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Characteristics of a large-scale continental shelf edge delta and its effect on related gas reservoir in Baiyun Sag, Pearl River Mouth Basin, South China Sea

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A large continental shelf edge delta is developed in the Enping Formation of Baiyun Sag, Pearl River Mouth Basin in South China Sea. The area of the delta is about 4500km², and the thickness is up to 1100m. This study was the first comprehensive study using data of the ancient biology, drilling and completion data and high precision 3D seismic data. By analysing the formation of unconformities and tectonic movement, the delta in the Enping Formation is divided into 3 stages. Sand ratio decreased, grain size becomes finer and sorting of rock grain improves in the delta formation from bottom to top.

Comprehensive analysis of the results show that the first and the second stages belong to braided river delta and the third stage belongs to the meandering river delta. According to the analysis of rare earth elements, trace elements and heavy minerals, the change of the source for the delta sediment of the Enping Formation is confirmed. The source of first stage delta is the nearby low uplift. The source of the second stage delta is from a middle transport distanced area. The third stage delta is derived from the granite area, which is far to the north. According to the latest research results; there are 4 kinds of sedimentary facies, 7 sub phases and more than 10 kinds of micro facies in the Enping Formation. Delta plain river sand-body, delta front underwater channel sand-body and channel mouth sand bar are good reservoirs.

The main source rocks of the Enping Formation are the coal bearing strata in the delta plain and the shallow sea strata. The total hydrocarbon expulsion quantity is 85 billion cubic meters of oil equivalent. Delta oil and gas resource amount is up to 2.05 billion cubic meters of oil equivalent. The result of this study is different from that of the previous study, the result of which is that the main hydrocarbon generating formation is lacustrine mudstone of the Wenchang formation. This new research results will lead to the major changes in the future exploration direction, from the exploration of oil to the natural gas.

