

# **PS The Use of Seismic Data in Analyzing Offshore Reservoirs in the Black Sea\***

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## **Abstract**

The main purpose of this paper is the physical interpretation of seismic amplitude for the purpose of hydrocarbon exploration and exploitation. In the right geological scenarios, the interpretation of seismic amplitude can have a significant impact in reservoir characterization.

The numerous developments in seismic and amplitude interpretation over the years have made it clear that seismic amplitude technologies have more of a role to play in establishing proven reserves. An accurate understanding of seismic amplitude signatures is critical in the recognition of direct hydrocarbon indicators (DHIs) in the exploration phase and even in the development phase.

The purpose of the current study is to evaluate hydrocarbon potentials of an offshore Miocene siliciclastic reservoir and to minimize the differences in the amplitude phase and timing for non-reservoir reflections and thereby enhance the signals related to production differences. The data on which the current study is based are well logs from an exploration well and both 2D and 3D seismic data acquired through geophysical prospecting from depths ranging from 100 to 1500m. To achieve that purpose, a number of techniques were applied.

The results of the preliminary 3D seismic map were encouraging, with a high potential for hydrocarbons in the studied Miocene formation and in the neighboring area, and were consistent with the results obtained from the exploration well. Further evidence on the reliability of the seismic data comes from the assessment of data quality. In this case study, the seismic data interpretation was in accordance with the actual well results, demonstrating a reasonable level of certainty in the interpretation of seismic amplitudes.

In conclusion, the past years have witnessed significant developments in the way seismic data is used in oil and gas exploration and production, 3D seismic use being the most important, not only to map structures in detail but also to determine reservoir properties from the analysis of seismic amplitude and other attributes.

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Note: Research references include:

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Case studies from the archive of EXXON Mobil.



# The use of seismic data in analysing offshore reservoirs in the Black Sea

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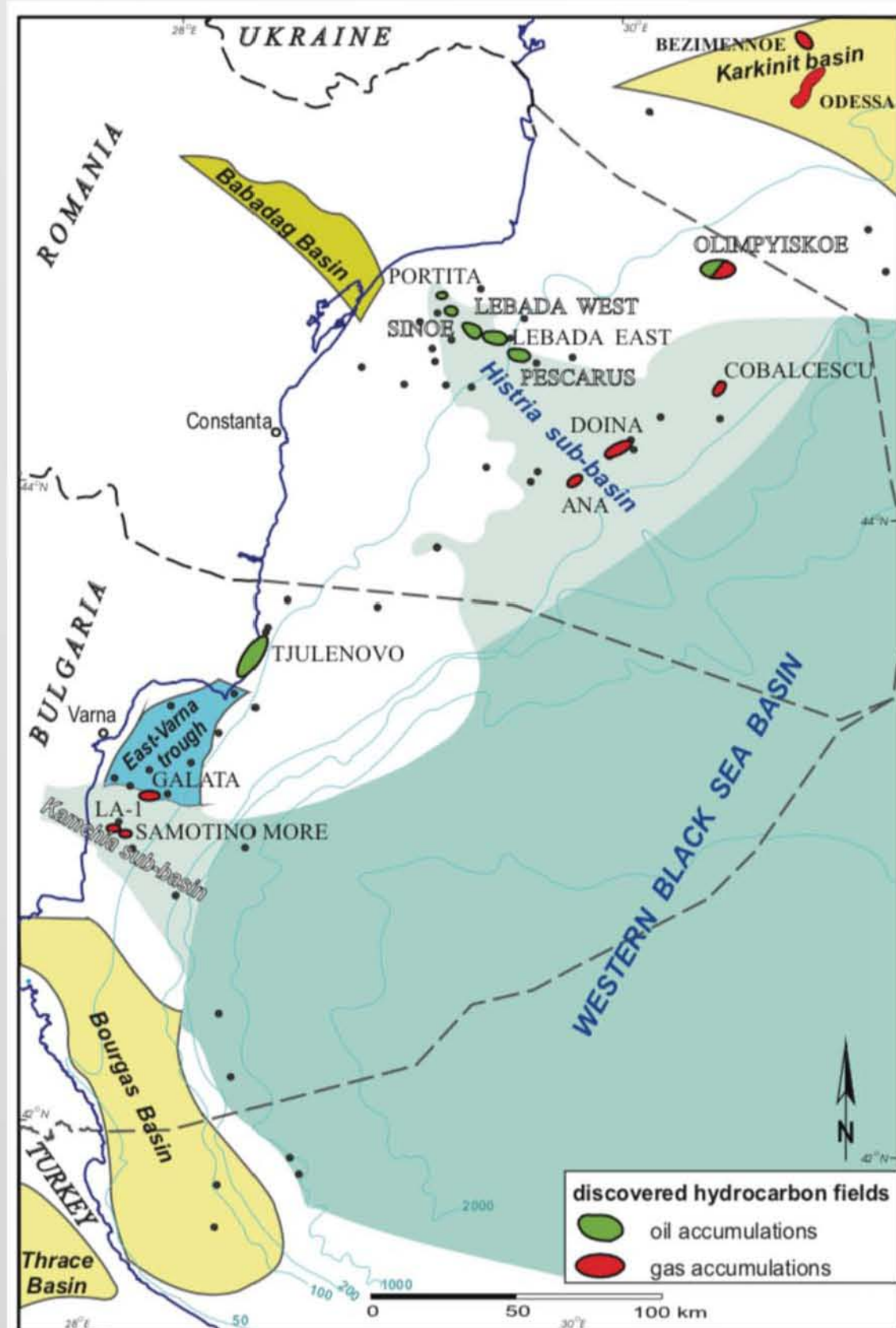


Fig. 4. Map of sedimentary basins in the Western Black Sea Zone and discovered hydrocarbon fields (after Georgiev, 2011)

In total 15 hydrocarbon discoveries have been made in the WBSZ (Figure 4), including 6 gas, 2 gas-condensate and 7 oil or gas-oil fields. 9 fields are in the Romanian offshore sector, 4 in the Bulgarian offshore sector and 2 in the Ukrainian offshore sector. The Olimpiyskoe discovery was made by Ukraine, but now belongs to Romania.

Most of the fields have not been appraised yet due to different reasons, such as limited hydrocarbon reserve and lack of investments.

All the discovered hydrocarbon accumulations are in shallow-water shelves in less than 100 m water depth (Figure 4). They are related to different sedimentary basins – 8 are in the Histria sub-basin; 2 in the Vikovian depression, interpreted as a western branch of the Karkinit basin; 3 in the Kamchia subbasin and the adjacent southern edge of the Moesian Platform. The Tyulenovo field is very close to the East Varna trough, while the Olimpiyskoe field is close to the Histria basin.

Hydrocarbon accumulations in the WBSZ were discovered within reservoirs of rather different age. In this respect, their genetic correlations are of great importance.

## Conclusions

The results of the preliminary interpretations were encouraging, with a high potential for hydrocarbons in the studied Miocene formation and in the neighbouring area, and are consistent with the results obtained from the exploration well.

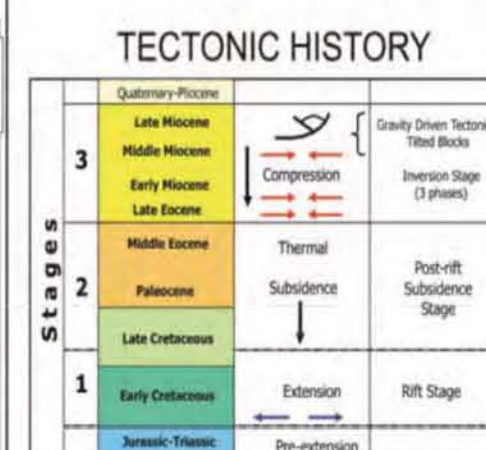
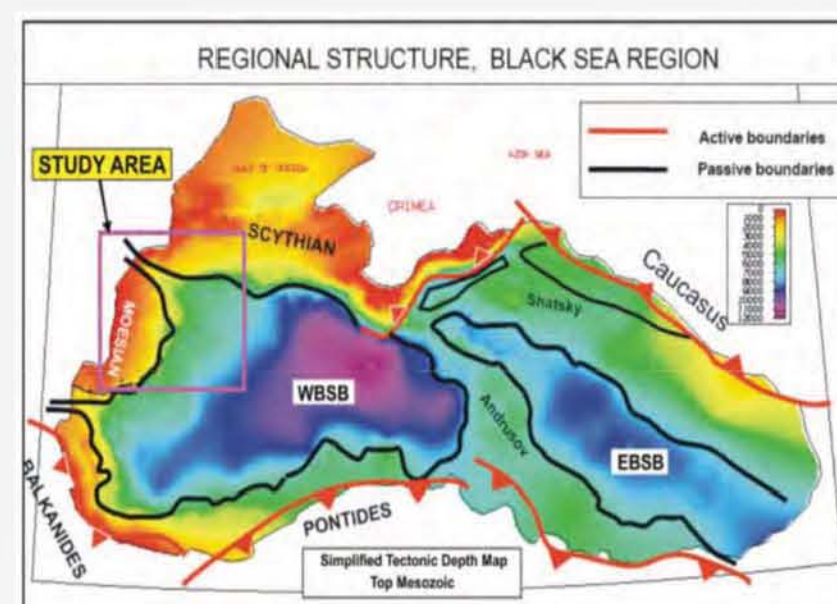


Fig. 1. Major Mesozoic ridges, thicker Tertiary sediments in the western part of the Black Sea, than in the Eastern part (after Bega et al., 2010)

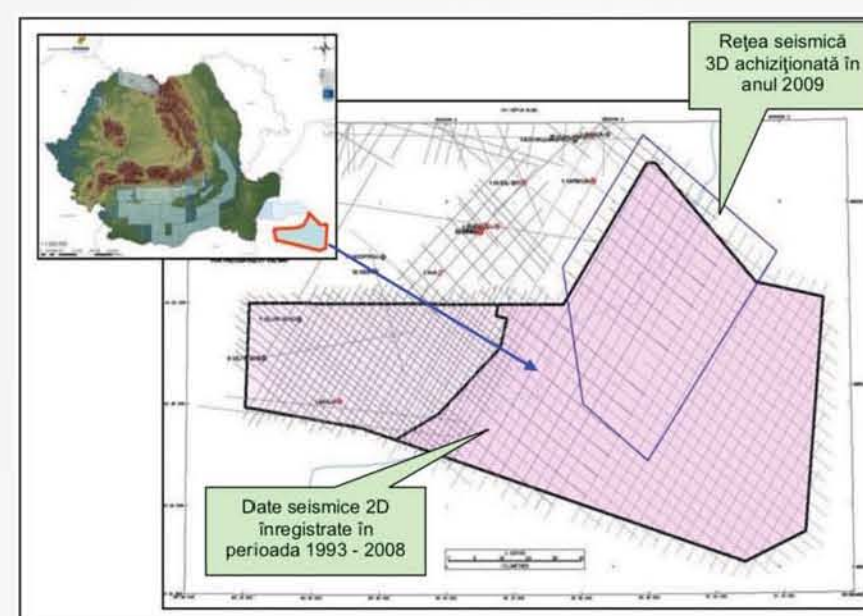


Fig. 2. The perimeters covered by the 2D and 3D seismic data acquisition program.

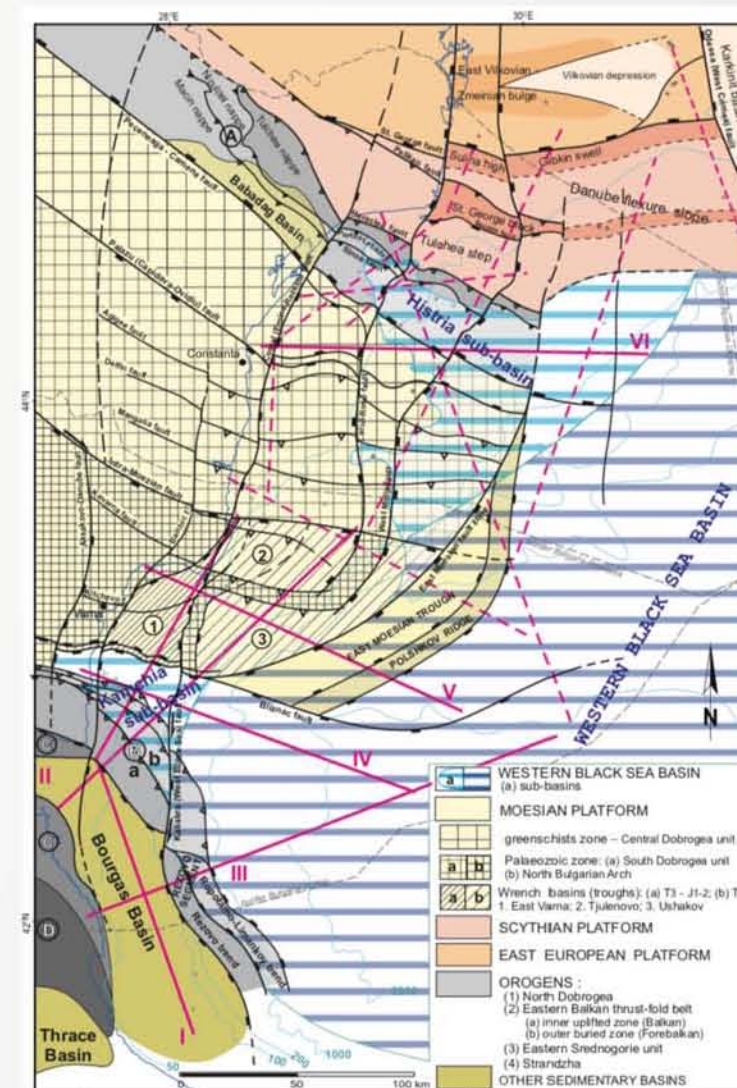


Fig.3. Tectonic map of the Western Black Sea zone.

