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Measure the initiation of turbidity current from slope failure

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Submarine slope failure and the density current it generates is an important source to sink pathway that delivers sediment into deep sea. Here we study the initiation of sandy turbidity currents from slope failure using direct measurements across the interface of sediment and ambient water. Pore pressure measurements show that the rate of sediment release is regulated by the generation and dissipation of pore pressure drops. When the deposit is unstable landslide style slope failure occurs, which generates pore pressure drops that stabilizes the deposit. The stable deposit releases sediment grain by grain while the abnormally low pore pressure dissipates, until the deposit is unstable again and repeats the cycle. Current velocity measurements show that the initial velocity of the turbidity current generated by slope failure is insensitive to the different rates of sediment release during a slope failure event. Furthermore, while higher porosity leads to higher average rate of sediment release in different experiments, the current velocity remains unchanged. This is because water entrainment, instead of the rate of sediment supply dominates the development of turbidity current from slope failure. As a result, the development of turbidity current from slope failure is decoupled from the mechanics of sediment release from slope failure.

Keywords: turbidity current, slope failure, pore pressure, initiation, self-stabilizing