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RESEARCH PAPER

Distribution of the Mesozoic in the continental margin basins of the South China Sea and its petroliferous significance

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Abstract: Based on 40 wells encountering the Mesozoic sedimentary rocks, 52 thousands kilometers of seismic profiles covering most parts of the South China Sea (SCS) and the latest collection of gravity and magnetic data, the distribution of the Mesozoic in the continental margin of South China Sea and the oil and gas exploration prospect are studied. The Mesozoic is distributed in three main areas in the SCS: (1) the area of eastern Pearl River Mouth Basin and Southwest Taiwan Basin, where the Mesozoic buried at 1–3 km deep and 2–8 km thick, is thickest in the Chaoshan Depression and east Dongsha Uplift, and there is a long axis gentle fold in the east of the Pearl River Mouth Basin; (2) Liyue-Palawan Basin area, where the Mesozoic, 2–4 km deep and 2–5 km thick, is thickest in the south depression of the Liyue Basin; (3) Zhongjiannan-Wan'an-western Nanwei Basin area, where the Mesozoic is 3–5 km deep and 2–3 km thick. According to the spatial location relationship between the Mesozoic distribution and deep faults, it is inferred that the Mesozoic distribution is controlled by the eastern Yangjiang-Yitong Shoal fault, Balabac fault and YueDong-Wan'an fault, and affected by the uneven base uplifting and block faulting caused by the Mesozoic Pacific plate subduction to the East Asian continent. The study on the distribution of residual Mesozoic strata, structural traps and source rocks concludes that there are two favorable areas for the Mesozoic hydrocarbon exploration, namely, Chaoshan Depression and Dongsha Uplift in the east of Pearl River Mouth Basin, and south depression in the Liyue Basin. However, the exploration prospect of the Zhongjiannan-Wan'an-western Nanwei Basin area needs further investigation.

Key words: South China Sea; continental margin; Mesozoic; fold; source rock; petroleum prospect

Introduction

Since the 1990s, the Pre-Cenozoic residual basins, especially the Mesozoic residual basins in China, have drawn high attention from researchers in China [1-6] who all considered that the Mesozoic residual basins are a new domain and strategic replacement for oil and gas exploration in China's future. Because offshore oil and gas exploration in Chinese Pre-Cenozoic residual basins is very difficult, the exploration and geological research level there is low [1–2]. In view of this, we systematically collected the data of 40 wells encountering the Mesozoic and 2 trawl samples revealing the Mesozoic sedimentary rocks, and 52 thousands kilometer seismic data covering the whole South China Sea basin and gravity and magnetic data in a large scale. On the basis of previous research findings, and by processing, analyzing and interpreting drilling, trawling, seismic and gravity and magnetic data, we have examined the distribution range, depth and thickness of the Mesozoic in the South China Sea continental margins, and predicted favorable Mesozoic areas for oil and gas exploration according to the previous research of the Mesozoic source rocks and hydrocarbon conditions.

1 Basic data

There are 40 wells and 2 trawl samples encountering the Mesozoic sedimentary rocks in the South China Sea margin basins, which are mainly concentrated in Southwest Taiwan Basin, Pearl River Mouth Basin in the northern South China Sea, and Liyue Basin, Palawan Basin, and 52 thousands kilometers of seismic lines covering most of the South China Sea areas (Fig. 1, Tables 1 and 2).

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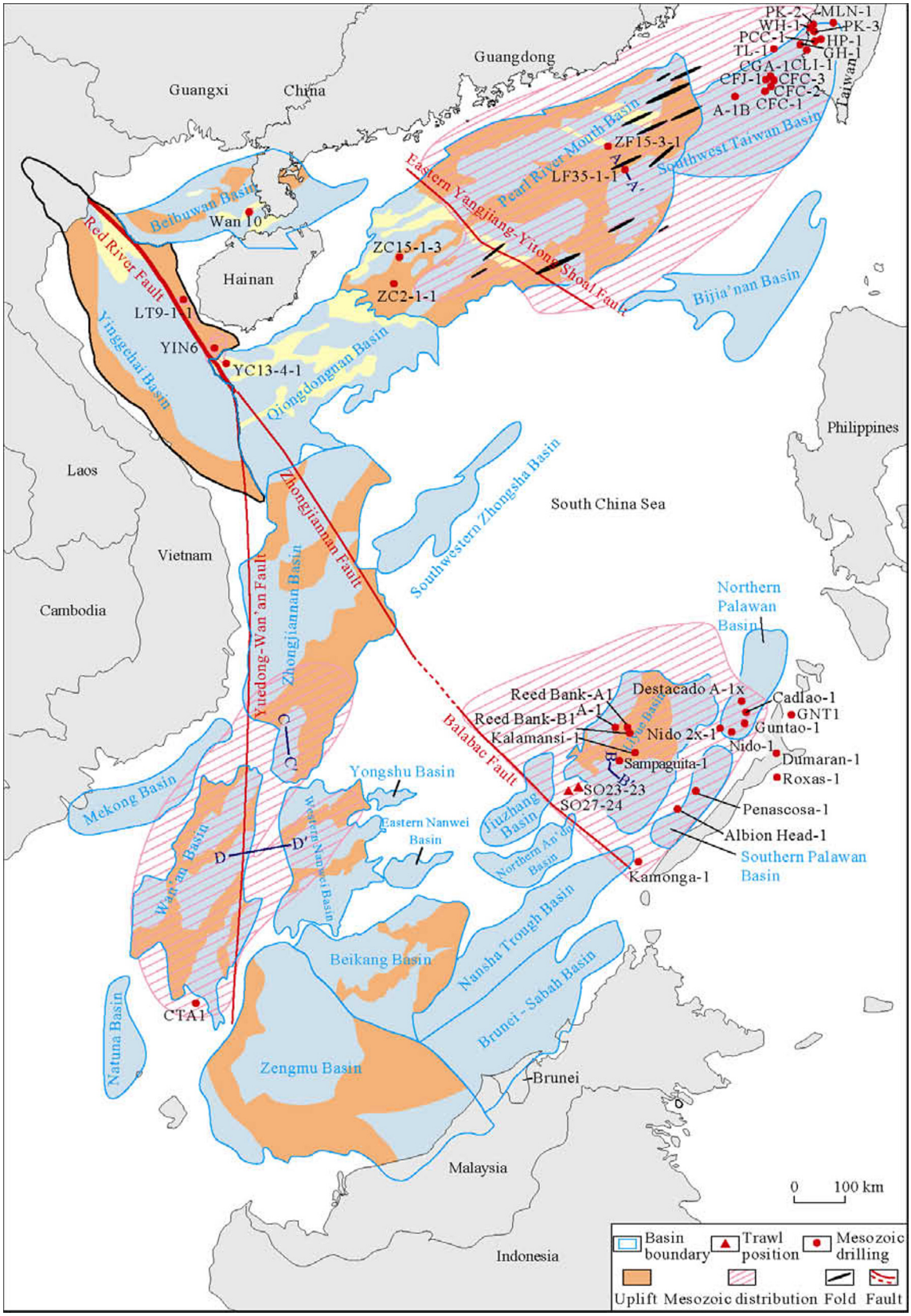

Fig. 1 Schematic diagram of South China Sea Basin and predicted Mesozoic distribution

Twenty-three wells drilled the Mesozoic in the northern marginal basins of South China Sea, including Beibuwan Basin, Yinggehai Basin, Qiongdongnan Basin, Pearl River Mouth Basin and Southwest Taiwan Basin (Table 1). The southern central marginal basins in South China Sea include over 10 basins like Wan'an Basin, Liyue Basin and Palawan Basin etc, where 17 wells and 2 trawl samples encounter the Mesozoic sedimentary rocks (Table 2). The Mesozoic deposits are mainly shale and conglomerate rocks, but also contain a small amount of limestone, mudstone, chert and claystone,