Neotectonic assessments from deformation structures in raised marine deltas: examples from the Bay of Fundy area

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Earthquake-induced deformation structures serve as evidence for historic and prehistoric ground failure within glaciomarine and ice-contact deposits along the margins of southeastern Canada and the northeastern United States. Historic earthquakes with magnitudes greater than M5+ have produced liquefaction structures within waterlain sediments at: Newbury (1727) and Cape Ann (1755), Massachusetts; Massena, New York (1944); and Saguenay, Quebec (1988). Other historic earthquakes with epicentres located within the Bay of Fundy area, and that could have produced local soft-sediment de-

Atlantic Geology, March 1996, Volume 32, Number 1

formation, include: the Passamaquoddy Bay area (e.g., 1817, 1904 earthquakes), the Miramichi area (e.g., 1869, 1982 earthquakes) and the Moncton-Dorchester area (e.g., 1855 earthquake).

Deformed proglacial deltaic deposits that represent an ice-proximal, glaciomarine environment were examined as possible indicators of postglacial seismic activity at St. George, New Brunswick and Lower Five Islands-Economy Point, Nova Scotia. Despite a distance of 230 km between the study sites, the deformation structures demonstrated similar features, facies and origins. Several styles of deformation structures were recognized that could be attributed to penecontemporaneous deformation and common to particular mechanisms of formation and facies, including ball and pillow structures associated with: (1) loading by rapid sedimentation, (2) glacial movement, or (3) from percussion by dropstones. These were common in the bottomset units. Crumpled, rolled-up or boudinaged layers were likely formed by several mechanisms, including: (1) intra layer or intra-unit compaction or stretching; (2) in association with gravity slumping, mainly in the foreset units; and (3) from loss of support due to (i) ice-melting, (ii) glacier movement, or (iii) fluid-escape structures, common in the foreset and topset units. Deformation associated with catastrophic fluidization of topset facies or overlying Holocene sediments is considered to be the best indication of possible seismic shock.

These preliminary results demonstrate that physical structures within deltaic sediments can provide a record of neotectonic activity and contribute valuable data for assessment of earthquake occurrence and/or recurrence.