



Morphotectonic, seismic characteristics and development of the Off Pearl River Mouth Canyon, North South China Sea margin

A. Wei-wei DING (1) , B. Jiao-biao Li (1), C. Jun Li (1) , Ming-bi Li (1)

(1) Key Laboratory of Submarine Geoscience of the State Oceanic Administration, Hangzhou 310012, China

The north continental margin of the South China Sea is the main depocentre for sediment supply from South China via Pearl River. The shelf break is located at water depths of ~400m. The continental slope is dissected by numerous canyons, each of which is fed by several tributaries. These canyons commonly stop at the shelf-break or slightly upward from it. The unique and notable exception is the Off Pearl River Mouth canyon (OPRM Canyon in brief), a feature that is deeply incised into the shelf landward of the shelf-break, up to 400m water depth and connected to the youngest channel-levee system of the Pearl River Fan on the wide continental shelf extending more than 200km from the Chinese coast. After capturing several tributaries near the shelf-break, the OPRM Canyon continues basinward as a channel with well-developed levees.

In this paper mechanisms of canyon evolution and factors that controlled it are revealed by analyzing the morphology and the sedimentary structure of the canyon, as well as main features of the continental margin around the canyon. This study is based on investigation by swath bathymetry in the canyon area combined with different types of seismic data.

The results show that the course of OPRM Canyon displays three distinct trends. From its head region in the shelf edge and upper slope areas, the canyon shows an initial NW-SE course. However, just on entering the Baiyun Depression at about 1000m water depth, it is sharply diverted to a predominantly E-W direction. The course changed

to NW-SE again at the position of 18°42'N, 116°E with the water depth of 2100m and flow into the deep sea at about 3500m water depth. The two abrupt shifts in course of the canyon allows us to describe the canyon's morphological features under three main domains.

The main canyon forming mechanism was the erosion of the canyon floor by sediment flows along the axial thalweg, causing sediment failure both laterally on the flanks and at the canyon headwall. Erosive flows are interpreted to result from hyperpycnal currents at the paleo-Pearl River mouths discharging into the South China Sea. During the lowstand levels of the South China Sea the canyon was located in an area of high sediment supply close to the paleo-Pearl River mouths. This is indicated by the sedimentary structures with buried fluvial channels in several sequence boundaries with the period corresponding to each lowstand period since the gradient of the slope become ongoing to the present status (16.5Ma). Deep-water fans were figured out in corresponding lowstand system tracts in Baiyun Depression. Periodic sea level falling, abundant sediment supply from the Paleo-Pearl River and long-term thermal subsidence of Baiyun Depression in Pearl River Mouth Basin resulted in the development of the OPRM Canyon and other gullies in this area.

The geometry of the Canyon with different orientations was also associated with the structural background controlled by a network of faults. The possible relationship between the changing direction along the canyon and the local tectonics are discussed. We believed that fault-controlled zones of weakness pre-determined the location of the distal canyon and also facilitated erosional downcutting during its formative stages.

Keywords: submarine canyon, morphotectonic, lowstand, buried channel, fault-controlled, South China Sea