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## The generation mechanism of deep natural gas, Tabei uplift, Tarim Basin, Northwest China: insights from instantaneous and accumulative effects

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The Tabei uplift is located in the northern part of the Tarim Basin, while the Lunan area is in the eastern part of Tabei uplift. The dryness coefficients of natural gas range from 0.62 to 0.99 (average: 0.92), the methane contents range from 30.42% to 96.4% (average: 85.10%), and the methane carbon isotopes range from -47.30‰ to -33.80‰ (average: -36.96‰) in the Lunan area. Compared with the actual regional thermal evolution of the source rock, the natural gas exhibits excessively heavy dryness coefficients and methane carbon isotope characteristics. To investigate the genesis of heavy methane carbon isotopes and dry gas in different areas of the Tabei Uplift. Natural gas chemical composition and carbon isotope were used to analyze the genesis of natural gas, basin modeling was conducted to reconstruct the natural gas generation process, and the geologic causes of this phenomenon are discussed. The results show that the natural gas is primary cracking gas and sourced from marine type II kerogen. The dryness coefficient, methane carbon isotopes, and source rock maturity gradually increases from the west to the east. Instantaneous effects led to the dry gas and relative heavy methane carbon isotopes generated at a low maturity level. The current natural gas in the Ordovician reservoirs was all generated during the Himalayan orogeny. Long period pause of the gas generation between the two hydrocarbon generation phases is the main cause for the instantaneous effects.