



Peculiarities of convection and oil maturation in 3D porous medium structure.

Professor Yurie Khachay (1) and Mansur Mindubaev (2)

(1) Institute of Geophysics, Ural's Department RAS, Yekaterinburg, Russian Federation (yu-khachay@yandex.ru), (2) Institute of Geophysics, Ural's Department RAS, Yekaterinburg, Russian Federation(mansur_mg@mail.ru)

An important estimation of oil source thickness productivity is to study the thermal influences of magmatic intrusions on the maturation of the organic matter. The heterogeneity of permeability distribution of the reservoir rock and respectively the convection structure provide temperature heterogeneity and different degree of maturity for the oil source material. A numerical algorithm for solving the problem of developed convection in two-dimensional and three-dimensional models of the porous medium, which consists of a system of Darcy equations, heat conduction with convection term and the continuity equation, is developed. Because of the effective values of the coefficients of thermal conductivity, heat capacity, viscosity and permeability of the medium depend from the temperature; the system of equations is nonlinear. For solution we used the dimensionless system of coordinates. For numerical solution we used the longitudinal cross-implicit scheme. The coordinates step for the 3D model had been used constant and equal to $H/20$, where $H=1$ - dimensionless thickness of porous medium layer. As it is shown from the variants of numerical solution, by the stationary regime of developed convection because of the temperature heterogeneous distribution in the sedimentary reservoir the formation of oil source matter different degree of maturity is possible. That result is very significant for estimation of reservoirs oil-bearing. The work was fulfilled by supporting of the Fund of UB RAS, project 1518532.

Reference

1. Yurie Khachay and Mansur Mindubaev, 2016, Effect of convective transport in porous media on the conductions of organic matter maturation and generation of hydrocarbons in trap rocks complexes, Energy Procedia. 74 pp.79-83.