CONTINENTAL SLOPE SEDIMENTATION MODELS: LAURENTIAN CHANNEL AND HALIBUT CHANNEL REGIONS, EASTERN CANADA

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Recently acquired seafloor multibeam, and 2D and 3D seismic reflection data of the St. Pierre and Halibut Slope regions provide evidence for successive mass failures at a variety of scales. The occurrence of stacked and regionally extensive mass failures suggests that this is a fundamental process for slope sedimentation in this area; the most recent mass-transport event was in 1929. There are a variety of factors that explain the significance of mass failures in this area: 1) Drainage of the Great Lakes, which are the largest inland bodies of water in North America, cause the St. Lawrence River and Laurentian Channel to act as major fluvial and sediment transport conduits for most of eastern North America. It was also a major ice-outlet corridor during numerous Quaternary glaciations. As a result, sedimentation rates at the mouth of Laurentian Channel and on Laurentian Fan have been periodically high, leading to potential generation of high pore pressures and a thick column of underconsolidated sediment. 2) Sediment sampling in the region has shown the presence of intra-formational methane gas within the shallow portion of the sediment column. Generation of gas within sediment reduces its strength properties. 3) Gas hydrates, which may be indicated by bottom-simulating reflectors, are interpreted to occur in the region. Their dissociation may provide another potential source for shallow gas. 4) Recognition of buried sedimentary bedforms suggests sandy intervals underlying St. Pierre and Halibut Slope areas. Listric faults extending from surface escarpments into this interval suggests that possible detachment surfaces, perhaps in response to generation of overpressures occur within them. 5) The area overlies the Cobequid-Chedabucto fault, a paleo-transform margin, which appears to have a higher level of seismicity than most of the Canadian east coast margin. Ground accelerations due to earthquakes plays a critical role in initiating sediment failure, as in the 1929 Grand Banks submarine landslide during a M7.2 earthquake. Mass transport processes are clearly a significant mechanism of sediment delivery in the shelf to slope setting of the greater Laurentian Channel region. These processes are dependent upon a variety of pre-conditioning factors, both lithologic and structural, yet likely initiated by seismicity. The ubiquitous nature of such processes in the Quaternary section is a critical component to understanding reservoir potential of underlying rocks that reside in the same geologic setting.