Quaternary geology and seabed geohazards of the continental margin offshore Haddock Channel off southern Newfoundland

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The deep continental margin off Nova Scotia and Newfoundland has numerous submarine landslides. Submarine landslides are a potential hazard for hydrocarbon development and a possible source of tsunamis. The deep-water area off Haddock Channel is unusual for the very active shallow salt tectonics. This area was studied to establish whether the salt tectonics increased the risk of submarine landslides in the area. The region was studied from 300 line-km of Huntec high-resolution seismic reflection profiles, used to map the stratigraphic occurrence and geographic distribution of landslide deposits.

Eight long piston cores were used to determine the age of the stratigraphic section and hence the age of the younger landslide deposits. Chronology was based on the recognition of detrital carbonate beds (Heinrich layers) and their correlation with

dated sections elsewhere. The principal sediment recovered in cores is mud, deposited from proglacial plumes when continental ice crossed the continental shelf.

Seismic correlation was carried out by defining key reflections at a type section. Correlation was difficult due to erosion along the main valleys, fault scarps, mass-transport deposits, and evacuation of failed sediment and resulting changes in the sub-bottom depths of key seismic horizons. In particular, correlation across the major Haddock valley proved impossible. Six reflectors were identified in the upper 100 ms of sediment. The shallowest was correlated throughout most of the study area and correlates with a Heinrich layer observed in several cores. The shallowest regional mass-transport deposit immediately underlies this reflector. Two other major mass-transport deposits are recognized deeper in the section. Failure scarps are recognized at the margins of all three deposits.

Numerous shallow faults were located in the study area and fault-line scarps tens of metres high are common. The orientation of faults is difficult to determine from the available seismic profiles.

The restriction of large mass-transport deposits to only a few stratigraphic horizons and their presence in multiple valleys suggests an origin by regional earthquake shaking, rather than any local trigger. Such regional failures have a recurrence interval of 10–20 thousand years.