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Thermal and fluid regime of the crystalline basement reservoirs

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Purpose of our geothermy research in the Archean and Proterozoic crystalline basement was to locate fractured, loosely-aggregated, zones capable of trapping oil that could have possibly migrated from the terrigenous Devonian. In the granite-gneiss layer, minor temperature variations can imply the heterogeneous structure of the basement and the presence of fractured reservoirs that can be best detected by the high-precision temperature logging. Our instruments and techniques developed at the Kazan State University Chair of Radio Electronics permit the detection of the anomalies associated with permeable zones of several centimeters in thickness. This method has allowed the precise outlining of minor fractured, permeable zones as deep as 5800 m. Most temperature anomalies can serve as a reliable reservoir indicator. The recent well logging works in the crystalline basement have shown that the number of fractured reservoirs and their temperature grow with depth. Loosely-aggregated zones and reservoirs are associated with thermogradients lower than (0.2 to 0)°C/100 m and higher than (4 to 5)°C/100 m. Anomalous thermogradients can be considered a result of the convection mass transfer in fractured zones and an indication of good reservoir properties and constant movement of fluids. Tests, performed in superdeep wells within the eluvium intervals in the granite-gneiss layer of the earth's crust have produced fluid. The geothermy data suggest that the permeable zones in the crystalline basement can consist of fractured rocks, the outlined layers of which vary in thickness from well to well. They unambiguously suggest high hydrocarbon potentials of the crystalline basement.