

Analysis of Stress Condition of Faults in Oil-Gas-Bearing Areas Using GIS and Seismic Data

Michail Vakhnin

*Institute of Geology of Komi SC UB RAS, Pervomajskaya 54, 167000, Syktyvkar, Komi Republic, Russia
oilkominc@mail.ru*

The data about the stress condition along faults in the area of oil and gas deposits are the basis for the prediction of directions of filtration flows, migration, formation and preservation of deposits. One of the ways to receive such data is tectonic-physical simulation applying morphokinematic analysis of faults and using regional geological information system. For fault systems the parameters of spatial distribution, such as strike azimuth, dip angles and relative quantitative distribution of faults determined by seismic data, were studied. Such method, as rose-diagrams of fault strikes, was used.

For the analysis GIS was used, which was realized on the basis of ArcGIS and including the following maps: general maps and oil-gas zonation map for the North-East of the European platform, seismic and drilling data map, maps of deposits, local structures, structural maps for basic reflectors. The faults were determined and digitized by the structural maps according to seismic work results.

With the help of developed software tools in ArcGIS environment the analysis of fault strikes for various structural elements was carried out.

The simulation resulted in the data on the relative density and predominant strike of the faults at different depths for the basic reflectors. The accuracy of simulation made about 10%. The rose-diagrams were built by separate squares of areas and sum of squares within structural elements. Also the composite rose-diagrams, resulted from the sums of all the reflectors by squares and sums of squares for separate reflectors, were built.

The composite rose-diagrams of fault strikes showed that the faults have predominant SW and NE strikes for the fault systems of the sedimentary cover.

Also the coordination of basic faults with space decoding data was carried out. During this coordination the comparison with the lineaments defined by Landsat-7 satellite shots. The major part of the lineaments matches the faults determined by geologic-geophysical data, which testifies to the activation of a part of the faults in the newest stage of tectonic development of territory.

At the comparison with lineament density map the faults with maximal newest tectonic activity were determined, e.g. the northern part of the East Kolva abyssal fault. The influence of this fault on oil-gas content of the local structures was analyzed.

The data of the analysis of fault strike and density were laid into basis for the reconstructions of stress-deformation condition of rocks at the North-East of the European platform.