

Influence of development of raw hydrocarbon deposits on the geodynamic state and seismic regime of the Earth's crust in the Southern Urals

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Abstract The article presents the results of the analysis of the impact of field development on the geodynamic state and seismic activity of the earth's crust of the Southern Urals, were compared in field development, anthropogenic changes in the bowels of district fields with the level of seismic activity, correlation between indicators of development of deposits and the parameters of the seismic activity of the earth's crust and the statistical analysis of the seismic regime of the area deposits of hydrocarbon raw materials. Correlation analysis of field development indicators and seismic activity parameters revealed an almost linear relationship ($r > 0.9$) between reservoir pressure and the number of events (including low-energy pulse events) and a close relationship between the average debit and the number of events. A model of the seismic activity of hydrocarbon deposits in the Southern Urals is constructed in the form of a set of graphs of the frequency of seismic events and changes in their angle of inclination. The constructed model indicates a change in the nature of seismic activity in the subsurface of the field area, which consists in a decrease in the energy of events and an increase in their number. The cyclical nature of seismic activity on the territory of the Orenburg oil and gas condensate field (OOGCF) is revealed. Currently, there is an accumulation of stress associated with the continued drop in reservoir pressure during the field operation and natural tectonic processes against the background of a decrease in the rate of hydrocarbon production. Reducing production volumes at OOGCF does not reduce the man-made load on the Earth's crust, but reduces the rate of stress accumulation. This leads to a decrease in the energy of seismic events and an increase in their number (taking into account the pulses).

Keywords Geological environment, seismic activity, hydro geodynamic processes, oil and gas fields, Southern Urals.

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