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Application of acoustic stratum inversion for predicting lithophysical rock properties of complex oil and gas prospective objects

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Russia has developed a system of interpretation of seismic data OTRI (Optimized Technology of Reservoir Investigation) containing the unique program of the acoustic stratum inversion (ASI). A distinctive feature of the program ASI is obtaining stratum sections of acoustic impedance $I_p(t, x)$ with a minimum time thickness of the layers, corresponding to the real resolution capability of the seismic data (4-8 ms). That makes it possible to evaluate the average impedance I_p of layers with high accuracy (few percents) and in combination with log data to predict lithophysical and capacity properties of terrigenous and carbonate sediments. Another feature of ASI is the innovative way of seismic inversion regularization, which consists in specifying the range of I_p changes in marker beds and intermarker space. It allows to obtain reliable impedance forecast when moving tens and even hundreds of kilometers away from the stratigraphic wells with sonic log data, ensuring high efficiency of ASI application for regional seismic data interpretation. Examples of forecasting of geological sections properties using ASI to identify prospective areas of shale oil-saturated sediments spreading in the Volga-Urals and West Siberian oil and gas provinces are given, as well as prospecting of organogenous structures and potential areas with possible content of hydrocarbons in the terrigenous sediments of Eastern Siberia.

