Failure Structures in the Quaternary Deposits of the St-Lawrence Estuary (QC, Canada)

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Quaternary sediments of the St-Lawrence estuary reveal an important series of failure deposits, which accumulated at the front of a "shelf-edge" delta during a forced regression lowstand episode. This study, part of the COSTA-Canada project (Canadian Contribution to the Study of the Stability of Continental Slopes), is based on the analysis of more than 700 km of high-resolution seismic reflection profiles.

The St-Lawrence estuary is divided in two major sedimentary zones by an Appalachian submarine rise of bedrock (the partially filled Laurentian Channel incised into Greenville rocks to the north, and a series of filled Appalachian basins to the south). In this study, only the sedimentary structures of the Laurentian Channel are being considered. Our analyses show important accumulations of failure deposits, principally at the entrance of the Saguenay Fjord, which can be up to 23 km long and up to 175 ms thick. At the Saguenay mouth, there are also numerous types of failure deposit structures, such as an important failure scar 100 ms high, and numerous failure canyon signatures.

The materials constituting the failure deposits originated from paleo-deltas on the north shore of the St-Lawrence (located in a shelf edge position) and were transported downslope toward the south wall of the Laurentian Channel. The deposits were laterally dispersed over 33 km and formed important depocentres up to 100 ms thick. These depocentres have an external geometry similar to submarine fan deposits and contain numerous facies. These distinct facies correspond to the different types of gravitational transport processes and will be discussed in function of their internal architecture.