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Yongtai Yang¹, Wenzhi Zhao¹, Baomin Zhang¹, Caineng Zou¹ (1) Research Institute of Petroleum Exploration and Development, Petrochina, Beijing, China

Application of Chronostratigraphy and Sequence Stratigraphy to Petroleum Exploration in the Northern Qaidam Basin, Northwest China

Jurassic stratigraphic division and effective source rock identification are outstanding questions in the northern Qaidam Basin due to harsh environment and poor exploration, and the Middle Jurassic coal measures are considered main source rock all along. In 1998, however, a set of over 600m thick excellent source rock was penetrated in Lengke-1 on Lenghu Structure Zone, and sporopollen analyses have indicated that it belongs to Lower Jurassic.

Based on the latest chronostratigraphic data of drilling and outcropping, a study of Upper Triassic- Jurassic sequence stratigraphy is conducted, which has revealed that the Upper Triassic- Jurassic sediments can be divided into 5 sequences and 12 system tracts. Using geochemical parameters in Lengke-1 well and outcrops, it can be recognized that the source rocks have mainly developed in deep-lake facies mudstones of sequence 2 and sequence 3's transgressive system tracts. Through tracing regional seismic profiles, sequence 2 (J1) and sequence 3 (J2) are defined in the southwestern and northeastern Lenghu Structure Zone respectively. An analysis of seismic stratigraphy and sedimentary facies indicates that the sequence 2 contains extensive deep lake facies in the transgressive system tracts, forming the most important source rock in the study region. In contrast, the transgressive system tracts in the sequence 3 contain very smaller semi-deep lake facies.

On the basis of the identification of Jurassic source rocks, in combination with oilfield position and reservoir and seal factors, two petroleum systems, J1(!)-R and J2(!)-E, are identified. Several structures in and around J1(!)-R are favorable targets for next exploration.