Geophysical Research Abstracts
Vol. 17, EGU2015-12866, 2015
EGU General Assembly 2015

Deep suture zone in the North Barents Basin

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Study of sedimentary basin evolution is a part of research for the forecast of oil and gas capacity of the North Barents shelf. Maps of potential fields anomalies are compiled on the basis of the latest geophysical databases, structural maps of the seismic horizons are analyzed, the location of sources of potential fields anomalies are calculated, 3D density and magnetic models of Earth's crust are constructed.

Six seismic complexes are allocated in sedimentary cover structure: Devonian – Lower Carboniferous, Upper Carboniferous – Lower Permian, Mid Permian – Lower Triassic, Triassic – Lower Jurassic, Upper Jurassic – Lower Cretaceous, Lower Cretaceous – Quaternary. The research of lateral changes of allocated layers thickness gives an idea of sedimentation in the region on various time intervals.

The structural and tectonic scheme of the region is made after analysis of new geologic-geophysical materials. Contact zones of heterogeneous blocks of the crystalline basement are marked, disjunctive dislocations in a sedimentary cover and the upper crust, and also zones of increase of sediments thickness in various seismic complexes are designated.

The deep suture zone delimiting Mesozoic and Paleozoic sedimentary basins has the most important geological value among disjunctive zones of the region. This zone stretches along the Admiralty Arch in East part of the North Barents shelf and is marked by negative magnetic anomaly 30-50 km wide. In view of special tectonic value of the suture zone marked by this anomaly we have calculated the 3D magnetic crust model. The sedimentary layers of a model section is based on seismic data.

As a result of modeling the studied anomaly of a magnetic field can be approximated by the block of basement rocks of the lowered magnetization (1.2 A/m). The surface of this block is located in a zone of anomaly at a depth of 12-14 km. The asymmetry of anomaly is accounted by an inclination to East of the borders of the block with low magnetization.

Calculated basement magnetization is 1.9 A/m to the West from an anomaly zone that is a characteristic for many igneous and metamorphic rocks of the diorite composition. Magnetization of the basement formations sharply increases to 3.6 A/m to the East. Similar values of magnetization are characterized basalts and dolerites, and also many metamorphic rocks of the basic and ultrabasic composition. Thus, the simulated magnetic field anomaly not only corresponds to limits of the heterochronous sedimentary basins, but also shows the border between two heterogeneous basement blocks.

"Bright spot" anomalies are marked out on seismic sections. Bright spots are mainly located near the zone of negative magnetic anomaly along the East part of the North Barents Basin. The AVO analysis of the anomalies of the seismic recording has allowed to allocate possible hydrocarbon reservoirs and to subdivide them into the gas-saturated and oil-gas-saturated.