

Hyperpycnal events observed in the Gaoping Submarine Canyon

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As the result of the interplay between frequent earthquake occurrence, typhoon invasion, and heavy rainfall, many rivers in Taiwan have the potential to generate hyperpycnal plume especially when the typhoon passes through the Taiwan Island and brings a large amount of rainfall. In order to capture the hyperpycnal turbidity current signal, two moorings each configured with an SCTD and ADCP, one with an additional non-sequential sediment trap, were deployed in the head region of the Gaoping Submarine Canyon three days after the typhoon-induced peak of the river discharge and suspended sediment concentration (SSC) of the Gaoping River in southern Taiwan (Figure 1). Our data show a demarcation between a tidal and hyperpycnal regimes. The latter lasted for the first 5 days for the 18-day deployment, as defined by higher water density due to high suspended sediment concentration. Several lines of evidence indicate the presence of the tail end of a hyperpycnal turbidity current (HTC), including the retention of warm water near the canyon floor, high SSC, down-canyon directed flow and its vertical structure, and high terrestrial fraction (larger than 70%) of the organic particles carried in the flow. The decreasing mass flux during the passing of the HTC is also an indication of a waning HTC. Our findings also show that the vertical flow structure and the direction of the gravity-driven down-canyon HTC were little affected by the instantaneous tidal oscillations in the canyon.

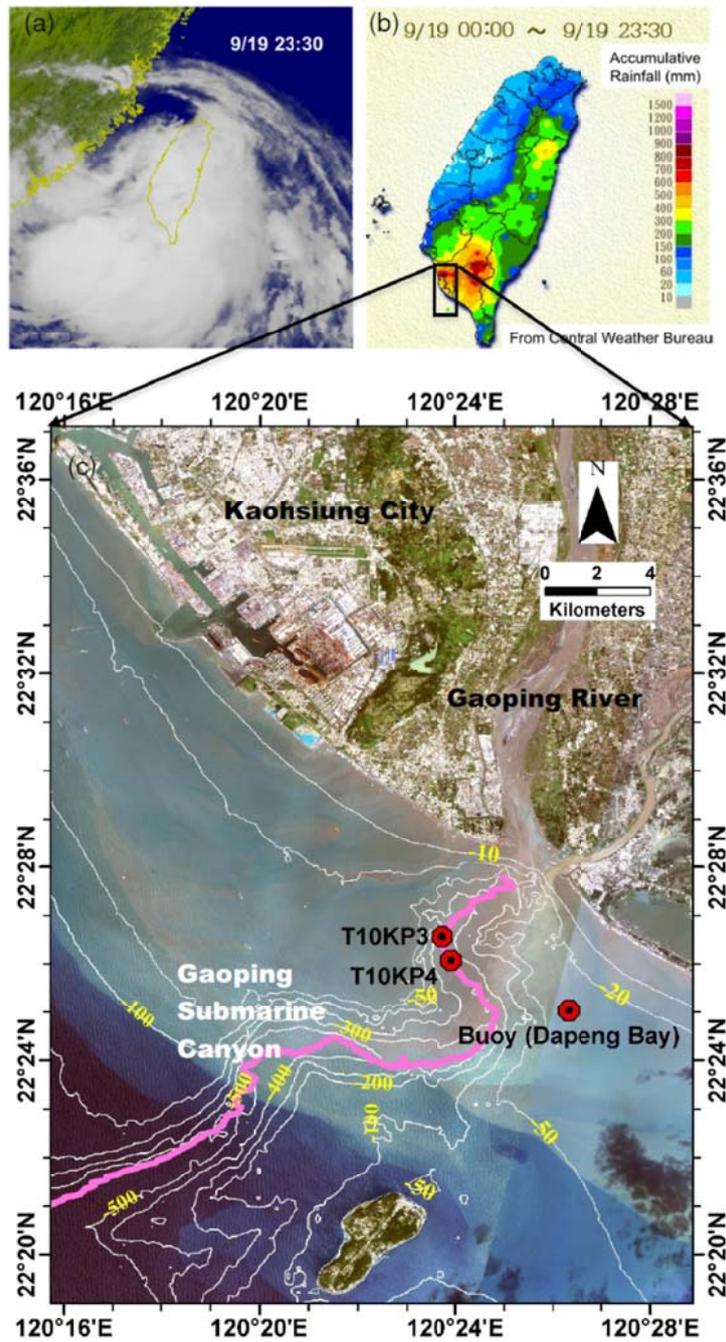


Figure 1. Typhoon Fanapi hit Taiwan on Sep. 19th. (a) The satellite image indicated the cyclonic clouds covered all over the island. (b) The heavy rainfall accumulated over 1000 mm in one day in the southwestern Taiwan. Especially, the high precipitation was concentrated mostly in the drainage basin of the Gaoping River in the southern central range. (Graphs in a and b are by courtesy of Central Weather Bureau-CWB in Taiwan) (c) This graph was taken by FORMOSAT-2 on Sep. 21st and superimposed by the Gaoping Submarine Canyon bathy contour (From Center for Space and Remote Sensing Research-CSRSR, National Central University, Taiwan). The pink line illustrated the thalweg of the submarine canyon. Two mooring's locations were pointed out by red circle in the thalweg. Another red circle was the weather buoy site maintained by CWB.