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Late-Wisconsinan submarine moraines along the north shore of the Estuary and Gulf of St. Lawrence (Eastern Canada)

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A series of ice-contact submarine fans and morainal banks along the Québec North-Shore of the Estuary and Gulf of St. Lawrence (Eastern Canada), between the Manicouagan River delta and the Mingan Islands, have been revealed with great detail by recent multibeam echosounder and high-resolution subbottom profiler surveys. These grounding-line landforms are observed between 65 and 190 m water depths and were constructed as the marine-based margin of the Laurentide Ice Sheet (LIS) stabilized or readvanced. Radiocarbon ages obtained from shells sampled in sediment cores collected in glaciomarine deposits 6 km south of a grounding line in the Sept-Îles area indicate a stabilisation that took place around 11 000 14C yr BP (12.5 ka cal BP with a ΔR=120 $\pm$ 40 yr). In the Mingan Islands area, organic matter collected in distal deposits of an ice-contact fan is dated at 10 800 14C yr BP (11.6 ka cal BP). The position of the Sept-Îles and Mingan deposits, 20 km south of the $\sim$9.7-9.5 14C kyr BP North-Shore Moraine, suggests that these ice marginal landforms were constructed during the Younger Dryas (YD) cold episode and that they might be the eastward submarine extent of the early YD St. Narcisse morainic system. Superimposed till sheets and morainal banks observed within grounding line deposits indicate that this stability phase was interrupted by local readvances that were marked in some cases by ice streaming. Segments of this morainic system are also visible along the shoreline in some sectors, where they have been generally washed out of fine fragments by waves. Another series of ice-contact deposits and landforms of similar nature observed farther offshore and at greater depths (100-190 m) were formed during a previous phase of stabilisation of the LIS margin. This older morainic system was probably deposited immediately after the opening of the Estuary and Gulf of the St. Lawrence.