



The controlling factors on the submarine canyon system: a case study of the Central Canyon System in the Qiongdongnan Basin, northern South China Sea

Ming Su (1,2,3), Cheng Zhang (3), Xinong Xie (3), Zhenfeng Wang (4), Tao Jiang (3), Yunlong He (3), and Cuimei Zhang (5)

(1) Key Laboratory of Renewable Energy and Gas Hydrate, Guangzhou Institute of Energy Conversion, Chinese Academy of Sciences, Guangzhou Guangdong 510640, China (suming@ms.giec.ac.cn), (2) Guangzhou Center for Gas Hydrate Research, Chinese Academy of Sciences, Guangzhou Guangdong 510640, China, (3) Key Laboratory of Tectonics and Petroleum Resources of Ministry of Education, China University of Geosciences, Wuhan Hubei 430074, China, (4) China National Offshore Oil Zhanjiang Ltd. Corporation, Zhanjiang Guangdong 524057, China, (5) Key Laboratory of Marginal Sea Geology, South China Sea Institute of Oceanology, Chinese Academy of Sciences, Guangzhou Guangdong 510301, China

Based on the integrated analysis of the high-resolution 2D-3D seismic data and the drilling data, this study analyzed the tectonic-sedimentary evolution since Late Miocene, and discussed the controlling factors on the formation and development of the CCS. The sediment failure caused by the relative sea level falling could discharge the deposits from the slope to the canyon. The two suits of the infillings, the turbidite and the mass transport complex, were derived the northwestern source and northern source respectively. The distinct different sediment supplies from the different areas, would lead to the variation of the internal architectures. The tectonic transformation around 11.6 Ma provided the tectonic setting for the CCS and formed an axial sub-basin in the central part of the Changchang Depression, which could be suggested as the rudiment of the CCS. The tectonic activity of the Red River Fault at 5.7 Ma could strengthen the hydrodynamics of the deposits at the junction of the Yinggehai Basin and the Qiongdongnan Basin, and trigger the high energy turbidite current. The mass transport complex from the northern continental slope system would be constrained by the Southern Uplift, which played as the barrier for the infillings of the CCS. Due to the sufficient sediment supply during the Holocene period and the paleo-seafloor morphology, the relief of modern central canyon with the starving shaped in the eastern Changchang Depression may be accentuated by deposition of sediments and vertical growth along the canyon flanks, where the collapse deposits were widely developed. Corresponding to the segmentation of the CCS, the forming mechanisms of the canyon between the three segments would be different. The turbidite channel in the head area was triggered by the abundant sediment supply from northwestern source together with the fault activity at 5.7 Ma of the Red River Fault. The formation and evolution of the canyon in the western segment should be the combined effects of the turbidite channel from northwestern source, the mass transport complex from the northern continental slope, and the paleo-seafloor geomorphology. In the east segment, the canyon should be constrained by the tectonic transformation at about 11.6 Ma and the insufficient sediment supply from the wide-gentle slope.