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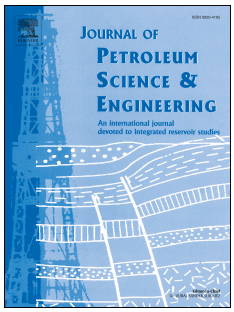

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Geochemical characteristics and factors controlling natural gas accumulation in the northern margin of the Qaidam Basin

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Abstract: The northern margin of the Qaidam Basin is an important area for natural gas exploration that includes the recently discovered Dongping and Niudong gas fields. However, the origins of the natural gas and the primary factors controlling gas accumulation in the region are unclear, particularly in the piedmont zone. Planning and exploration strategies are limited by a lack of knowledge about natural gas accumulation mechanisms. In this study, various comprehensive geochemical, geophysical and geological techniques were applied to investigate the origin and distribution of natural gas in this area, as well as the main factors controlling gas accumulation. The results demonstrate that the gas deposits are dominated by gaseous hydrocarbons with C_1/C_{1-5} ratios in the range 0.76–0.99. The natural gases are characterised by wide variations in $\delta^{13}C_1$ values (−19.1‰ to −36.1‰) and relatively heavy $\delta^{13}C_2$ values (−19.82% to −25.42%). The oil and gas in the investigated area exhibit a zonal spatial distribution and have features typical of coal-generated gases. The locations of major hydrocarbon-generating depressions and source rock maturity exert primary control on the distribution of oil and gas reservoirs. Paleo-uplifts and paleo-slopes controlled the direction of hydrocarbon migration and accumulation, while faults and conducting systems connected to the hydrocarbon source rocks constituted channel systems that controlled the transport of oil and gas. Suggestions for future exploration have been put forward, which will provide significant guidance for gas exploration in the area. Future promising areas for exploration include the paleo-uplifts in the east of the Altun Mountains and the west of the Qilian Mountains front and the Eboliang-Lenghu structural belt in the northern margin of the Qaidam Basin. These results will also provide guidance to natural gas exploration and research efforts in other basins with similar geological settings.

Keywords