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**New Advances in Hydrocarbon Exploration in Chinese Marine Carbonate Sequences**

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Marine sediments cover over 3.3 million km<sup>2</sup> of area in onshore China. Marine carbonates host about 36.5 billion tons of oil equivalents in place, making up 20% of total hydrocarbon in place resources in China. Recent exploration activities have proved these sediments to be extremely prolific. Up to 2009, approximately 1.44 billion tons of oil and 318.26 billion m<sup>3</sup> of natural gas reserve have been proved in the marine sequences of Tarim Basin, including the huge Tahe-Lunnan field, with proved oil reserve of 1.18 billion tons, and natural gas reserve of 64.7 billion m<sup>3</sup>. In the marine sequences of Sichuan Basin, proved natural gas reserve of 1,200 billion m<sup>3</sup> has been discovered, together with the identification of Puguang-Longgang-yuanba gas fields (total proved gas reserve over 500 billion m<sup>3</sup> and indicated gas resource of 1000 billion m<sup>3</sup>). Marine sequences in Ordos Basin have proved natural gas reserve of 433.71 billion m<sup>3</sup>, with a huge discovery Jingbian field of 400 billion m<sup>3</sup> proved reserve. Because the hydrocarbon discovery ratio of Chinese marine sequences is only 10%, a great potential for future discovery is promised for the marine sequence.

Four facts make the hydrocarbon prospectivity of Chinese Marine Sequence vary greatly in different areas: (1) sediments deposited in Paleozoic and subjected to multi-tectogenesis in late; (2) Stable plates are small in size, while tectonic activities were strong; (3) high degree of organic source thermal maturity; (4) great burial depth of exploration targets causing large difficulty for exploration. It is proved that Chinese marine sediments generally have an excellent authentic hydrocarbon formation condition, but has subjected to different post-accumulation reworking. This has caused a huge difference in prospectivity for different marine sediment basins. Thus hydrocarbon accumulation is jointly controlled by both original petroleum system conditions and later stage alterations (which is also the essential difference against oil accumulations in the continental basins in Eastern China), but still with a good possibility for formation of large scale hydrocarbon accumulations. The hydrocarbon accumulation and distribution in the marine sequences has 5 characteristics: (1) Excellent source rocks are distributed regionally in marine sequences providing a solid basis for hydrocarbon accumulation. (2) Good quality seal, esp. gypsum and salt cover and good preservation conditions are the key for large scale oil and gas field formation. (3) Reservoir formation are jointly controlled by depositional facies and diagenesis - multiple phases of dissolution events caused cavity, cave,

fracture and original reef-shoal facies porosity, fracture both form excellent reservoirs. (4) Most accumulations have experienced multiple phases of reworking, and final character of accumulation is controlled by the latest stage of alteration. (5) Regional scale paleo uplifts, original ramp of depositional basin margin and structure hinge zone are major play fairways for large oil and gas fields and accumulations.

Two exploration strategies are suggested for Chinese marine carbonate sequences. “Source-seal co-control” the hydrocarbon generation and preservation conditions, and thus should be noticed for prolific region selection. “Hinge zones and slopes” control oil and gas accumulation, which should be recognized for prospective play fairways. By applying these two strategies, this study predicts the hydrocarbon accumulation and distribution pattern in Chinese marine sequences. This prediction has provided an assistance for the new exploration breakthroughs in marine sequences of West Sichuan Depression (Chuanke-1 well) and Bachu-Maigaiti Slope (Yubei-1 well).