Far More Prolonged Deep-sea Turbidity Currents triggered by typhoon and earthquake in the Gaoping Submarine Canyon

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Submarine turbidity currents are argued to deliver more sediment along their long-runout propagation than other dynamic processes from shelf to deep sea. The *in situ* temporal and spatial features of turbidity currents are urgently required for a better quantitative constraints on sediment transport and deposition in the deep sea. Here, we document yearlong direct monitoring of turbidity currents in the middle reach at a water depth of 1265 m and the lower reach at 2425 m on the margin of the Gaoping Submarine Canyon off Taiwan, which has the wettest typhoons and active earthquakes. Both the two moorings (~35 km apart) were equipped with sediment traps and various sensors to collect particles consecutively with 18 days interval and to record velocity, sediment concentration, temperature and salinity with 20 min interval. Seven turbidity currents are identified consistently at these two reaches with enhanced sediment flux, which was recorded by a time-series sediment trap at 30 m above the seafloor. By combining the atmospheric measurements and earthquake data, four turbidity currents are triggered by the four powerful typhoons crossed Taiwan during typhoon season in boreal summer 2015, and one event is attributed to the M_L 6.5 Kaohsiung earthquake in southern Taiwan in February 2016. The two types of turbidity currents associated with individual typhoon and earthquake show a sustained duration ranging from 9 to 41 days, far more prolonged than the longest documented deep-sea turbidity currents (~10 days) in other locations. The flow velocity observed on the margin (~0.2 m/s) is much weaker than that in the thalweg of the canyon (> 5.8 m/s) inferred from the break of cables. For the first time, our observation provides the variability of the timing and hydrographic properties of the turbidity currents triggered by individual mechanisms for better constraints on flow capacity and sediment redistribution.

Keywords: in situ mooring observation, prolonged turbidity currents, typhoon and earthquake

