Kuan Wang, J Geol Geophys 2017, 6:5 (Suppl)
DOI: 10.4172/2381-8719-C1-0012

Fine seismic reservoir prediction in Shaximiao formation on east slope of western Sichuan depression

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The Shaximiao formation on the east slope of western Sichuan depression is a typical tight sandstone gas reservoir, the thickness of the sandstone reservoir is thin and the P-impedance of the surrounding rock as well as the sandstone is seriously overlapping, and the geophysical characteristics are concealed. It is difficult to depict channel sand precisely and to conclude the overlay style. Moreover, it is influenced by the shallow delta sedimentary model. The gas reservoir has the characteristics of narrow channel, thin thickness and strong heterogeneity. Therefore, it has a large number of river sand in the study area, with complicated sedimentary regularity, multi-cycle and multi-flow. All of these increased the difficulties to study the sedimentary microfacies and the accurate prediction of reservoirs. This paper aims to solve the difficulties in the sandstone characterization, sedimentary facies study and reservoir prediction of the tight sandstone gas reservoirs in the study area, under the guidance of seismic sedimentology. Firstly, the seismic response characteristics of sand bodies in the study area are summarized and analyzed. Then, using forward model to analyze and verify the causes of the differences in characteristic responses, after classifying the sand bodies, established the identification patterns of different types of sand bodies. Secondly, based on the high-resolution seismic data, an integrated method, which concludes small-scale subdivision, intensive stratigraphic section, frequency-dividing and seismic wave-trough attributes, is applied in this paper to clearly describe the distribution of river sand bodies, tiny river and hidden river. Based on the fine characterization of the river channel, the sedimentary facies distribution of each layer is predicted by using the waveform difference analysis and the meandering river shallow water delta model. Then, the sedimentary facies controlled seismic reservoir inversion method was used to forecast the reservoir parameters of the key blocks in the study area. In the process of inversion, the single variable method was utilized to experiment the inversion function type and each parameter, and to select the final optimal result. Finally, based on the classification criteria of reservoir physics, the results of seismic reservoir inversion are used to predict the distribution of high quality reservoirs. Combined with the results of fine sandstone facies, sedimentary facies study and reservoir prediction, a comprehensive evaluation of the development of the river channel can be put forward validly.

Biography

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