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Morpho-sedimentary features of the Gaoping Canyon System in the accretionary wedge off SW Taiwan

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Gaoping Canyon (GPC) is a river-connected canyon that delivers a vast amount of sediments from the Taiwan mountain belt to the Manila trench of the South China Sea. The canyon course traverses through the actively uplifting accretionary wedge, thus structural activities exert strong controls on the deposition/erosion of the canyon system. In this study, we use an array of data, including multi-beam bathymetry, reflection seismic profiles, sub-bottom profiles, and sediment cores to discuss the interactions among bathymetry, sediment transportation and deposition, and tectonic activity along the GPC.

The bathymetry shows that the GPC can be divided into three segments of upper reach, middle reach, and lower reach, respectively, according to literature. The upper-reach is an erosive meandering channel incising into the Gaoping shelf and upper slope with a thalweg depth (relief) in the range of 200-500 m, and a longitudinal gradient of -1.78 %. The canyon thalweg is mostly erosive with sediments accumulated in a few depressions along the thalweg. Piles of hyperpycnites were found on the thalweg of the canyon head, immediately off the Gaoping river mouth. Sediment cores show that the turbidity currents are mostly confined within the incised valley. The middle reach of GPC is nearly straight and develops along the footwall of the NNW-trending splay fault that separates the upper and lower slope of the accretionary wedge. The thalweg depth is in the range of 500-800 m, featuring the deepest of the canyon thalweg for the GPC, and a longitudinal gradient of -1.52 %. The canyon thalweg is mostly erosive with gravel lags. Sediment cores show that the turbidity currents are mostly confined in the incised valley.

The lower reach can be subdivided into proximal and distal segments. The proximal lower reach features large-radius lateral migrating meanders and abundant landslide scars along the banks/levees of the channel. The thalweg depth is in the range of 130-400 m, and a longitudinal gradient of -0.64 %. The relatively shallow thalweg depth leads to overspilling of the turbidity currents, forming a slope fan on the deforming accretionary wedge. The distal lower reach develops among and cutting through a series of uplifting submarine ridges, leading to small meanders and erosive and by-pass channels.

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