



Morpho-sedimentary features and sediment dispersal of the Fangliao Submarine Canyon in the active margin offshore SW Taiwan

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Using newly collected multi-channel seismic profiles and bathymetric data this paper characterizes morphology and relates it to structural and sedimentary processes in the Fangliao Submarine Canyon and contrasts with the nearby Kaoping Canyon about 20 km in distance by the sediment dispersal in terms of source to sink. The Fangliao Canyon consists of three distinct morphologic parts: an upper canyon, a lower canyon and a distal submarine fan. The upper canyon indents into and begins at the shelf edge and extends downslope in a relatively straight course for a distance of about 22 km and ends at water depth of about 600 where the canyon turns sharply to the southwest. The deflection of canyon course is caused by the presence of a structural high of diapiric mud ridge. The lower canyon runs southwestwards along the western edge of the elongate ridge for a distance of about 45 km and is in water depth of about 900 m where the canyon mouth opens and sediments disperse laterally and downslope, forming a relatively small submarine fan of about 400 square kilometers.

The upper canyon is represented by a relatively narrow (3-4.5 km), V-shaped valley with canyon relief less than 300 m. Seismic profiles reveal terminations of parallel reflectors against steep canyon walls and slumping and sliding features, suggesting erosional canyon down-cutting. In the lower canyon, the canyon width increases to 12 km wide and canyon relief greater than 400 meters, indicating intense down-cutting of canyon floor and lateral erosion of canyon walls. However, the cross-sectional morphology is characterized by varying V-and U-shaped valleys. Relatively flat reflectors onlap the canyon floor and result in U-shaped cross sections, indicating combined effects of erosion and deposition. The distal submarine fan is a low-relief depositional feature probably resulting from channelized and overbank deposition.

Although under the same conditions of climate, sea-level changes and tectonics of the SW Taiwan margin the Fangliao Canyon differs greatly from the nearby Kaoping Canyon in terms of sediment dispersal. The sediment source of the Fangliao Canyon is mainly derived from the canyon head indenting the shelf edge where neither major rivers nor deltas are close to or present, resulting in limited sediment supply from the shelf to the canyon head. Therefore, the Fangliao Canyon serves as a sediment pathway fed by limited sediments from the shelf edge, allowing to transport sediments for a relatively short distance of about 70 km and depositing them at the upper continental slope in water depth of about 1000 m, forming a small fan, the ultimate sediment sink. In contrast, the head of Kaoping canyon is connected to the Kaoping River, a small mountainous river with a high sediment yield. Recurrent hyperpycnal flows during the flood seasons are transporting great amounts of sediments to the Kaoping canyon head to generate powerful down-slope sediment flows, transporting sediments for a long distance of about 260 km across the entire continental slope and reaching the deep-sea Manila Trench, the ultimate sediment sink. Without continuous and large supply of sediments to the canyon head the Fangliao Canyon can be considered as a sediment pathway with limited capacity for transporting shallow marine sediments to the deep sea.

Key words: submarine canyon, morphology, sediment dispersal, seismics, Taiwan