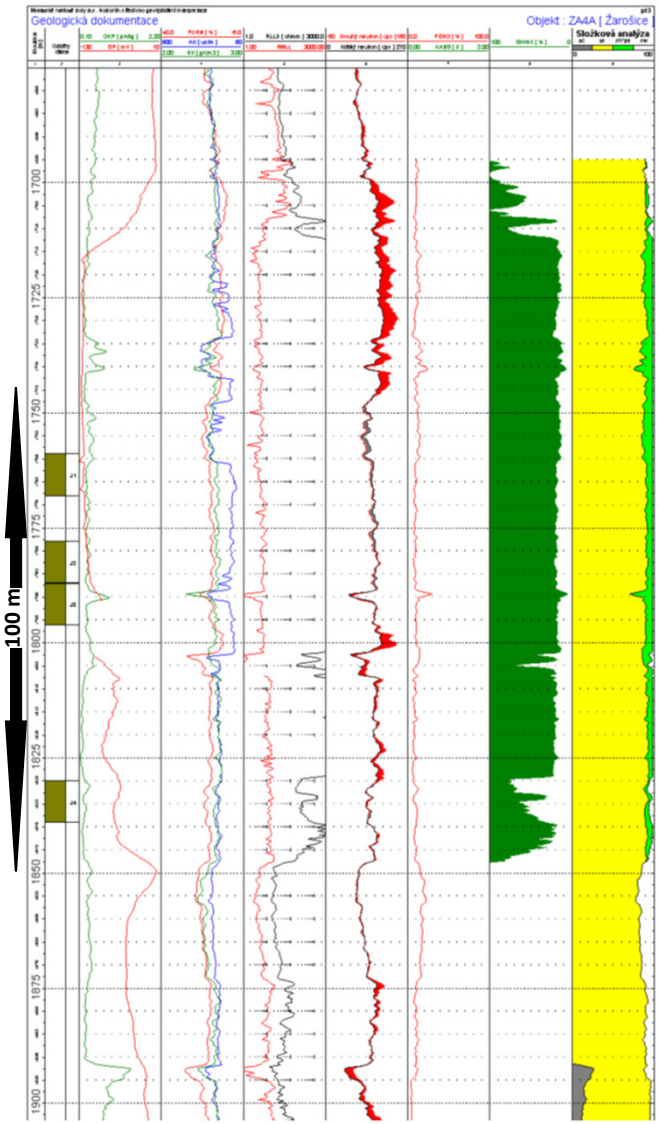
Role	Entity Name	Type	Abbreviation
Main applicant	Česká geologická služba / Czech Geological Survey	Research organisation (SPO)	CGS
Project partner 2	MND a.s.	Large enterprise (POO)	MND
Project partner 3	NORCE Norwegian Research Center AS	Research organisation (OCS)	NORCE
Project partner 4	Vysoká škola báňská – Technická univerzita Ostrava / VSB – Technical University of Ostrava	Research organisation (VVS)	VSB
Project partner 5	Geofyzikální ústav Akademie věd ČR, v.v.i. / Institute of Geophysics of the Czech Academy of Sciences	Research organisation (VVI)	GFU

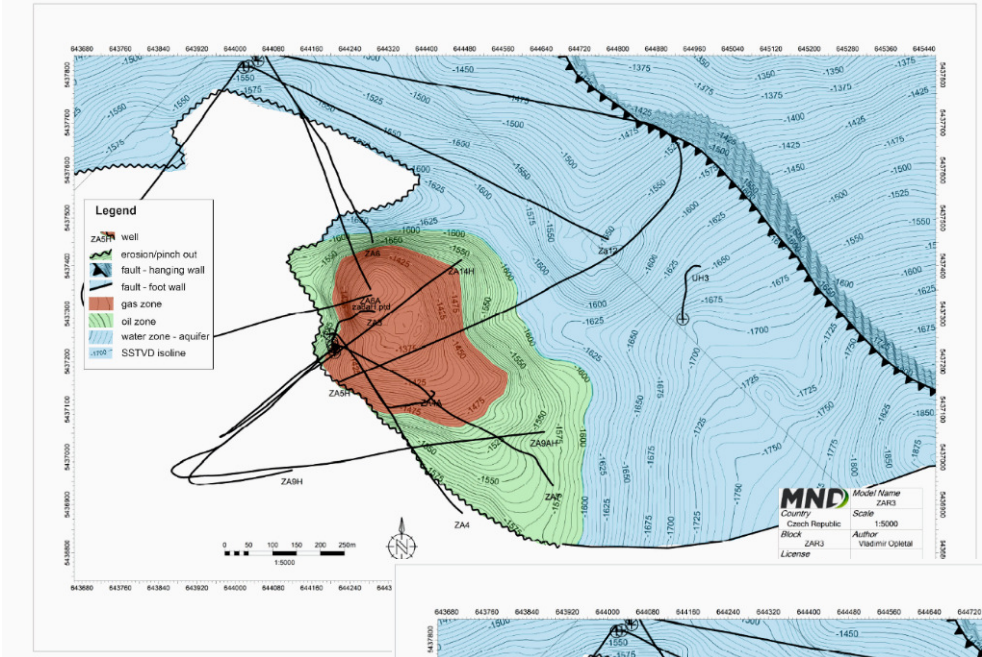
Project Objectives and Structure

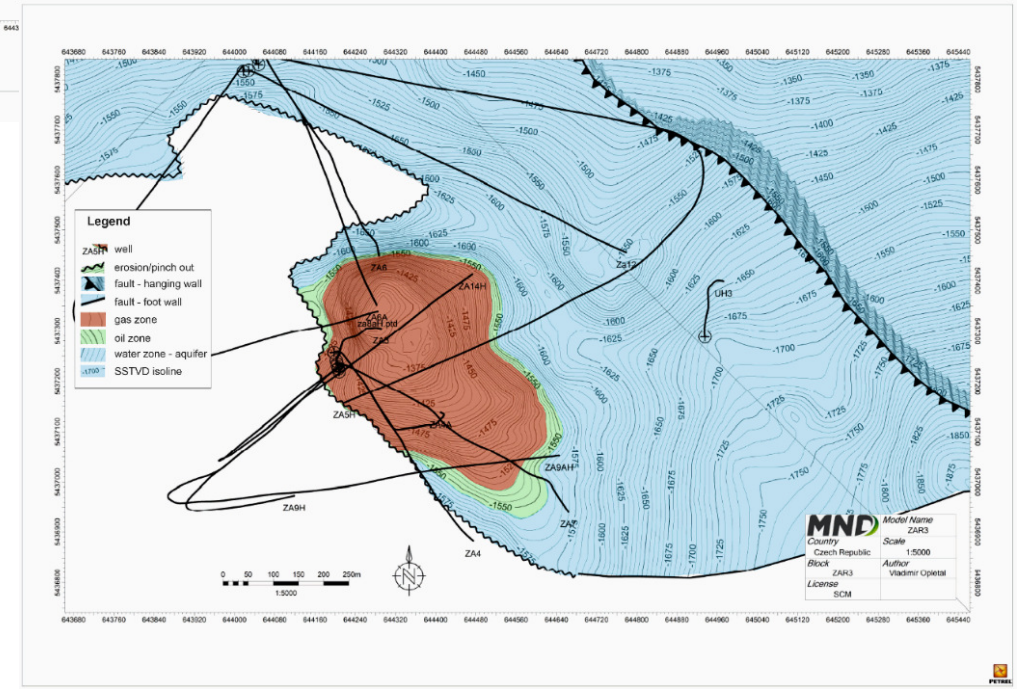
- **Main objective** is to prepare implementation of a **CO2 geological storage pilot project** at the mature **Zar-3** oil & gas field
- **Specific project goals**:
  - construction of a **3D geological model** of the storage complex
  - dynamic modelling and **simulations of CO2 injection** in the reservoir using various scenarios
  - evaluation of **geomechanical and geochemical properties** of the storage complex
  - assessment of the **risks related to CO2 storage** on the pilot site
  - preparation of a **site monitoring plan**
  - development of **scenarios for future site development**, including design of CO2 injection facilities
  - strengthening of **Czech-Norwegian cooperation** in the field of CCS



Zarosice Oil and Gas Field (Jurassic Play)



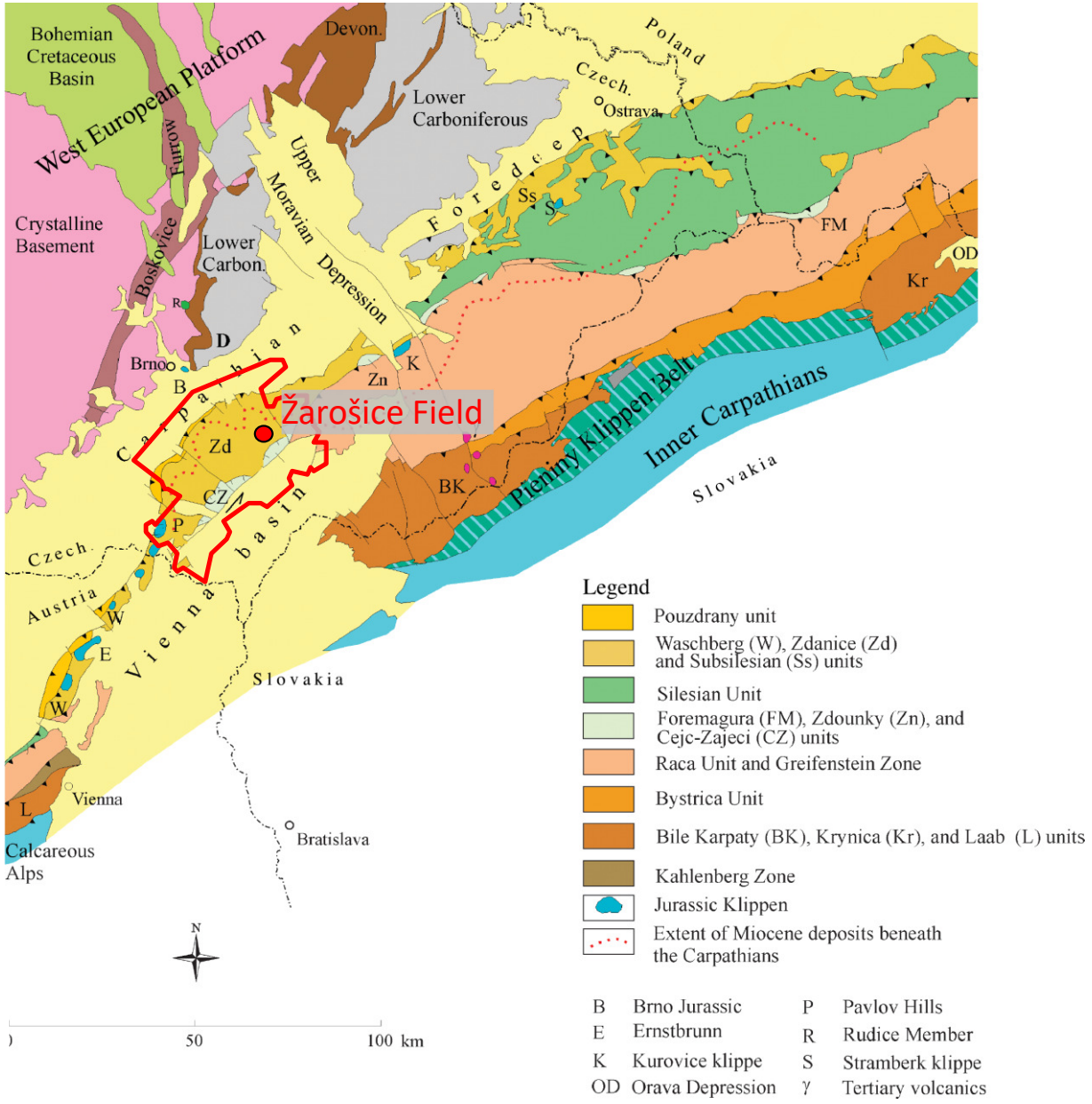




Total cumulative production from field

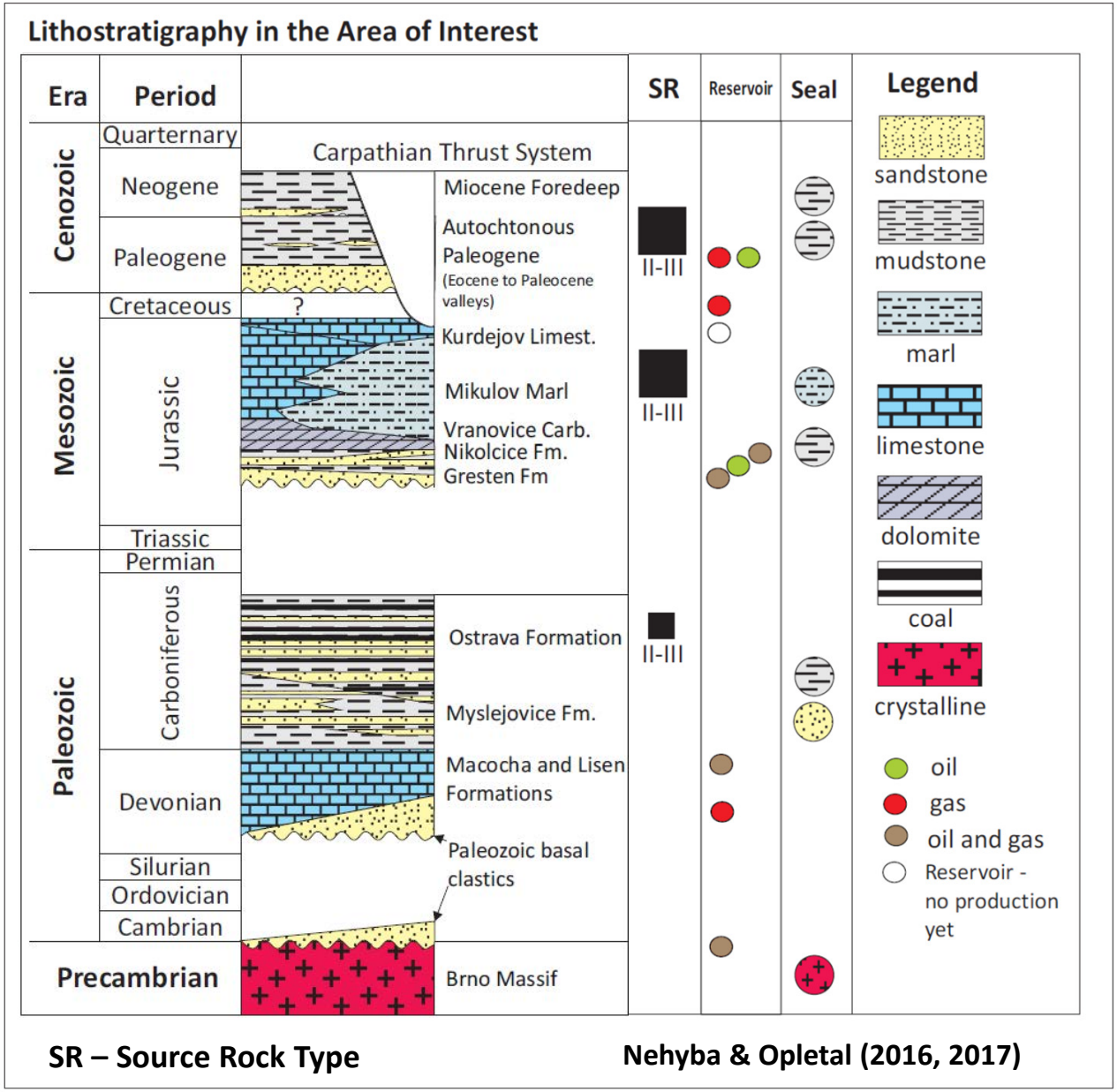
- **467 251 m³ oil**
- **49 343 900 m³ of gas**

Surface Geology – Slopes of Bohemian Massif



Modified after Picha et al. (2006)

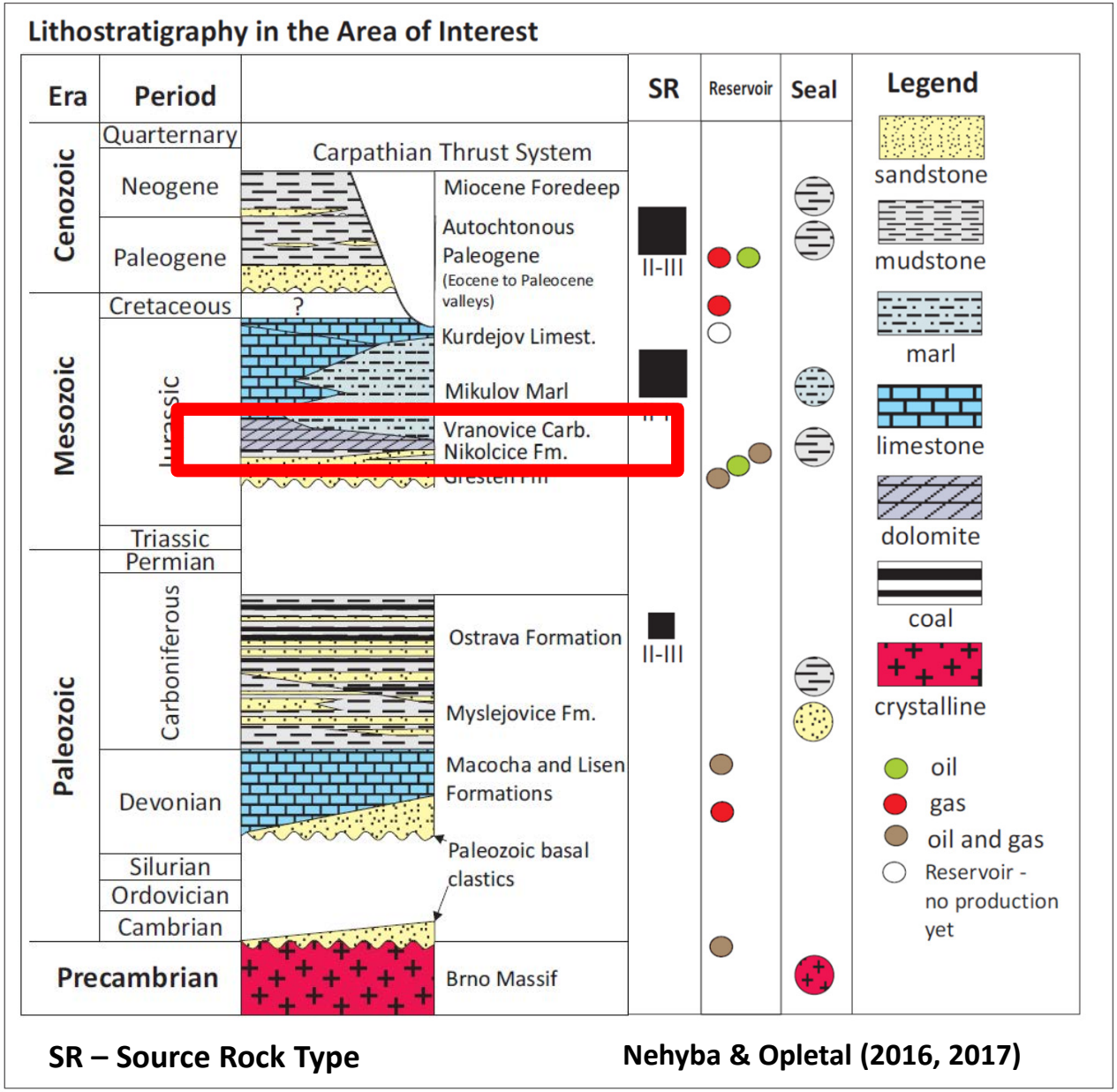
Litostratigraphy and Hydrocarbon Habitat



SR – Source Rock Type

Nehyba & Opletal (2016, 2017)

Litostratigraphy and Hydrocarbon Habitat



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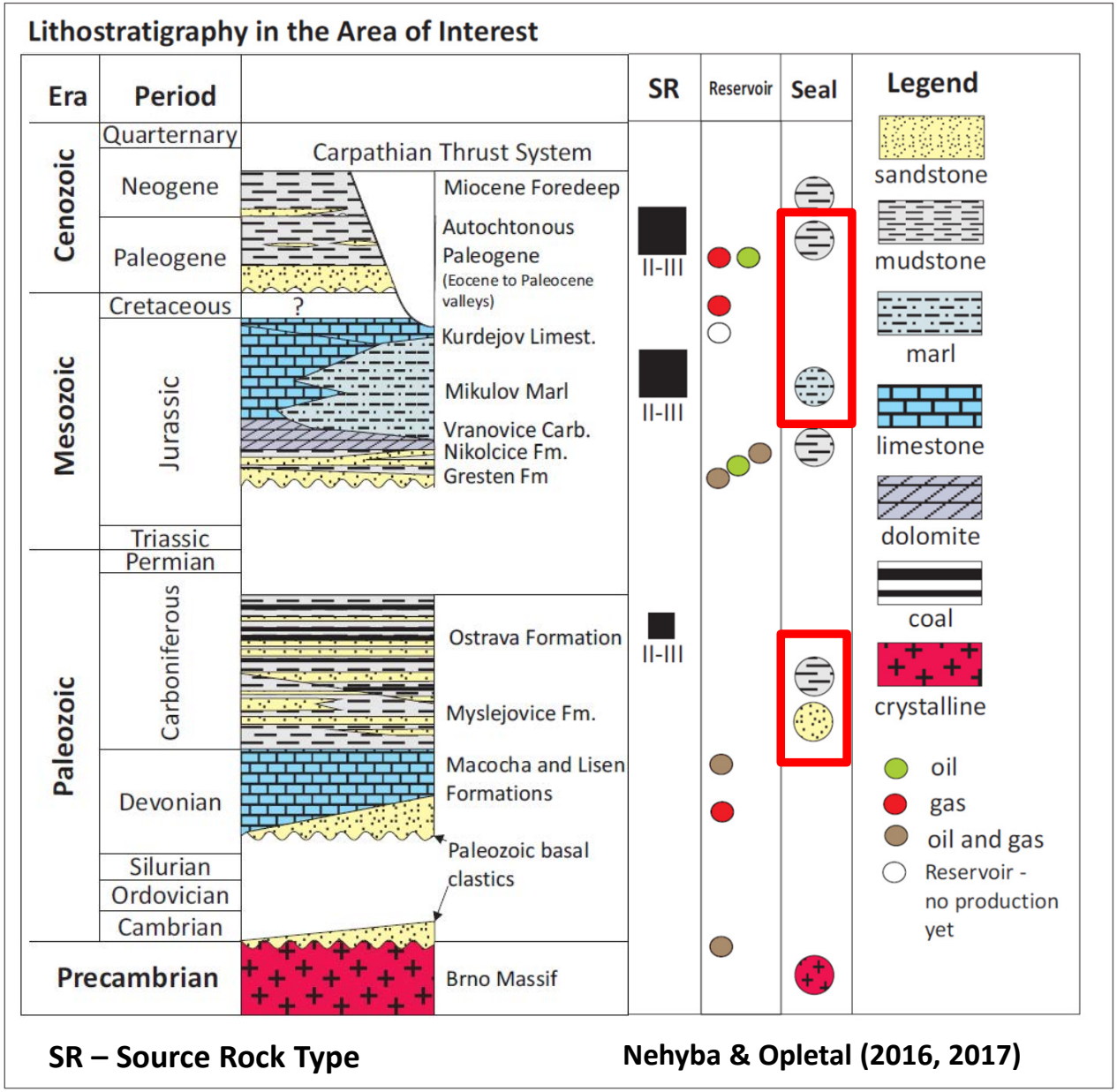

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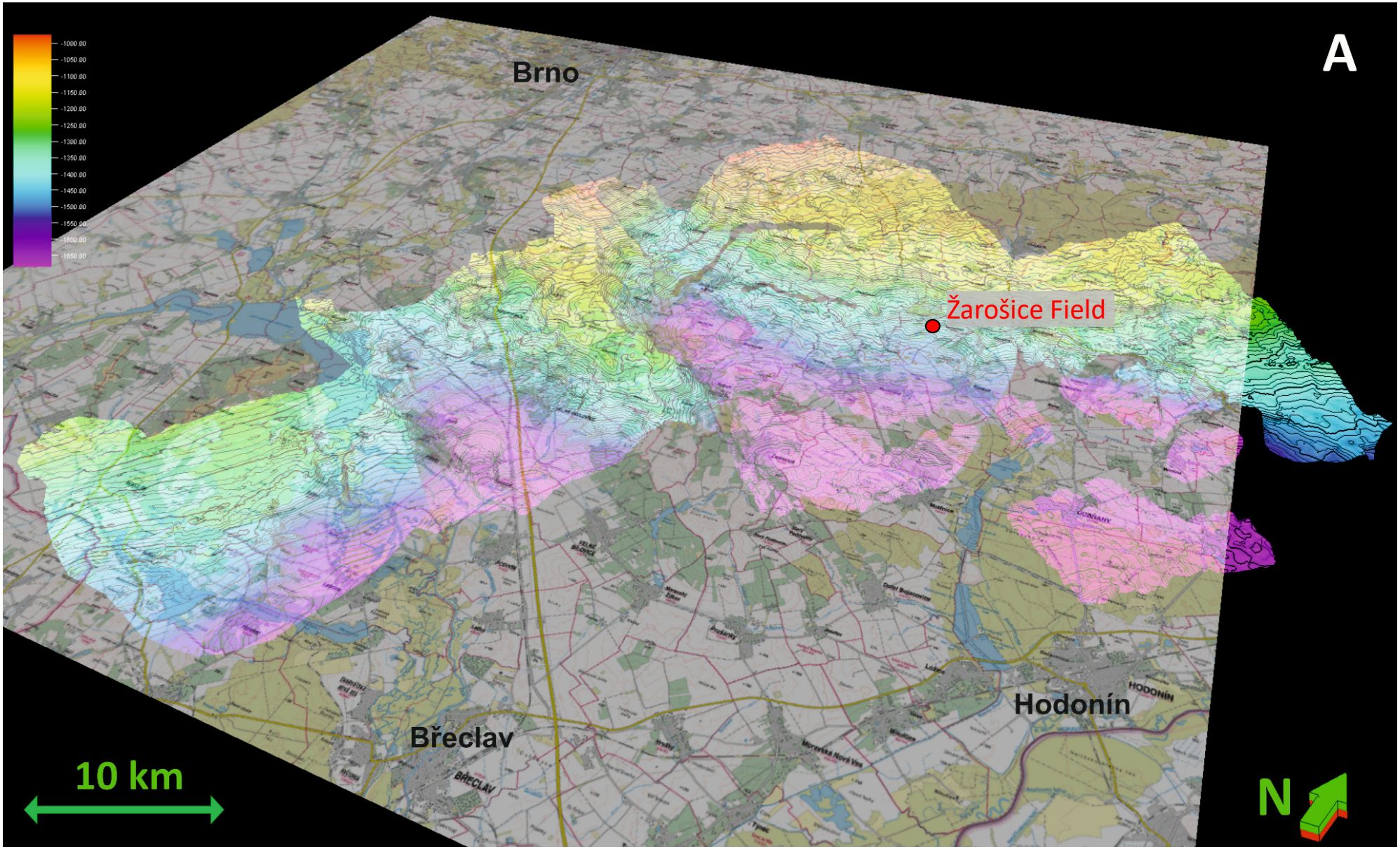
3D View – Top of Pretertiary Surface Interpretation



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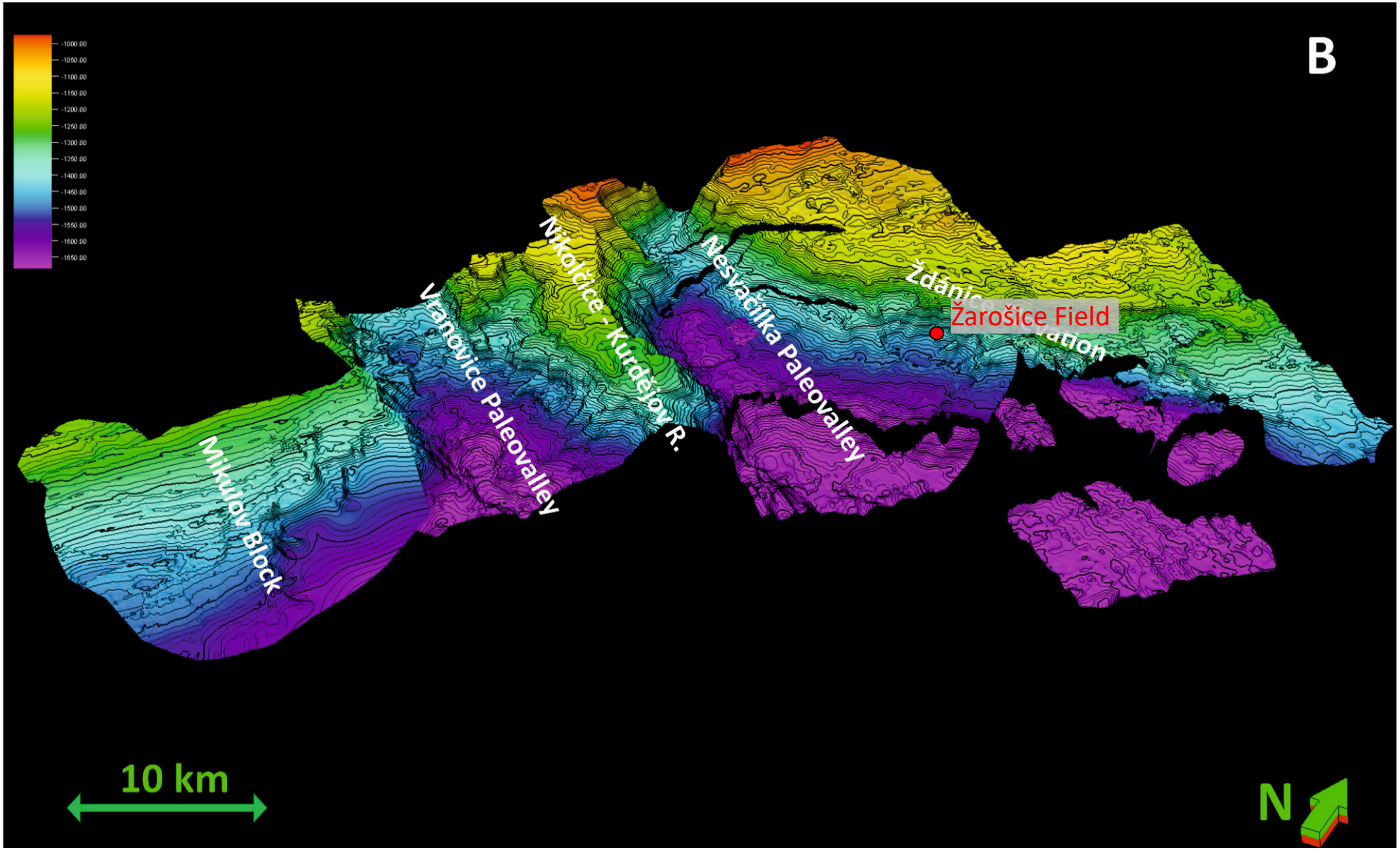
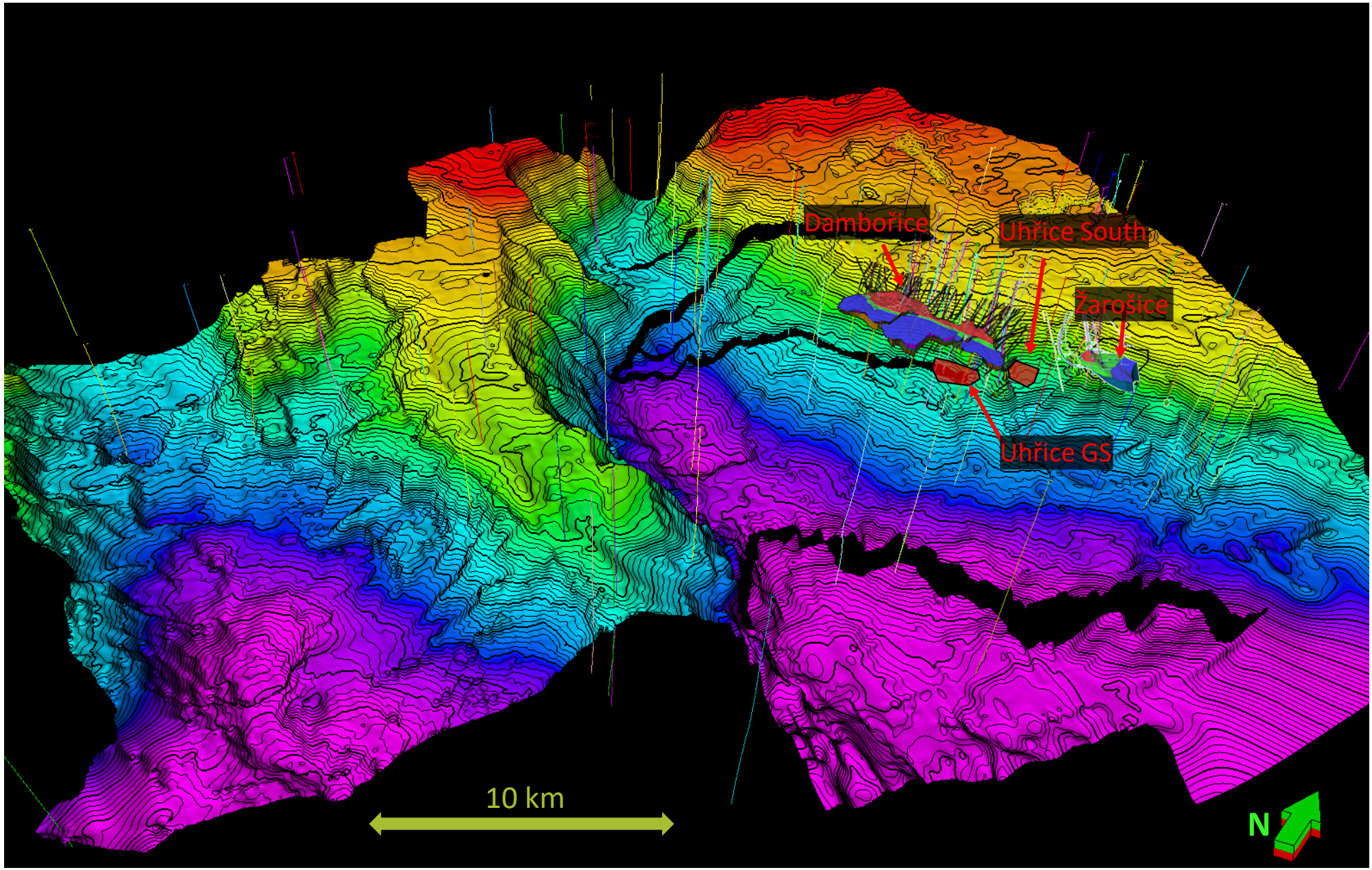
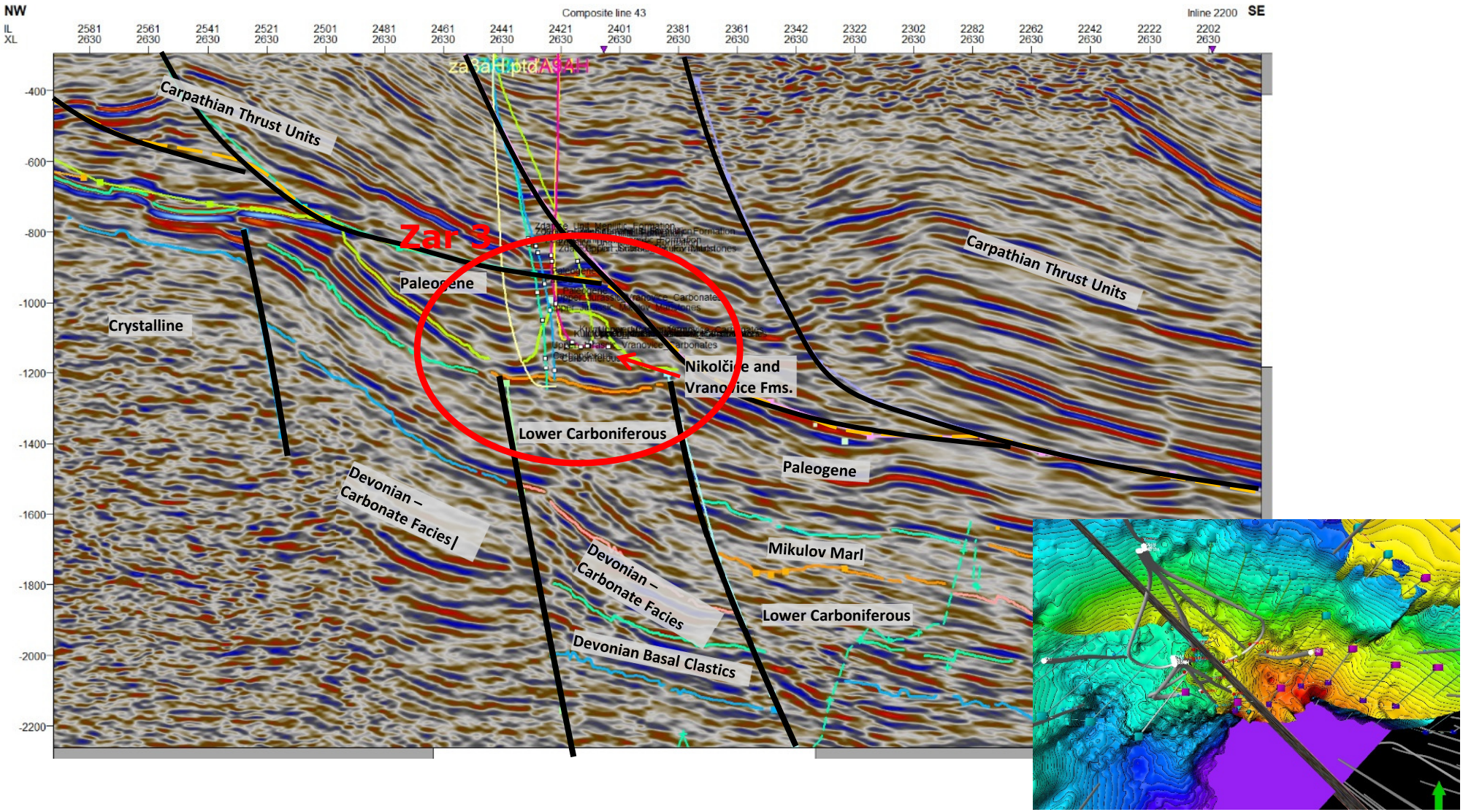


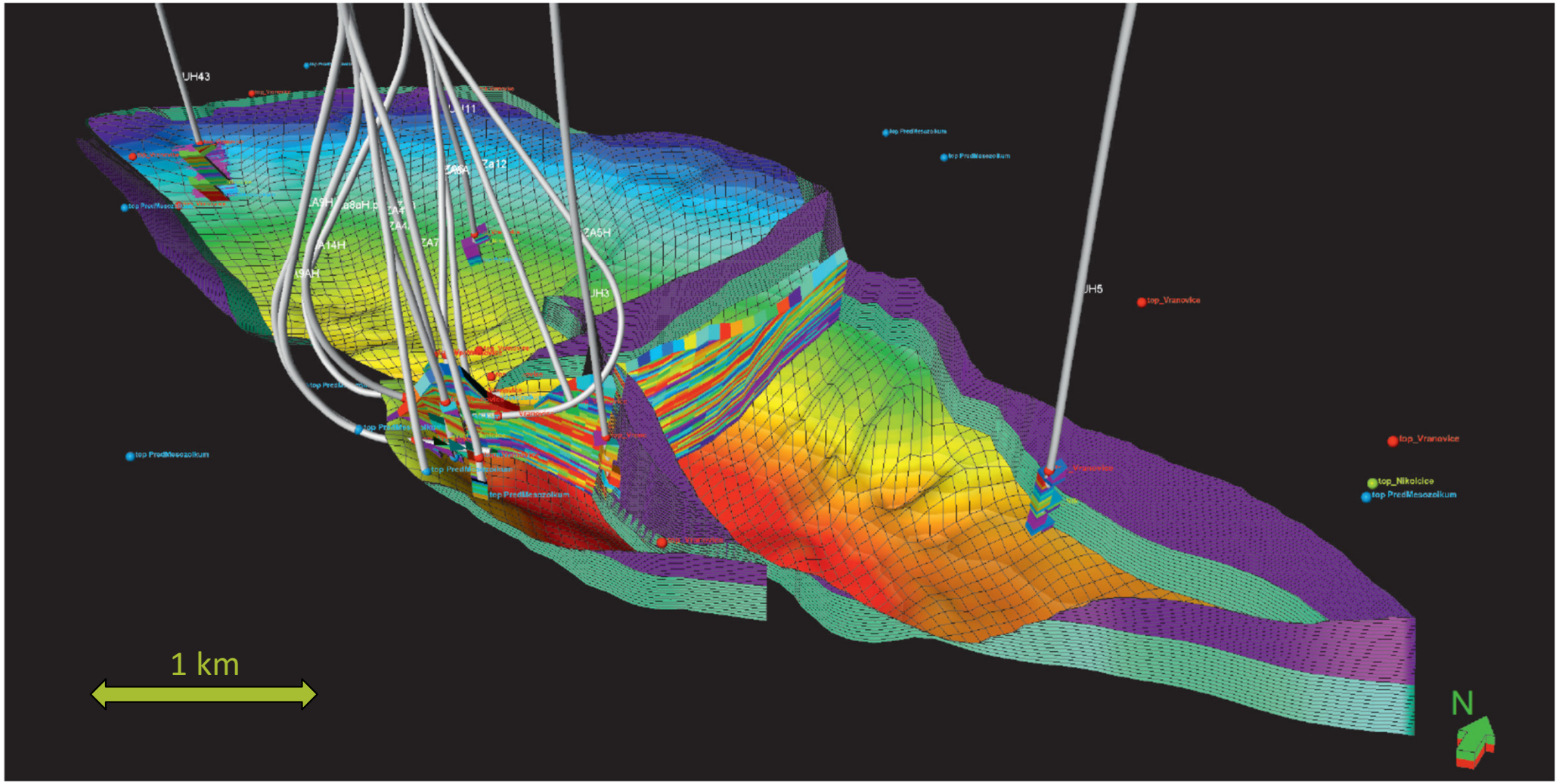
3D View on Paloevalleys – Fields in Jurassic Plays



3D Seismic Interpretation – Xline 2630



3D View – Full Model Grid – Reservoir Cross Section



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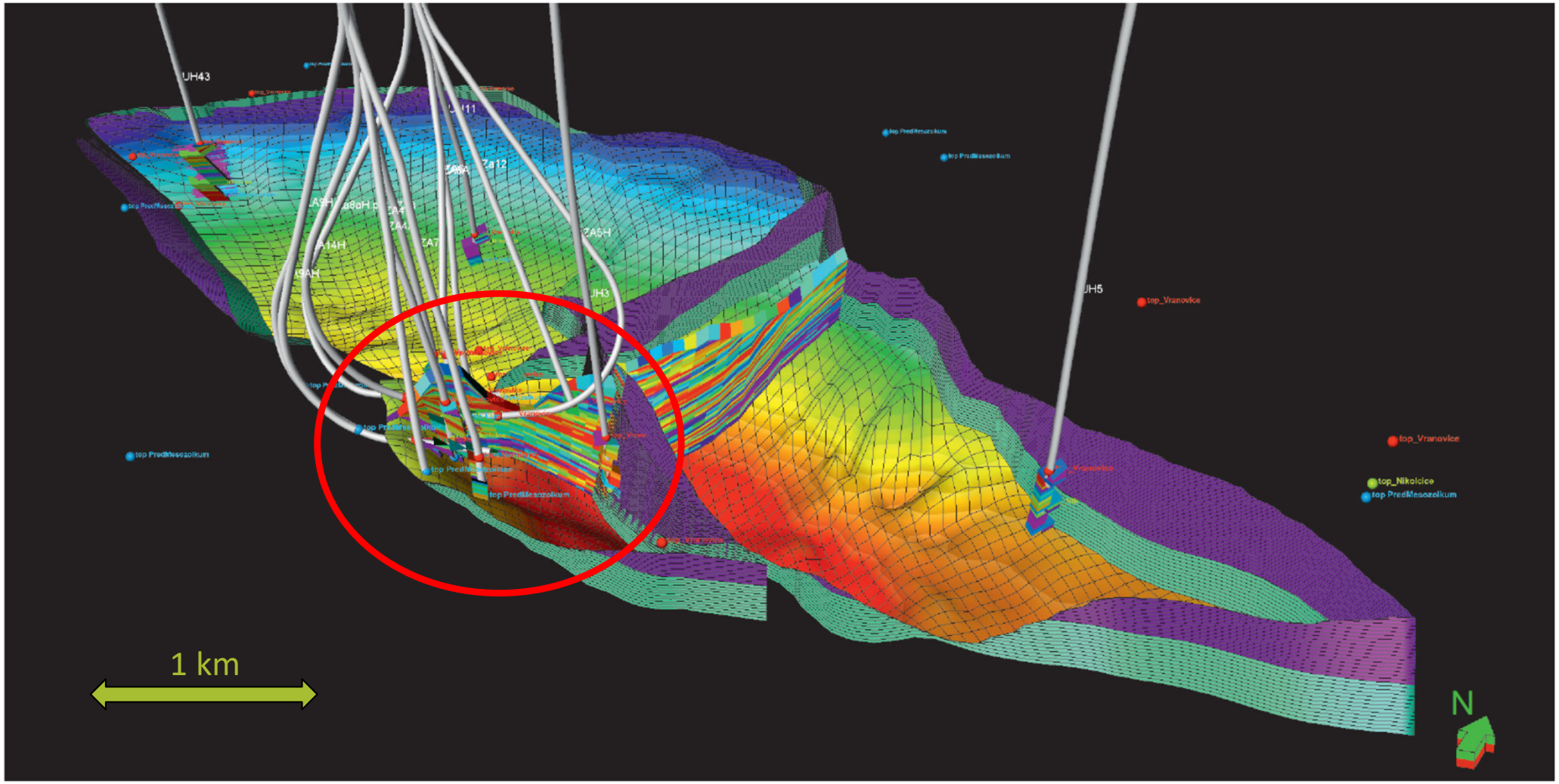
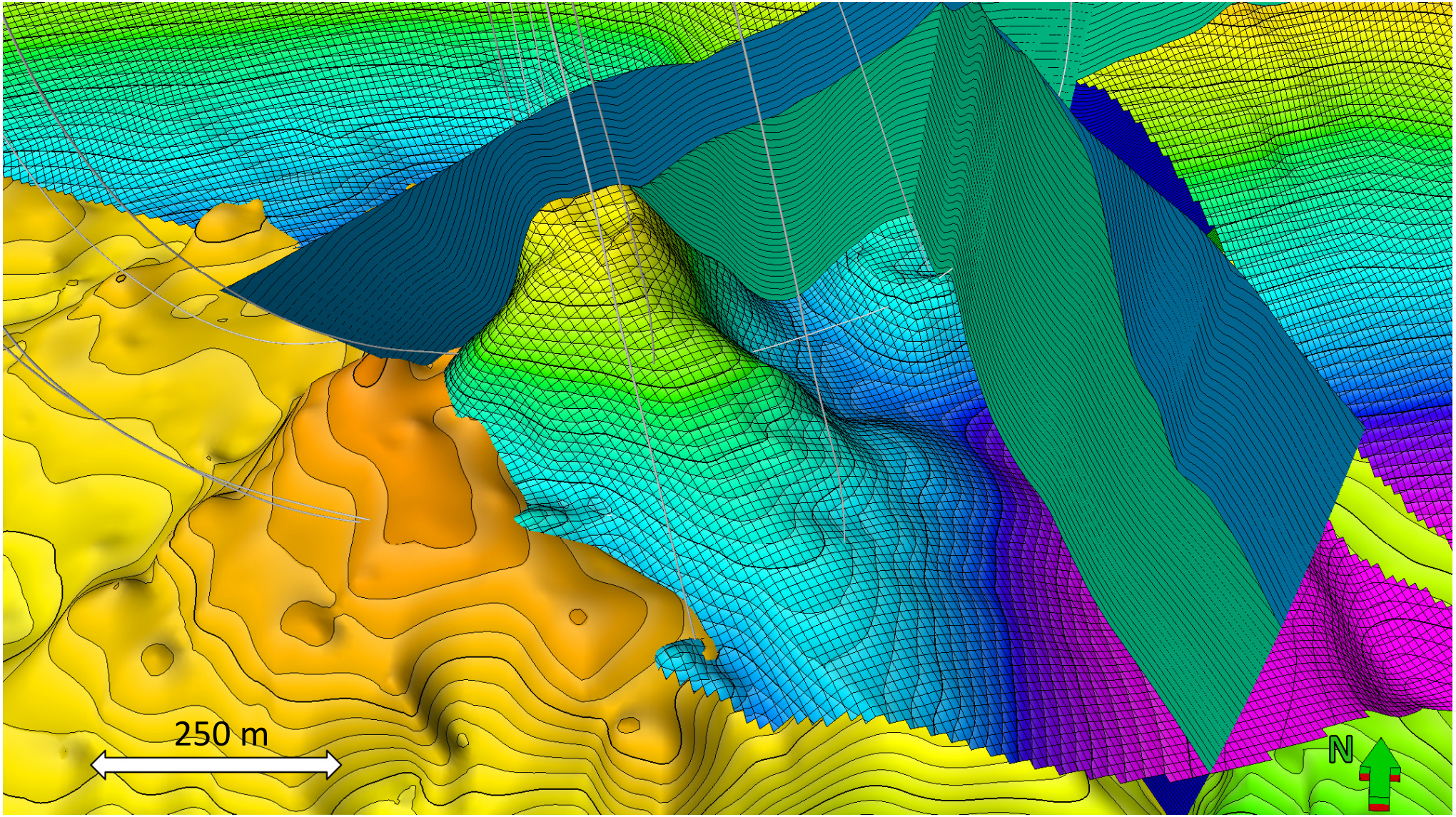
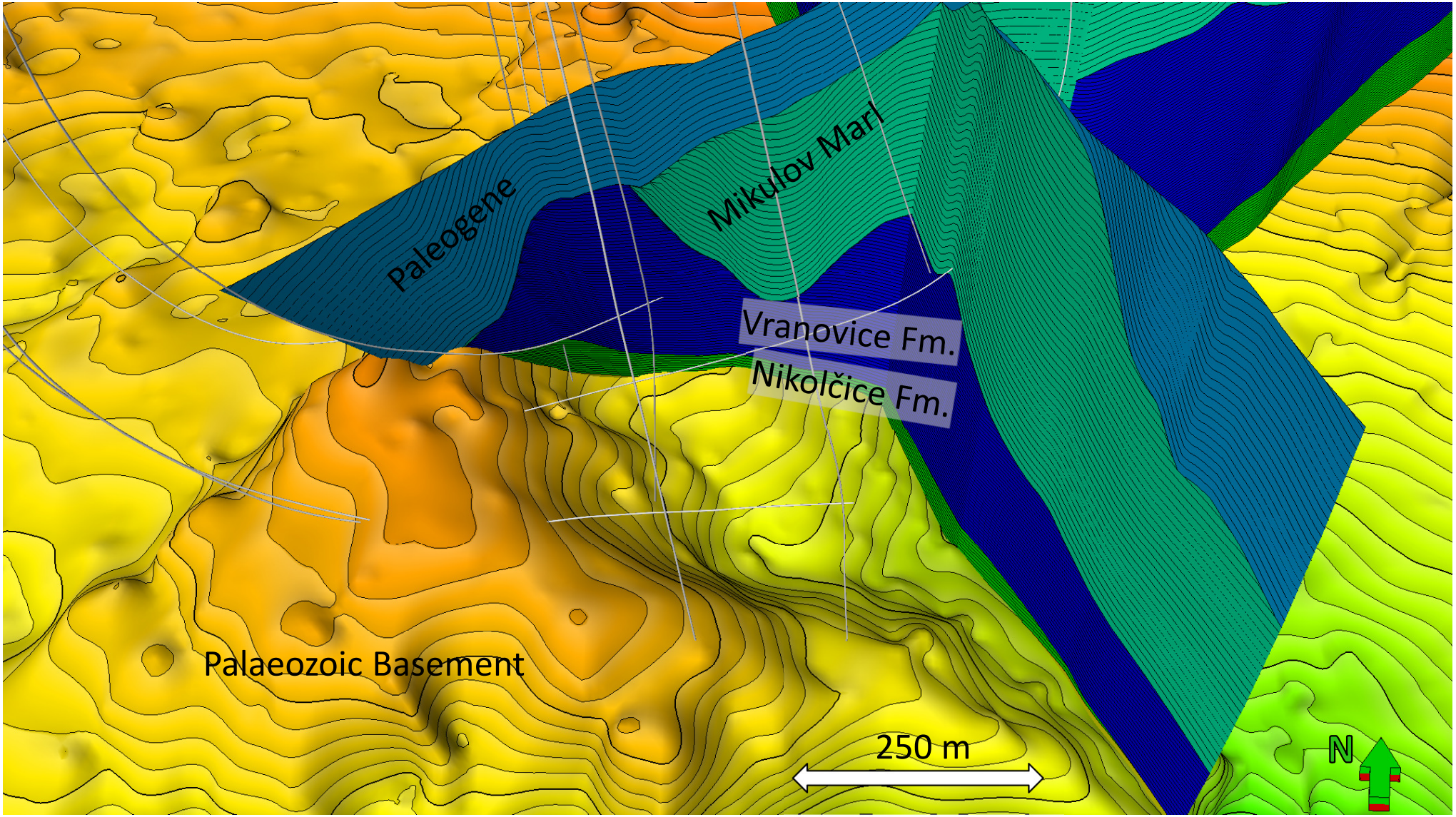


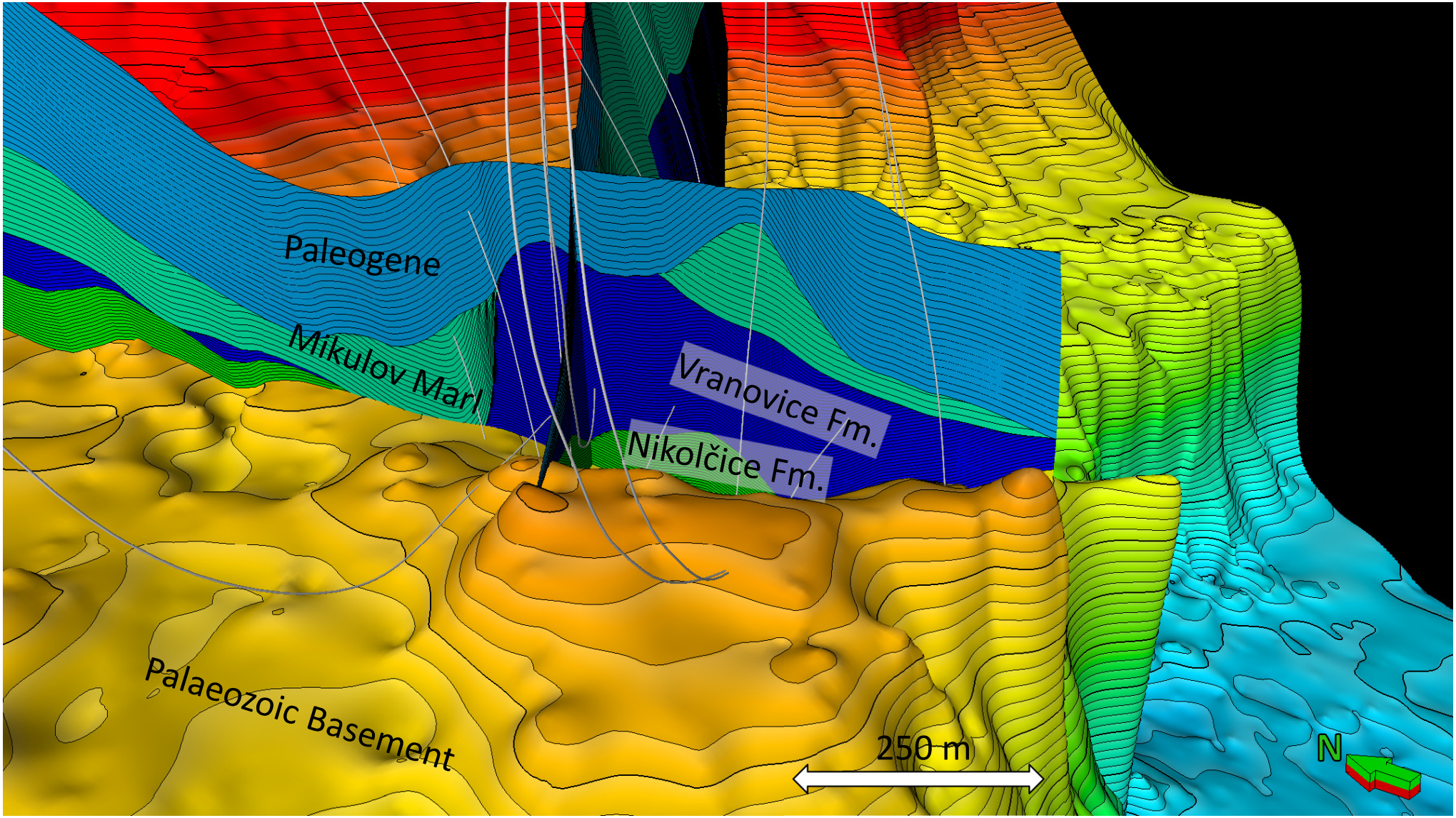
3D View – Model Grid – Top of Reservoir



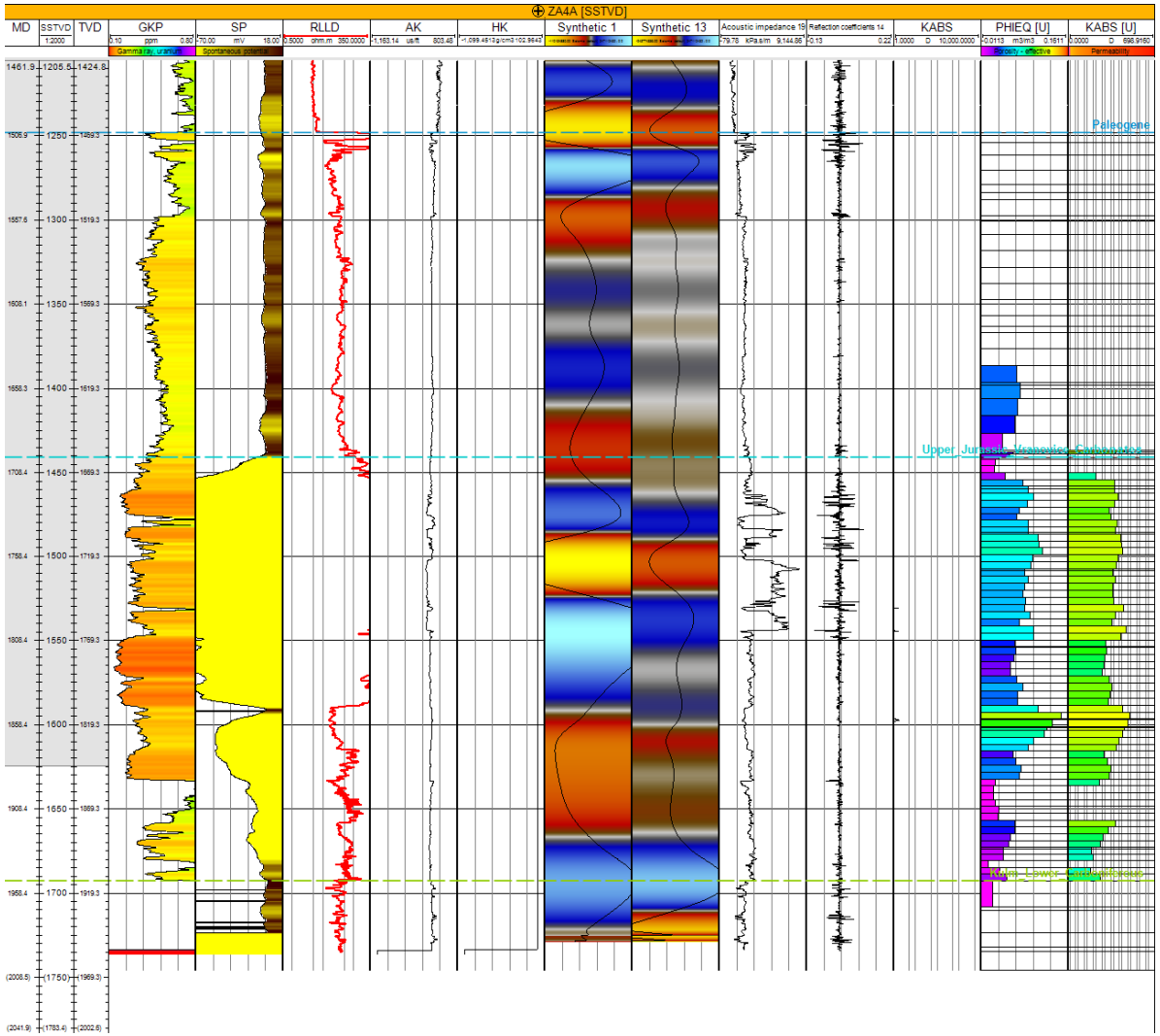
3D View – Model Grid – Grid CrossSection SW-NE



3D View – Model Grid – Grid CrossSection NW-SE



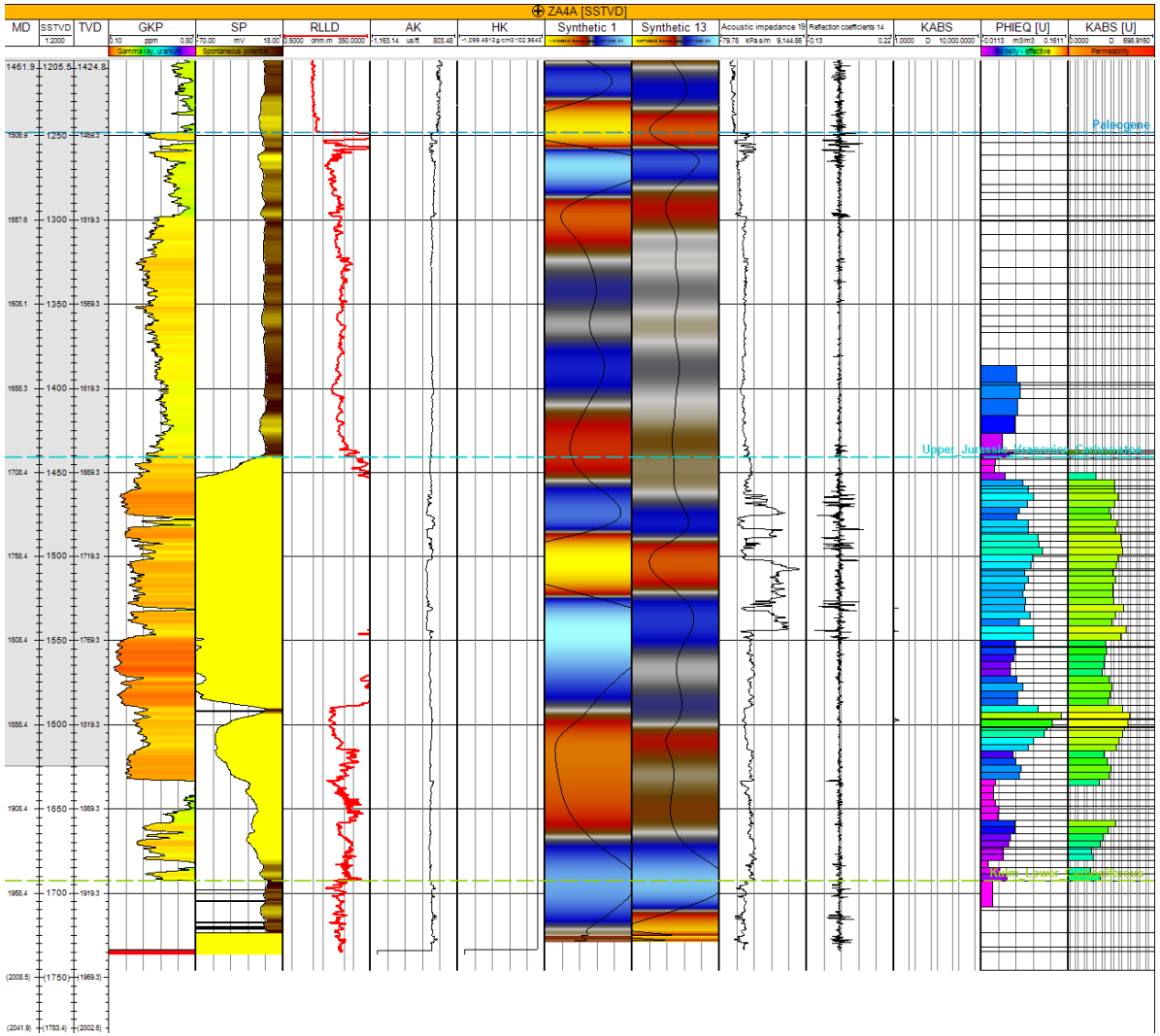
Petrophysical Properties – Vugs – (Por – Perm)



Sample	Žarošice Core #2, Box #6, Interval 0.0 - 0.3 m	
Dimensions	Diameter	Length
	10 cm	18.5 cm
Porosity	12.5 %	
Saturation	Water	Oil
	6.6 %	18.6 %
Permeability axial	Overburden pressure	Radial confining pressure
[md]	[bar]	[bar]
500.1	34.5	34.5
491.0	68.9	34.5
514.5	137.9	68.9
510.0	137.9	75.0
Permeability radial		
99.3	137.9	75.0

Fig. 1-2
The core as cut and after extraction

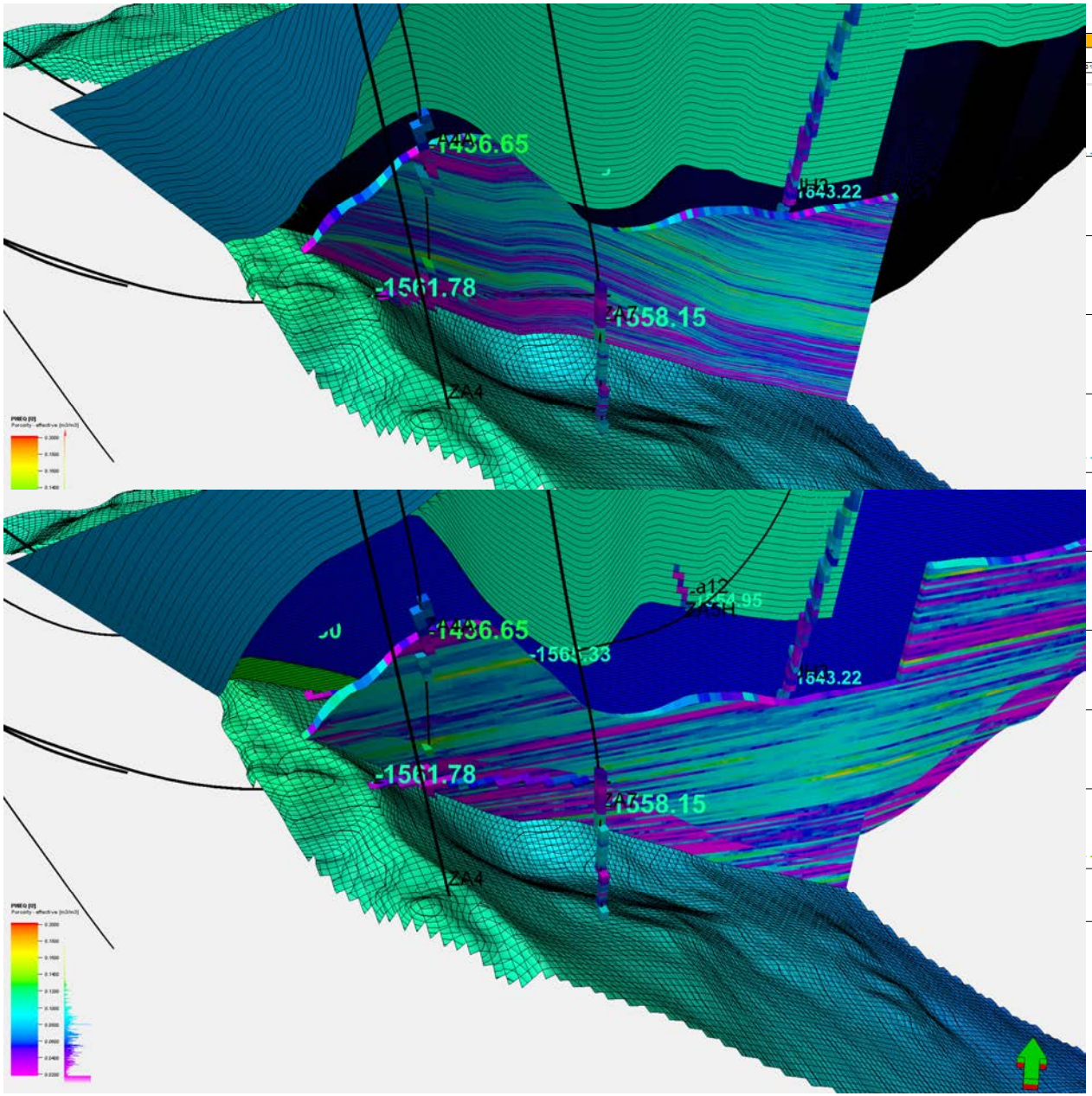
Petrophysical Properties – Well Logs - Fractures

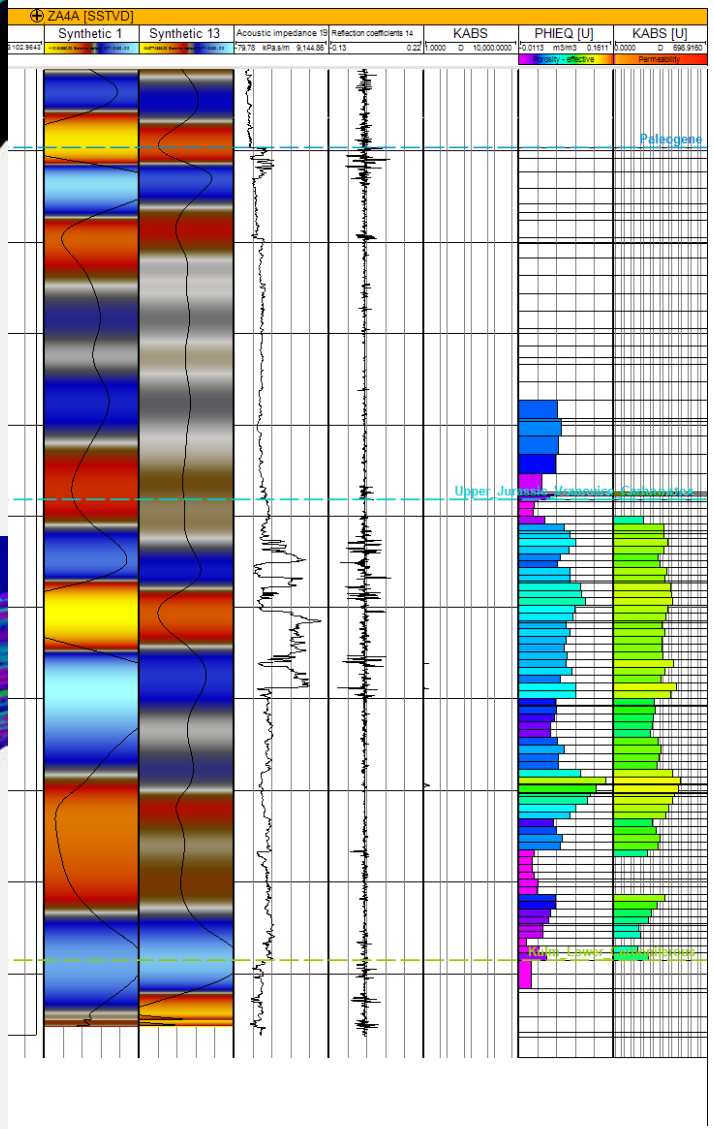


Žarošice 7, jádro 1, bedny 4 - 5

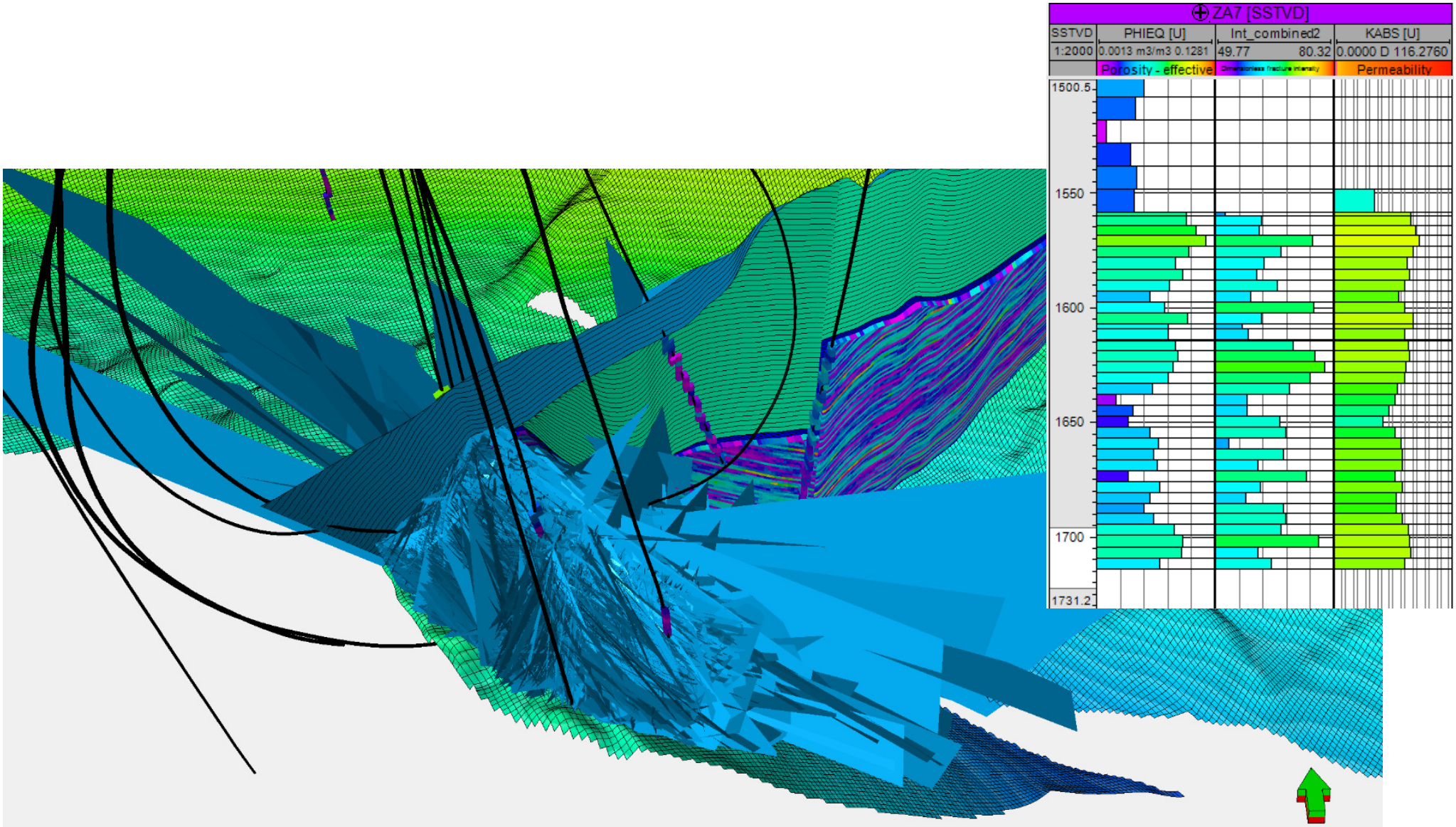
Žarošice 7, jádro 1, bedny 6 - 7

Petrophysical Properties – Distribution in 3D

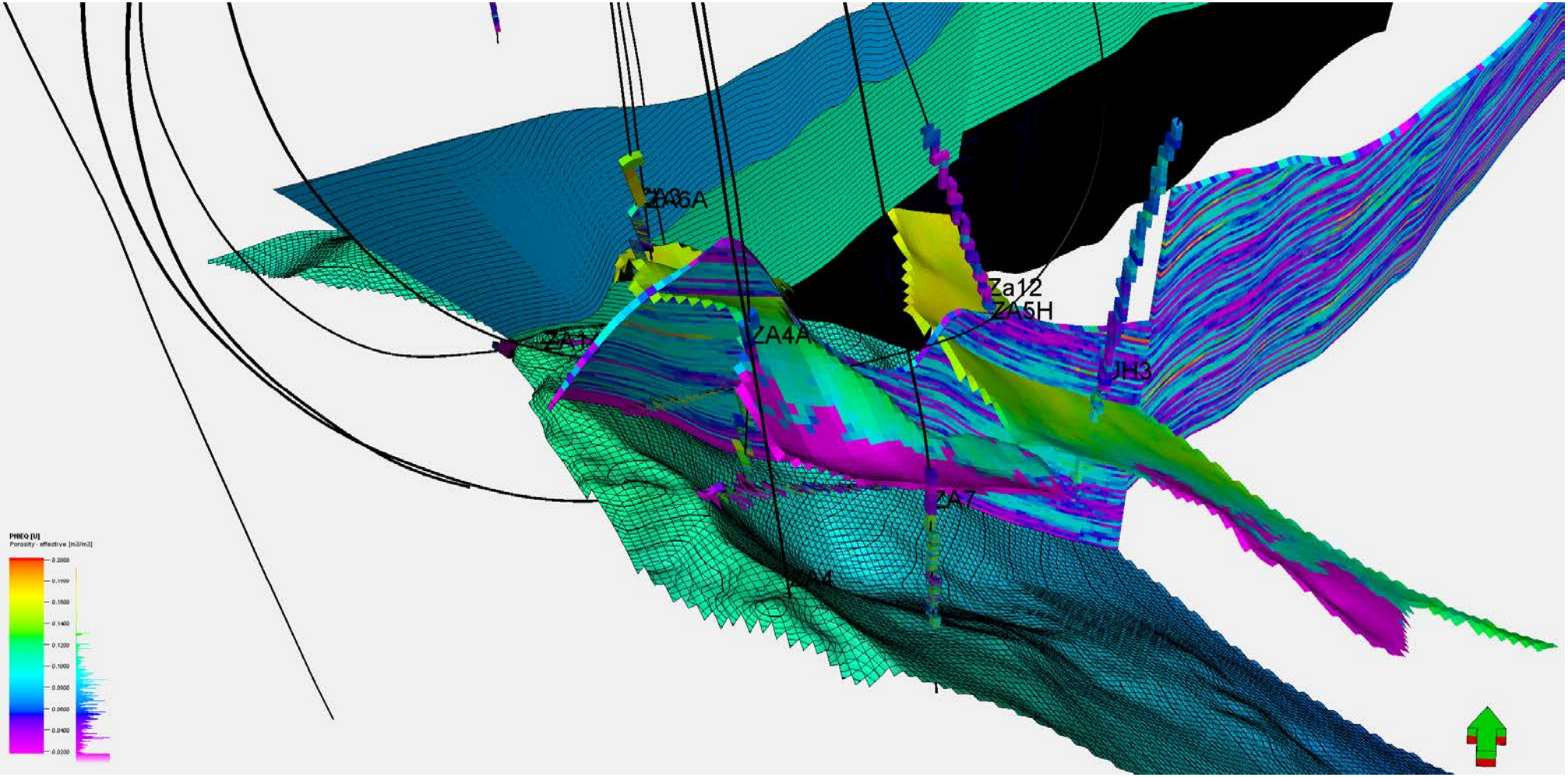




Fractures Distribution in 3D => Fracture Intensity Grid



3D Grid in 10x10 m Horizontal Density



Summary

- Static geological model was finished and haned over to Dynamic modelling team
- The final static reservoir model grid was set at 10 x 10 m cell density in horizontal and 1 m density in vertical direction
- The Follow Base and Sub Horizontal layering was prepared and standard Gaussian simulation reservoir properties algorithm was used for its distribution
- Couple of iterations of fracture model were finished and final fracture density grids were constructed and used for highly permeable zones detection
- The dynamic modelling is ongoing and the first history match iterations are finished
- Simultaneously the geochemistry, geomechanics, monitoring, risk analysis and scenarios of future site development work packages are ongoing

- The end user club of potential emiters is being set up
- The results of this pilot project in carbonate reservoir will be used in larger CO_2 injection project planned in the Devonian carbonates aquifer in Nikolčice-Kurdějov ridge which is being prepared for higher rate CO_2 injection

Thank You

Acknowledgement:
The CO2-SPICER project benefits from a € 2.32 mil. grant from Norway and Technology Agency of the Czech Republic.