

## **Multi-proxy records of the turbidites from the Beinan River-Taitung Submarine Canyon system off eastern Taiwan: Inferences on triggering mechanisms of the turbidity currents**

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Taiwan has a unique setting with tectonically active high-standing mountains, and intense monsoonal rainfall and cyclonic storms, which result in short-term events such as earthquakes, and typhoon-induced floods and hyperpycnal flows. These short-term events are regarded as the main cause of generation of turbidity currents and in turn deposition of the turbidity layer known as turbidite. The turbidite deposits act as robust archives to evaluate the occurrence of past extreme events, their frequency and related risk. This study utilizes three short sediment cores collected from the Beinan River estuary to continental slope, eastern Taiwan to identify the triggers of the turbidity currents using a multi-proxy (sedimentological, and organic and inorganic geochemical) approach and then uses this knowledge to better understand the mechanisms forming deep-sea turbidites in the Taitung Submarine Canyon. Grain size, X-ray fluorescence, C/N ratio, total organic and inorganic carbon concentrations, stable carbon isotope and lignin results from the short cores combined with multivariate statistical tools suggest that the turbidite layers of these cores were formed by both hyperpycnal flows and earthquake-induced slope failures. The core collected from the Beinan River creek has the turbidite layers dominated by the terrigenous sediments delivered during the hyperpycnal flows in the Beinan River. Whereas, the core taken from the front and middle section of the Taitung Canyon, which has a reverse fault in the middle section of the canyon, is characterized with event layer caused by the collapse of the continental shelf by the earthquake. Moreover, the deep-sea sediment core (MD18-3538) collected from the middle section of the Taitung Canyon represents several turbidity layers of varying thicknesses. Results obtained from the core indicate that the source of the turbidite layer in core MD18-3538 include mixed sources including Beinan River and the Luzon Island Arc. Since this core is located far away from the land, the energy of the hyperpycnal flow caused by the typhoon is not enough to transmit such a long distance. Only subsequent turbidity currents, or turbidity currents caused by earthquakes or slope collapses, can bring terrestrial sediments to this area for deposition.

**Keywords:** Extreme events; Beinan River; Taitung Submarine Canyon; Hyperpycnal flow; Geochemistry