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The 1929 Grand Banks submarine landslide revisited

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On November 18th, 1929 a large submarine landslide occurred along the St. Pierre Slope of the southwestern Grand Banks of Newfoundland, as a result of a Mw 7.2 earthquake. This submarine landslide led to the first recognition of naturally-occurring submarine turbidity currents and is one of the few landslides known to have generated a tsunami. The event caused 28 causalities in Newfoundland and severe infrastructural damage. Earlier investigations of the area identified widely distributed shallow mass failures (15 – 20 m high escarpments), but no evidence of a larger headscarp. It is difficult to conceive, therefore, how this distributed shallow failure that rapidly evolved into a turbidity current would have generated a tsunami. It is hypothesised in this study that a deeper rooted sediment failure (∼500 m), involving faulting and mass-rotation, was involved in the sediment failure and this displacement generated the tsunami. In order to test this hypothesis, the volume and kinematics of the 1929 slope failure are analysed by means of recently acquired high resolution seismic reflection and multibeam swath bathymetry data, in addition to a significant volume of legacy data. The data allow determination of: 1) the dimension of the failure area, 2) the thickness and volume of failed sediment on St. Pierre Slope, 3) fault patterns and displacements, and 4) styles of sediment failure involved. Shallow (20 m high) sinuous escarpments and a number of faults are observed along the upper St. Pierre Slope (500 - 2 500 m water depth). The uppermost and largest of these escarpments shows association with a fault system. Preliminary results, therefore, indicate a complex sediment failure pattern along the St. Pierre Slope, possibly involving a deep-seated decollement and mobilization of a large volume of surficial sediment through retrogressive failure. Causes for the tsunami are yet to be determined.