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A submarine canyon conduit under typhoon conditions off Southern Taiwan

James T. Liu*, Hui-Ling Lin, Jia-Jang Hung

Institute of Marine Geology and Chemistry, National Sun Yat-sen University, Kaohsiung, Taiwan 804-24, Republic of China

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Abstract

The function of a submarine conduit under typhoon conditions is examined. The study site is the Kao-ping river, shelf, and submarine canyon (KPRSC) system located off southern Taiwan on a wave-dominated microtidal coast. The head of the canyon is located approximately 1 km off the river mouth. Two comprehensive 1-month field experiments were carried out in 2000 and 2002 during the flood season of the river. Both experiments encountered typhoons that generated significant river discharge and wave resuspension events. Particle samples collected in 2000 by sediment-traps were analyzed for coarse fraction by the wet sieving method. Among the coarse fraction, foraminiferal species and their abundance were recorded as a tracer for biogenic particles of marine origin. Stable isotopes of carbon ($\delta^{13}C$) of organic particles of sediment-trap samples were analyzed as a tracer for particles of terrestrial origin. All the measured flow and particle concentration records were analyzed by conventional time-series analytical methods. Simultaneously observed records of suspended sediment concentration at the river mouth and the volume concentration of suspended particles near the canyon floor were compared. Instantaneous flux and cumulative transport of suspended particles near the canyon floor were estimated during the deployment period. Results show that Kao-ping Submarine Canyon is a multi-level and process-dependant two-way conduit for particles of terrestrial and marine origins. In general, terrestrial signals are stronger than the marine signals in sediment-trap samples near the head of the canyon. During typhoon events, in the early distal phase of their influence nonlithogenic and biogenic marine sources are enhanced; in the later proximal phase signals of locally generated terrestrial lithogenic sources are enhanced. An episode of momentary downcanyon flushing of suspended particles near the canyon floor is observed during one typhoon occurrence. This flushing suggests nondeposition during the typhoon at the locale of deployment despite increased input of particles to the canyon floor. It also suggests a mechanism by which turbidity currents could be triggered. Yet, this flushing phenomenon is not observed in another typhoon occurrence, suggesting it is not universal in the canyon's response to the typhoon.
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Keywords: River-sea system; Submarine canyon; Particle size; Nonlithogenic source; Biogenic source; Typhoon; Sediment-trap; Taiwan

1. Introduction

Worldwide in many river-sea transport systems that include submarine canyons, storms and energetic weather events play an important role in the hydrodynamics and particle transport on the shelf

*Corresponding author. Fax: +886 7 525 5130.
E-mail address: james@mail.nsysu.edu.tw (J.T. Liu).

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