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Fluid dynamic model of the energy transfer from the mantle to the surface of geodynamic zone in oceans and continents

A. Dmitrievsky (1), **I. Balanyuk** (2), O. Chaikina (2)

(1) Oil and Gas Institute Russian Academy of Sciences, Russia (A.Dmitrievsky@ipng.ru / Phone: +7 495-1357371), (2) P.P. Shirshov Institute of Oceanology Russian Academy of Sciences, Russia (inabalanyuk@ocean.ru / Phone: +7 495-1248529)

The authors present a new geomechanical model of mantle processes that effect on formation of oil-and-gas bearing basins, fault tectonics and thermal convection.

Any fluid migration is initially induced by lateral stresses in the crust and lithosphere which result from global geodynamic processes related to the mantle convection. The global processes are further transformed into regional movements in weakness zones.

Model of crust waveguides and idea of self-oscillation processes in mantle layers and fractured zones of the crust at different depths was used as the basis for developed concept. The content of these notions resides in the fact that there are conditions of dynamic balance in mantle layers originating as a result of combination and alternate actions of compaction and dilatance mechanisms. These mechanisms can be manifested in different combinations and under different conditions as well as can be complemented by other processes influencing on regime of fluid migration. They can act under condition of passive margin, ocean rift and ocean subduction zones as well as in consolidated platform and sheet. Self-oscillation regime, subvertical direction of fluid flows, anomalously high layer pressure, and high level of anomalies of various geophysical fields are common for them.

Specific manifestations of this mechanism can vary in dependence on geological settings and geodynamic situations. In particular, periods of self-oscillations and depths

of mantle layers can be various. Orientation of layers can be not only horizontal, but vertical as well, that is, self-oscillations can occur not only in waveguides, but in faults and impaired mantle zones as well. Predominantly vertical fluid migration can be accompanied by horizontal migration along crust waveguide.

Penetration of overabundant energy from lower thermodynamic zone high jointing of «crust waveguide» owing to energy «shake» of secondary migration, causes formation of industrial accumulation of hydrocarbons in traps especially in the closed zones of rift forming structures which does not comprise single field but gravitate to great positive elements. These elements, as a rule, have not area distribution

This model is considered on the examples of The Pacific, The Arctic Oceans (Sakhalin shelf, Barents Sea), Pre-Caspian and East European basins.