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Fault zone architecture and evaluation of its fault sealing properties, Xiahong North Fault in Junggar Basin.

Kongyou, W.¹, Siyuan, L.¹, Yangwen, P.¹, Guo Wenjian² and Liu Y¹

¹School of Geosciences, China University of Petroleum, Qingdao, Shandong 266555

²Research Institute of Exploration and Development, Xinjiang Oil Field Company, Petro-China, Keramay, Xinjiang 8340

A fault is not always a planar surface, but a 3D zone with complex internal structures, which can be divided into sub-units. The different sub-units present various sealing mechanism, leading to different means of fault sealing evaluation. Integrating core observation and seismic interpretation, the Xiahong North Fault is divided into east and west segments in plain view; while the fault zone consists of fault core and damage zone in section view. The fault core, presenting high-strain cataclasis, can be quantitatively evaluated by the indices of 'Compression', 'Shale Gouge Ratio' and 'Fault Zone Filling'. The damage zone, presenting less-strain cataclasis, highly-developed fractures, higher poro-perm properties, can be analyzed by evaluating the diagenetic cementation and oil thickening using thin sections and SEM. For the Xiahong North Fault, the results indicated: 1) the west segment presents better sealing properties of fault core than the east segment; 2) the damage zone is sealed by cementation in the west segment and filled by thickened oil. The SEM and fluid inclusion analyses suggested that there were at least three periods of fluid migration affecting the properties of the Xiahong North Fault, of which the 1st fluid migration was dominated by formation water and the 2nd-3rd fluid migration was accompanied by hydrocarbon migration. Therefore, the sealing properties of the Xiahong North Fault was a result of the multiple fluid activities in geologic history.

