



# Geothermal energy production from porous formations (Dunántúl Group)

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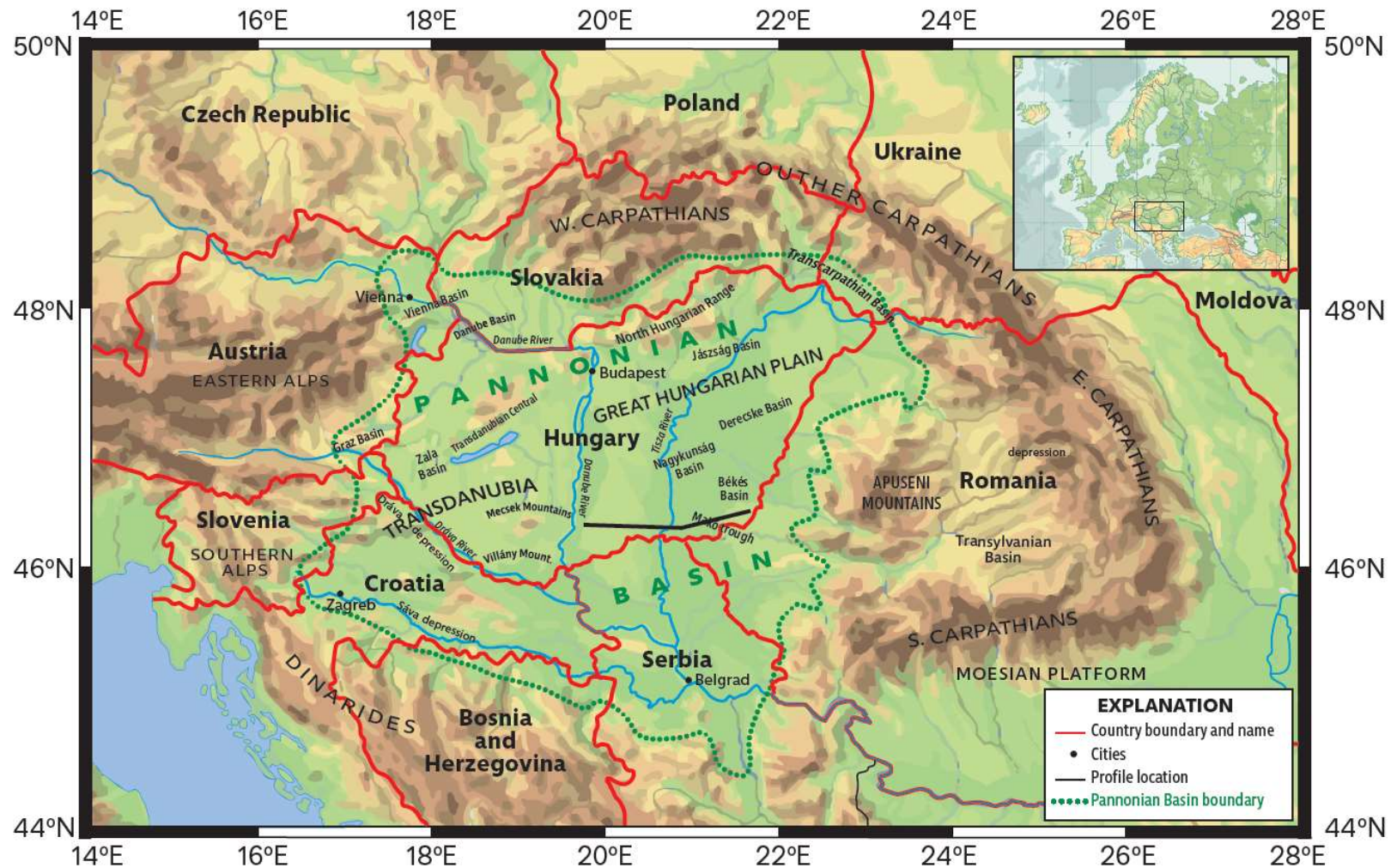
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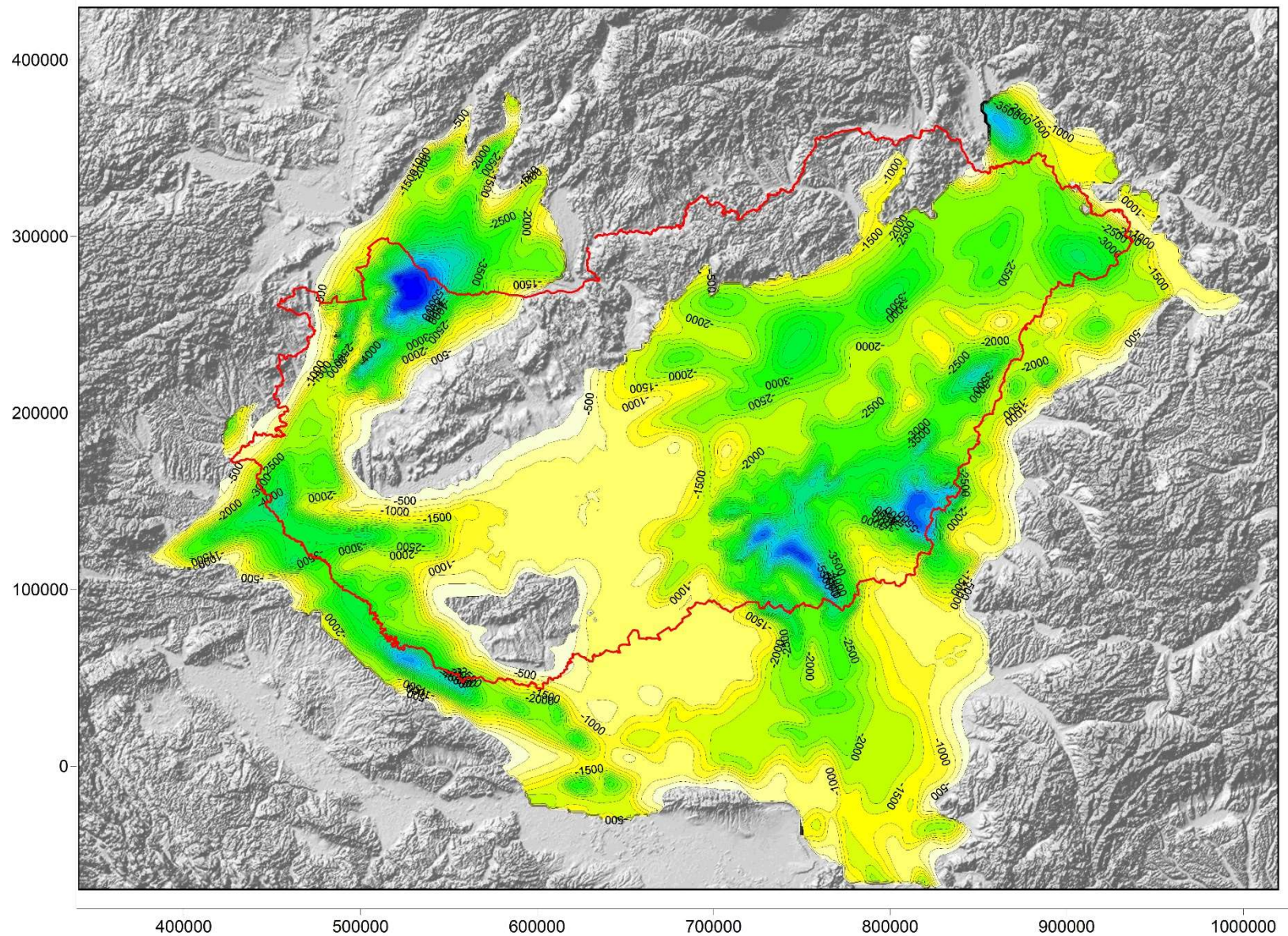
# Topography of the Pannonian Basin



(Almási, Szanyi 2024)

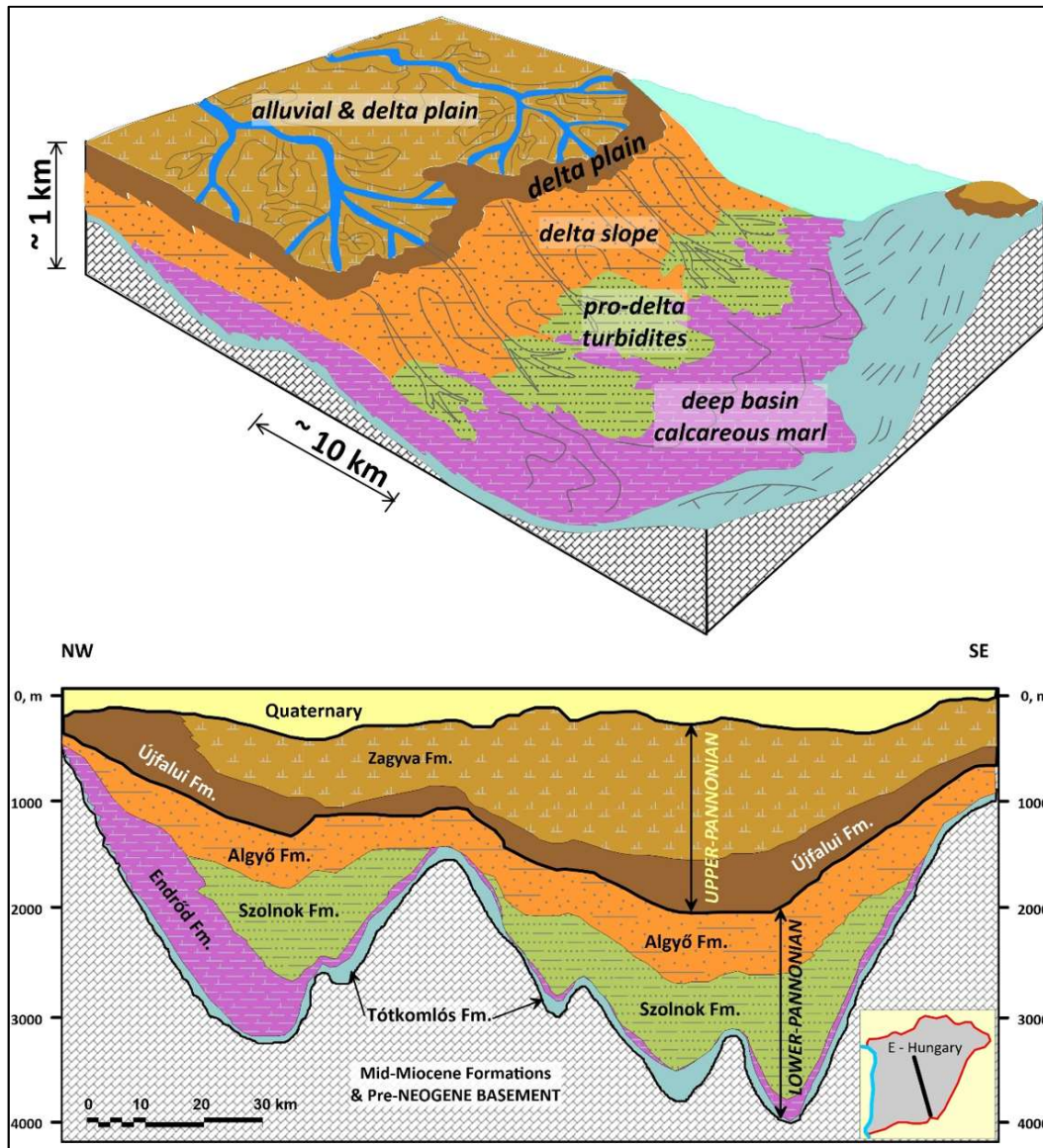


# Depth of the Pre-Neogen basement (Tóth 2009)





# Paleoenvironment

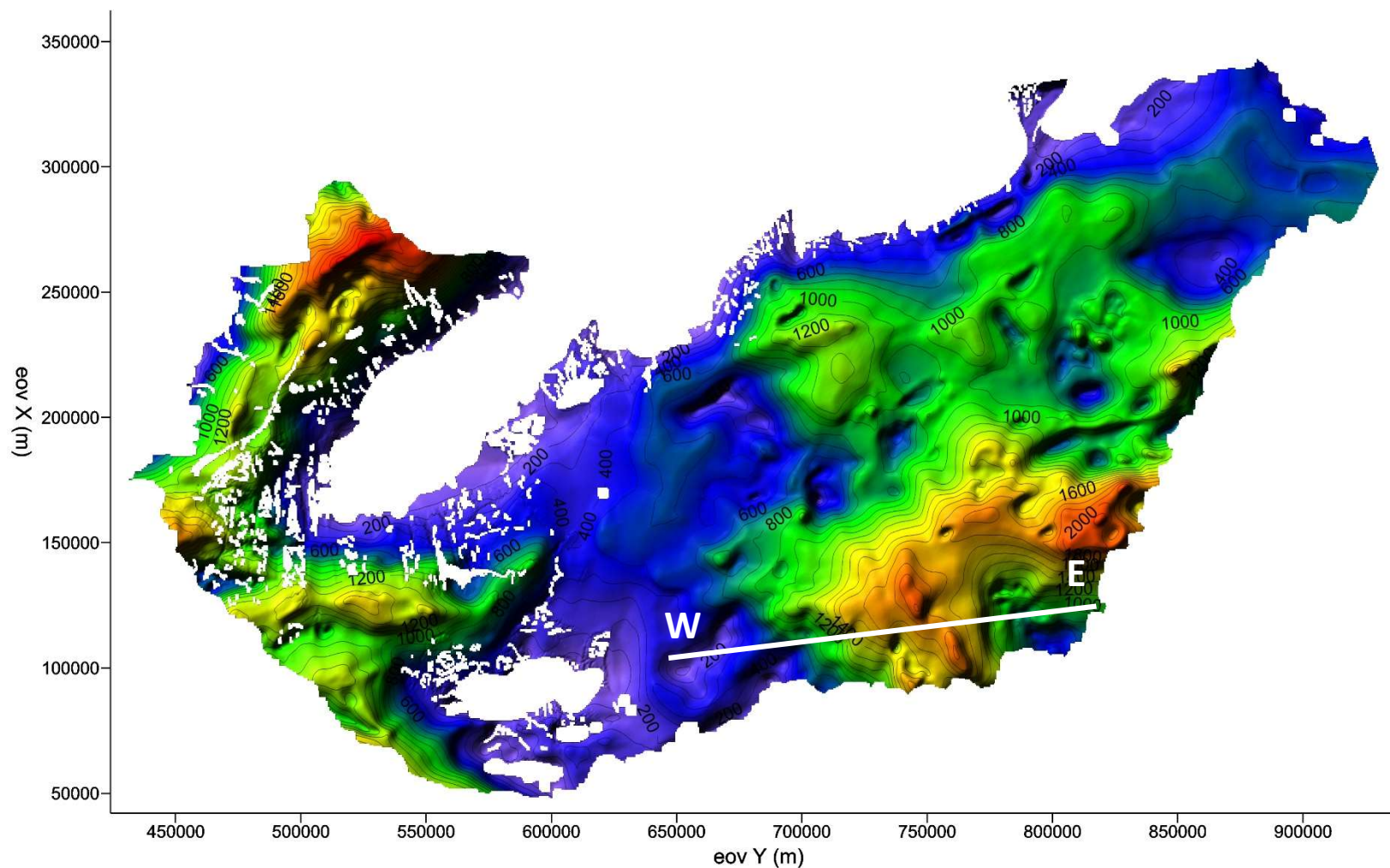


## Legend:

- Terrestrial: sand, gravel, loess & clay
  - Alluvial plain: silt, clay & sand
  - Delta plain: sandstone, siltstone & clay
  - Delta slope: clay marl & sandstone
  - Prodelta turbidite: sandstone & siltstone
  - Deep Basin: calcareous marl
  - Basal Unit: undifferentiated Mid-Miocene Fm. & weathered Pre-Neogene Basement
  - Basement: Sedimentary, metamorphic & igneous rocks
- } DG

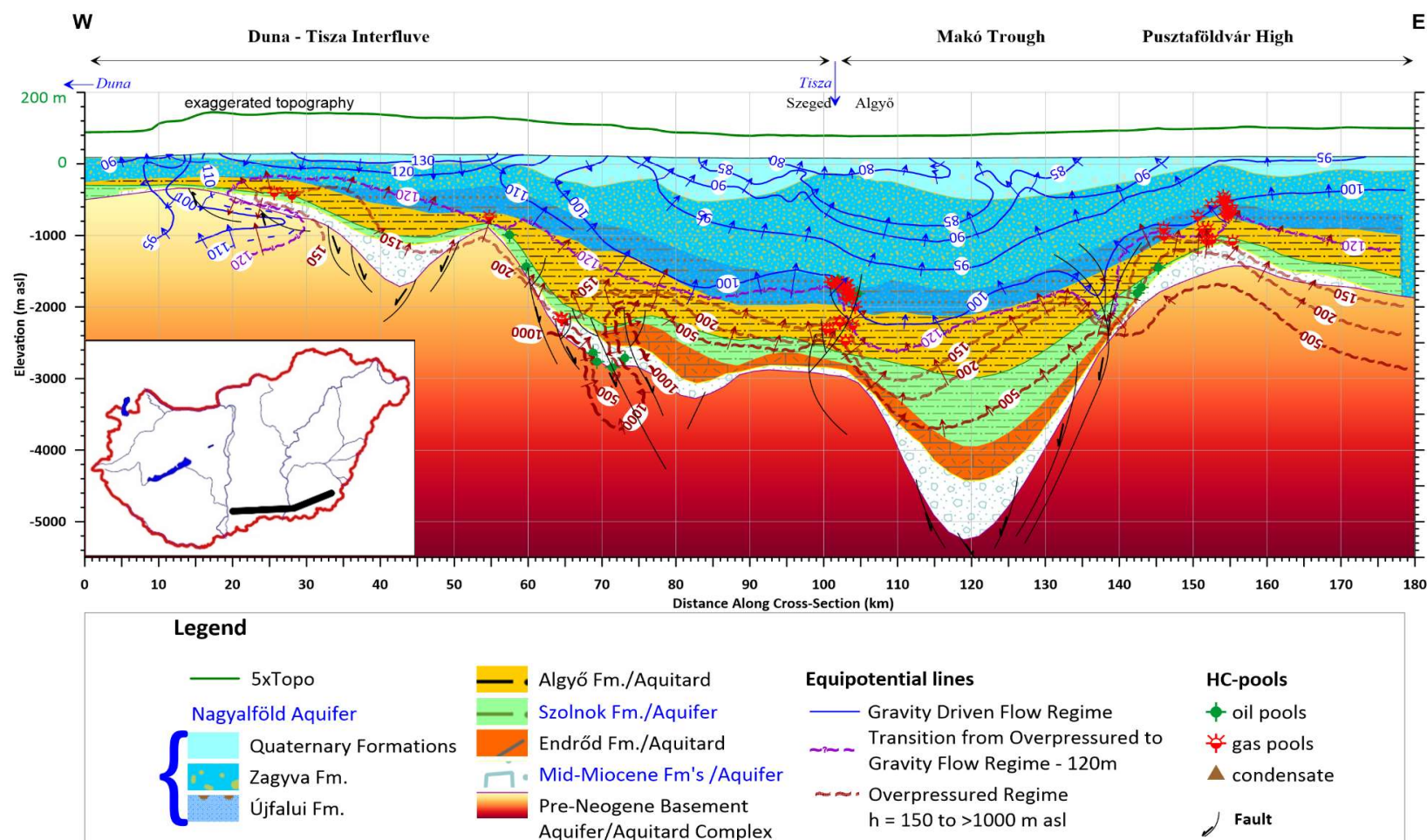


# Thickness of the Dunántúl Group (Upper-Pannonian strata)





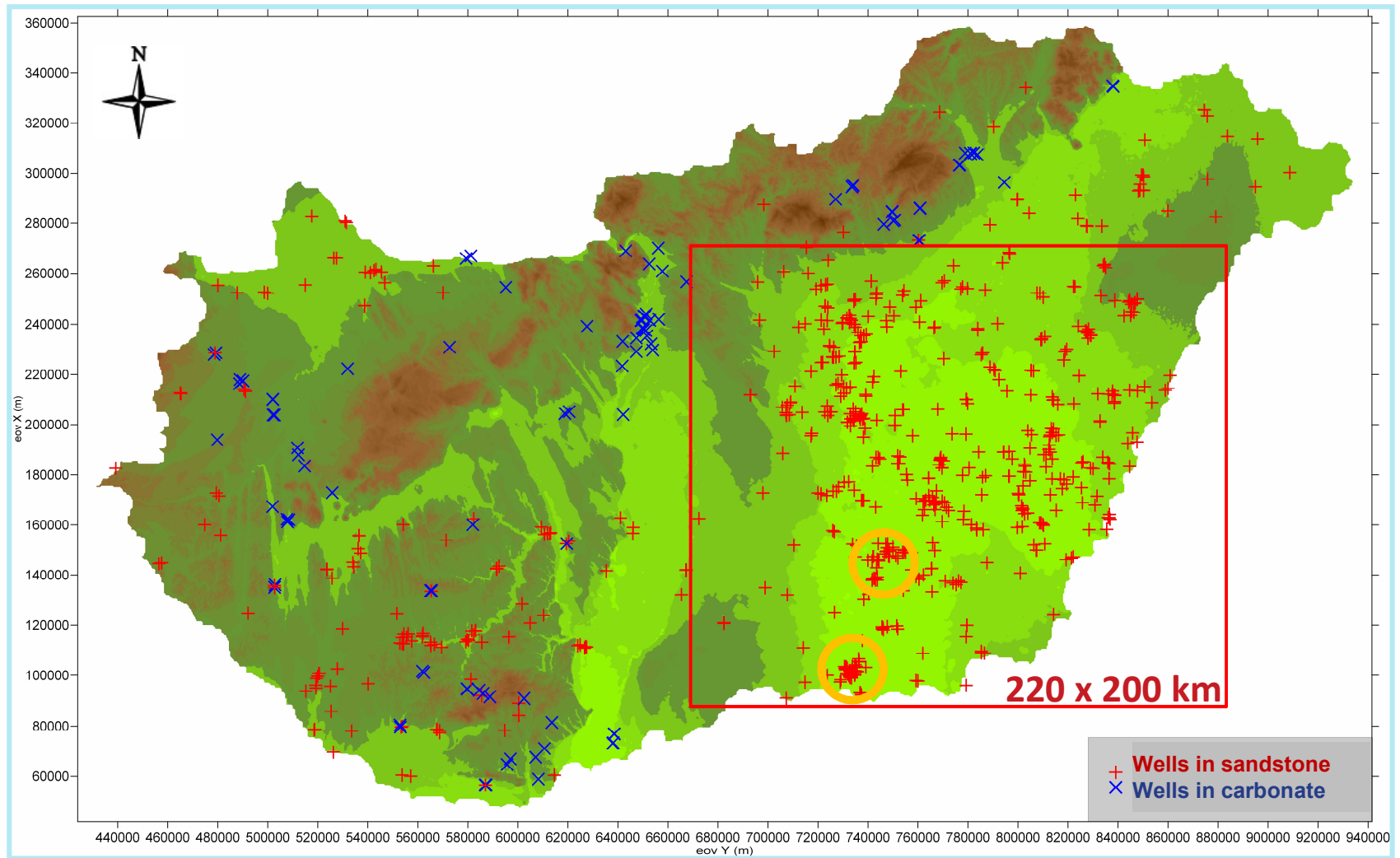
# Hydrodynamical background



(Almási, Szanyi 2024)



# Locations of thermal wells





# Agricultural use in the Szentes area

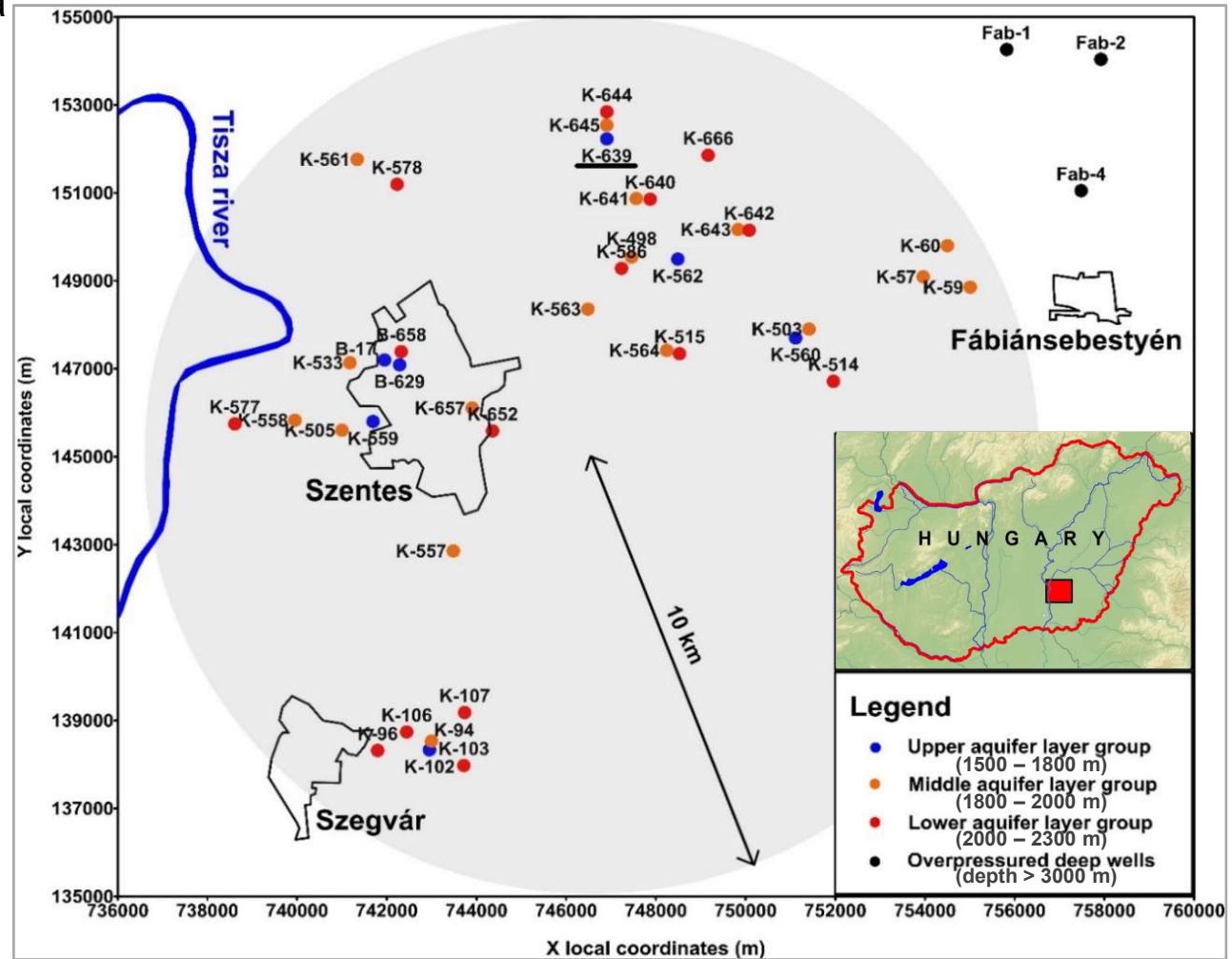
Greenhouse 60ha



Hatchery



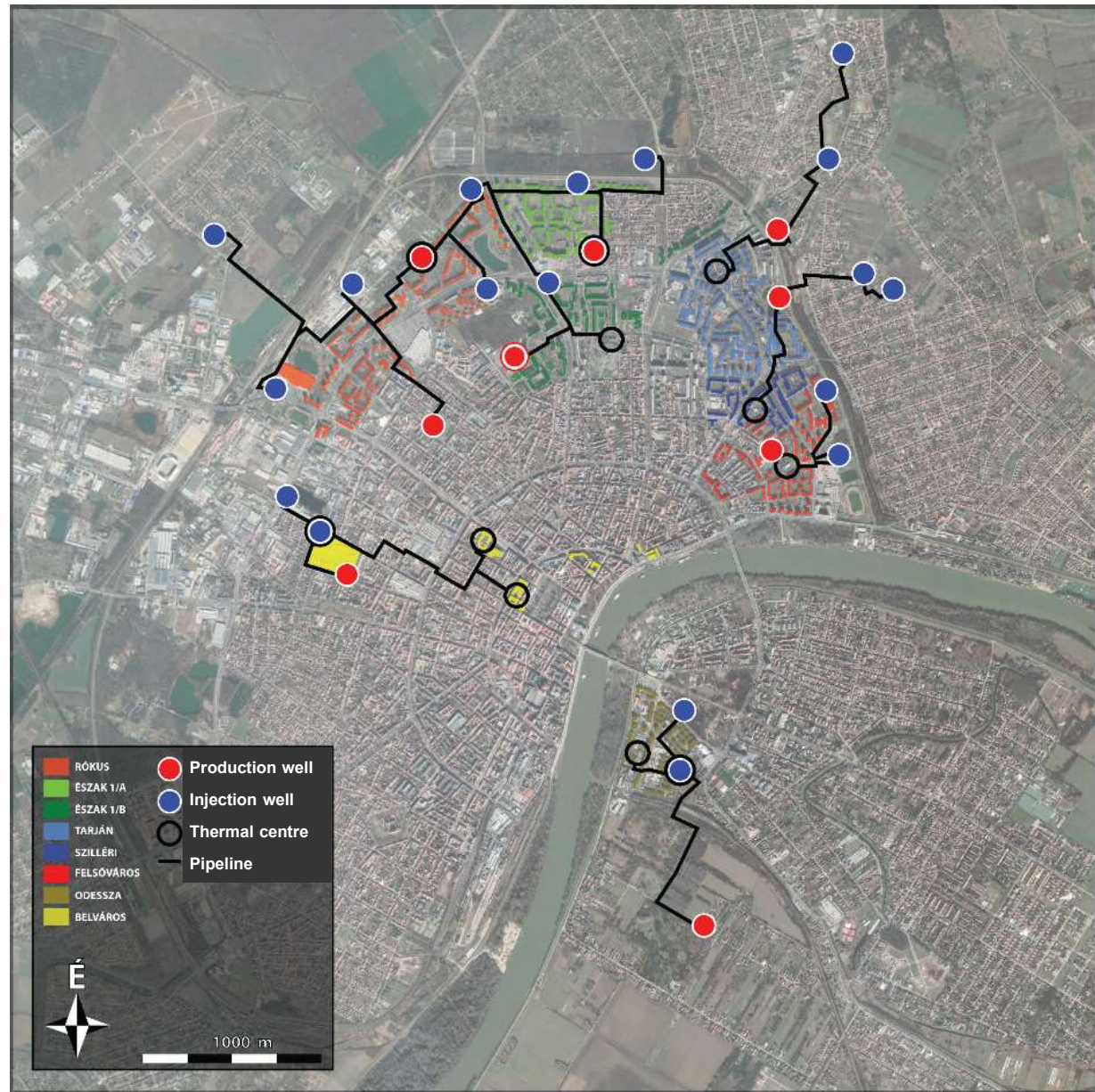
Grain dryer





# Planned 9 new geothermal systems in Szeged

- 9 production wells (2000m)
- 18 injection wells (1800 m)
- Average yield: 20 l/s (70 m<sup>3</sup>/h)
- Temperature 90-95°C





# Scientific cooperation



Sampled every 5 m from all 27 wells



7m core sample from layer to be screened for injection



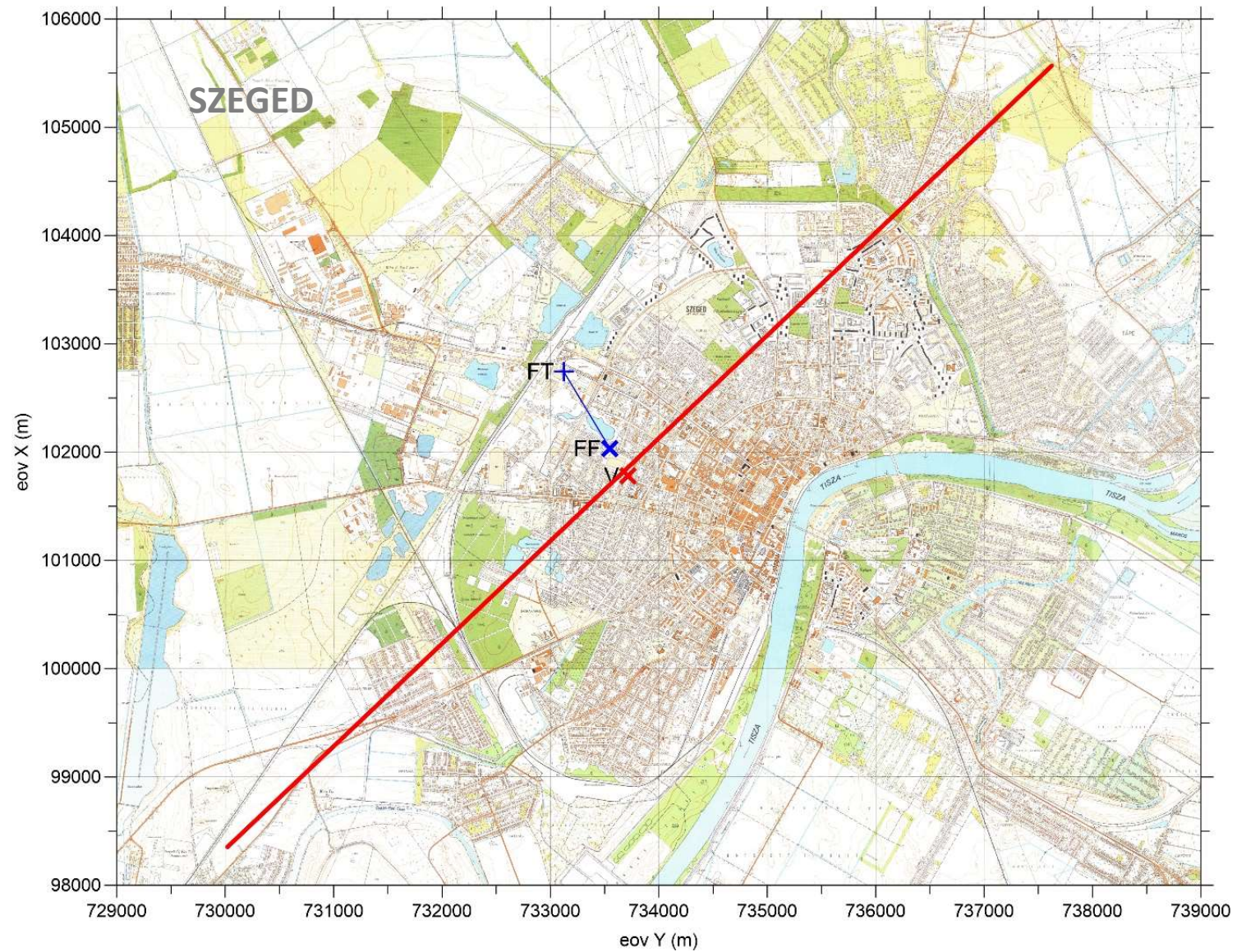
*(Bozsó et al. 2018)*





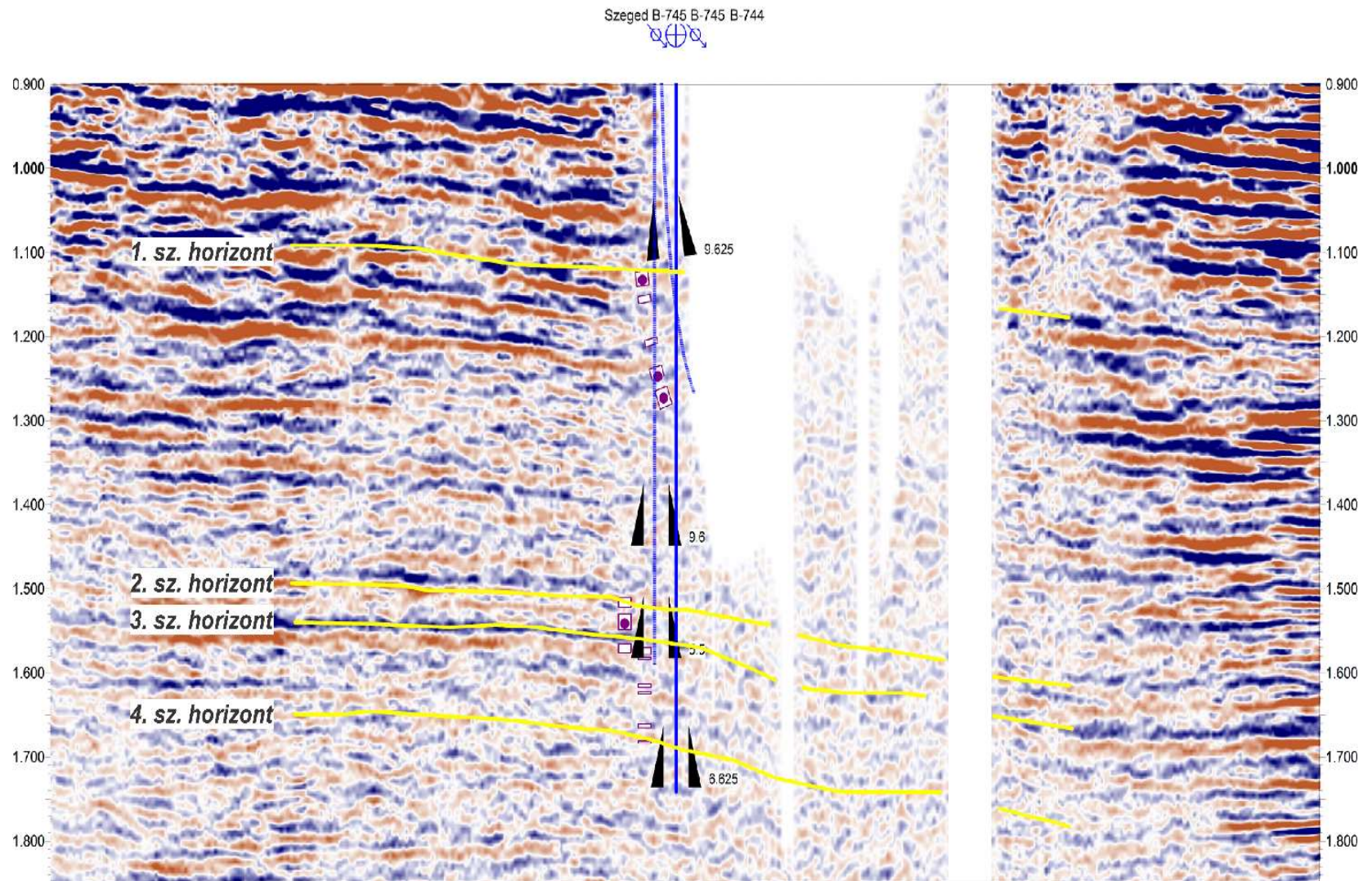


# Establishing the project with seismic survey





# SW-NE Seismic profile of Szeged

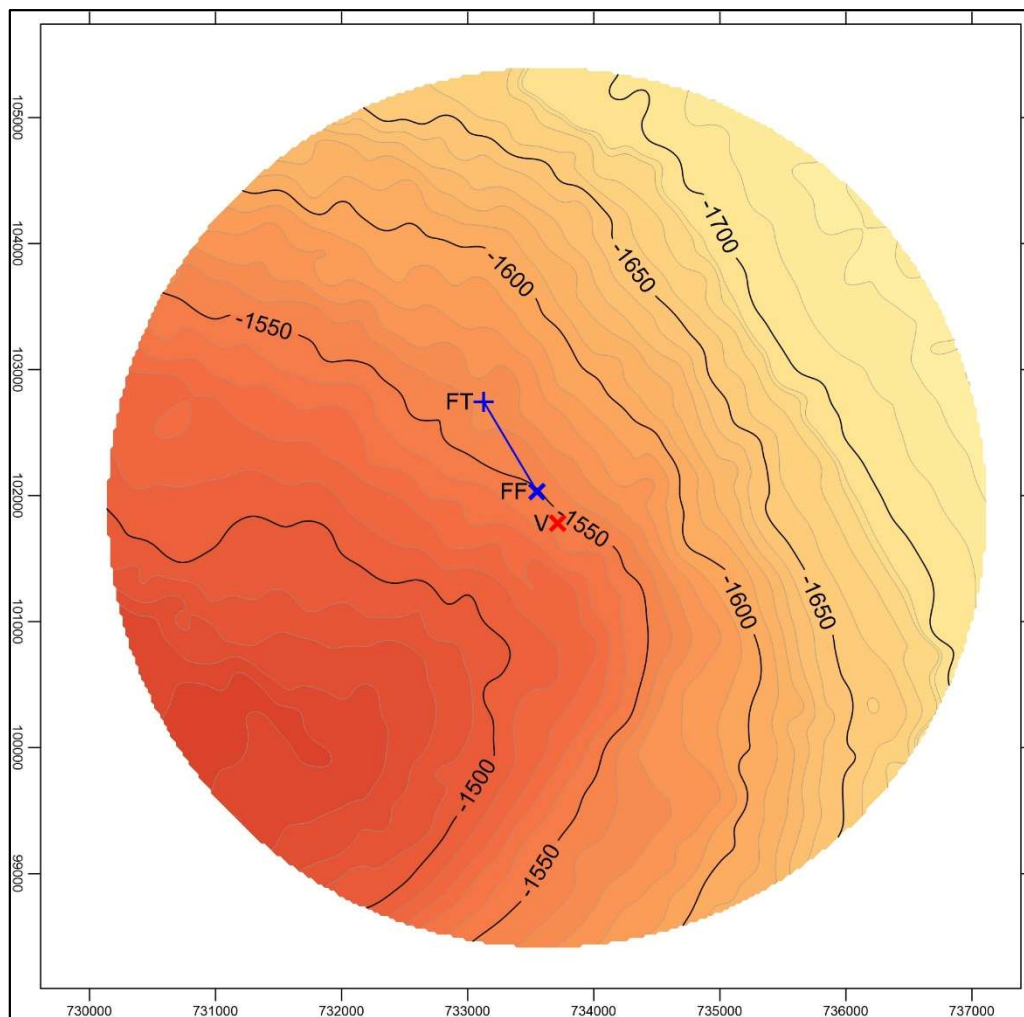


(Geomega Kft.)

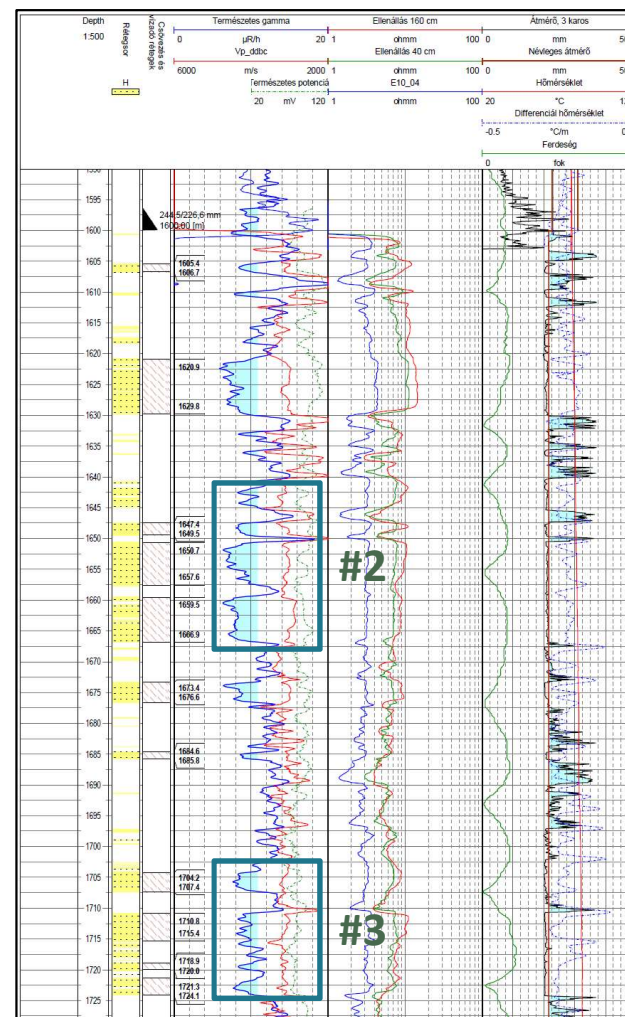




# Seismic interpretation of horizon #2 and well-log



Depth below sea level of horizon #2  
(Geomega Kft.)



Geophysical log  
(Geolog Kft.)

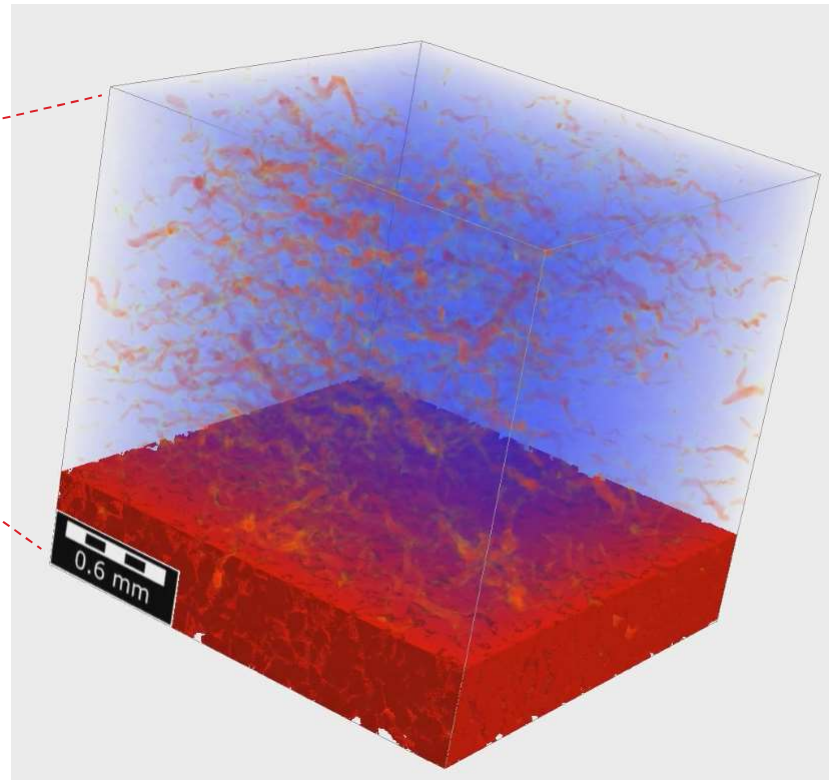
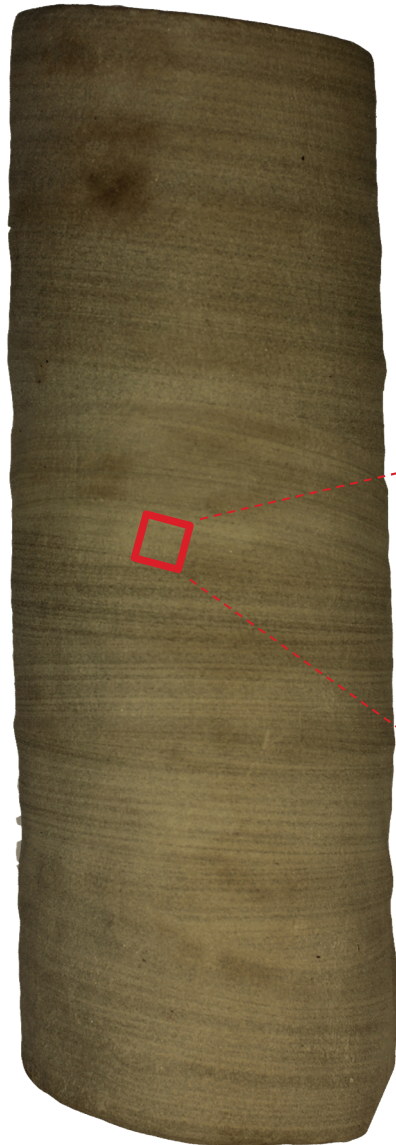




# Porosity and permeability data

Permeability (well test): 300 – 1500 mD

Porosity (lab) : 24 – 32 %



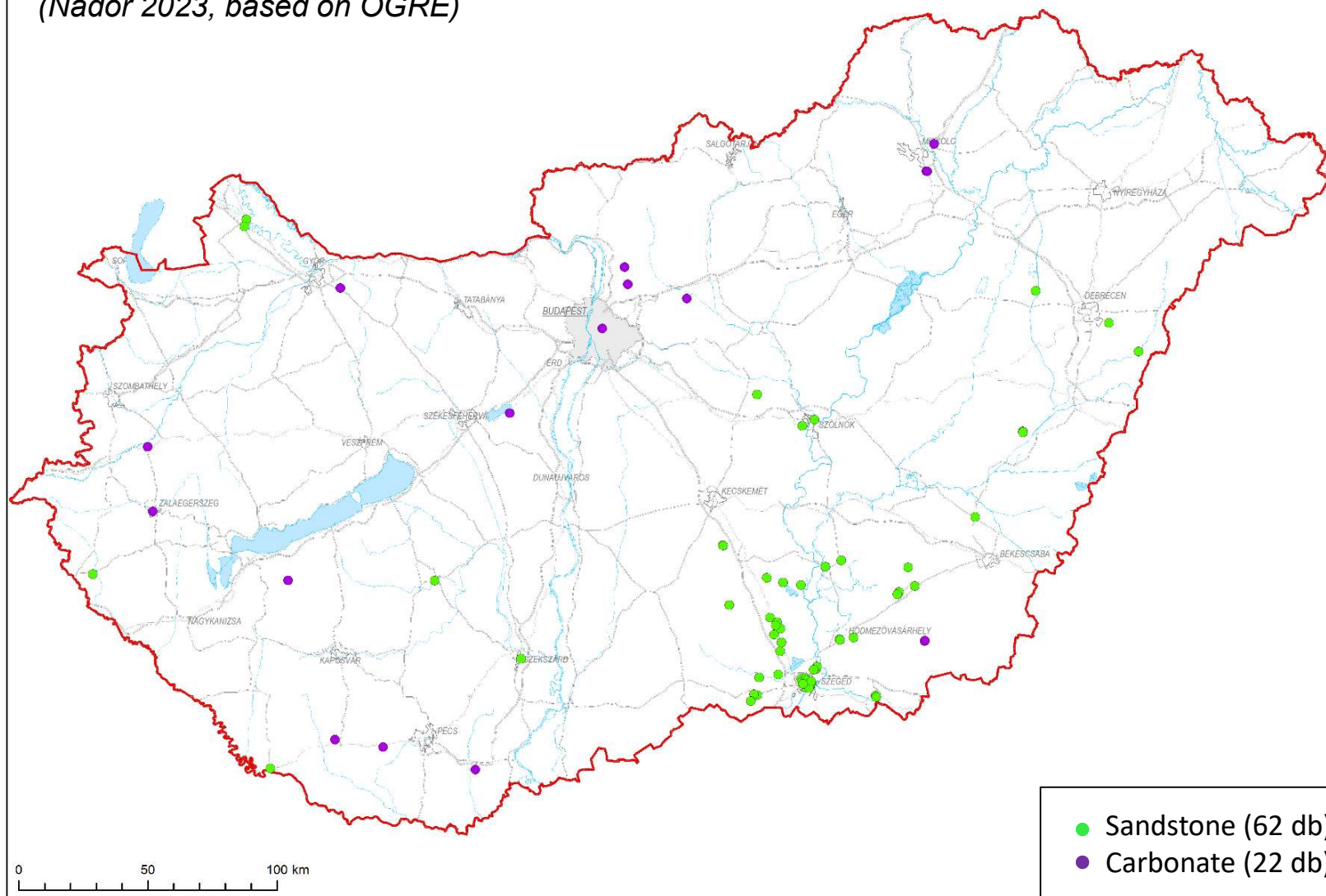
3D visualisation of the connected pores





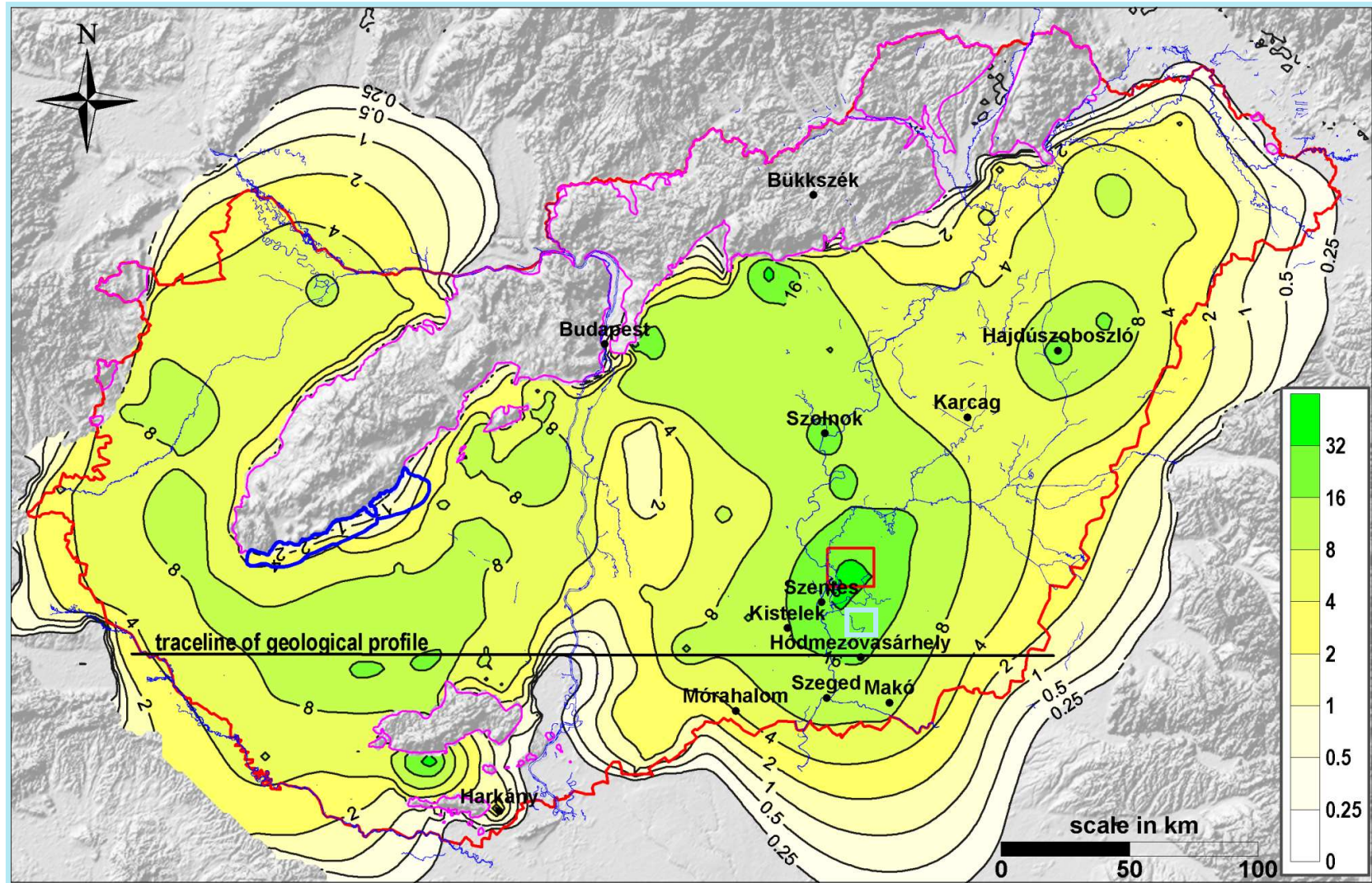
# Reinjection wells in Hungary

(Nádor 2023, based on OGRE)



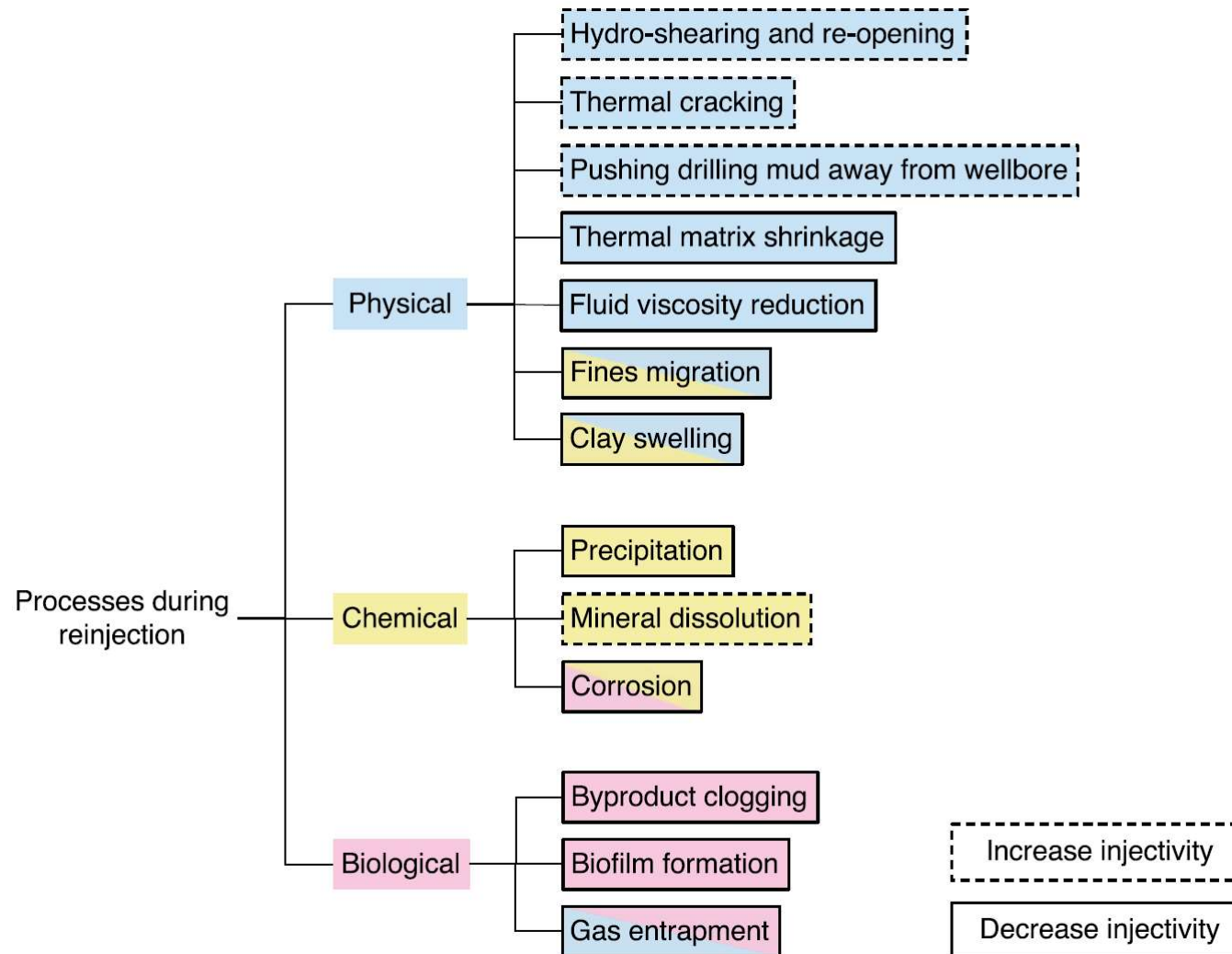


# The calculated drawdown in the DG (Tóth, 2009)





# Overview of mechanisms during reinjection according to Luo and co-authors (2023)





# Critical part of reinjection process

- Well design and well completion
- Properties of the sediment (hydrogeological-, rock-physical, ...)
- Operation methods (pressure, filtering system, maintenance, ...)
- Legislation

## Thank you !

### Problems:

- Clogging (physical, chemical, biological)
- Scaling
- Corrosion



Due to the systems complexity and uniqueness, the prediction of clogging processes is not a trivial task. However, the risk can be significantly reduced through systematic investigation and experience.

