X Национална конференция по геофизика, 04 юни 2021
X National Geophysical Conference, 4th June 2021

Комплексно геолого-геофизично изследване в района на Долно Камчийското понижение - практическо обучение за студенти

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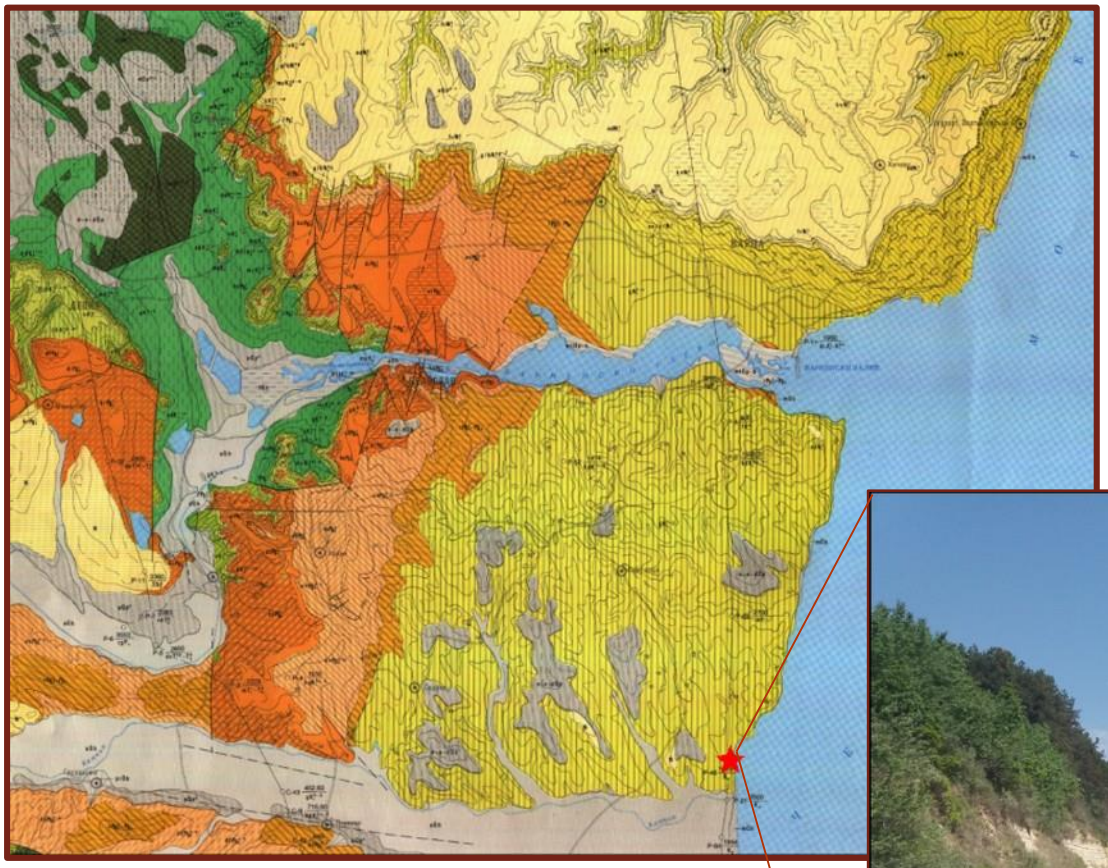
TOTAL

Training

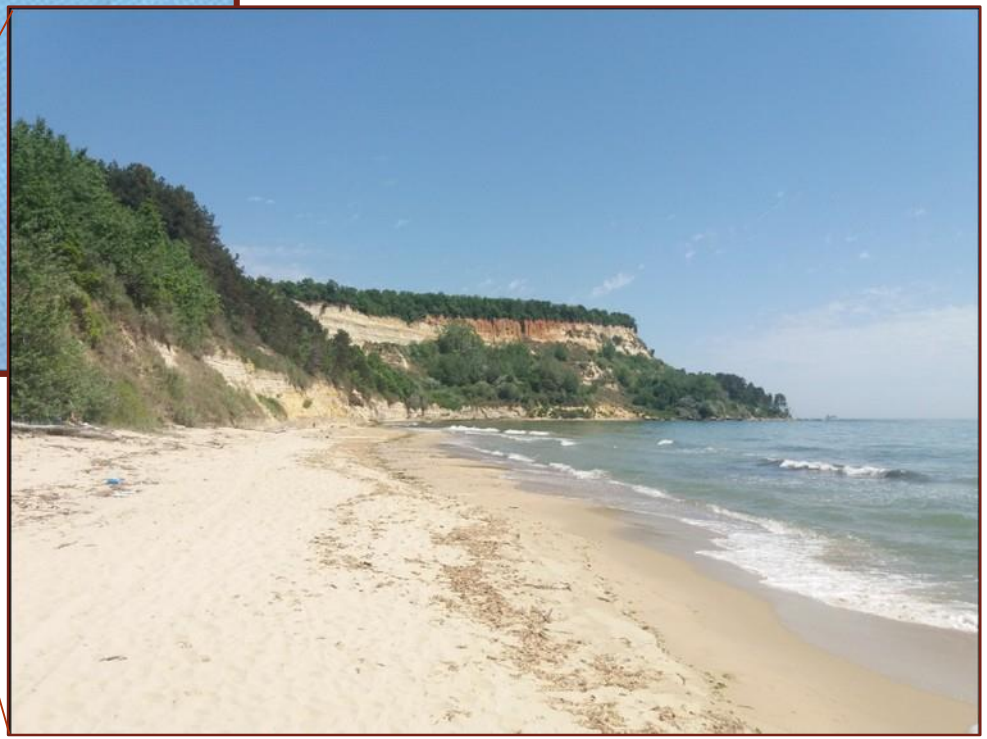
- 19-25 Mai 2019 complex “Romantika”, Kamchia
- 28 students and lecturers
- Practical tasks and theoretical lectures



Outcrop description



Geological map of Bulgaria (M1:100000), map sheet ”Varna and Zlatni pyasatsi” with position of the investigated outcrop (red star).



View of the Galata Fm outcrop at Romantika beach.

Practical tasks - Geology





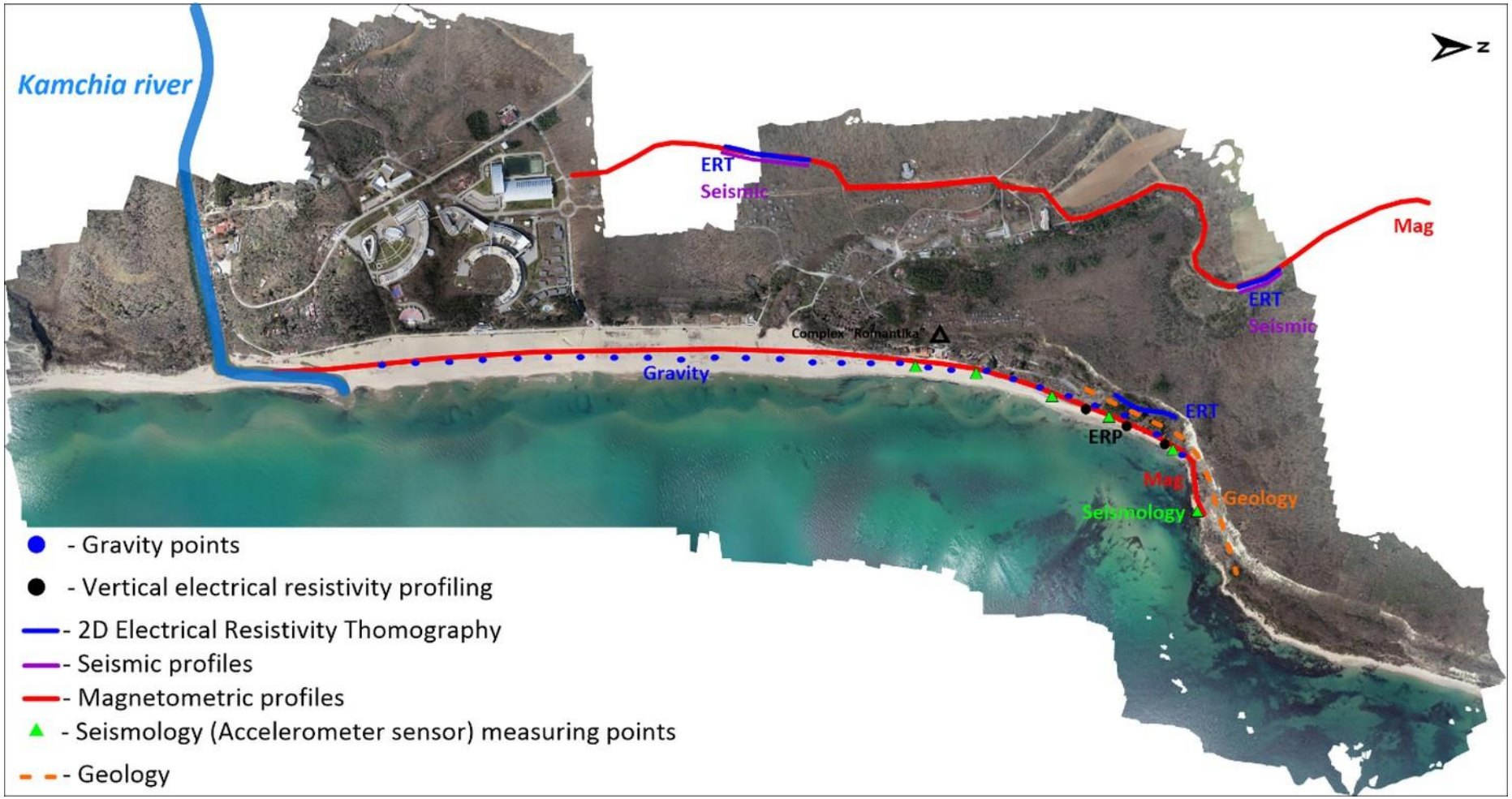
The training started with a presentation, containing the following sections:

- Introduction to sedimentary rocks and their features;
- Sedimentary sections description;
- Review of the most basic and frequently used laboratory methods for analyses of sedimentary rocks;
- Introduction to facies analysis and sedimentary environments interpretation;
- Short description on reservoirs and source rocks properties, and types of oil and gas traps;
- Stratigraphy of the Galata Fm.

The accent of the geological training was put on describing a sedimentary outcrop/section and gathering field observational data.



Collected data



Geophysical studies

- Electrical resistivity metho
- Ground-penetrating radar (
- Geomagnetic surveying.
- Kappametry.
- Gravimetrical surveys
- Seismic survey
- H/V spectral ratio
- Aero-photogrammetry.

















Seismic investigations





Seismic profiling (refraction method) along two lines having a total length of 230 m (each line has a length of 115 m).

Practical tasks – Seismic investigations

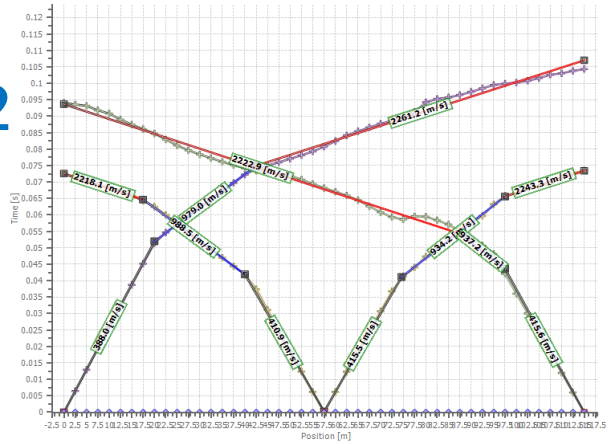




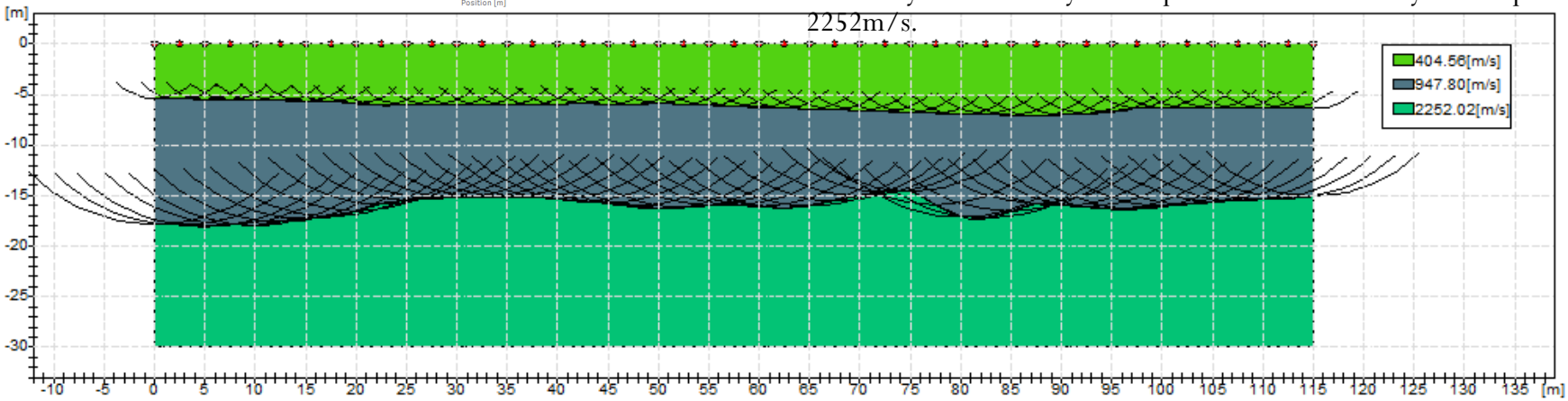


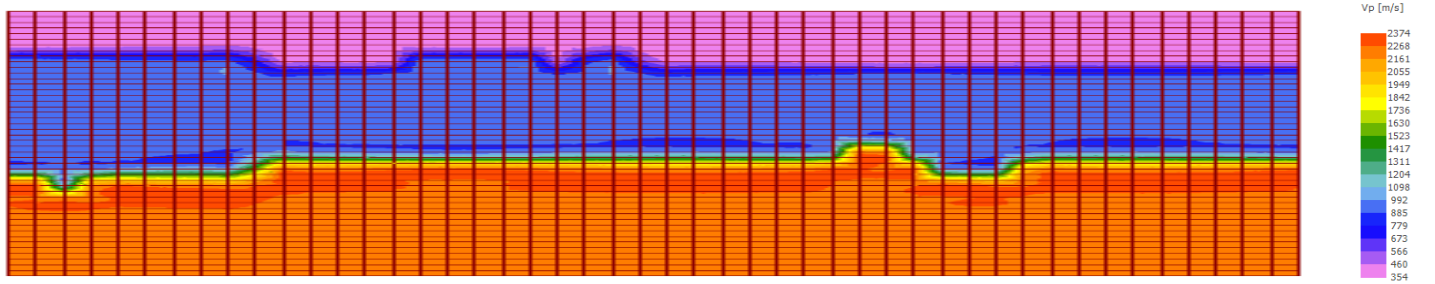
Practical tasks – Seismic investigations

Profile 2



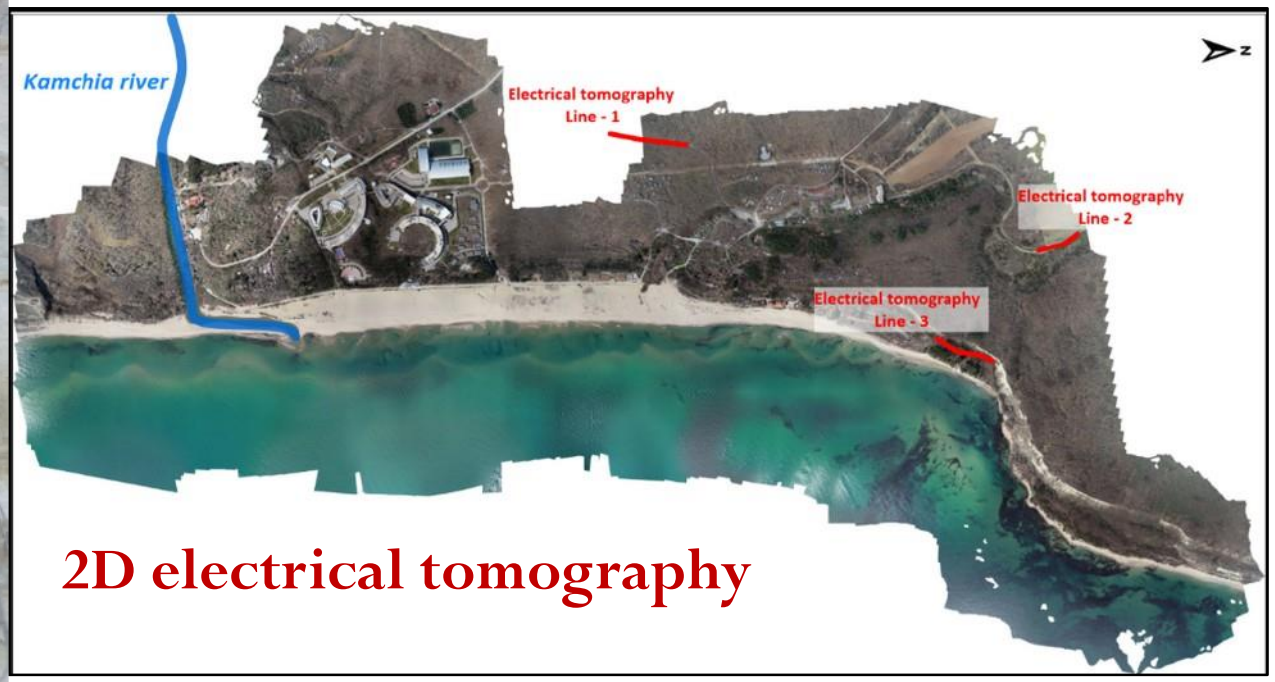
- **Layer 1** comprises the upper part of the geological section, composed of the near-surface soil layer, clayey sands and unattached sands. Thickness of this layer varies from 5 up to 6 m. The established velocity of compressional wave for Layer 1 is Vp = 404 m/s.
- **Layer 2** maps the layer of compacted sands. Thickness of this layer varies from 8 up to 13 m. The established velocity of compressional wave for Layer 2 is Vp = 947m/s.
- **Layer 3** maps the same geological variety-compacted sands and dense clays. The velocity of compressional wave for Layer 3 is Vp = 2252m/s.





Electrical resistivity investigations





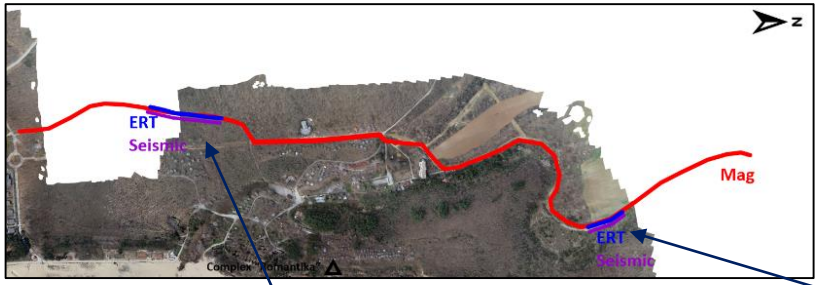
Practical tasks – 2D electrical tomography

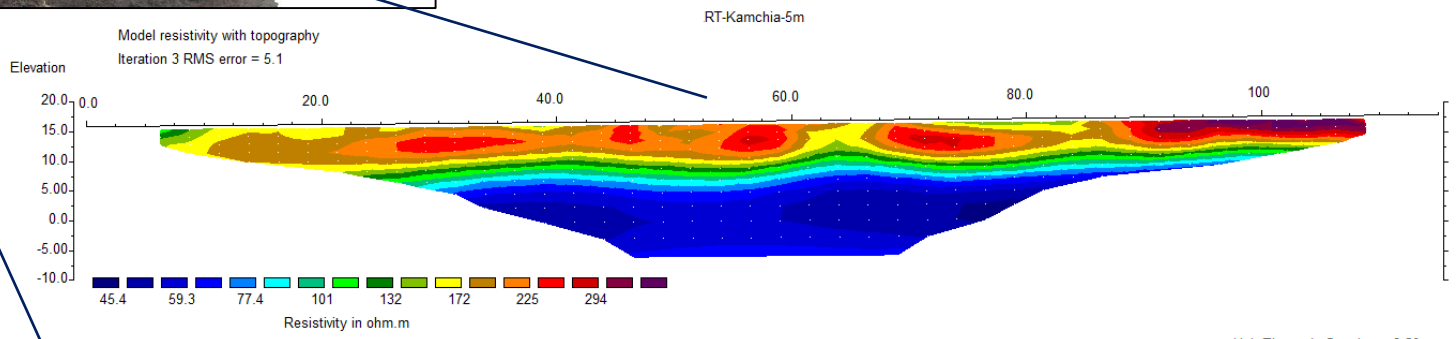


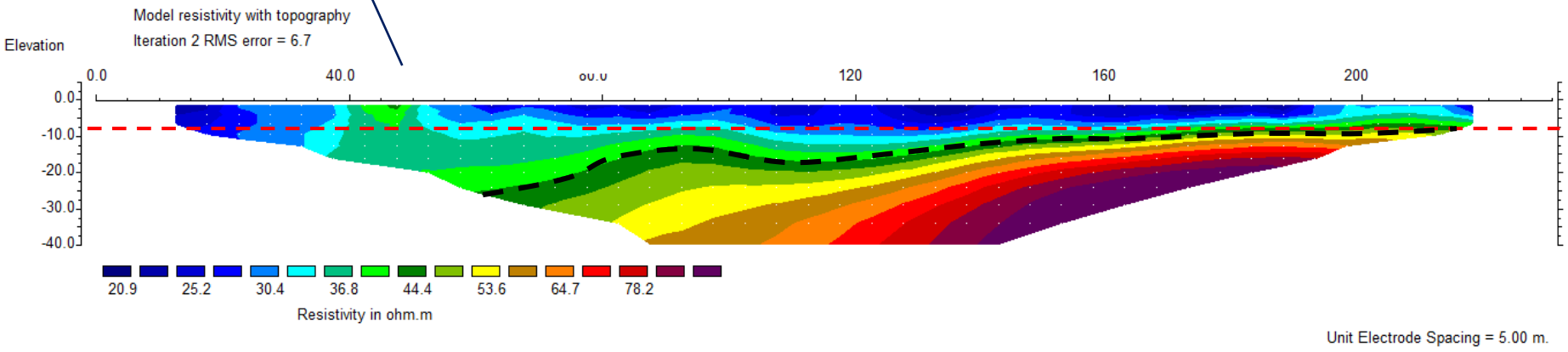




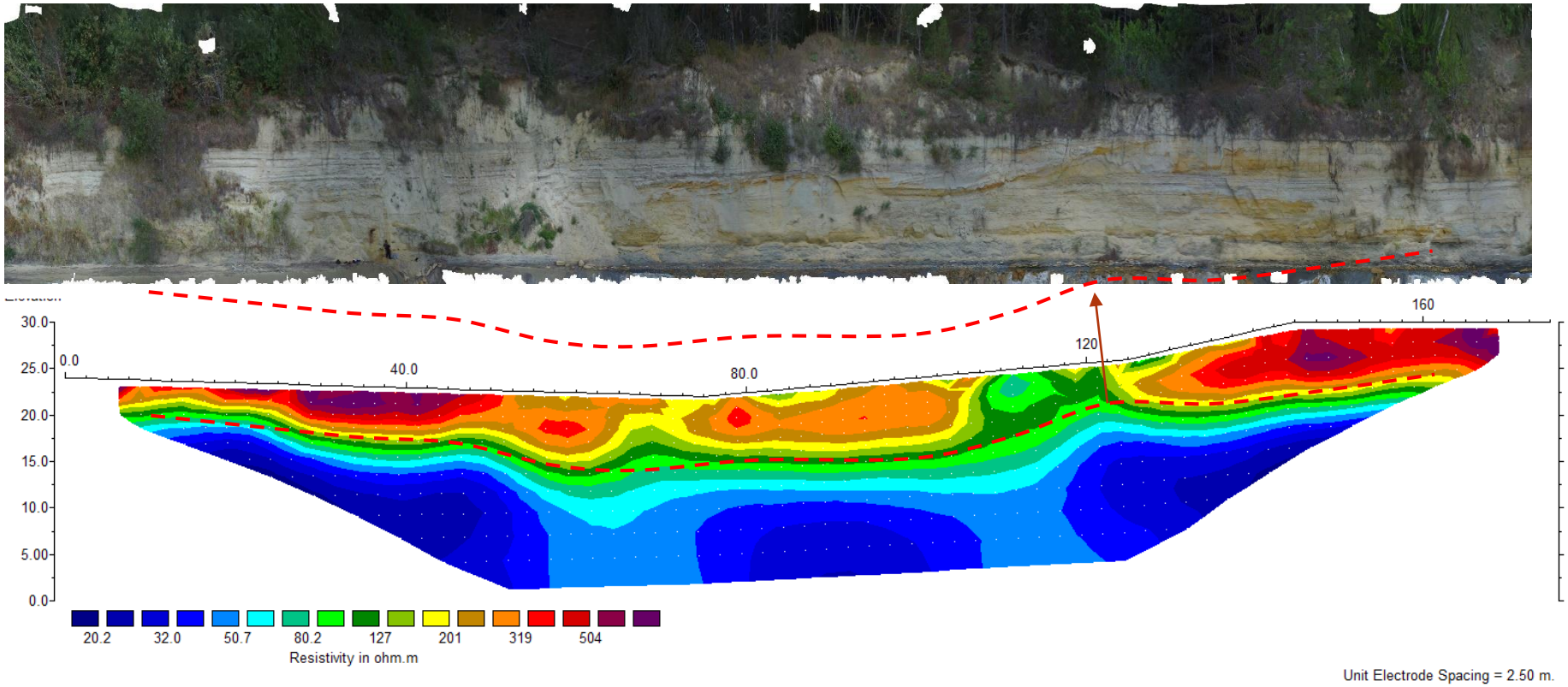
Practical tasks – 2D electrical tomography





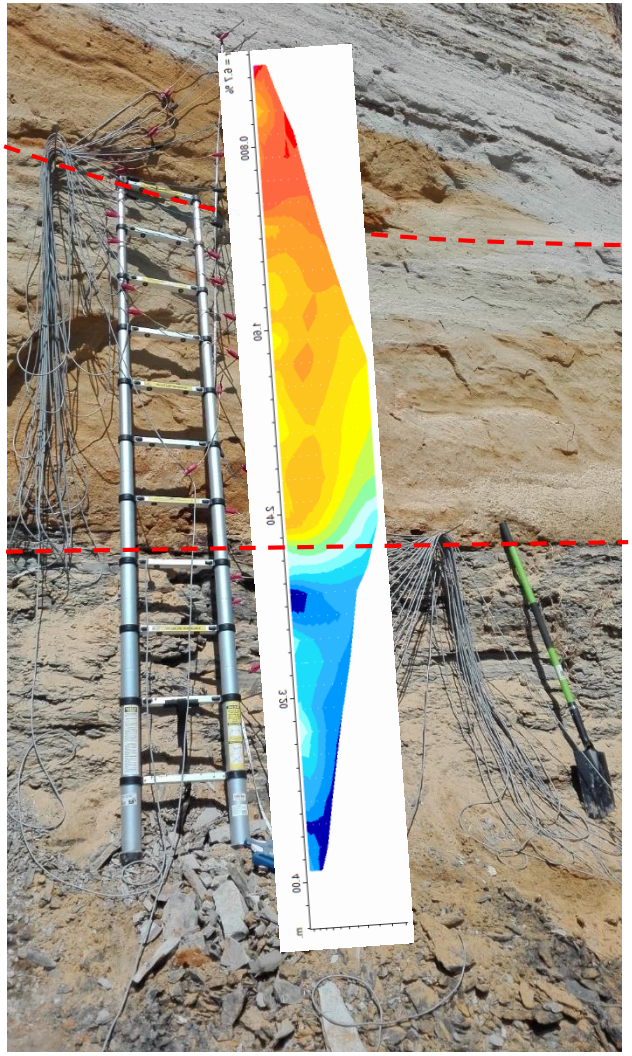


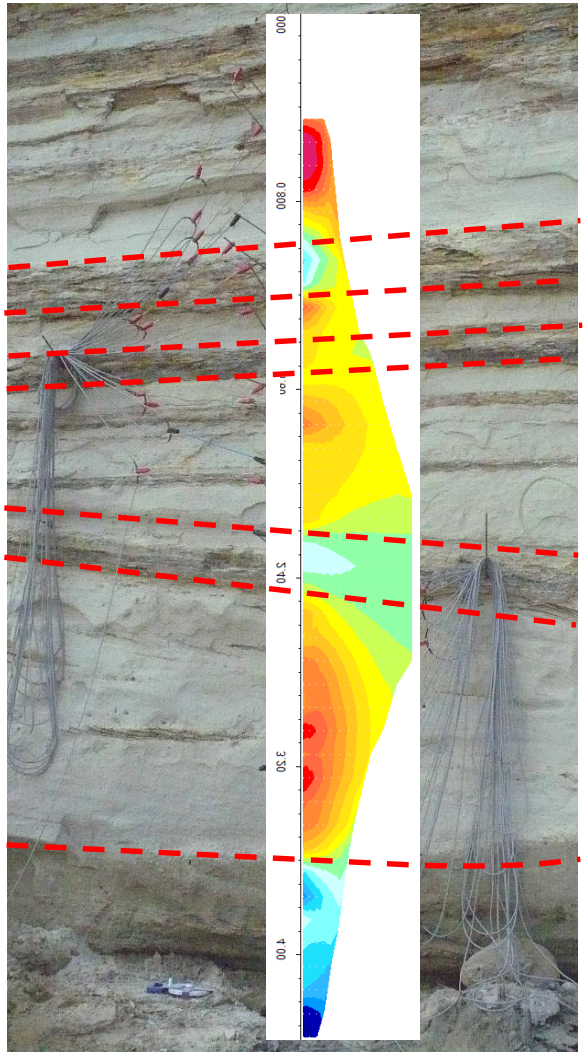
Practical tasks – 2D electrical tomography



The first electrical resistivity media (zone A) is characterized by the highest values of the electrical resistivity for the studied geoelectrical section-in the range from 50 m up to more then 500 m.
This zone maps the upper part of the Neogene sediment complex. It is composed of brown to yellow-brown sands with different grain composition.
The second electrical resistivity media (zone B) is characterized by relatively low values of the electrical resistivity for the studied geoelectrical section-in the range from about 20 m up to 50 m. It is composed of gray sandy clays. Underneath are spread gray to black solid clays.

Practical tasks – 2D electrical tomography





Practical tasks – Gravity

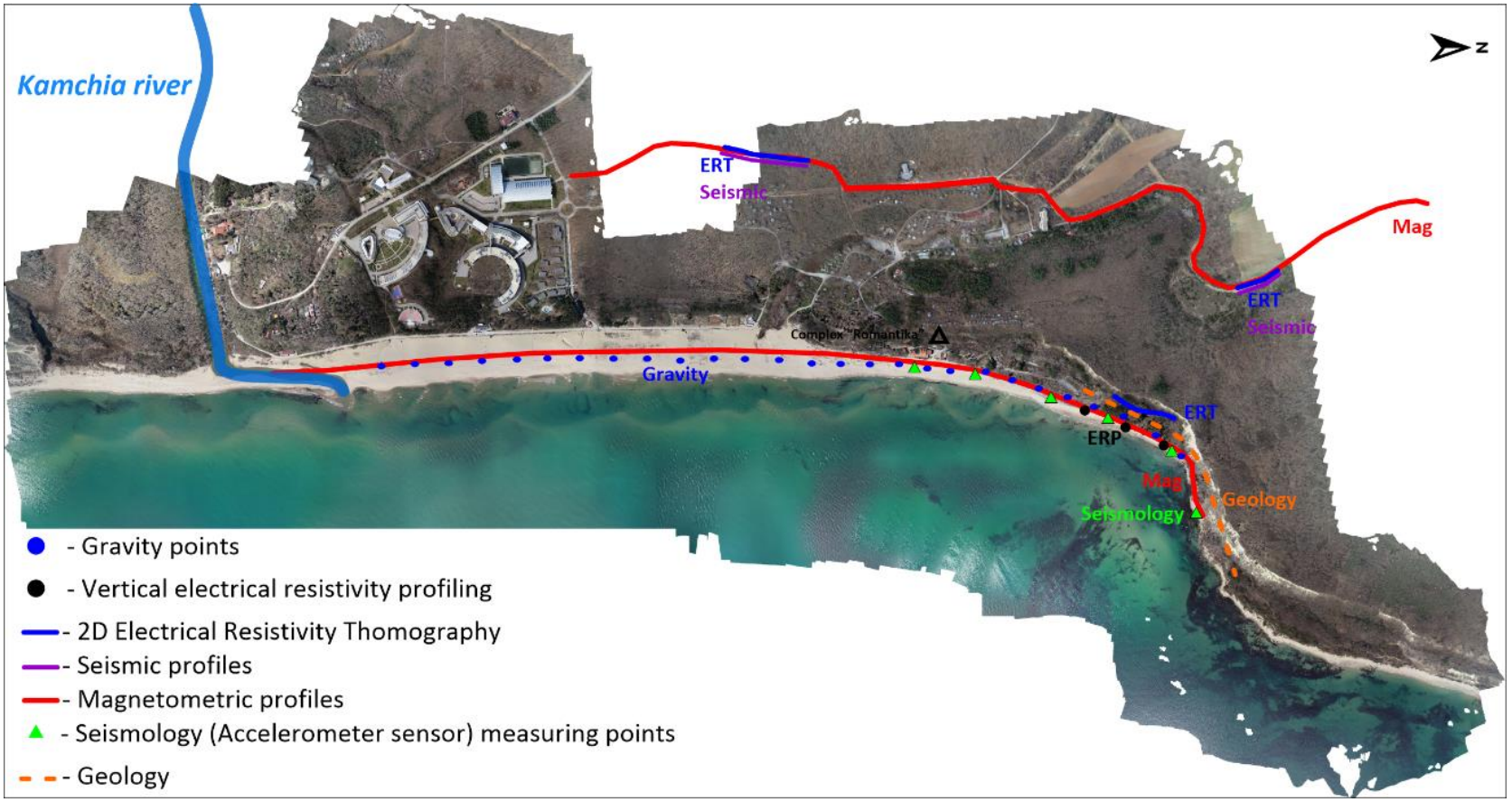






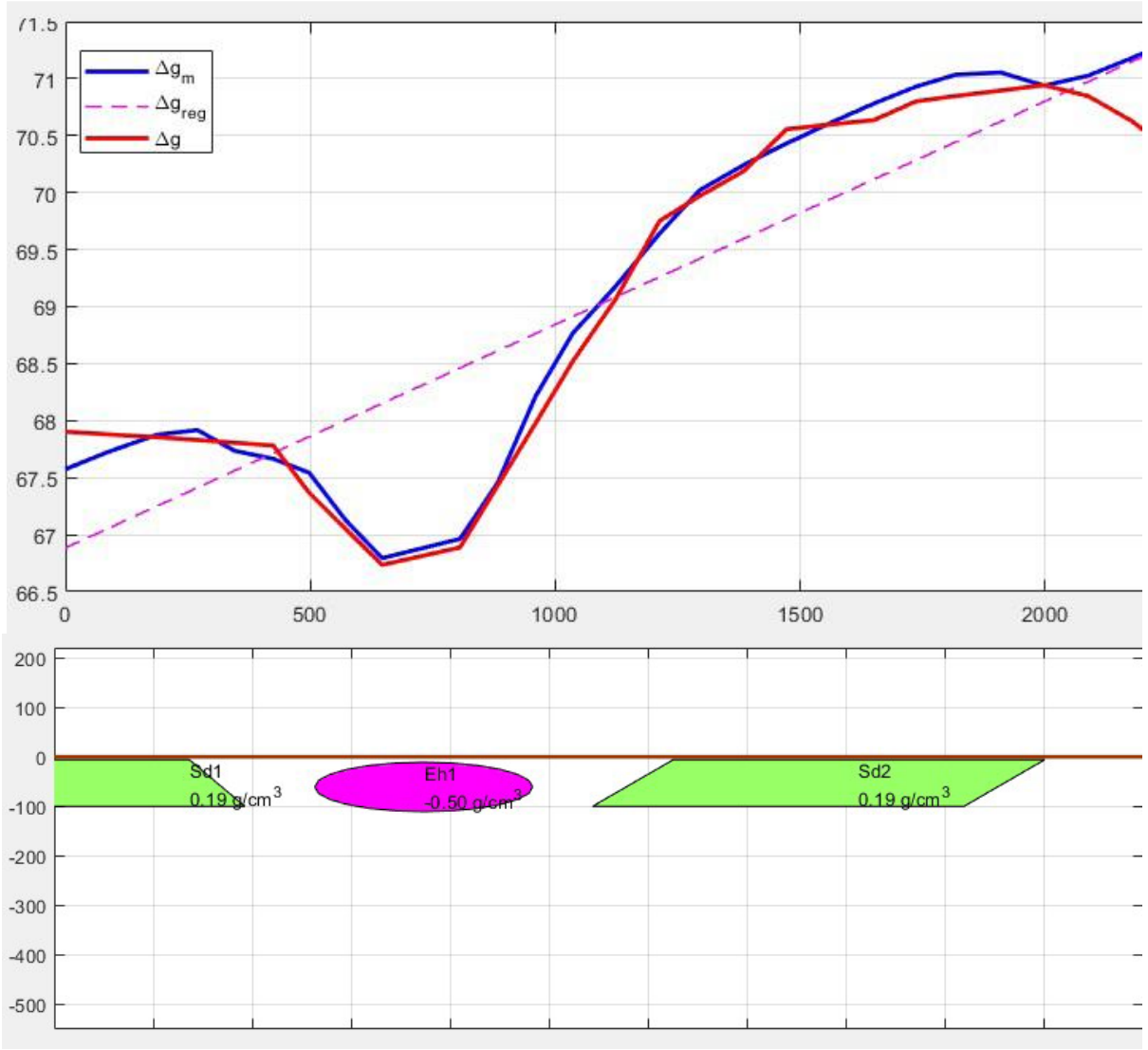


Results from Gravimetrical surveys



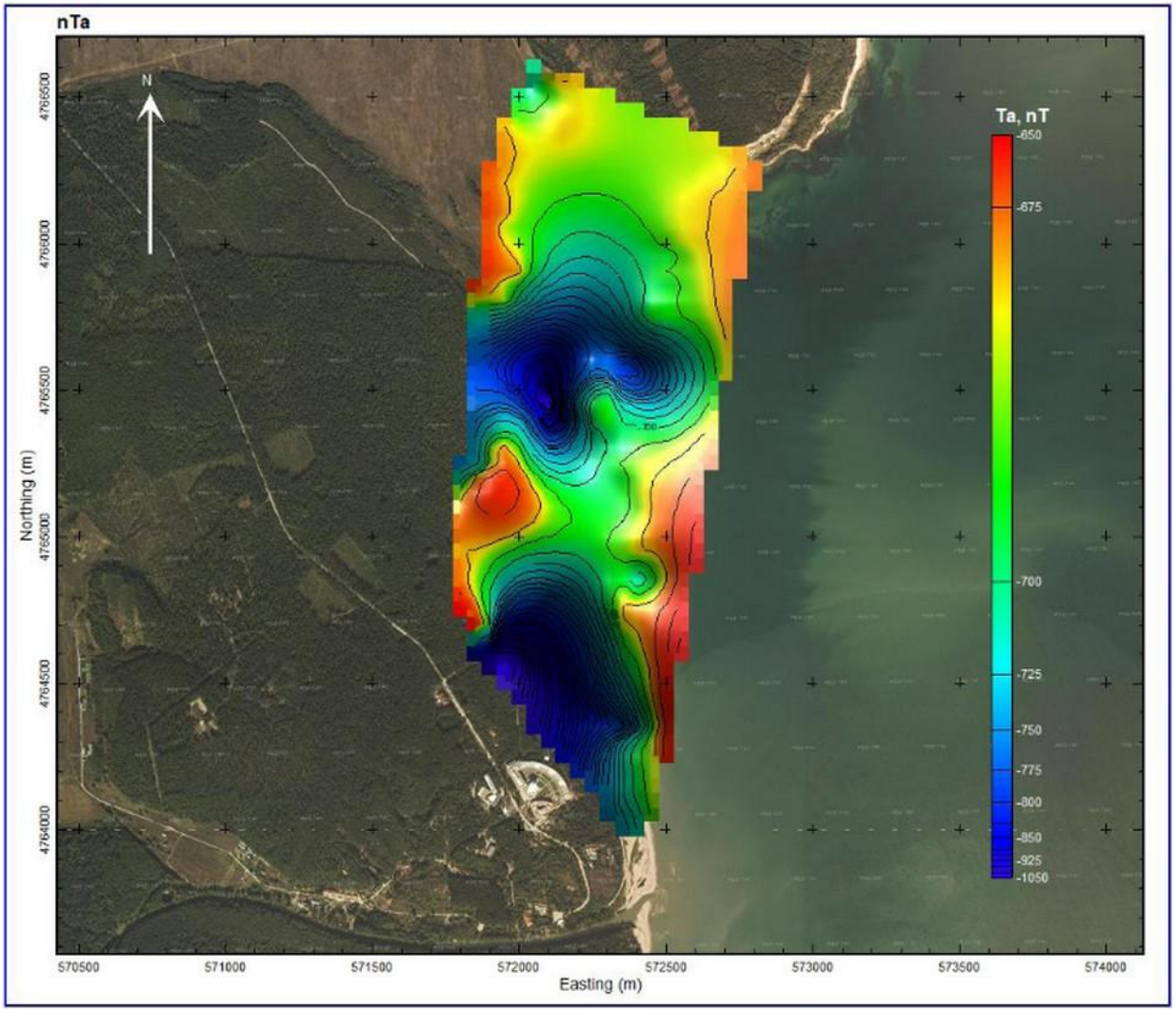
A gravimetric profile was measured (Gravimetric Profile 1) parallel to the coastline beginning - from the mouth of the Kamchia River in the south and ending - after the Romantika campsite in the north. The length of the profile is about 2200 m and consists of 26 measuring points located at an average distance of 88 m from each other.

Results from Gravimetrical surveys



Results from the gravity inversion of the Bouguer anomaly along Gravimetric profile 1

Practical tasks – Magnetometry



Map of the distribution of the geomagnetic field in the investigated area.

Practical tasks – Georadar



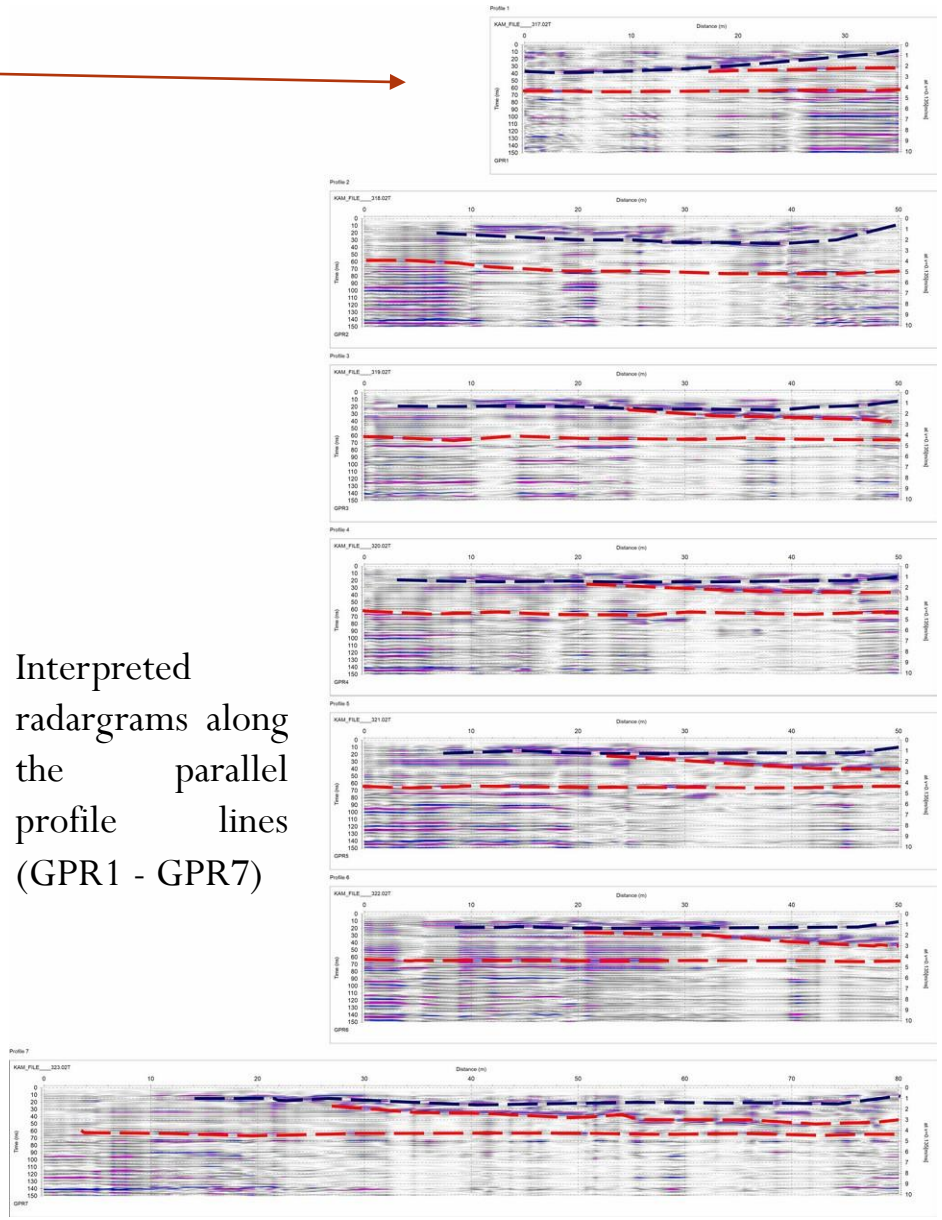




Practical tasks – Georadar



Interpreted radargrams along the parallel profile lines (GPR1 - GPR7)



Practical tasks – Seismology

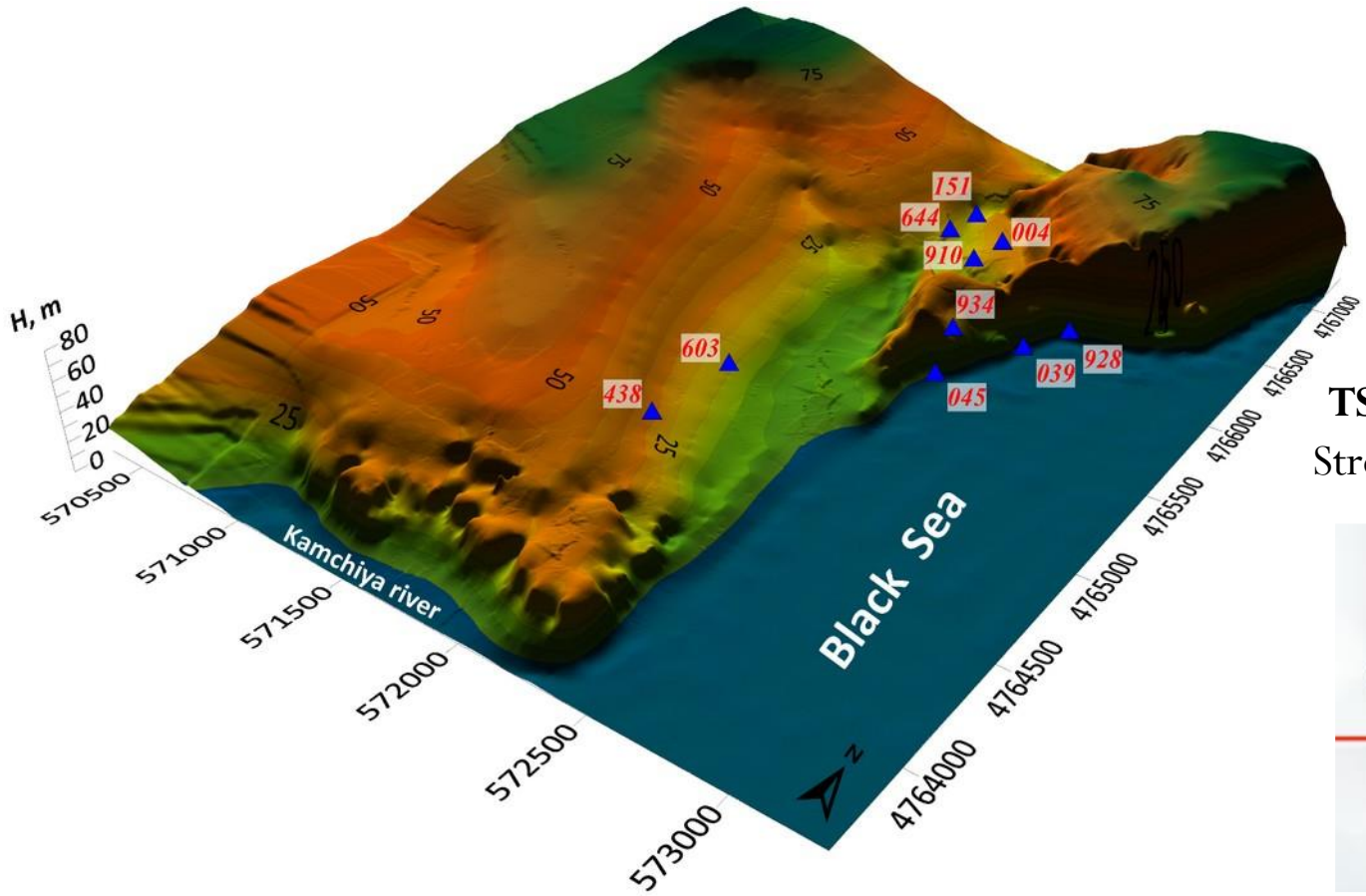








Practical tasks – Seismology



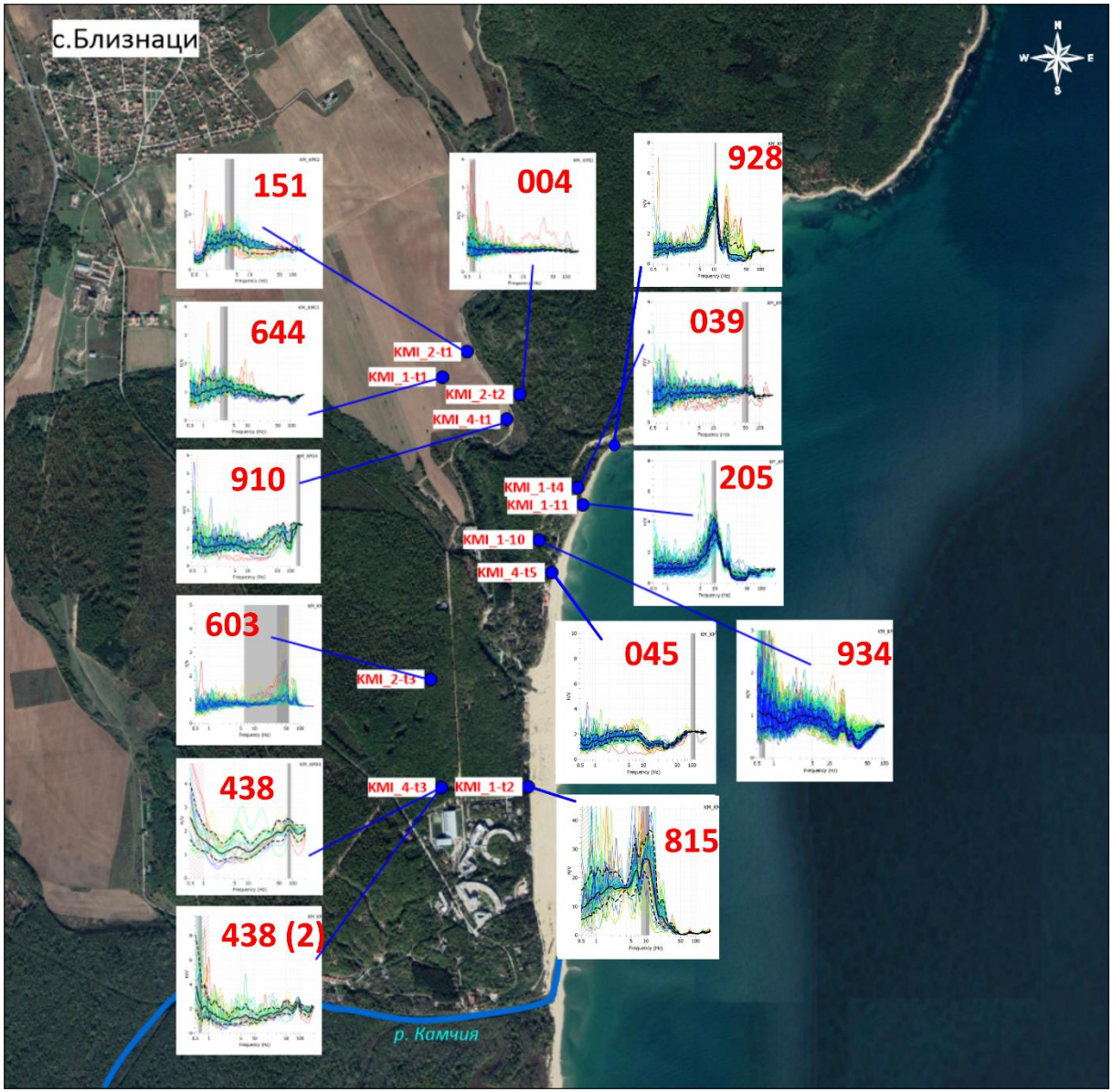
TSA-SMA Internet-Ready Strong Motion Accelerograph



About 11 point were selected for seismic noise recording in the studied area. Recording was performed with seismic equipment - EQMet's TSA-SMA Accelerographs.

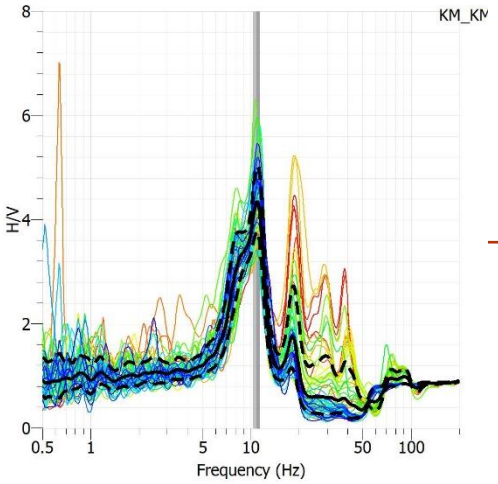
TSA-SMA is a 3-channel, 24-bit Strong Motion Accelerograph with flat response in range 0.5 Hz to about 100 Hz. The three channels of acceleration deliver data at sample rates up to 500sps.

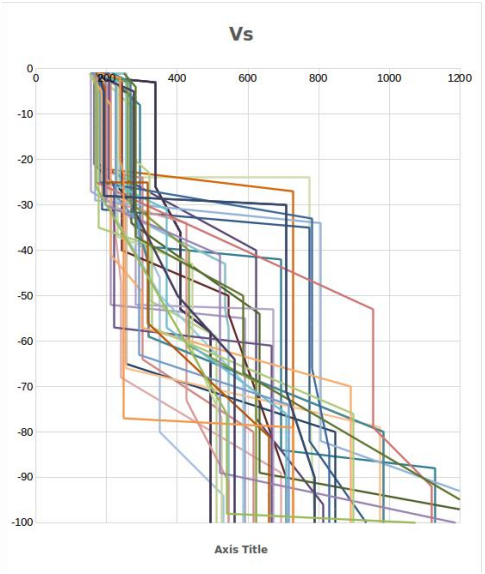
Practical tasks – Seismology



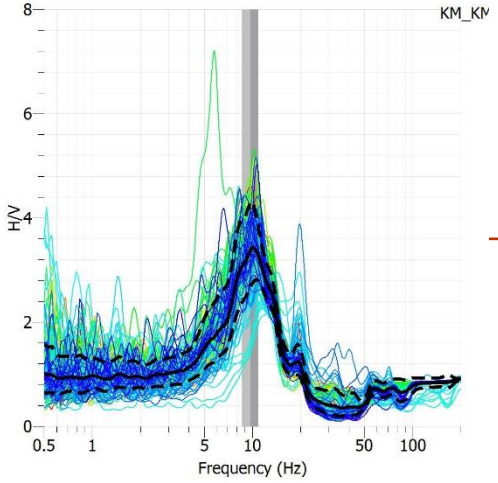
Practical tasks – Seismology

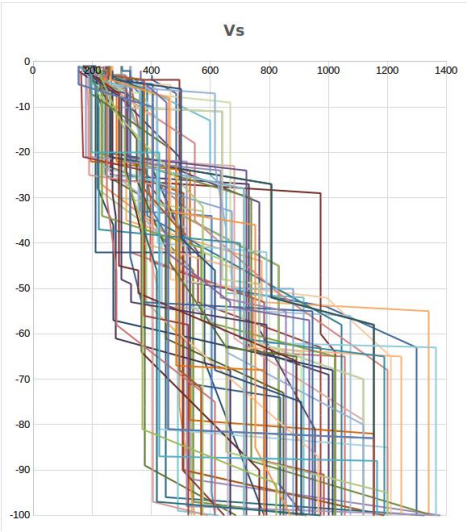
Point - 928





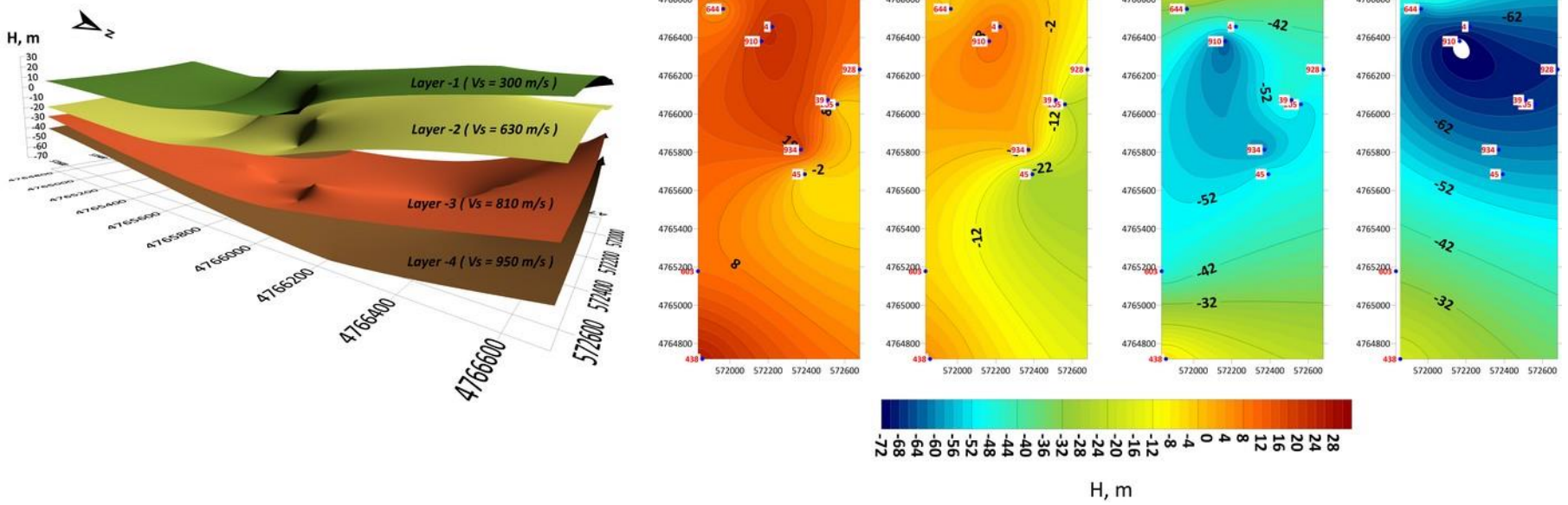
Point - 205





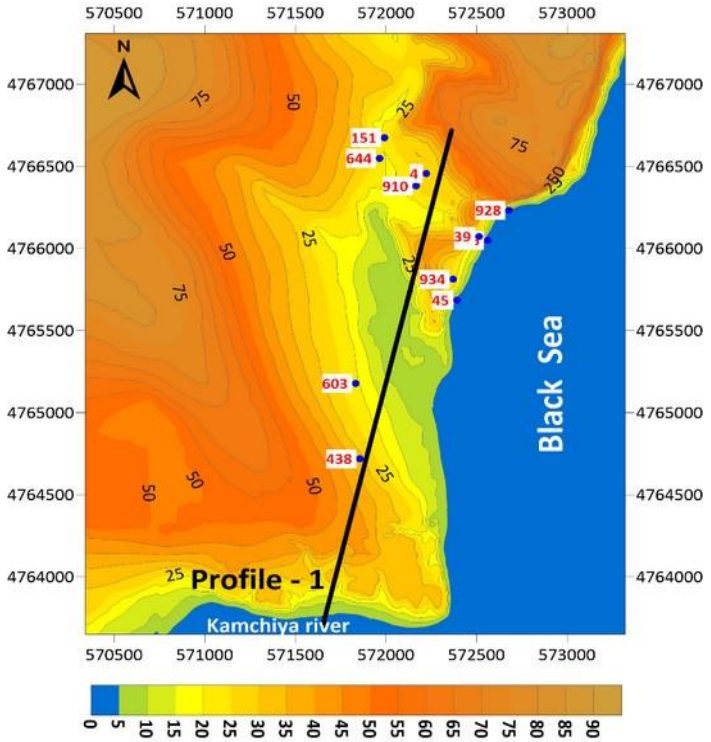
Practical tasks – Seismology

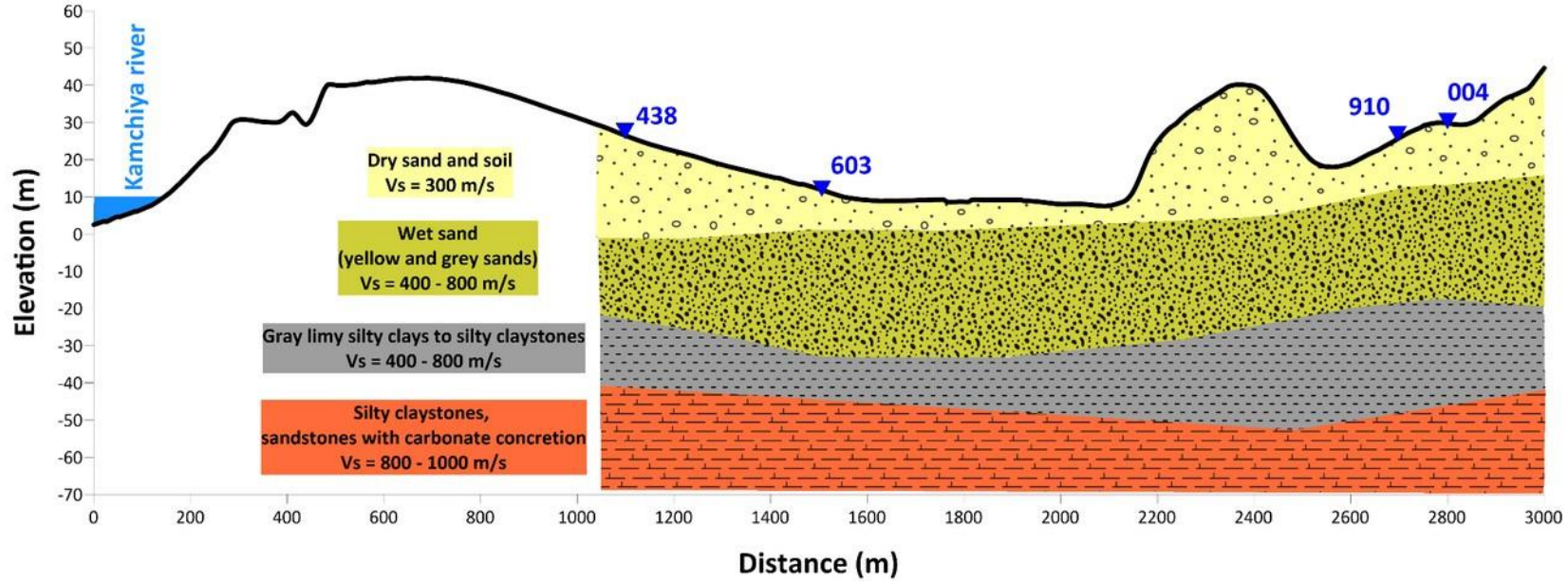
Inversion of H/V curves for each measuring point was performed and S waves velocity models obtained. Four main layers are recognized on the velocity models.
With the data from measuring point a 3D map of discontinuities between the layers is produced.



Conclusions

From the obtained 2D geoelectrical, seismological (H/V method) and seismic profiles, three major layers are very well distinguished





Conclusions

• First one is characterized by low velocities of seismic waves (about 400 m/s for P waves) and high values of electrical resistivity. It consists of unbound dry sands and soil.

• The second layer is with higher P waves velocities (700-900 m/s) and consists of thin, medium, thick- and massive bedded light yellow and gray sands, interbedded with thinbedded dark gray and brown non-calcareous silty clays and silts.

• The third main layer has very low values of electrical resistivity (between 20 and 50 m), and very high P seismic waves velocities above 2000 m/s. This layer consists oft thin-bedded and thick-laminated gray limy and silty clays to claystones, interbedded with laterally continuous
and discontinuous thin beds of fine-grained sands and silts.

