Seismic Reflection Pattern and Recognition of Grain Shoal Reservoirs

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Abstract

Grain shoal is an important exploration target in carbonate oil and gas fields. It is more difficult to predict the reservoirs in platform-margin shoal reservoirs than intra-platform shoal reservoirs. Previous studies have shown that as a typical intra-platform shoal facies deposit, the Lower Cambrian Longwangmiao Formation in central Sichuan Basin of China has strong reservoir heterogeneity, leading to diverse seismic reflection characteristics and difficulties in seismic prediction of reservoirs. Therefore, the seismic reflection pattern and recognition method of Longwangmiao Formation reservoirs in central Sichuan were studied, and the distribution of favorable shoal reservoirs was depicted. The research results show that (1) based on the drilling data, the change law of shoal reservoirs of Longwangmiao Formation in central Sichuan was clarified, and the geological model for reservoir was established; it is believed that the main reservoirs in Moxi develop well, and the peripheral reservoirs are generally thinner and more heterogeneous; (2) five seismic reflection patterns were summarized according to forward modeling on the aspects of block, class and grade; top boundary valley, internal strong peak and bimodal reflection characteristics are the best seismic reflection patterns of Longwangmiao Formation in central Sichuan; (3) according to the idea that the bottom boundary of reservoir corresponds to the highlighted peak, and the development degree of reservoirs affects the top boundary reflection of Longwangmiao Formation, the shoal reservoirs of Longwangmiao Formation can be effectively identified mainly by seismic attributes of maximum peak amplitude and weak amplitude at the top boundary and miniorly by three-dimensional highlight carving and waveform classification; (4) based on seismic-sedimentary facies study, it is believed that the shoal

cores respond to seismic response patterns 1 and 2, the shoal edge and scattered shoals respond to seismic response patterns 3 and 4, and the inter-shoal sea responds to seismic response pattern 5; the shoals continuously distribute in main body of Moxi, and the scattered shoals distribute in a strip northeastwards peripheral areas. The final prediction results are proven by actual drilling. The research results accelerate the exploration of peripheral area in Moxi and provide an important theoretical basis and technical support for exploration and development of Longwangmiao Formation in central Sichuan.

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