Fault tectonics of the NE Black Sea shelf and its relevance to hydrocarbon potential

V. I. Starostenko, B. L. Krupskyi, I. K. Pashkevich, O. M. Rusakov, I. B. Makarenko,
R. I. Kutas, V. V Gladun, O. V. Legostaeva, T.V. Lebed, and P. Ya. Maksymchuk

Although faults of the consolidated crust play crucial role in the origin of sedimentary features and hydrocarbon accumulation, the tectonic setting of the NE Black Sea shelf is poorly known. The aim of this work is to compile the most detailed map of faults in the consolidated crust and test comprehensively a linkage between crustal disturbances and potential hydrocarbon features. Understanding such a relationship may be helpful in planning location of exploration boreholes.

For the first time, 3D gravity and magnetic models have been obtained at a scale of 1:200 000 for the NE Black Sea shelf. Based on the analysis of the observed magnetic field and gravity effect of the consolidated crust, the most detailed map has been compiled for tectonic faults of the consolidated crust. The relationship has been derived between the crustal and sedimentary faults. The prospective local anticlinal features have been revealed to be associated with certain systems of tectonic disturbances in the different crustal layers and magnetic inhomogeneity in the crust. The magnetic bodies of the consolidated crust and sedimentary cover can be of common origin due to the influence of hydrocarbons vertically migrating along the deep faults.

The individual block of high density has been delimited by the faults in the consolidated crust where there occur practically all prospective hydrocarbon features. The southern margin of this block is recommended as a new potential area for oil and gas exploration where gas seeps are genetically related to the tectonic disturbances of different orders.

A first model has been derived for thermal evolution of the Kerch-Taman Trough from the pseudo well method. A total subsidence of its basement can reach 5.0-6.5 km. The present-day temperature vs. depth profiles have been calculated. A thermal and stratigraphic position has been determined for zones of oil and gas origin.