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Analysis of Shallow Gas Accumulations and a Reef Structure Observed on the Western Black Sea Continental Slope

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Investigation of possible gas and gas hydrate accumulations and determination of possible reservoirs in shallow marine environments have both economical and strategic importance. Today, the Black Sea is an important area in the world for hydrocarbon accumulations and seeps. In order to investigate gas and gas hydrate accumulations in the Western Black Sea continental slope, approximately 355 km of high resolution multichannel seismic data was collected in 2008. The data was processed using conventional processing steps. Anomalous zones of gas accumulations were determined on the final migrated sections using seismic attribute analysis. In a limited area, a Bottom Simulated Reflection (BSR) attributable to the gas hydrate accumulations was also observed.
Shallow gas accumulations were generally observed below the ridge structures forming anticline-type formations. The accumulations are located generally 100-200 m below the seabed, and the reflections from top of the gas reservoirs are distinguished by their distinctive negative polarity. Below these bright reflections are gassy sediments as semi-transparent dim zones. The instantaneous frequency sections show low frequency local anomalous zones, indicating a higher attenuation of seismic signal due to the gas accumulation. Besides, sediment thickness maps of Miocene and Plio-Quternary periods were determined on the final migration seismic sections.
A shallow reef structure buried at 40 m below the sea bottom in paleo-channel sediments was distinguished on the seismic data. Seismic analysis showed that it has carbonate beds with approx. 10 m thickness. The width and height of the reef structure is 1400 and 50 m, respectively. Moreover, there is a small scale anticline just above the possible reef structure including small-scale gas accumulations. A disseminated gas accumulation just below the possible reef structure was also observed. A new model for the sediment deposition, formation of the possible reef structure and fluid migration in the sediments was introduced. Suggested model shows that formation of the possible reef structure has started at the southeastern side of the structure and moved progressively to the northwest.