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南海南部陆缘构造变形特征及伸展作用: 来自两条973多道地震测线的证据

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Seismic stratigraphy, tectonic structure and extension factors across the southern margin of the South China Sea: evidence from two regional multi-channel seismic profiles

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摘要

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摘要 973项目"南海大陆边缘动力学与油气资源潜力"在南海南部陆缘采集了两条多道地震剖面,其中NH973-1测线始于南海西南次海盆,横跨了整个南沙地区,至于婆罗洲西北侧,NH973-2测线位于礼乐滩东侧.对地震剖面的解释共划分出7个层序界面,地层可以划分为5个构造沉积单元.根据地震解释对同时期断层的水平断距进行了测量及分析,获取了与脆性拉张相关的伸展信息:研究区的拉张作用可以分为两期,主要的拉张作用发生在大陆裂谷期(古近纪),形成了一系列的地堑-半地堑以及翘倾断块.第二期拉张作用的时期为漂移期(晚渐新世-早中新世),断层活动强度明显变弱,并主要集中在洋陆过渡带.在南海南部陆缘广泛发育了碳酸盐沉积,其发育的时代和南海的海底扩张时期一致.对位于礼乐滩东西两侧的两条地震剖面伸展特征的分析表明,其根据断层水平断距获得脆性伸展因子与根据深反射地震及重力反演获得的全地壳伸展因子之间存在差异,表明南海南部陆缘的拉张在纵向上并非是均一的,而是取决于深度发生变化.

关键词: 南海南部陆缘 沉积 构造变形 伸展因子 非均一

Abstract: Two recently acquired regional multi-channel seismic profiles across the southern margin, the South China Sea (SCS), are interpreted. One line is crossing the entire Nansha region from the deep oceanic Southwest Subbasin of the South China Sea, along the Nansha Islands to close to Borneo, and the other one runs east of the Reed Bank. Based on the interpretations of these profiles, we worked out stratigraphic sequences, tectonic structures and extension factors. Five tectonic-stratigraphic units are determined, together with 7 sequence boundaries. Detailed analyses on the extension factors based on the measurement of fault heaves reveal two episode of continent extension separated by a distinct unconformity, which likely correspond with the beginning of sea-floor spreading in the South China Sea. Early extension occurred during continental rifting (Late Cretaceous-Early Oligocene), and resulted in formation of half-grabens and rotated blocks controlled by a deeply rooted detachment system. Extension continued in our study area during the drifting phase of the Eastern Subbasin of the South China Sea (Late Oligocene-Early Miocene) until the subsequent opening of the Southwest Subbasin at about 25 Ma, but its intensity decreased markedly thereafter. Deeply rooted detachment systems evolved possibly during this second phase of extension at continent-ocean transition area. We suggest that a widespread carbonate platform developed across the Dangerous Grounds, concurrent with the drifting period of the Southwest Subbasin of the SCS. Fault-related stretching factors (β_f) to the west and east of Reed Bank are found to be comparable and show discrepancy with the whole crust stretching factors (β_c) in the study area as derived from gravity modeling. Thus we conclude that the continental crust of the southern margin might have experienced depth-dependent extension.

Keywords: Southern Margin Stratigraphy Deformation Stretching factors South China Sea

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