

Isostatic Gravitational Modeling and Seismic Interpretation for the Kerch Part of the Black Sea*

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Search and Discovery Article #40716 (2011)

Posted March 18, 2011

*Adapted from oral presentation at AAPG European Region Annual Conference, Kiev, Ukraine, October 17-19, 2010

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Abstract

Oil and gas exploration is very important for the economy of the Ukraine. Prykerchenska area is enough perspective for reserves of hydrocarbons (Stovba et al., 2009).

Gravity data were taken from the National Geophysical Data Center (www.ngdc.noaa.gov). The closer track line was in the South-East shelf of the Black Sea. These data are 1969, from the Oceanographic Institution of the USA. Using the Generic Mapping Tools (GMT) software has given free air-anomalies (FAA) as input data.

Geologic interpretation for the water area may be fulfilled through FAA (Nabighian et al., 2005). We have used gravity modeling as the basis for isostatic compensation (Ipatenko and Ipatenko, 2002). First stage is calculation of the layer thicknesses for bathymetry with condition of equilibrium for earth's crust. Second stage is estimation of the layer thickness from anomalous data of FAA.

Length of profile is 270 km. Modeling has been performed for layers. Due to bathymetry thicknesses were derived for sediment-granite, diorite, basalt, and mantle layers. Different densities were used: sediment-granite (1.32-2.42), diorite (2.8-2.85), basalt (3.1), and mantle (3.3) in g/cm³. Given density for anomalous layer is 2.4 and length is 209 km. The deepest is 8 km and thickness is 6.2 km for 121km of profile. Basalt deeps are located between 10-17 km and mantle deeps within 18-32 km. Dip of basalt and mantle layers are observed to the end of the east part of the profile.

Investigated profile traverses through the Sorokin Trough and the Kerch-Taman Trough. Gravitational modeling confirmed seismic interpretation.

Seismic line was taken closest to gravity line. Integration of the seismic data and gravity investigation gives an opportunity to better understand the sediment-granite border and properties. It allows acoustic inversion of seismic data. We used density section and velocity section to invert seismic data into acoustic impedance section.

References

Ipatenko, S.P., and A.S. Ipatenko, 2002, New about Earth's physics (start of geonomy)/Kiev: Corund, 185 p.

Nabighian, M.N., M.E. Ander, V.J.S. Grauch, R.O. Hansen, T.R. LaFehr, Y. Li, W.C. Pearson, J.W. Peirce, J.D. Phillips, and M.E. Ruder, 2005, Historical development of the gravity method in exploration: Geophysics, v. 70/6, p. 63ND-89ND.

Stovba S., O. Khriachtchevskaia, and I. Popadyuk, 2009, Hydrocarbon-bearing areas in the eastern part of the Ukrainian Black Sea: The Leading Edge, v. 28/9, p. 1042-1045.



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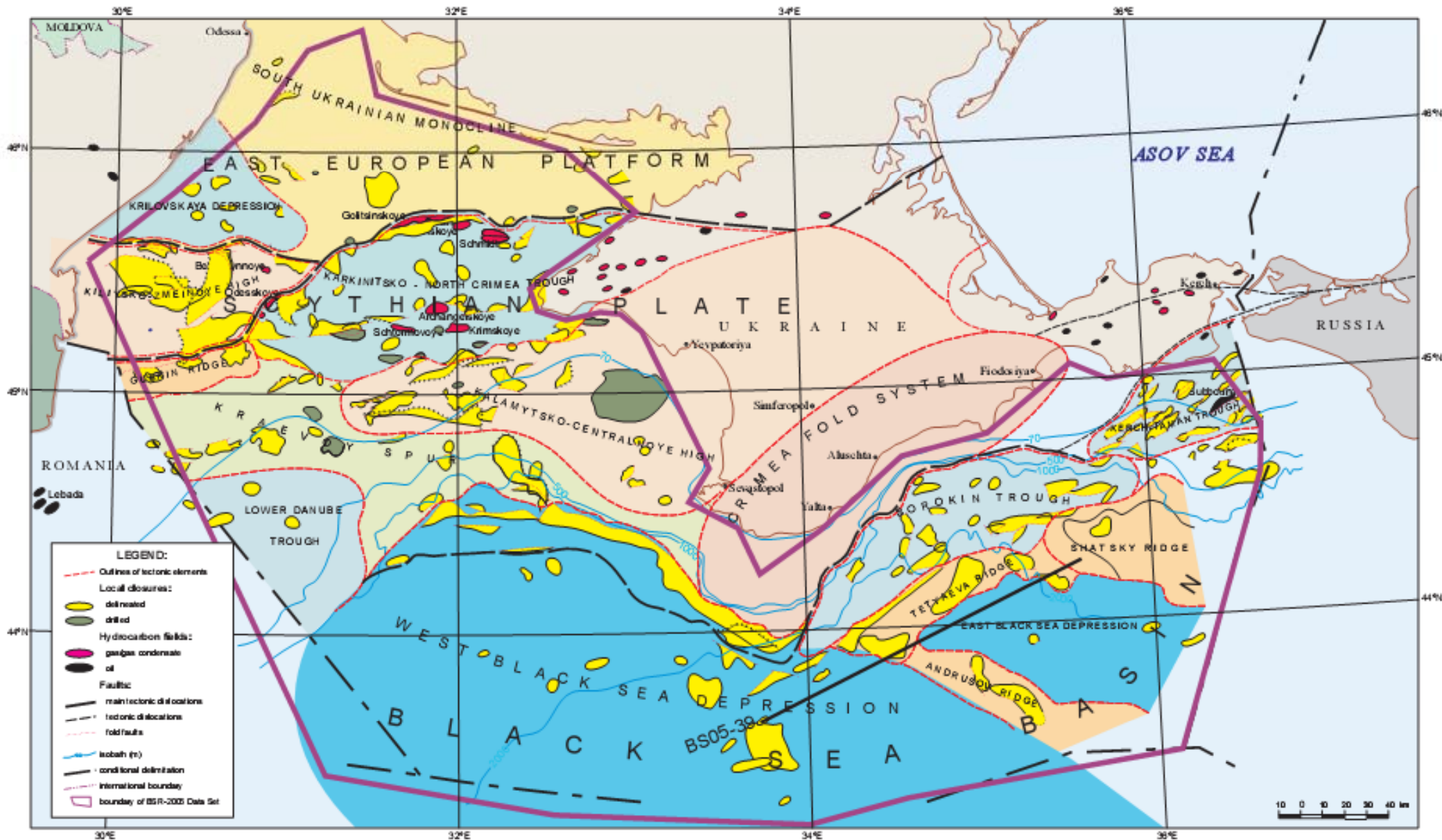
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**Isostatic gravitational modeling and seismic interpretation
for the Prekerchensk part of the Black Sea**

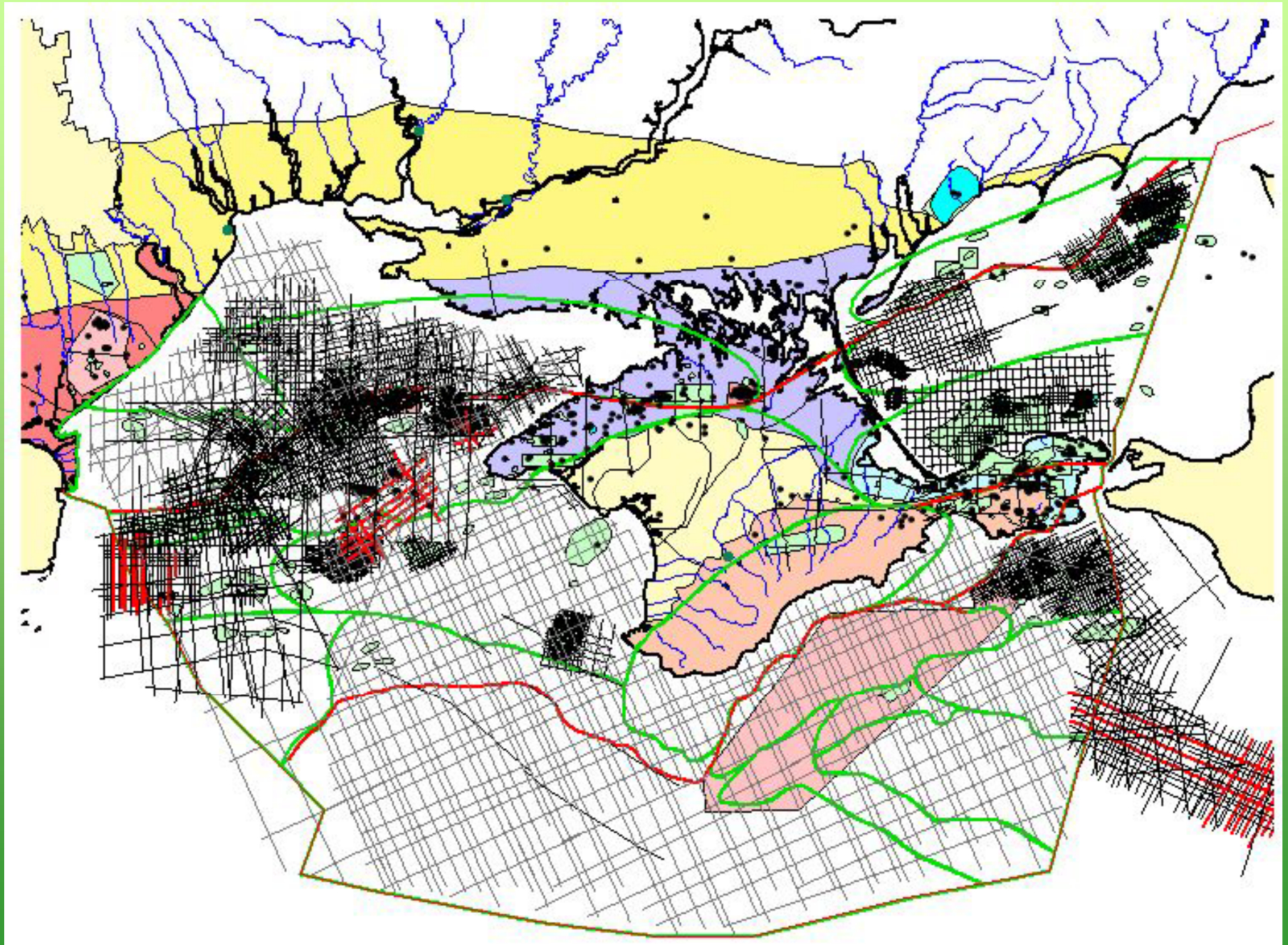
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Kyiv – 2010

Tectonic map Ukrainian sector of the Black Sea



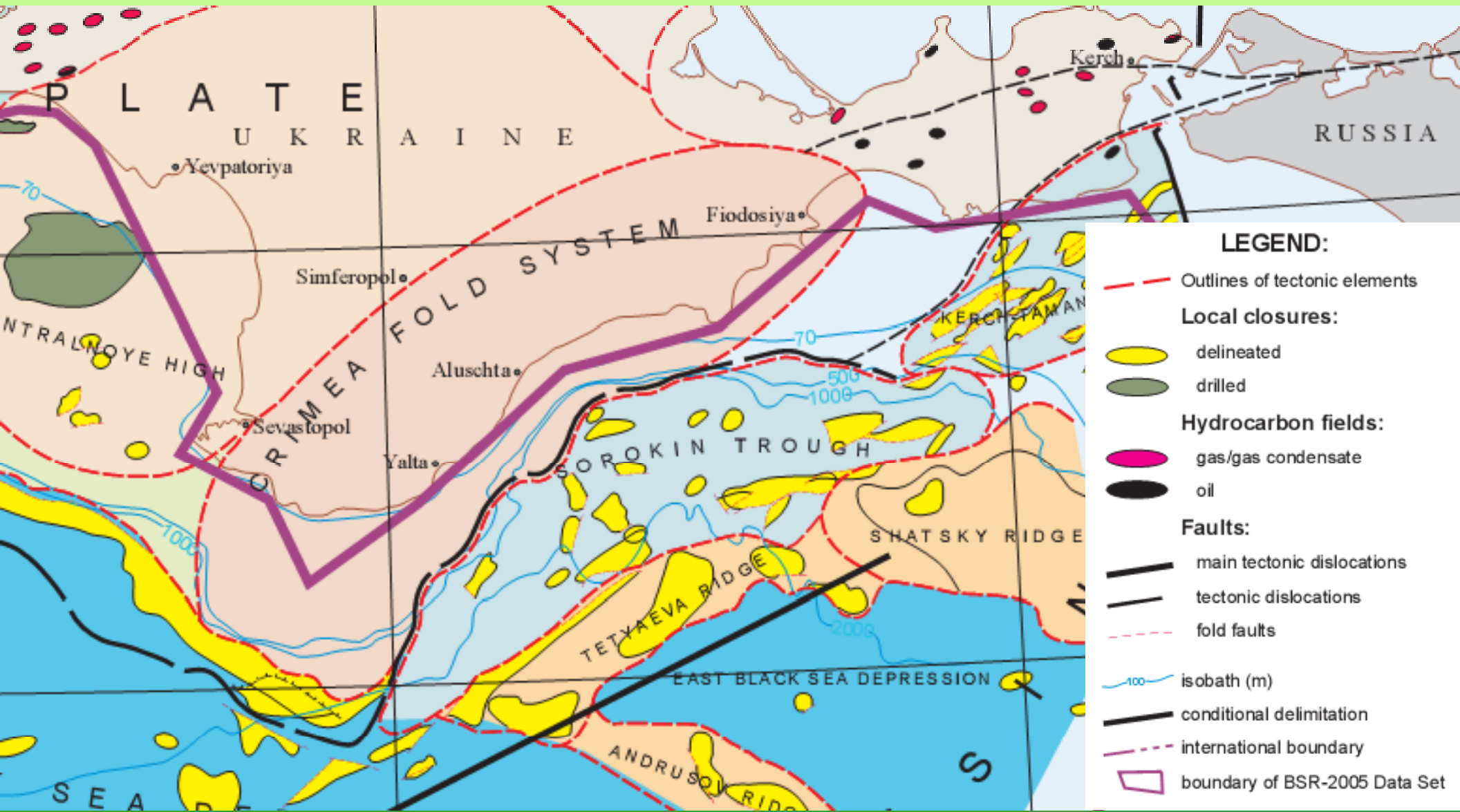
Oil and gas exploration is very important for economy of Ukraine



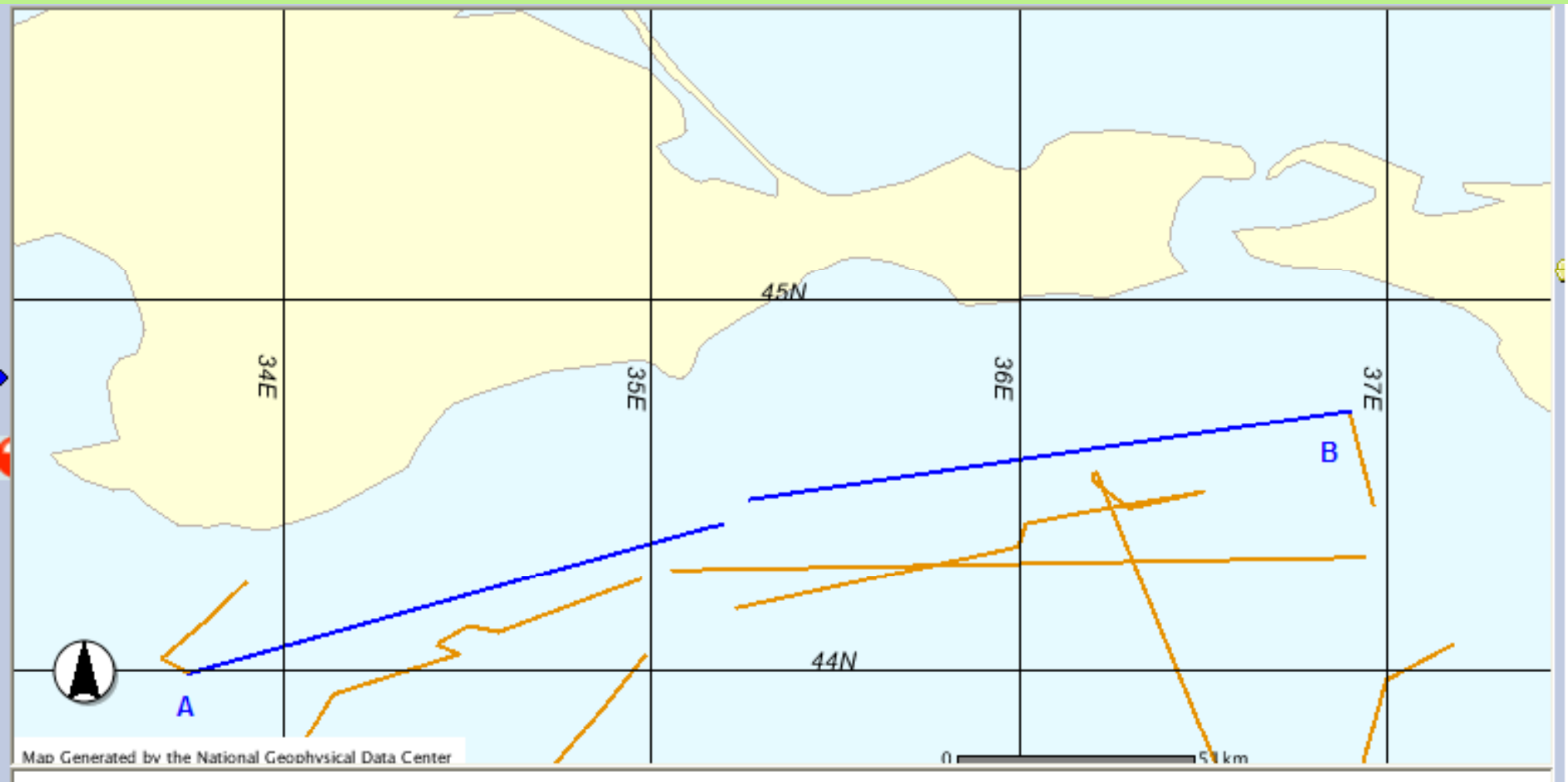
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Prykerchenska area is enough perspective for reserves of hydrocarbons



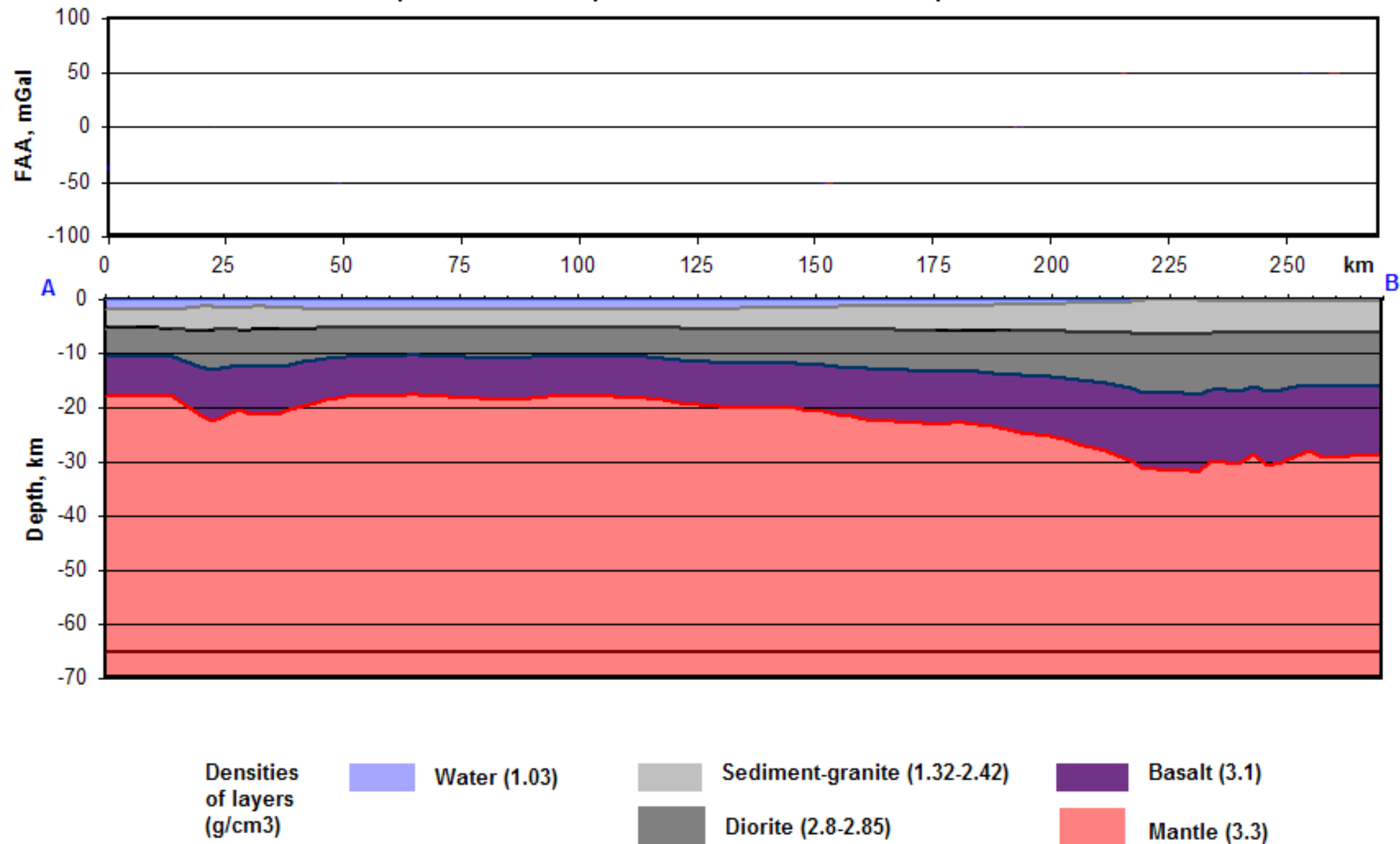
Gravity data were taken from the National Geophysical Data Center (www.ngdc.noaa.gov). The closer track line was in South-East shelf of the Black Sea. These data are 1969 from the Oceanographic Institution of the USA.



Bathymetry

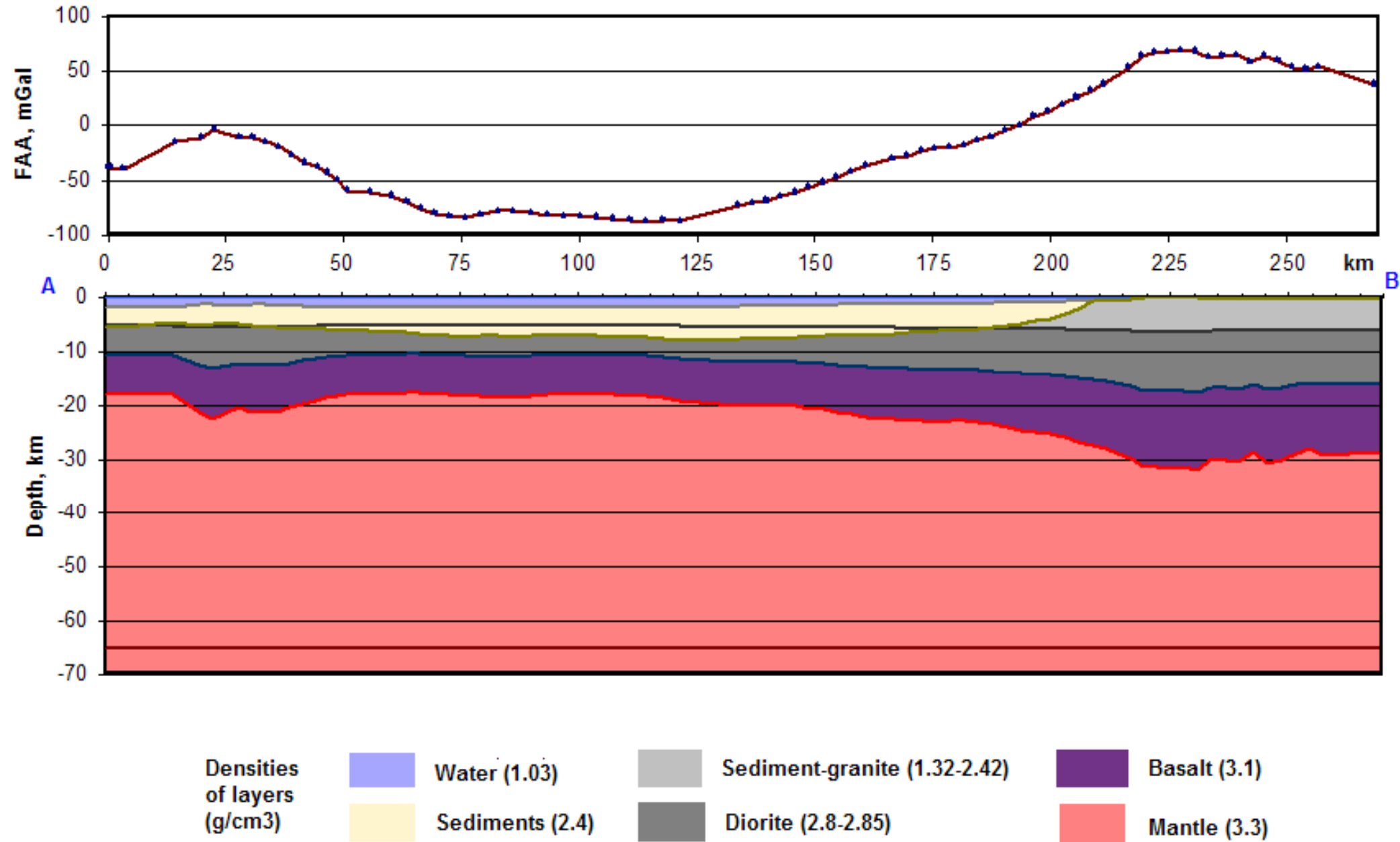
Isostatic compensation for the Prekerchenska part of the Black Sea on basic bathymetry (Ipatenko S. and Ipatenko A., 2002)

Isostatic compensation for profile of Prekerchenska part of the Black Sea

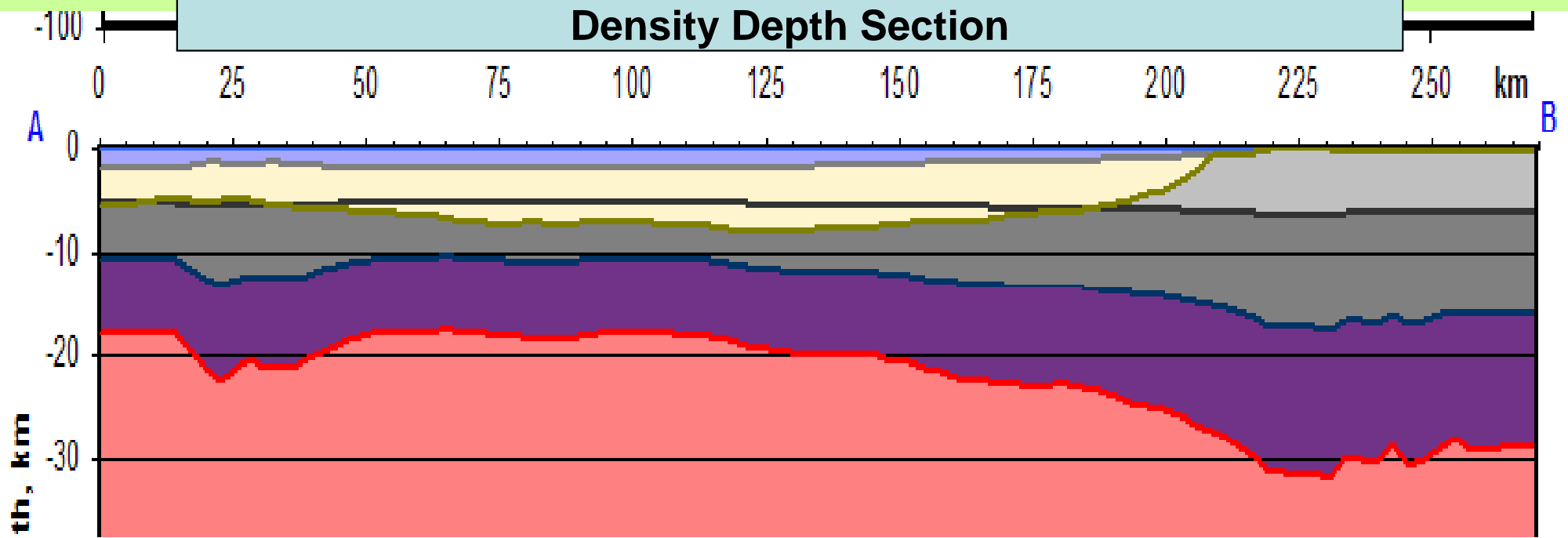


We have fulfilled gravity modeling FAA after isostatic compensation

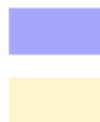
Gravity modeling for Prekerchenska part of the Black Sea



Density Depth Section



Densities
of layers
(g/cm³)



Water (1.03)

Sediments (2.4)



Sediment-granite (1.32-2.42)

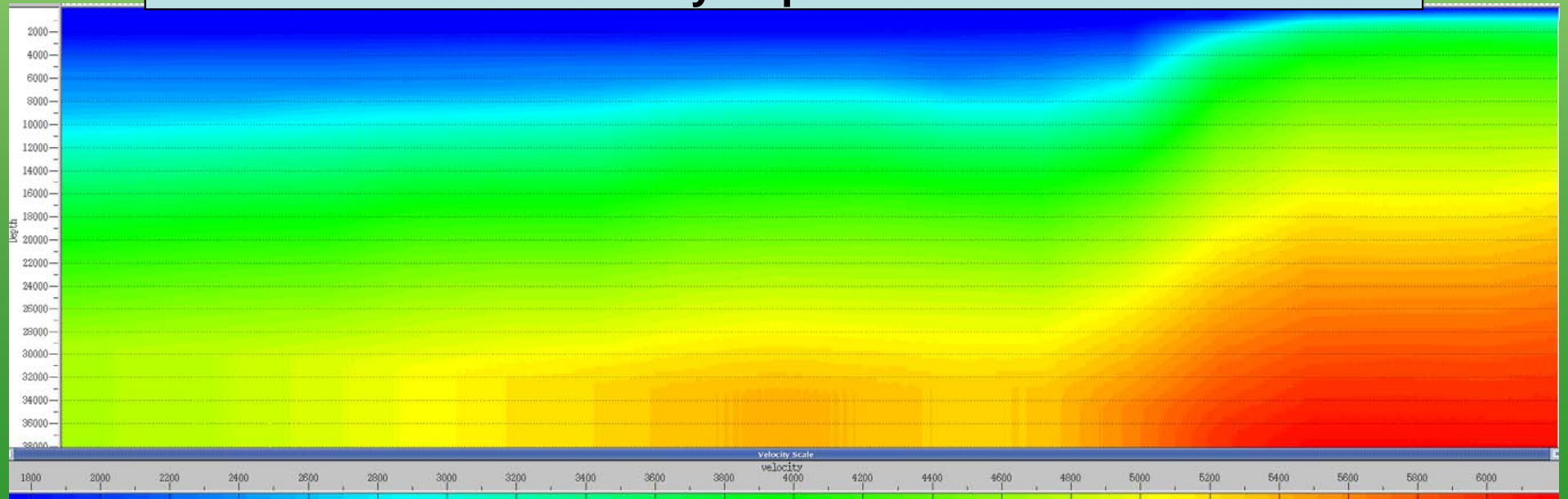
Diorite (2.8-2.85)



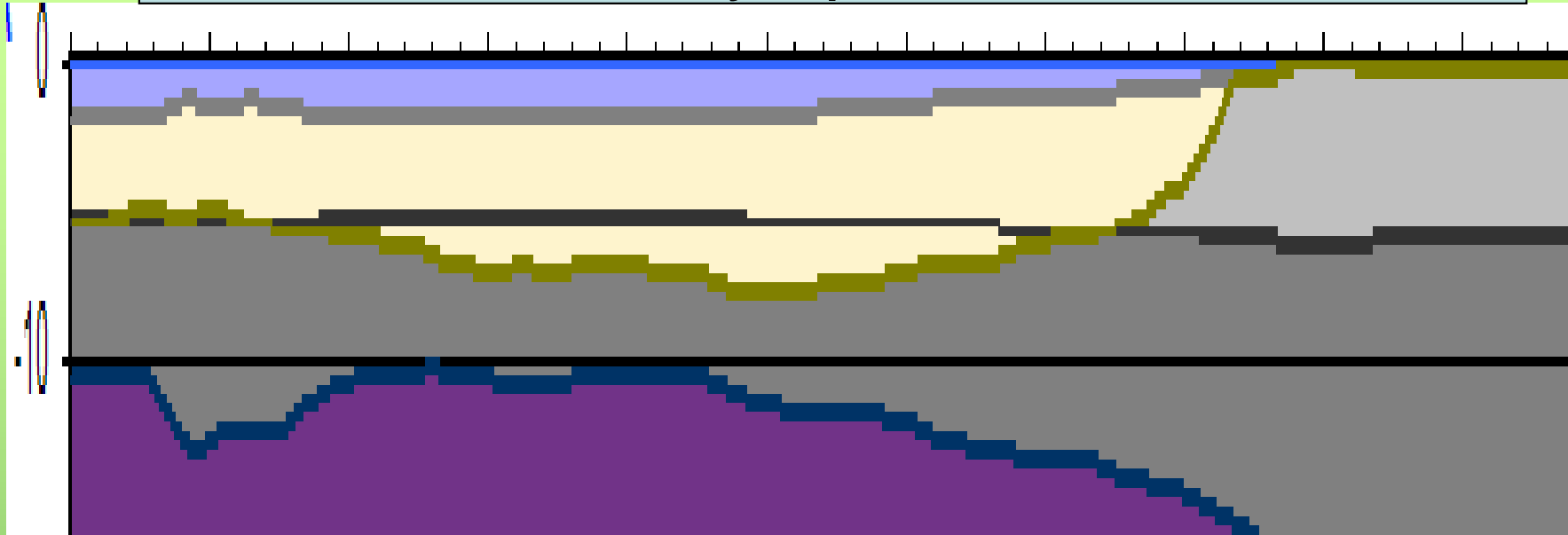
Basalt (3.1)

Mantle (3.3)

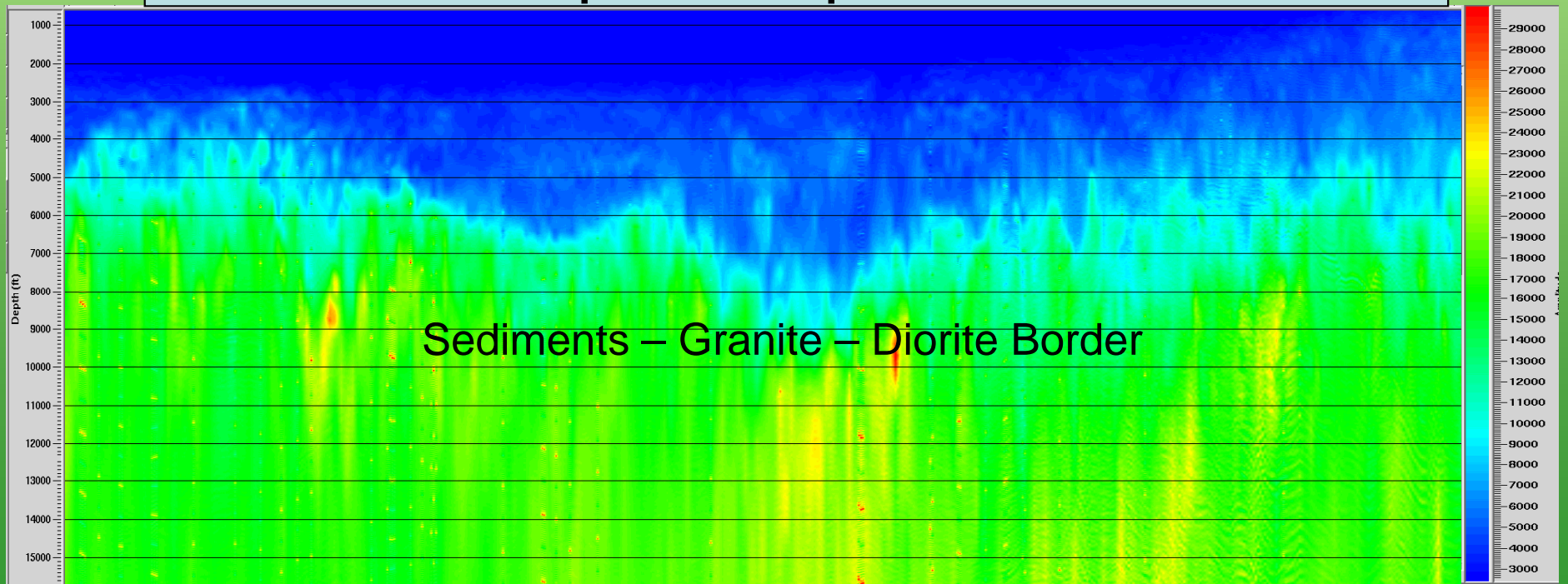
Velocity Depth Section



Density Depth Section



Impedance Depth Section



Conclusions

- Length of profile is 270 km. Modeling have been performed for layers. Due to bathymetry were derived thicknesses for sediment-granite, diorite, basalt and mantle layers. Densities were used different for sediment-granite (1.32-2.42), diorite (2.8-2.85), basalt (3.1) and mantle (3.3) in g/cm³. Given density for anomalous layer is 2.4 and length is 209 km. The most deep is 8 km and thickness is 6.2 km for 121km of profile. Basalt deeps are located between 10-17 km and mantle deeps within 18-32 km. Dip of basalt and mantle layers are observed to end of profile of east part.
- Investigated profile traverses through the Sorokin Trough and the Kerch-Taman Trough. Gravitational modeling is confirmed seismic interpretation.
- We used density section and velocity section to invert seismic data into acoustic impedance section.
- Integration seismic data and gravity investigation gives an opportunity of better understanding sediment-granite-diorite border

Reference

- Ipatenko, S.P., Ipatenko, A. S. New about Earth's physics (start of geonomy)/ Kiev: Corund, 2002. – 185 p.
- Nabighian, M.N., Ander, M. E., Grauch, V. J. S., Hansen, R. O., LaFehr, T.R., Li, Y., Pearson, W. C., Peirce, J. W., Phillips, J. D., and Ruder, M. E. Historical development of the gravity method in exploration Geophysics, vol. 70 , No. 6, 2005, P. 63ND – 89ND.
- Stovba S., Khriachtchevskaia O., Popadyuk I. Hydrocarbon-bearing areas in the eastern part of the Ukrainian Black Sea The Leading Edge No. 28, 1042; September 2009, P. 1042 – 1045.



Thank you for attention!
Merci de votre attention!
Obrigado!
Gracias por su atención!
Mille grazie!
Danke schön!

Teşekkür ederim!
Спасибо за внимание!
Дякую за увагу!
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- Have any questions?
- Please, contact co-authors:

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