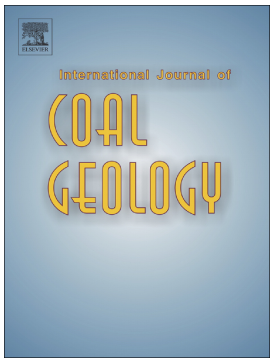

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Geochemical characteristics and origin of natural gas from Wufeng-Longmaxi shales of the Fuling gas field, Sichuan Basin (China)

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Abstract

As the first giant shale gas field in China, the Fuling gas field has recently been regarded as one of the most important regions for natural gas exploration and production in the Sichuan Basin. However, the origin of natural gas from Upper Ordovician Wufeng and the bottom of Lower Silurian Longmaxi (WL) shales in the Fuling gas field is poorly understood to limit a comprehensive understanding of gas generation, accumulation and exploration.

In this work, based on molecular and stable carbon isotopic composition of a total of 24 gas samples from five shale gas wells in the Fuling field, we analyzed the geochemical characteristics and gas origin, and discussed the cause for the geochemical anomalies (carbon isotopic reversals). Molecular composition results show that gases from the Fuling gas field are dry and mainly composed of methane (97.9 - 98.9 %), with a very low level of ethane (C_2H_6), propane (C_3H_8) and non-hydrocarbon gases (mainly CO_2 and N_2). These dry gases are classified as oil-associated gas and mainly derived from secondary cracking. Due to the lack of gas samples across a maturation gradient from immature to late mature, the WL gases in the Fuling field show an unclear evolution trend between the $\delta^{13}C_2$ and wetness values; however, all these samples are located in the isotopic reversal zone. Carbon isotopes