Goldschmidt 2026 Abstract
https://doi.org/10.46427/gold2026.35152

Accumulation of shallow gas in the LH19-3 field, Pear River Mouth Basin, South China

XIONG CHENG[1] AND DUJIE HOU[2]

[1]China Univeristy of Geosciences, Beijing
[2]China University of Geosciences (Beijing)

Shallow gas is subject to numerous geological constraints, including shallow burial depth, unconsolidated loose sand and mud as both reservoir and cap rocks, remoteness from mature source rocks, and unclear migration pathways. These issues severely hinder research on the accumulation mechanism and exploration deployment of shallow gas. Therefore, dissecting typical shallow gas accumulations is of great theoretical and practical significance for revealing the accumulation mechanism of shallow gas and guiding exploration.

Here, the LH19-3, a typical shallow gas field in the Pear River Mouth Basin was selected as an example to analyze the accumulation mechanism of shallow natural gas. The shallow gas is mainly accumulated in the Upper Miocene Yuehai Formation, and secondarily in the Middle Miocene Hanjiang Formation with a burial depth of 600–1000 m. Stable carbon isotopic and chemical composition indicate the shallow gas is a mixture of thermogenic and biogenic gas. Thermogenic gas is derived from shallow lacustrine source rocks of the Wenchang and Enping Formations in the sags, whereas biogenic gas is generated by shallow biogenic source rocks in the Hanjiang and Yuehai Formations. Thermogenic natural gas mainly accumulated in deep traps, part of them escaped to shallow strata during the Neotectonic Movement. The leaked gas migrated upward along faults and fault-related diapirs, and finally accumulated in the Yuehai and Hanjiang Formations. In addition, mudstone in the Yuehai Formation is well-developed, shallowly buried and at moderate temperatures, providing favorable conditions for methanogenic microorganisms. The in-situ biogenic gas accumulates nearby, leading to favorable accumulation conditions with dual hydrocarbon charge: deep thermogenic gas and shallow biogenic gas. The Yuehai and Wanshan Formations were deposited under major transgressive events, with extremely well-developed mudstones that form excellent direct and regional caps, ensuring the preservation of shallow gas accumulations. In summary, the LH19-3 shallow gas field is characterized by: dual gas sources: thermogenic and biogenic gas; shallow thermogenic gas migration and accumulation controlled by late-stage active faults/diapirs and cap rocks; thick marine mudstones as the cap rocks, with strong sealing mechanisms dominated by great thickness, saturated saline water, and high pressure in deep water.