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Characteristics and evolution process of strike-slip fault in Halahatang area, North Tarim Basin, NW China

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Characteristics and evolution process of strike-slip fault is a key issue restricting further exploration in Halahatang area, North Tarim Basin, NW China. This paper uses the new-acquired 3D seismic data and applies fault structural analysis method to study the characteristics of Halahatang area, and discusses evolution process of the faults.

The data used in this paper include 1960 km² 3D seismic data in prestack time migration in Halahatang area, and 4 wells logging data used to calibrate seismic horizon. The bin size of 3D seismic is 25 m×25 m with sampling rate of 4ms, and data length of 7000 ms. Firstly, the Eigen-structure coherency and SO semblance are used to identify the distribution of the strike-slip fault. Secondly, the segmentation of Ordovician strike-slip fault in the study area is studied and the control effect of segmentation on reservoir development and oil and gas enrichment is discussed. The slip distance of strike-slip fault is very small, the maximum is no more than 2 km. They are typical cratonic strike-slip faults which are developed inside the craton. There are four kinds of structural styles on the profile, which are vertical and steep, positive flower structure, negative flower structure and semi-flower structure. Five structural styles of linear extension, X type, braided structure, horsetail structure, and en-echelon structure are developed on the plane. There are obvious segmentation along the fault trend.

According to the strata subjected to strike-slip deformation and the structural styles in different strata, it is determined that the strike-slip faults have three stages of activity in Halahatang area.

In the Late Ordovician, NNE, NNW, NE, and NEE strike-slip faults are mainly developed in the study area. The faults on the seismic profile are steep and upright, with small displacements. Faults generally only break into the Ordovician, and later activities will cause faults to go up to the Silurian and even the upper Palaeozoic, which have different tectonic styles with that of the Ordovician faults. The NNE and NNW strike-slip faults form an "X"-type conjugate strike-slip fault, reflecting the conjugate strike-slip fault is generated by near north-south compression.

In the Late Permian, 4 NNW transtensional strike-slip faults are generated by the activation of some Ordovician strike-slip faults. In the Late Cretaceous-Palaeocene, the study area mainly develop several groups of NNE, near SN transtensional strike-slip faults. These transtensional strike-slip faults appear as graben and horst or stepped faults on the section. These transtensional strike-slip faults are R-shear faults in the Mesozoic and Cenozoic strata formed by the Ordovician NNE faults slip dextrally under the tectonic stress.