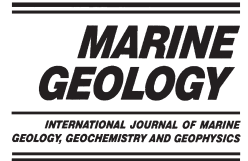




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The effect of a submarine canyon on the river sediment dispersal and inner shelf sediment movements in southern Taiwan

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Abstract

This study examines the influence of a submarine canyon on the dispersal of sediments discharged by a nearby river and on the sediment movement on the inner shelf. The study area includes the head region of the Kao-ping Submarine Canyon whose landward terminus is located approximately 1 km seaward from the mouth of the Kao-ping River in southern Taiwan. Within the study area 143 surficial sediment samples were taken from the seafloor. Six hydrographic surveys along the axis of the submarine canyon were also conducted over the span of 1 yr. Three different approaches were used in the analysis of grain-size distribution pattern. They include (1) a combination of ‘filtering’ and the empirical orthogonal (eigen) function (EOF) analysis technique, (2) the McLaren Model, and (3) the ‘transport vector’ technique. The results of the three methods not only agree with one another, they also complement one another. This study reveals that the Kao-ping Submarine Canyon is relatively a stratified and statically stable environment. The hydrographic characteristics of the canyon display seasonal variability controlled primarily by the temperature field and the effluent of the Kao-ping River. The hydrographic condition and the bottom topography in the canyon suggest the propagation of internal tides during the flood season (summer) of the Kao-ping River. The submarine canyon acts as a trap and conduit for mud exchange between the Kao-ping River and offshore. Near the head of the canyon there is a region of sediment transport convergence. This region is also characterized by high mud abundance on the seafloor that coincides with the presence of high suspended sediment concentration (SSC) spots in the bottom nepheloid layer. Outside the submarine canyon on the shelf where the evidence of wave reworking is strong, the northwestward alongshore transport dominates over the southeastward transport, which is a common theme on the west coast in southern Taiwan. © 2002 Elsevier Science B.V. All rights reserved.

Keywords: Kao-ping Submarine Canyon; bottom nepheloid layer; mud trap; grain-size distribution; EOF analysis; McLaren Model; transport vector; static stability; internal tide

1. Introduction

Submarine canyons are common features on

continental margins worldwide (Baker and Hickey, 1986; Durrieu de Madron, 1994; Gardner, 1989; Hagen et al., 1996; Hickey et al., 1986). They are important natural conduits for the transfer of terrigenous sediments to the deep sea (Baker and Hickey, 1986; Carson et al., 1986;

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