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TITLE: Frequent sediment density flows during 2006 to 2015, triggered by competing seismic and weather events: Observations from subsea cable breaks off southern Taiwan

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ABSTRACT:

At least 17 subsea telecommunications cables cross the Gaoping Canyon and Manila Trench system in the Strait of Luzon between Taiwan and the Philippines. There, cable breaks record rapid (5?16 ms? 1), long run-out (> 300 km) sediment density flows triggered by earthquakes and typhoons. Four major cable-breaking events have occurred in the last decade. In 2006, the Pingtung ML = 7.0 earthquakes formed up to 3 individual flows, some of which ran-out for up to 460 km. In 2009, Typhoon Morakot generated two sediment flows; the first was triggered by hyperpycnal river discharge, whereas a second flow formed 3 days later, possibly due to failure of recently deposited flood sediment in upper Gaoping Canyon. A flow in 2010 formed during a swarm of ML = 3?5 earthquakes that followed the ML = 6.4 Jiashian earthquake. Finally, Typhoon Soudelor of 2015 caused the Gaoping River to form a hyperpycnal plume that failed to break cables at < 2600 m depth, but broke at least 6 cables in deeper water. The 2006 Pingtung earthquakes produced the largest sediment flow(s) that produced 22 cable breaks. The other events were less destructive with each causing 6?9 breaks. Sources of the sediment flows varied with the triggering mechanism: those associated with hyperpycnal discharges probably began near the mouth of the Gaoping River. In contrast, earthquake-triggered landslides and subsequent sediment density flows formed anywhere on the adjacent continental margin. Flow speeds generally declined with increased run-out, lower seabed slope and increased channel width. Most variability (7?20 ms? 1) was observed over the 0.4°?1.0° slopes of Gaoping Canyon but speeds were mainly restricted to 5?8 ms? 1 in the 0.3° sloping Manila Trench. The 2006?2015 period of frequent cable-damaging flows is the first for the past two decades or longer. In the absence of evidence for increased seismic or anthropogenic activity, this disruptive period may reflect increased typhoon intensity and fluvial sediment discharge. Such typhoon-related flows may complicate interpretation of palaeo-seismic records derived from turbidites in such settings.

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