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Geochemical Character and Origin of Ordovician natural gas in Tazhong Uplift of Tarim Basin, China

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Ordovician natural gas of Tazhong Uplift is mainly composed of hydrocarbons. Methane concentration range from 31% to 93%, average 82.7%. Dryness of natural gas range from 0.73 to 0.99, and most is bigger than 0.9. On plane, Dryness of natural gas in southeast is bigger than in northwest, and natural gas in well Gulong-1 has the biggest dryness (Fig.1).

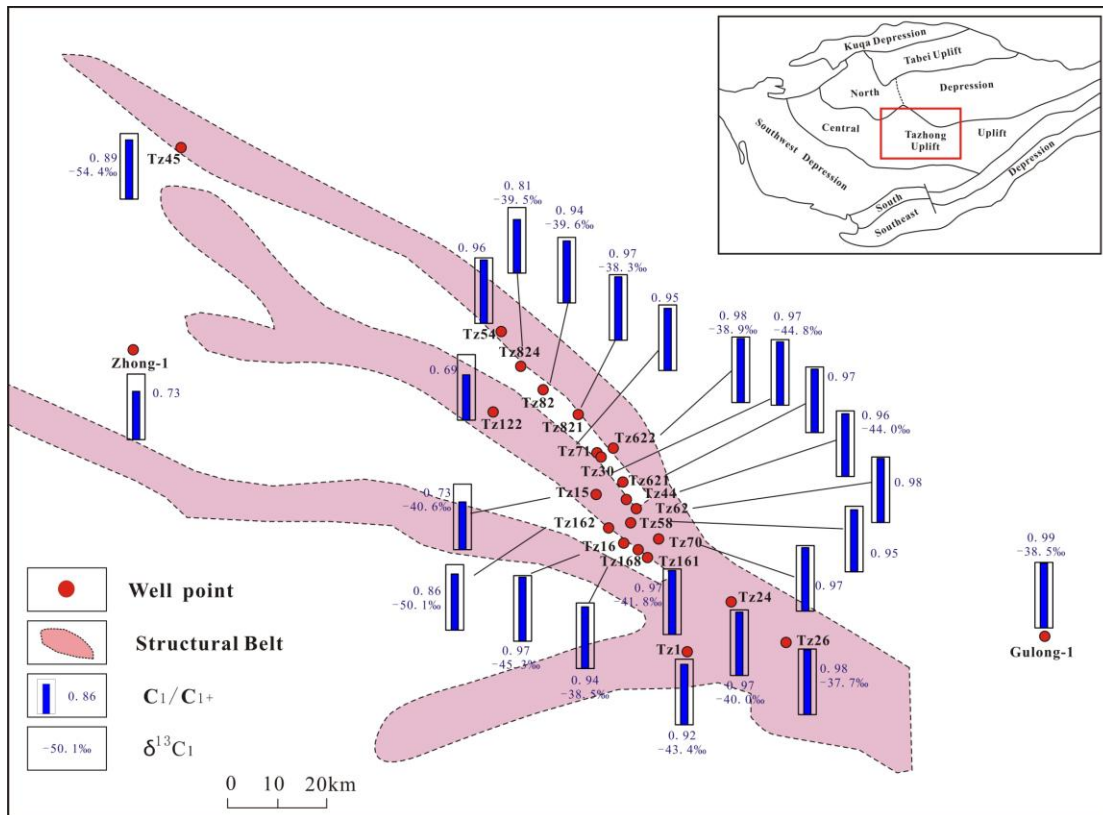


Fig.1 Dryness and δ¹³C₁ of Ordovician natural gas of Tazhong Uplift, Tarim Basin

Non-hydrocarbon is mainly composed of nitrogen and carbon dioxide, nitrogen concentration range from 0.82% to 30.7, average 7.16%. On plane, nitrogen concentration in southeast is higher than in northwest, we conclude that the higher concentration of nitrogen is corresponded to higher thermal evolution of source rocks below.

Isotopic ratio of $\delta^{13}\text{C}_1$ is lighter than -37.6‰ , $\delta^{13}\text{C}_2$ is lighter than -31.2‰ , shows natural gas was thermogenic and came from sapropelic organic matter. On plane, ratio of $\delta^{13}\text{C}_1$ and $\delta^{13}\text{C}_2$ is lighter in northwest than in southeast, and the difference of $\delta^{13}\text{C}_1$ to $\delta^{13}\text{C}_2$ is smaller in northwest than in southeast, which again corresponded to the thermal evolution of source rocks below, maturity of organic matter is higher in northwest than in southeast.

Carbon dioxide average concentration is 4.58%, isotopic ratio of $\delta^{13}\text{C}$ is heavier than -8‰ , which shows carbon dioxide was originated from inorganic carbonate corrosion.

Lower Paleozoic source rock of Tarim Basin is in high thermal evolution stage, and some is in dry gas generation stage. As a result, natural gas could come from these source rocks as well as from cracking of crude oils generated earlier. From Fig.2 we can conclude that all natural gas mainly came from primary cracking of Kerogen, less came from cracking of crude oils.

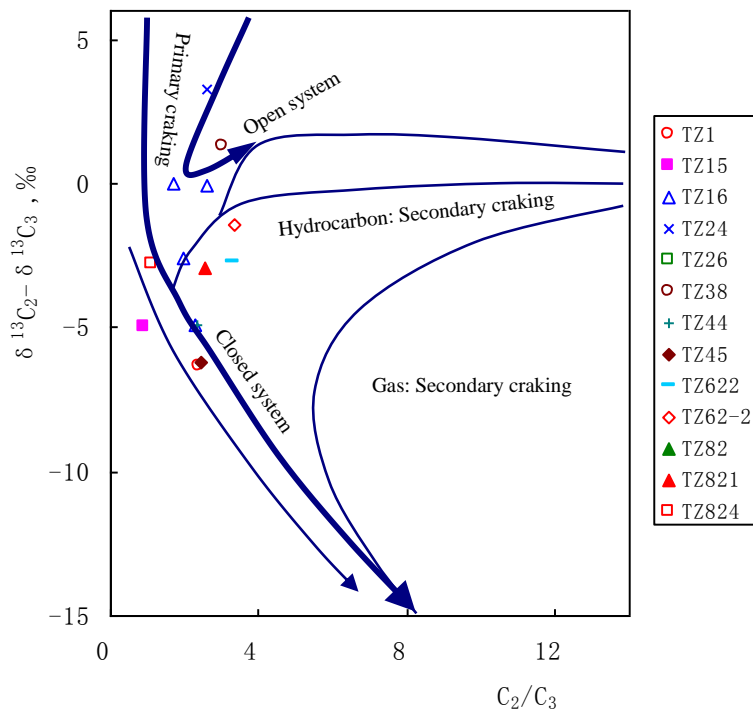


Fig.2 Genetic discrimination of Ordovician natural gas in Tazhong Uplift

In general, the differences of Ordovician natural gas were mainly controlled by the thermal evolution stage of organic matter, and partly controlled by the type of organic matter and secondary alteration. The maturity of organic matter in the southeast was finalized earlier, and natural gas in southeast of Tazhong Uplift mainly came from over matured Cambrian source rocks. The maturity of organic matter in northwest was finalized later, and natural gas in northwest of Tazhong Uplift mainly came from middle matured Middle-Upper Ordovician source rocks. All natural gas mainly came from primary cracking of Kerogen.