



# ***Vermilion Energy Inc.***

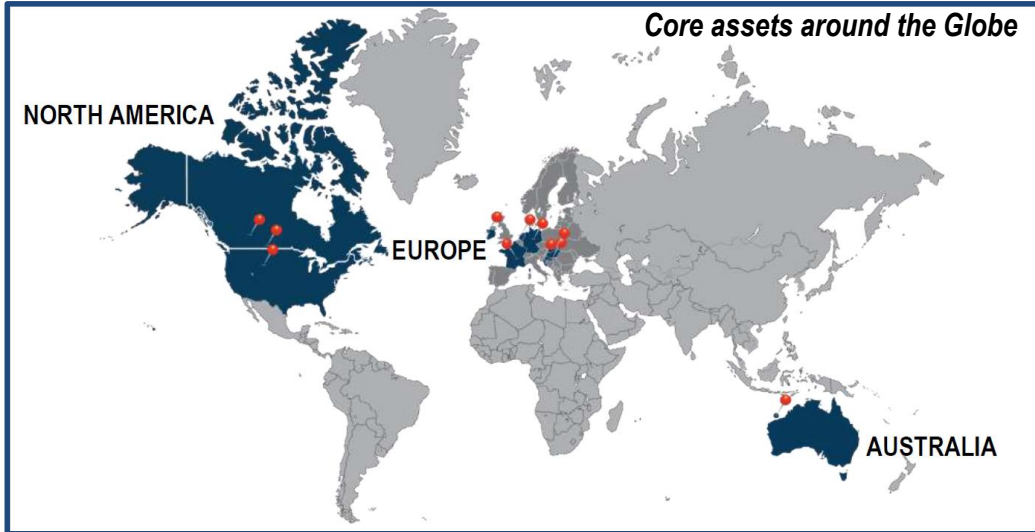
**Vintage and modern gravity data in HC exploration**

October, 2019





# Vermilion Energy / CEE business unit



## Central and Eastern Europe

- Established sizable land position in under invested basin
- #1 onshore landholder in Croatia
- Concessions in Hungary
- Entered farm-in agreement in Slovakia

## Ireland

- Corrib field constitutes ~95% of Ireland's gas production
- Q4 2017 production\_ 9,372 boe/d

## France

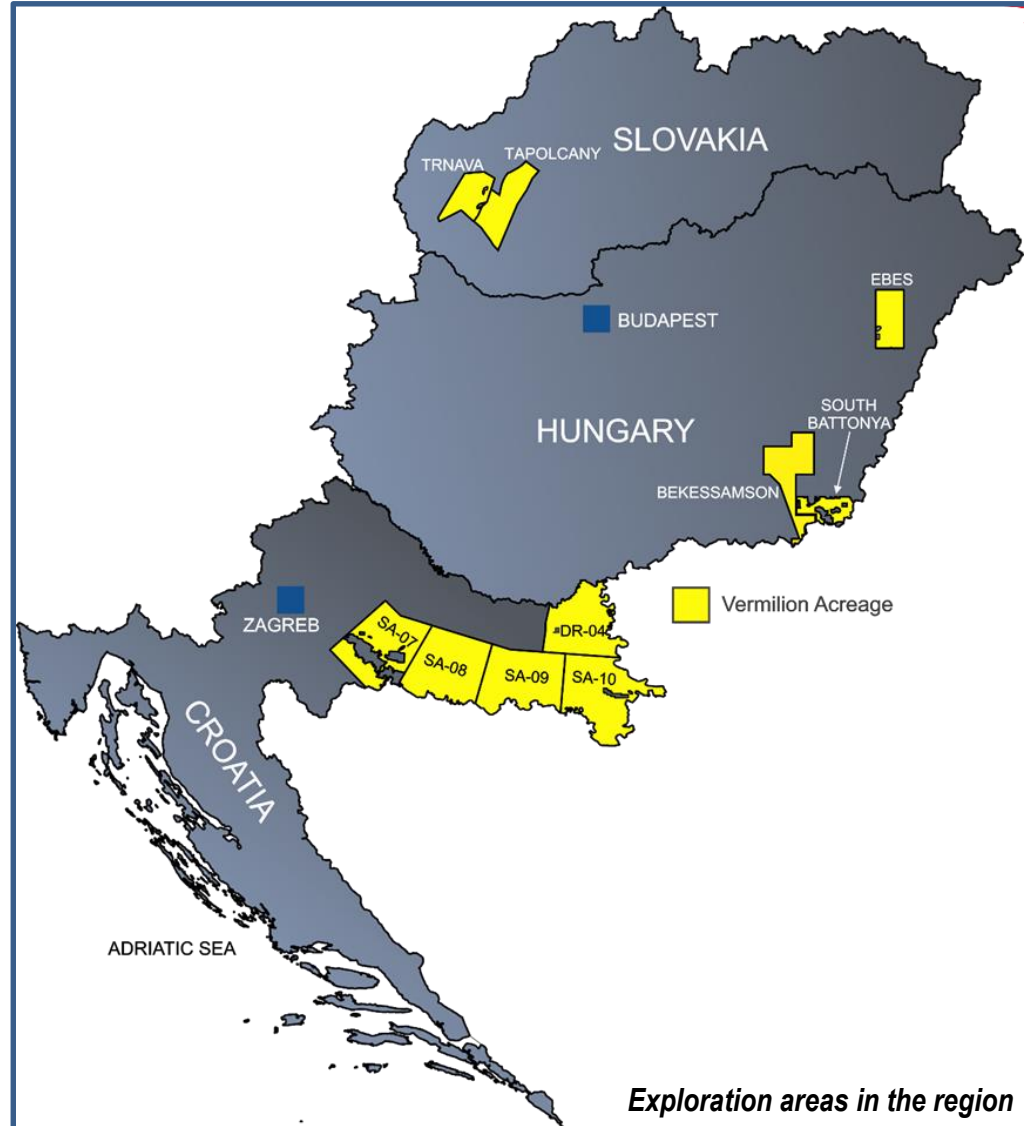
- #1 domestic oil producer with ¾ share of the domestic industry
- Q4 2017 production: 11,215 boe/d

## Netherlands

- #2 onshore gas producer
- Q4 2017 production: 9,381 boe/d

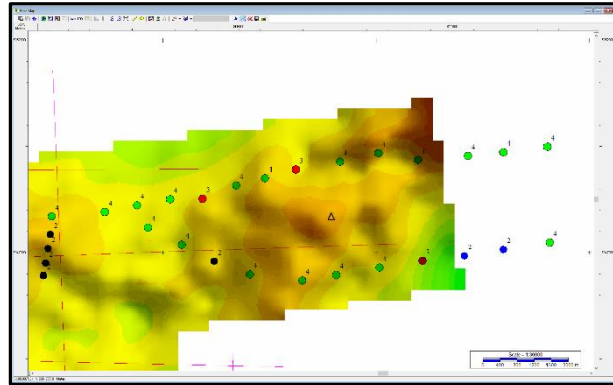
## Germany

- Establishing production operations and substantial exploratory land position in North German Basin
- Q4 2017 production: 4,4180 boe/d





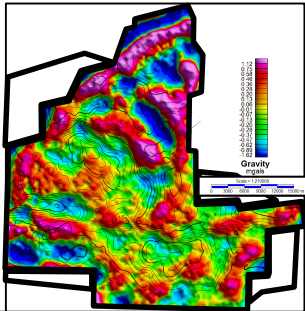
# Gravity data in HC exploration workflow



## Prospect

Potential  
accumulation  
outline

- *Only in case of good quality, high density data.*



## HC play

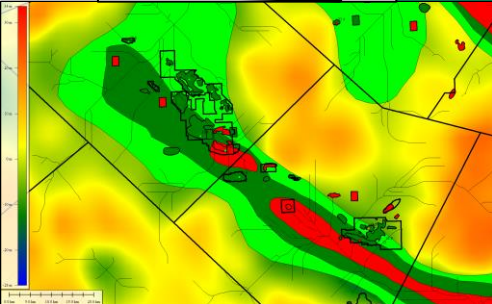
Trapping mechanisms  
Reservoir rocks

- *Newly acquired gravity data (ground, airborne).*
- *Employing modern acquisition techniques.*

## Basin

Basin outline  
Sedimentary fill  
Maturity levels  
Migration pathways

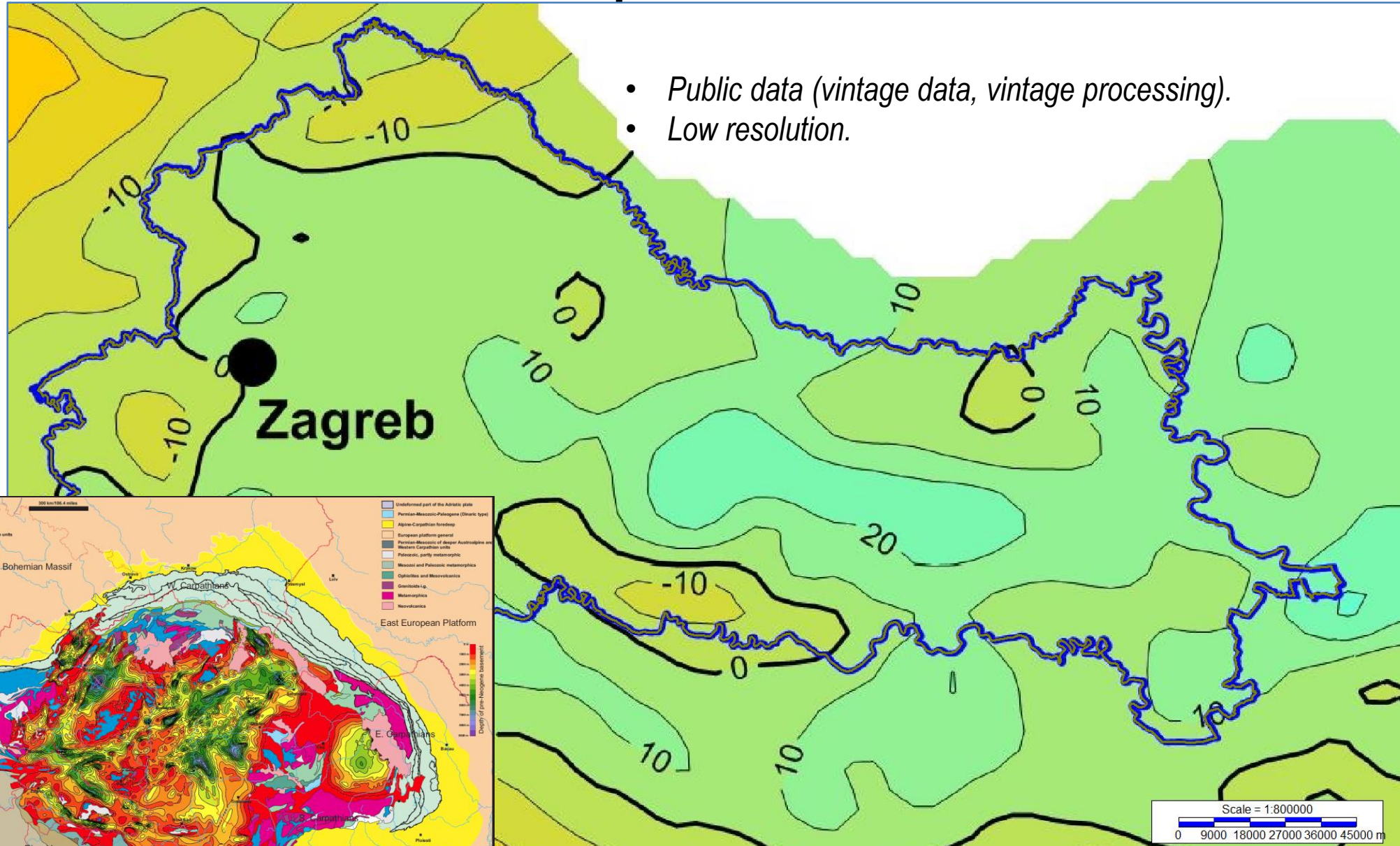
- *Vintage ground gravity data.*
- *Public gravity maps.*
- *Reprocessing of vintage ground gravity data.*





# Exploration workflow – first steps

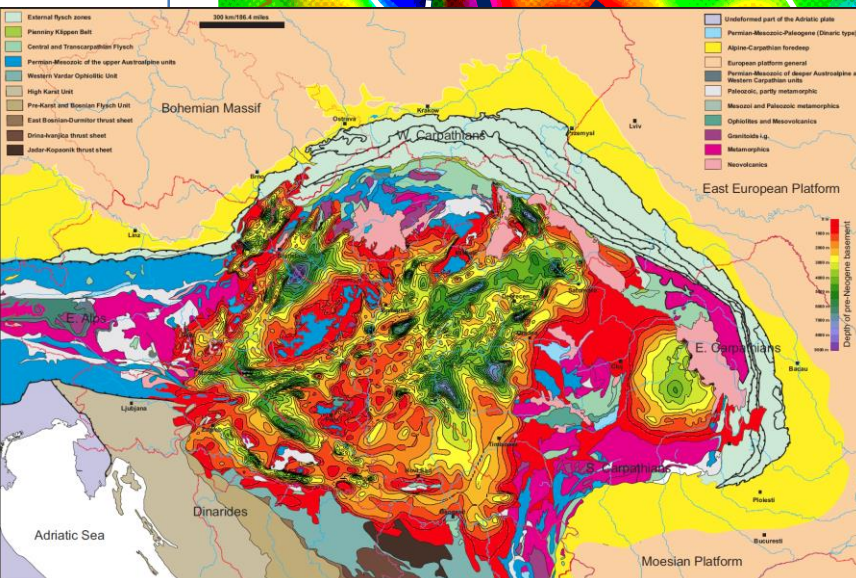
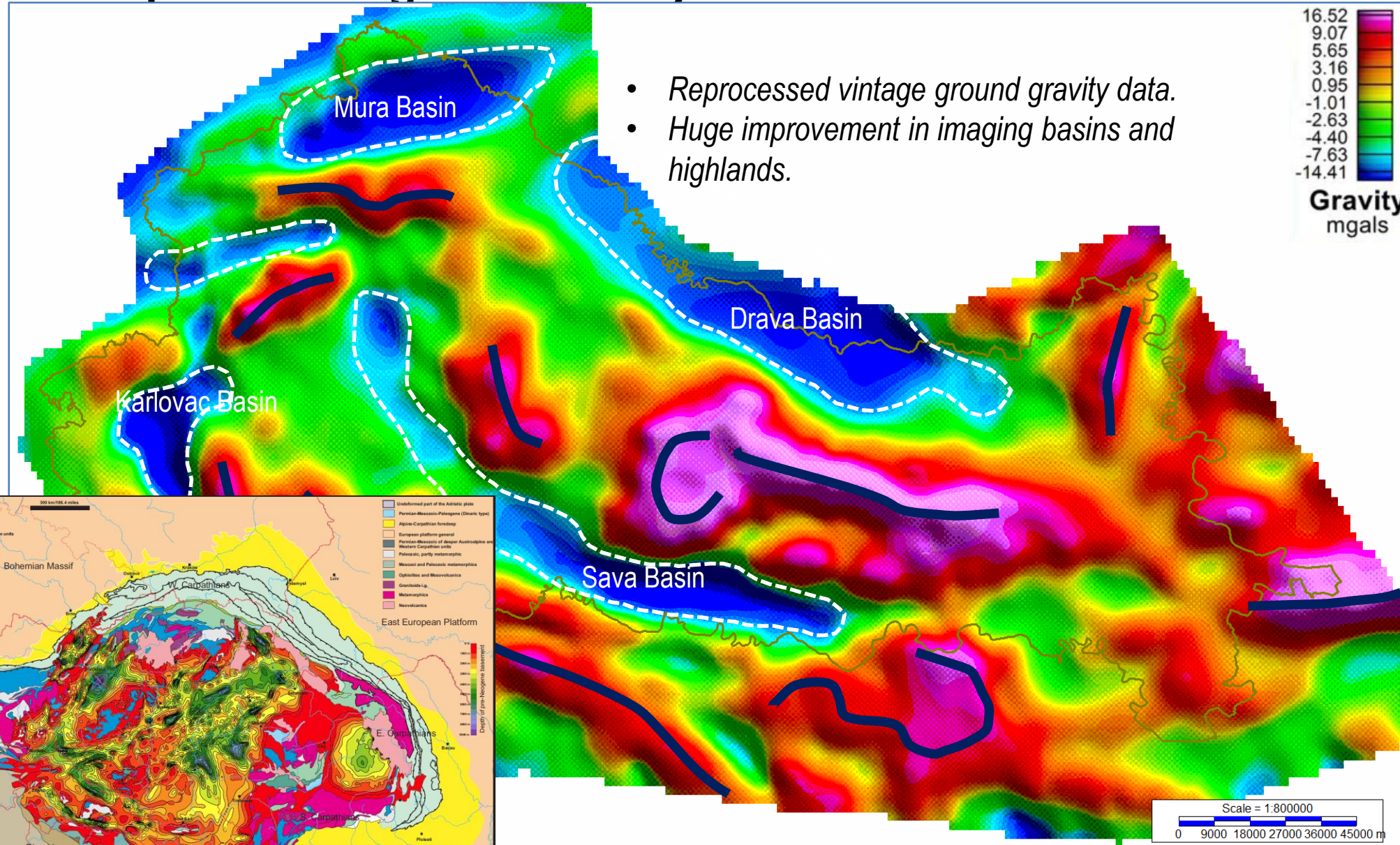
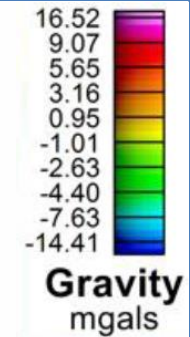
- *Public data (vintage data, vintage processing).*
- *Low resolution.*





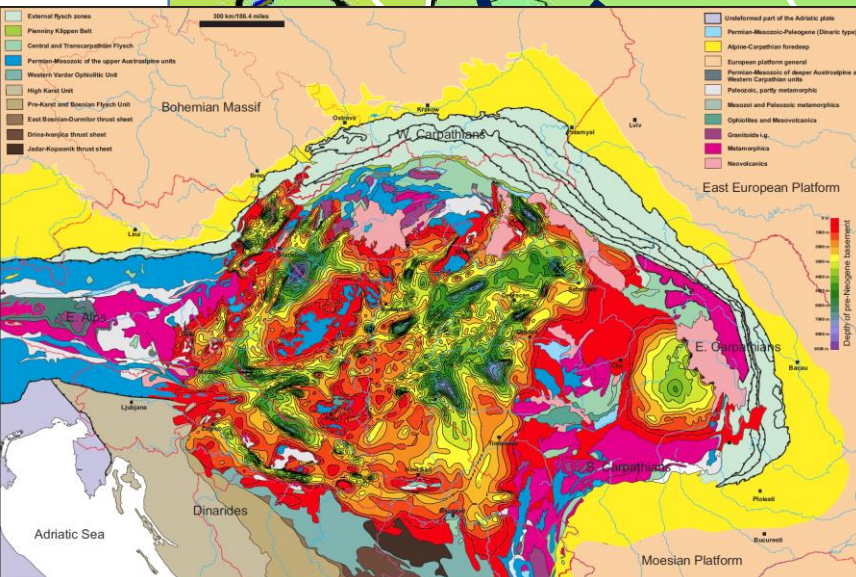
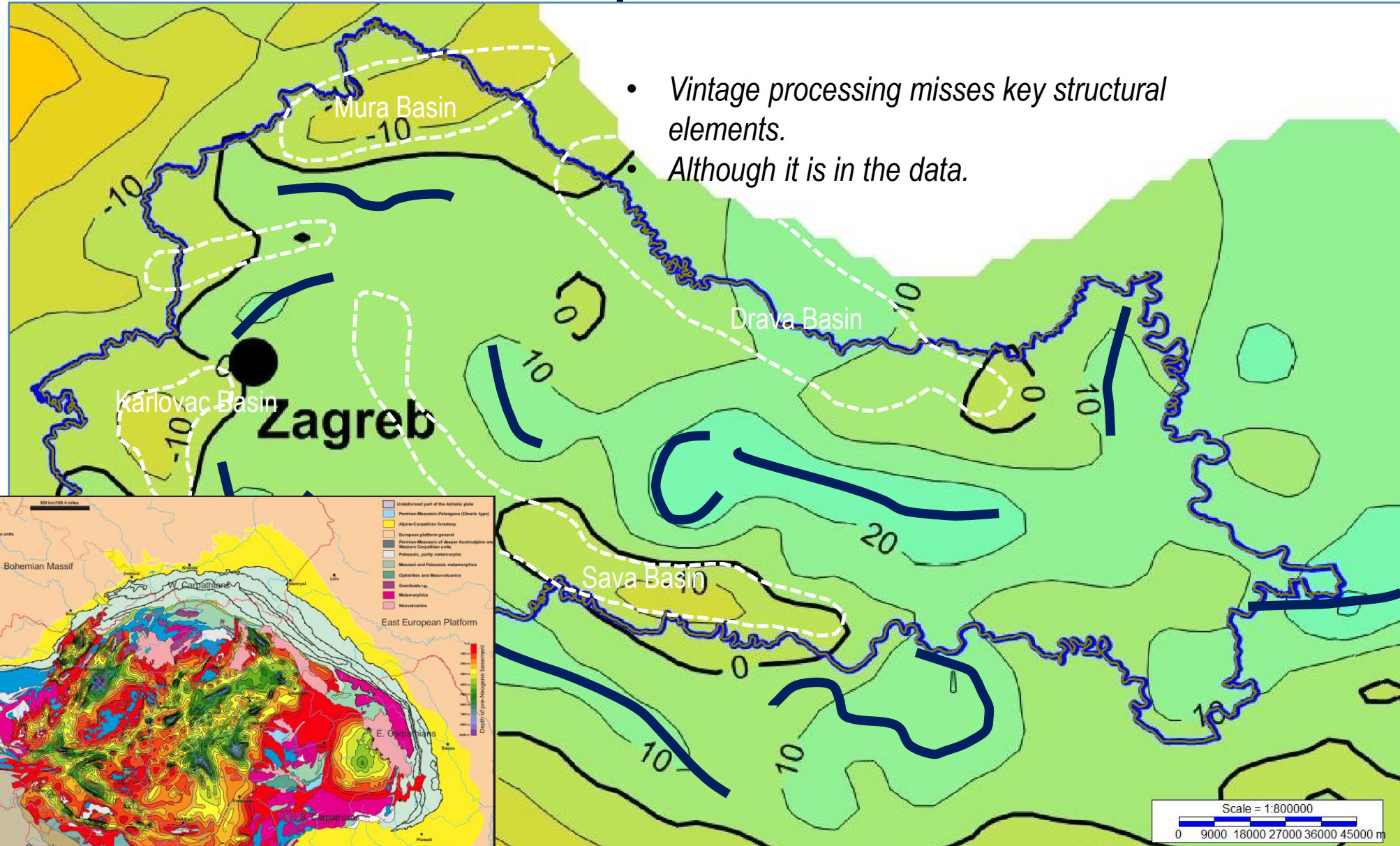
# Bell Geospace – Bouguer Anomaly

- Reprocessed vintage ground gravity data.
- Huge improvement in imaging basins and highlands.





# Exploration workflow – first steps



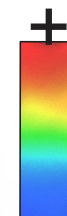


# GeTech – Bouguer Anomaly

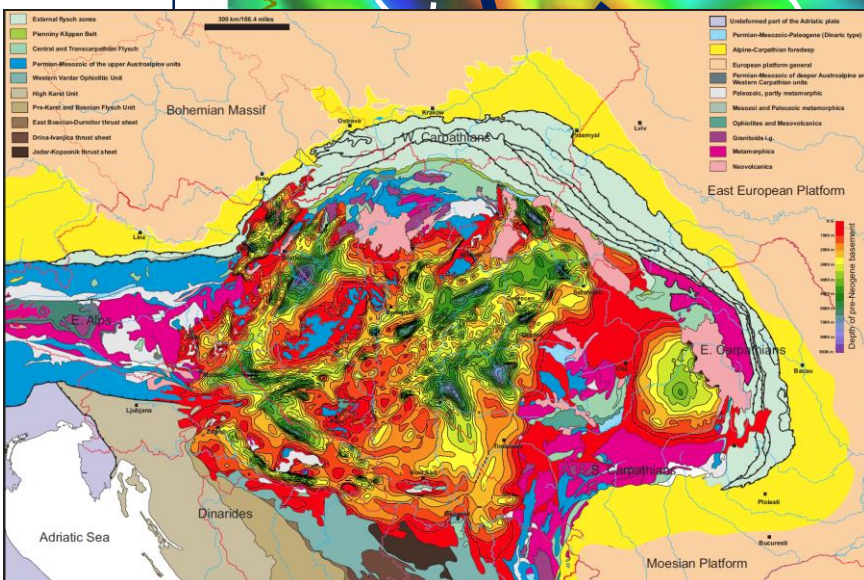


GETech Ground Bouguer map

- Second reprocessing did bring out the structural elements also.
- Establishing high confidence.

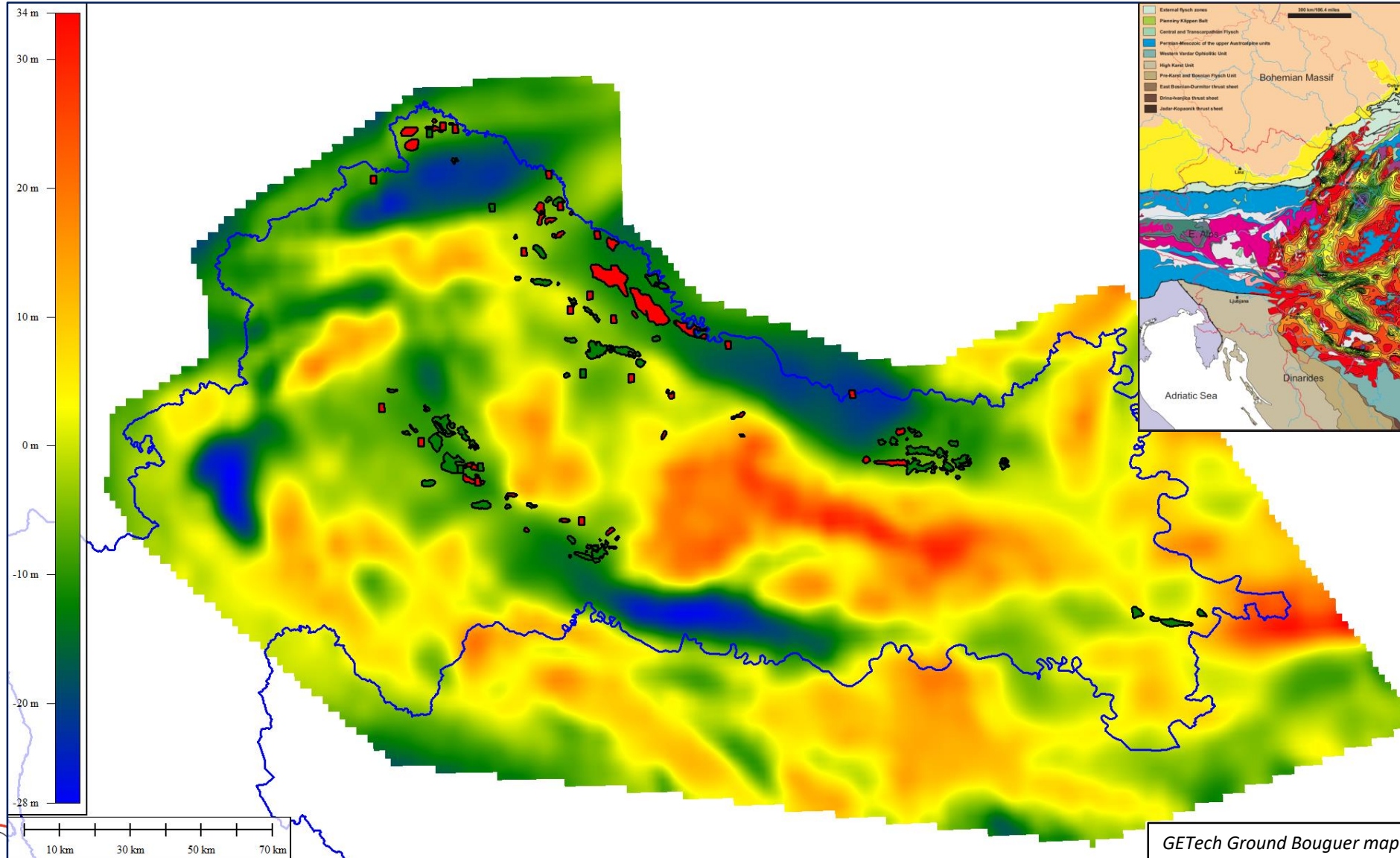


Scale = 1:800000  
0 9000 18000 27000 36000 45000 m





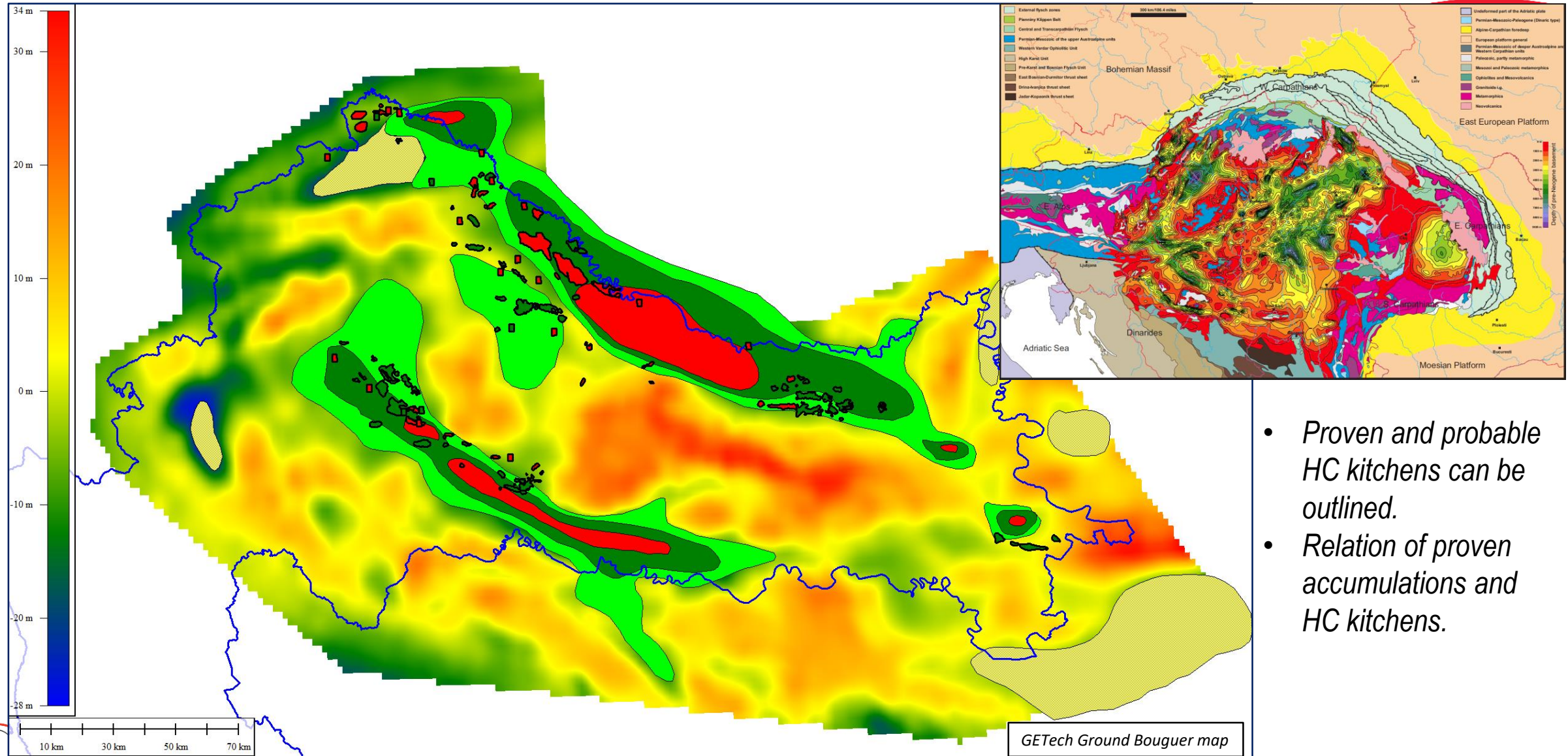
# Data integration as key to understanding I.



- Reprocessed Bouguer anomaly map can be used for basin scale HC potential analysis.
- Data from proven oil accumulations, wellbores, surface HC seeps, etc.



# Data integration as key to understanding II.

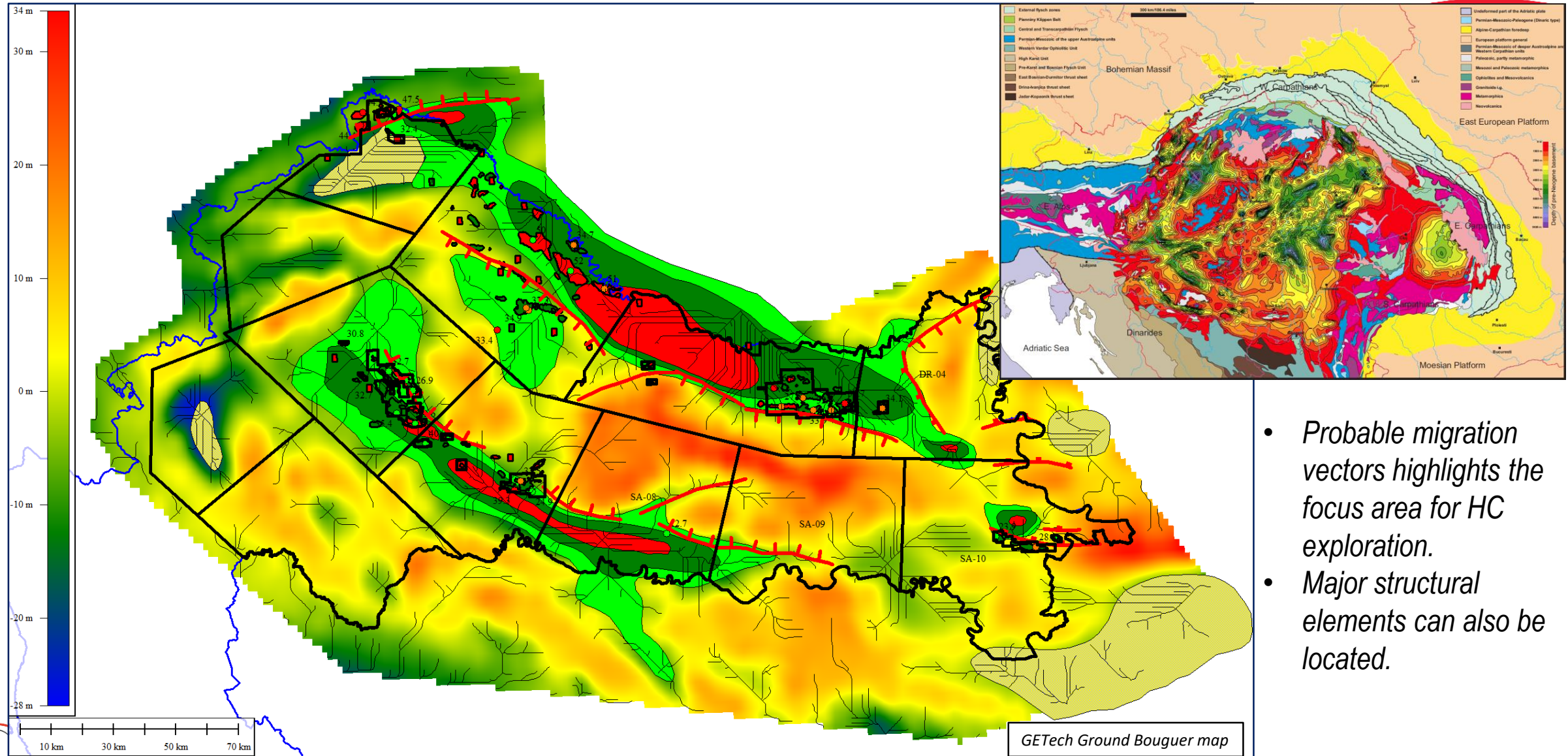


- Proven and probable HC kitchens can be outlined.
- Relation of proven accumulations and HC kitchens.

GETech Ground Bouguer map



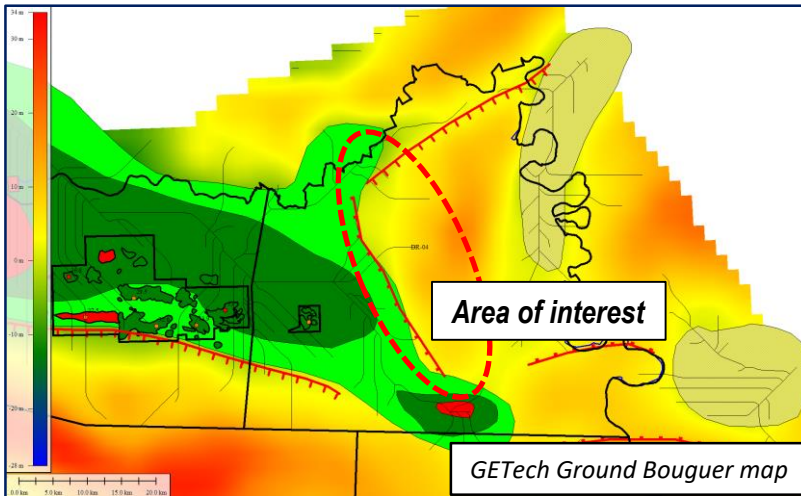
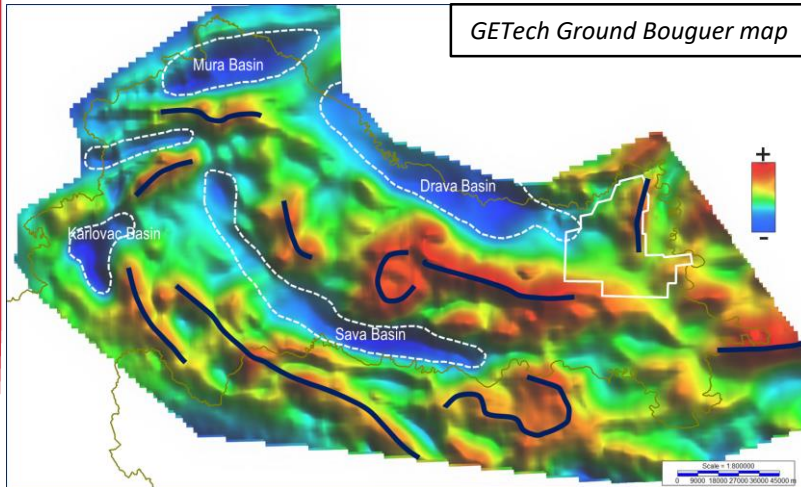
# Data integration as key to understanding III.



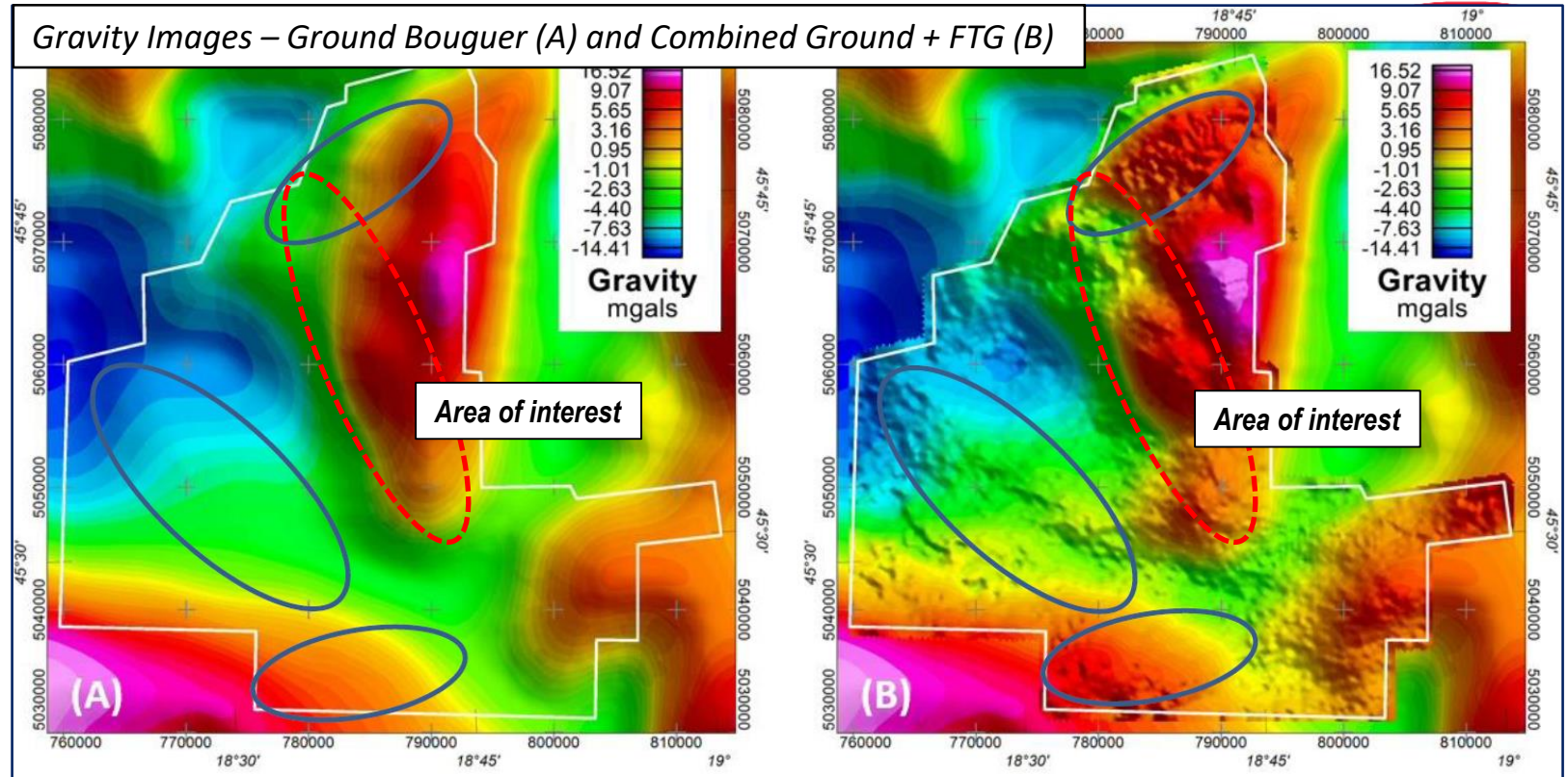
- Probable migration vectors highlights the focus area for HC exploration.
- Major structural elements can also be located.



# Eastern Drava Basin



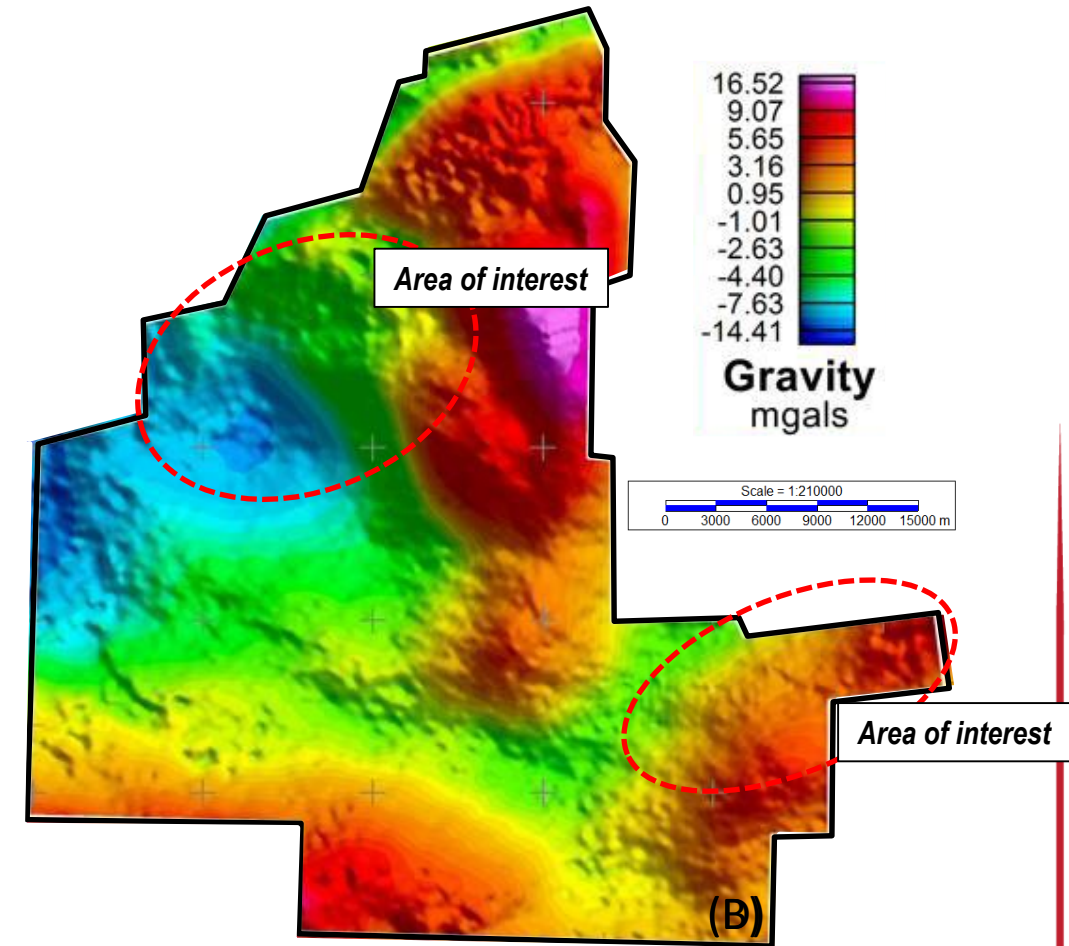
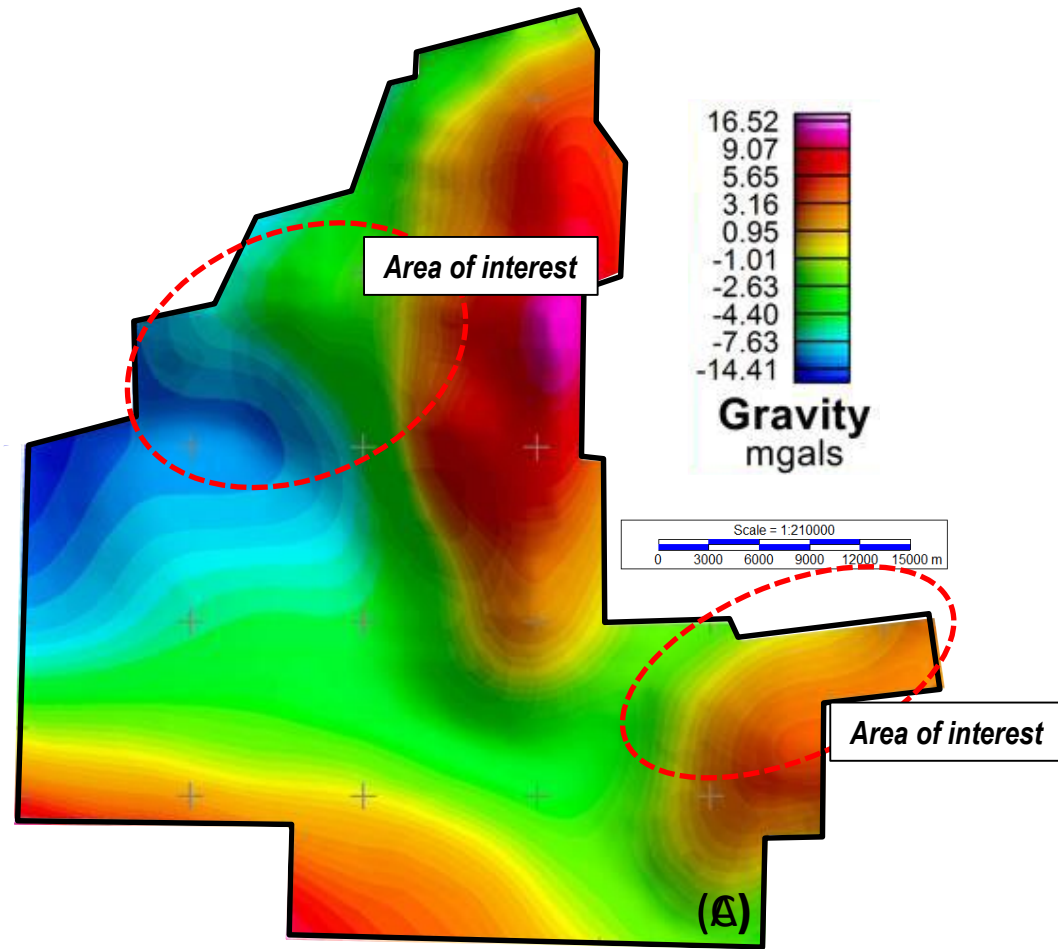
Gravity Images – Ground Bouguer (A) and Combined Ground + FTG (B)



- Potential migration vectors highlights the eastern edge of the Drava basin as an area have likely seen some HC charge from the proven basin.
- Airborne FTG and magnetic survey has been acquired for better imaging the area.
- Vintage 2D seismic data is of low quality.
- Based on the FTG data, new 2D seismic program have been executed.

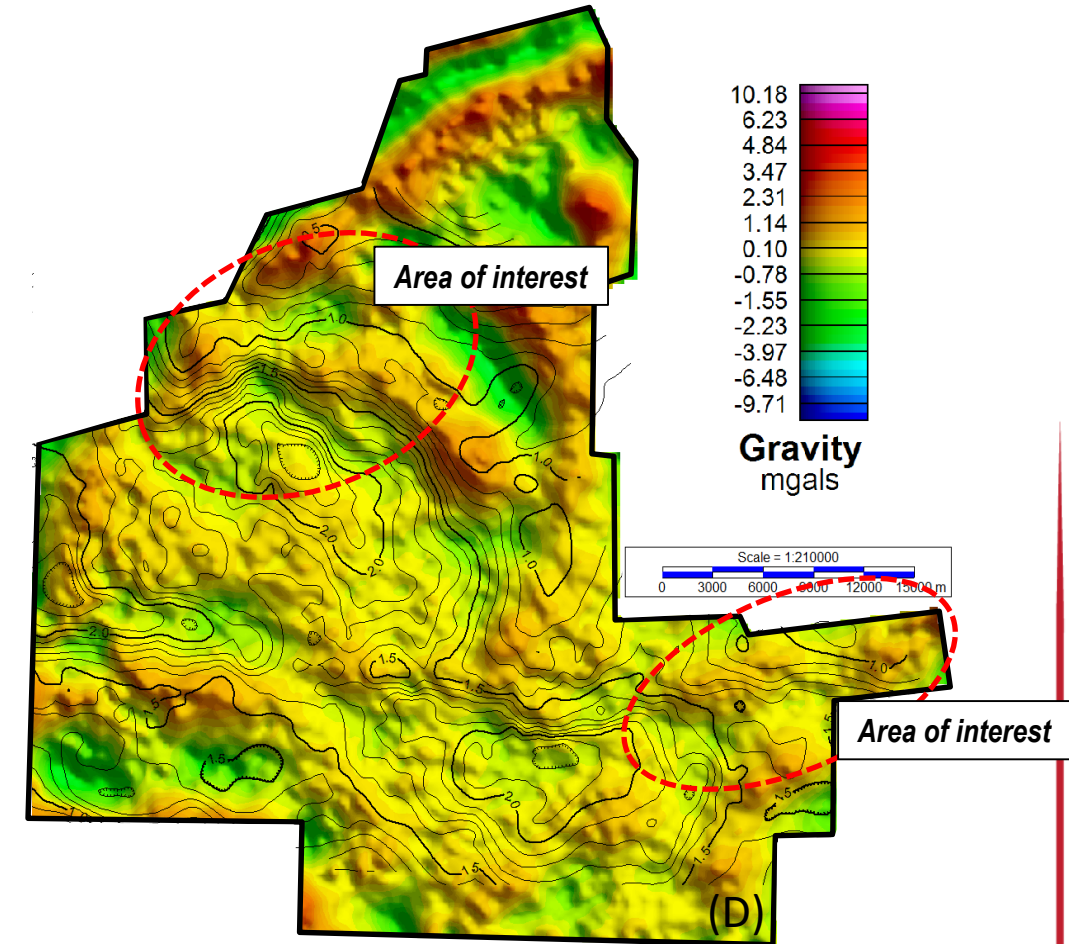
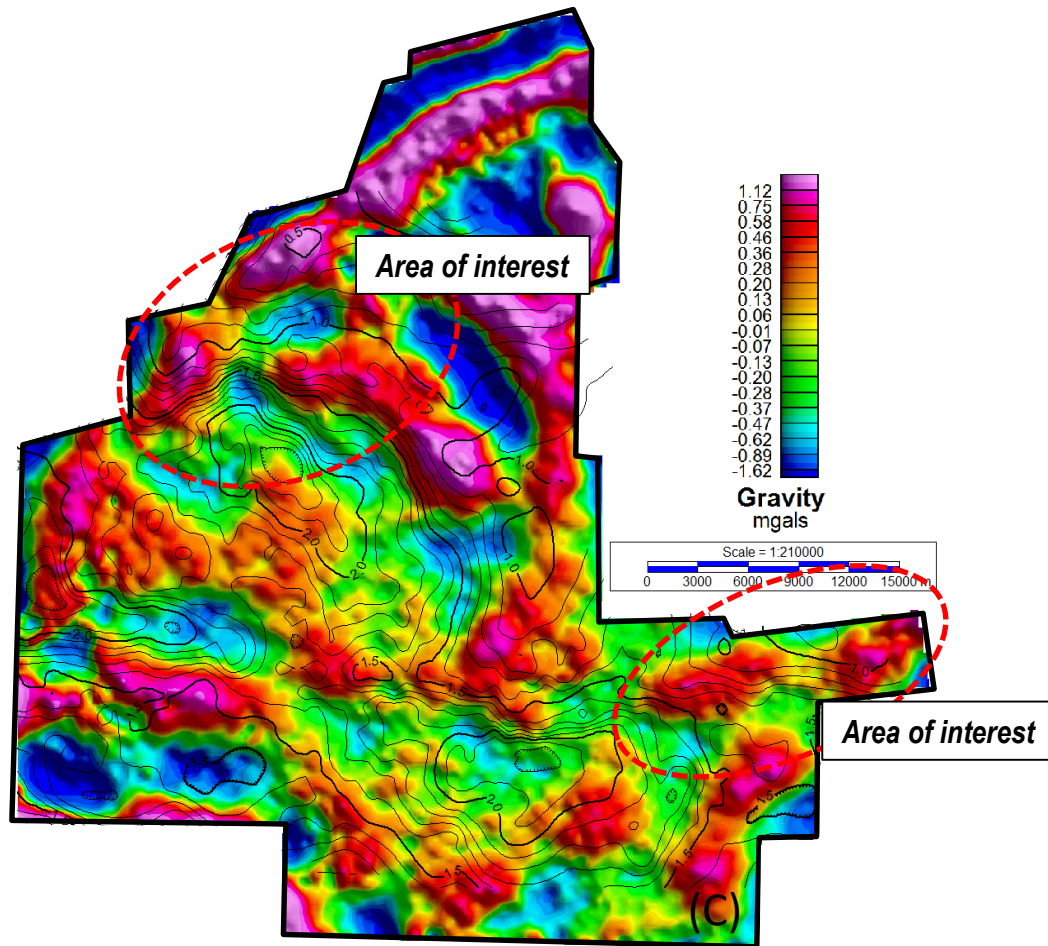


# Ground Bouguer (A) and Combined Ground + FTG (B)





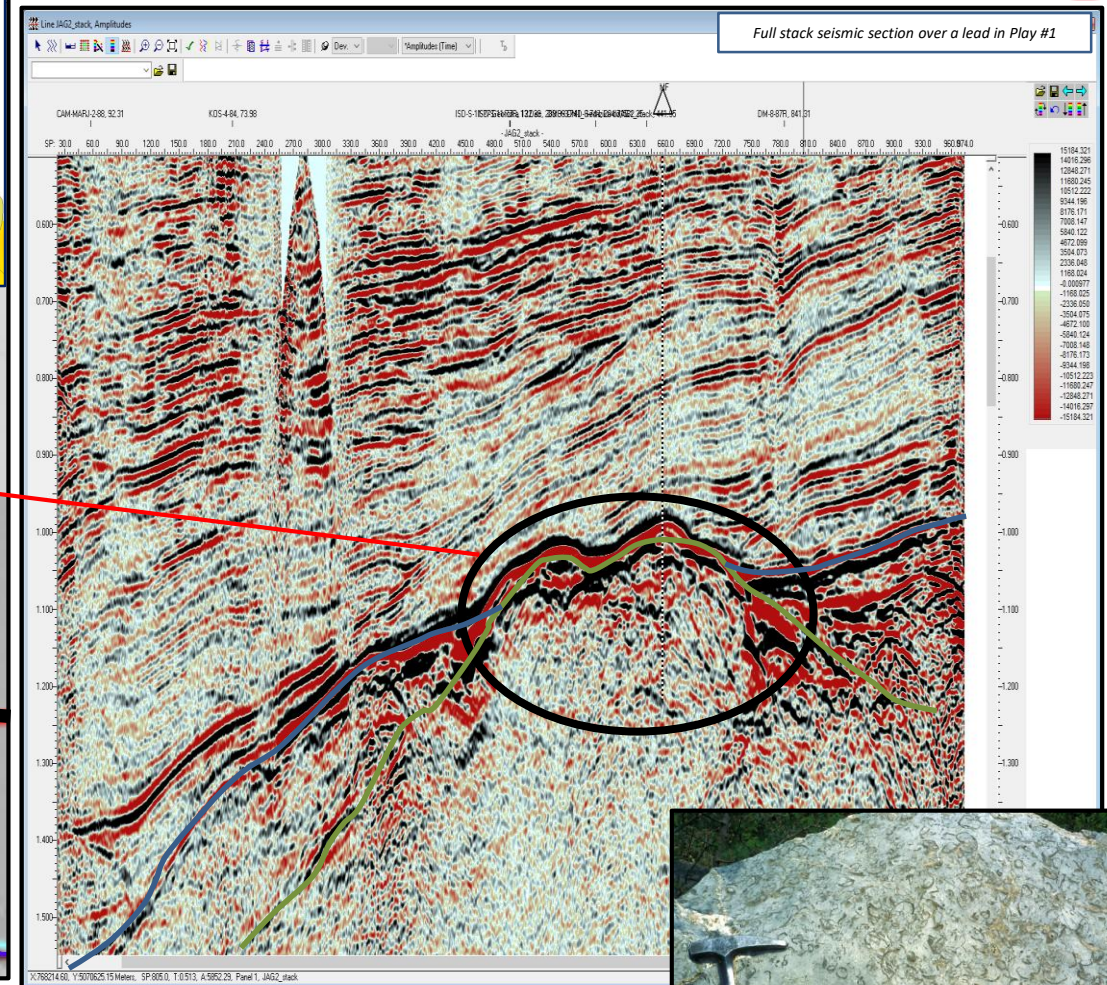
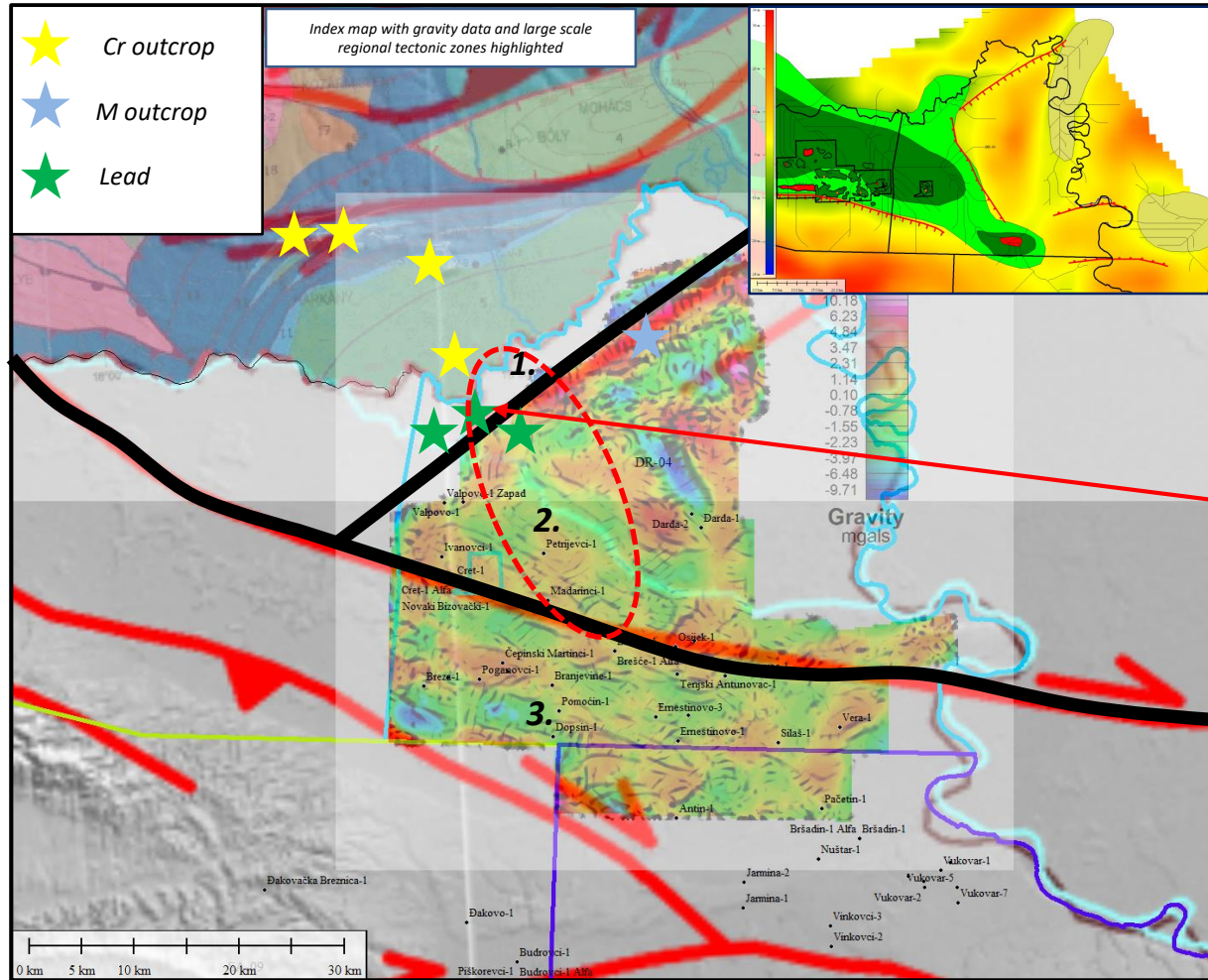
# Residual Gravity 10km (C) and Gravity (D) with TWT contour of the Base Pannonian





# Eastern Drava Basin - Nagyharsányi Limestone (Cretaceous) play

## Outcrops across the border

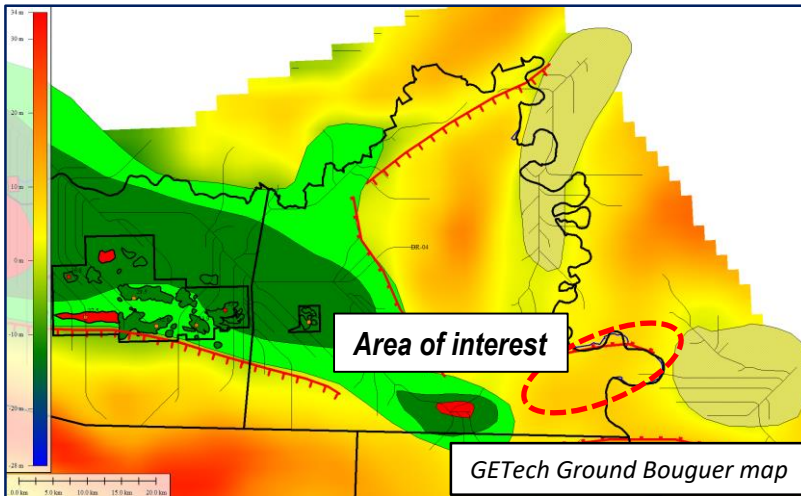
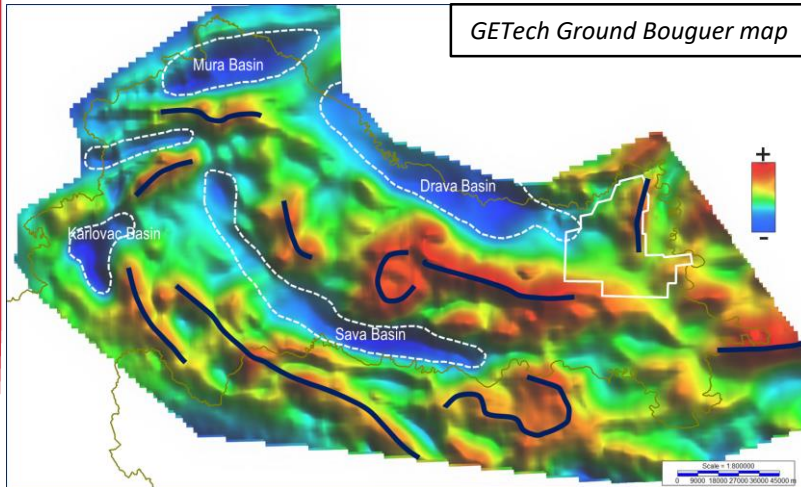


Surface anticline have already been excavated. Reservoir rock properties are well known. Large crystall-rich caves have been discovered during mining activity. Similar structures are assumed by seismic in the NW edge of DR-04 with similar rock properties.

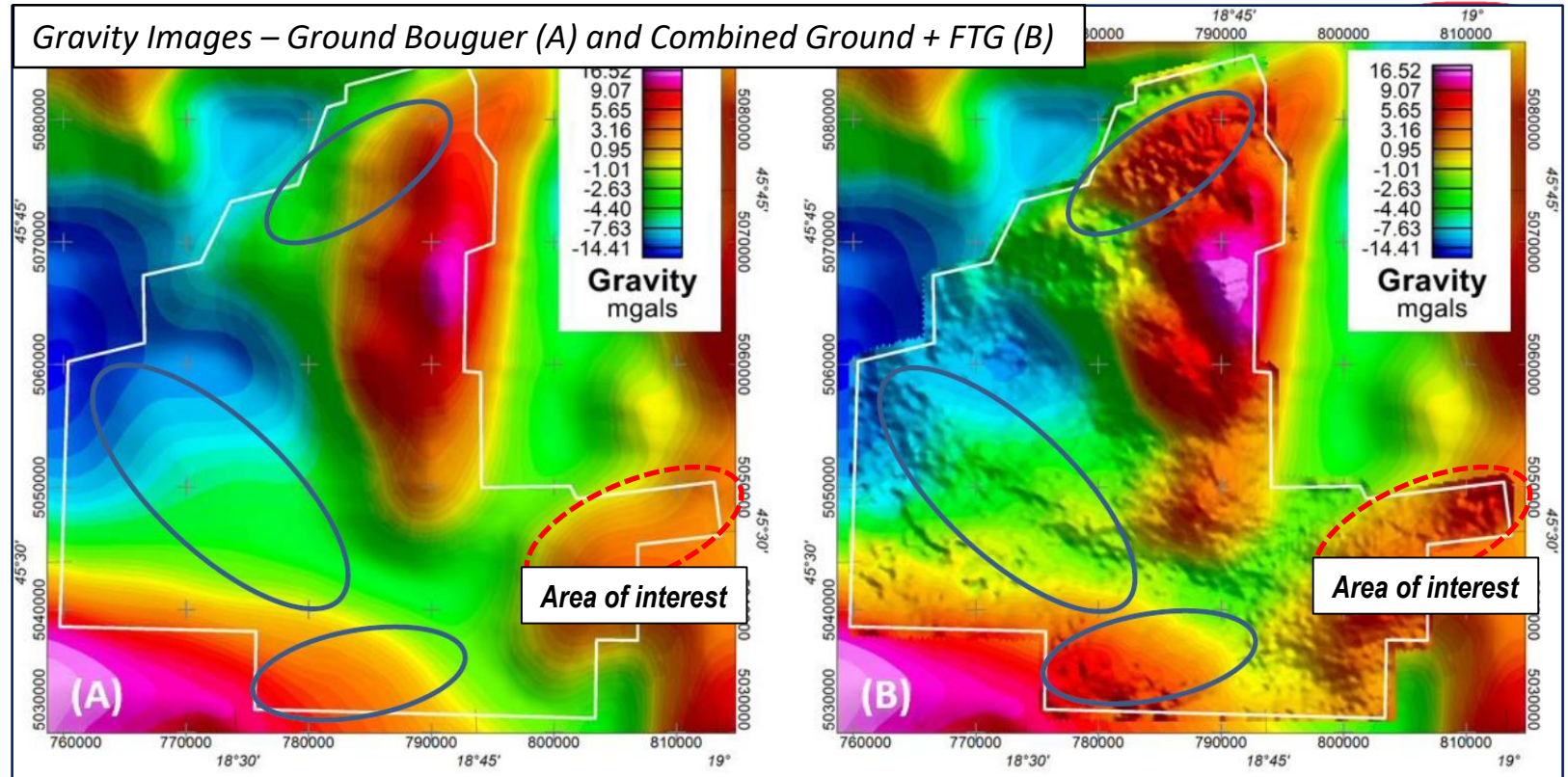




# Eastern Drava Basin



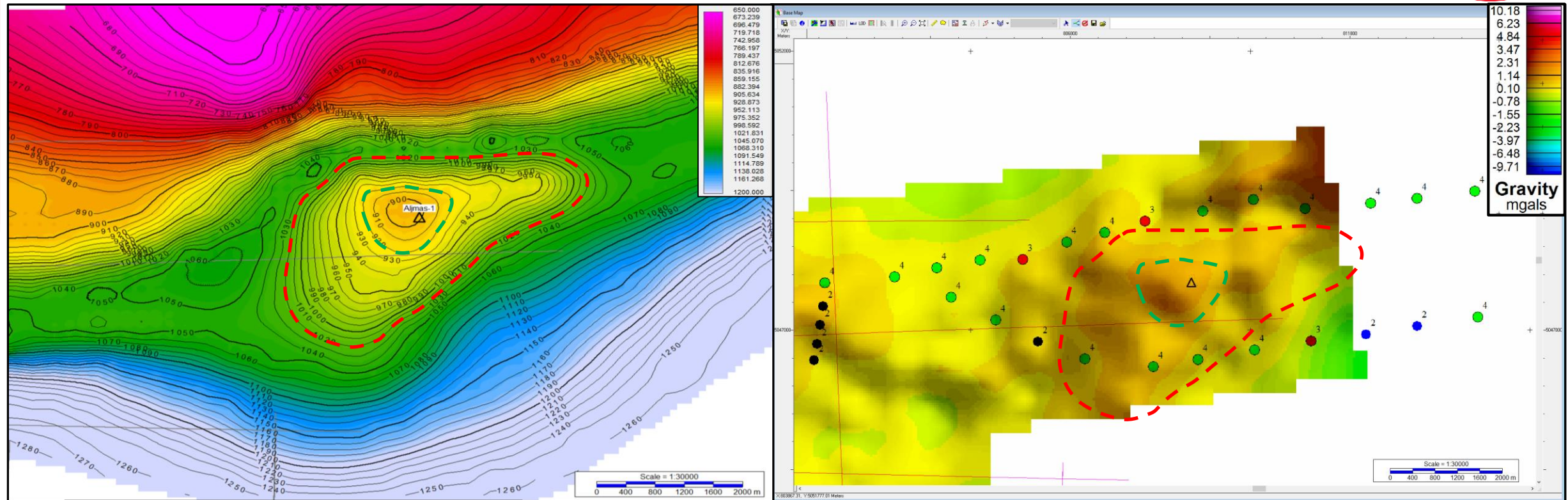
Gravity Images – Ground Bouguer (A) and Combined Ground + FTG (B)



- Potential migration vectors highlights the eastern edge of the license area.
- HC charge likely came from the East and not from the proven Drava Basin.
- Airborne FTG and magnetic survey has been acquired for better imaging the area.
- Vintage 2D seismic data is of low quality.
- Based on the FTG data, new 2D seismic program have been executed.



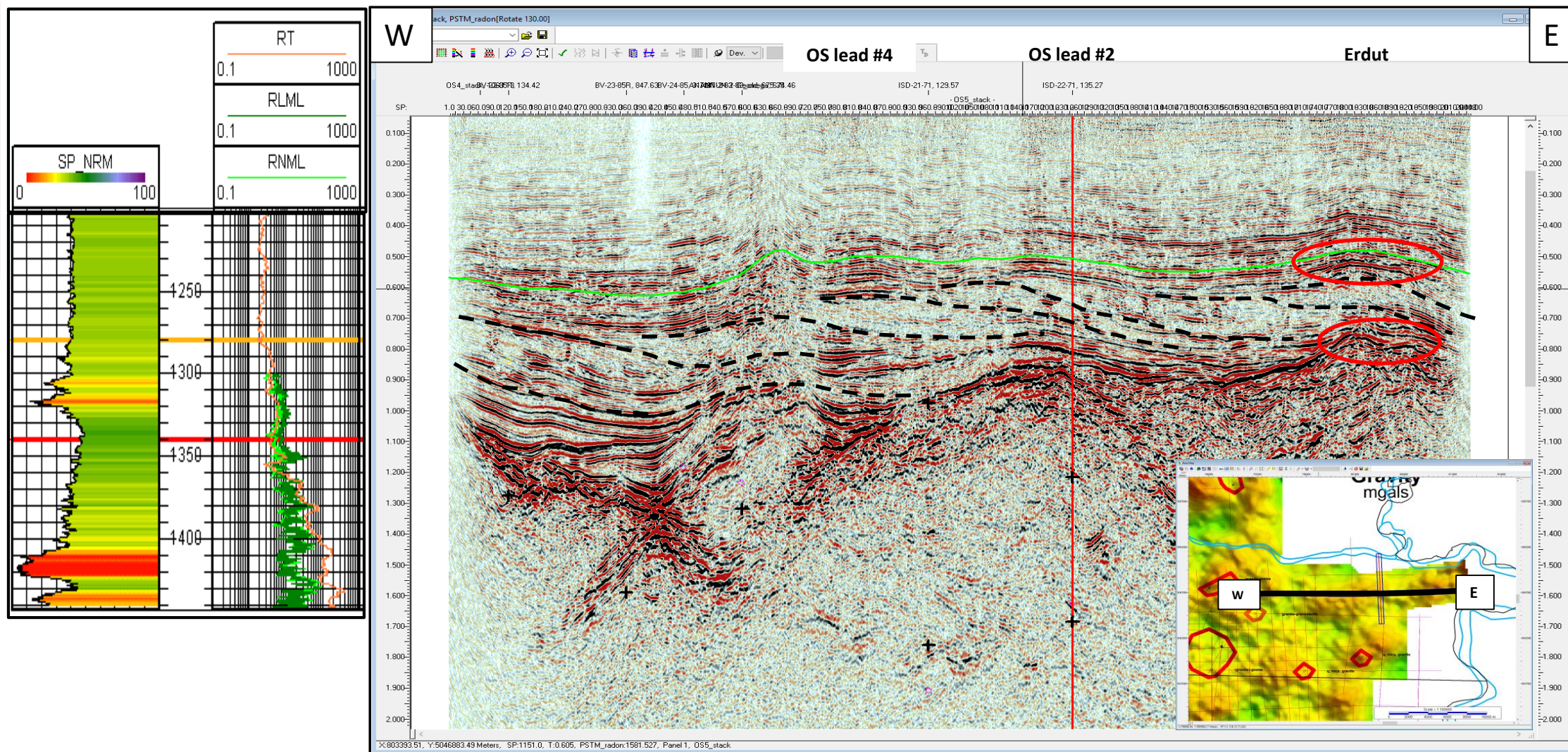
# Structural closure in the Miocene



Newly acquired seismic and Full Tensor Gravity suggesting a structural closure in the Miocene beds. These geophysical information are in line with the surface expression of the structure.



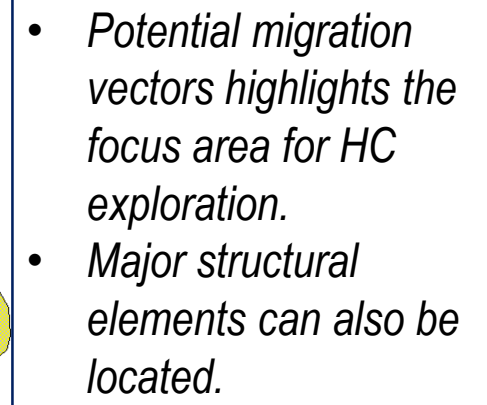
# Erdut Lead – X-section and Offset wells



Leads have been identified on newly acquired Osijek 2D seismic. Both are seismic amplitude anomalies in multiple horizons in the Pannonian section. Exploration tail exists in both cases.

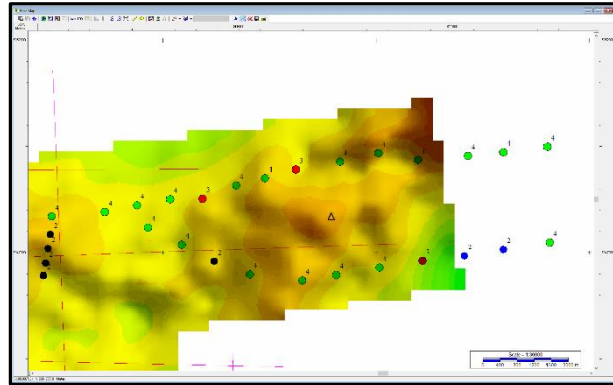


**VETVISION**  
the best energy company in the world





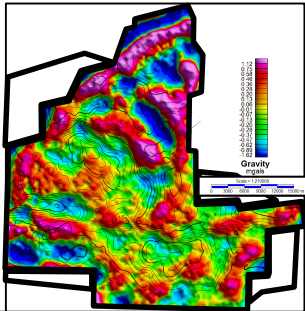
# Gravity data in HC exploration workflow



## Prospect

Potential  
accumulation  
outline

- *Only in case of good quality, high density data.*



## HC play

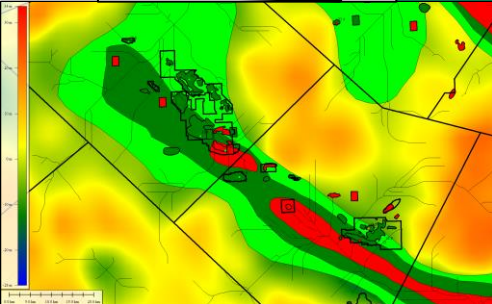
Trapping mechanisms  
Reservoir rocks

- *Newly acquired gravity data (ground, airborne).*
- *Employing modern acquisition techniques.*

## Basin

Basin outline  
Sedimentary fill  
Maturity levels  
Migration pathways

- *Vintage ground gravity data.*
- *Public gravity maps.*
- *Reprocessing of vintage ground gravity data.*







**Thank you for your kind attention!**

