

A possible origin of the 1989-1990 Laurentian Channel earthquakes

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Prior to February 2, 1989, the earthquake epicentre map of eastern Canada showed no earthquakes in most of the Laurentian Channel in the area between the Scotian Shelf and St. Pierre Bank. The only earthquakes shown were those near the mouth of the Channel, which were included in the Laurentian Slope Seismic Source Zone (LSP) of the 1985 National Building Code of Canada (NBCC).

Only one December 12, 1983 event of magnitude 3.0 was not included in the LSP for the 1985 NBCC. The LSP includes the major magnitude 7.2 event of November 18, 1929 and the numerous aftershocks that followed. Quite expectedly, beginning on February 2, 1989 with a magnitude 4.2 event, a striking series of 27 small, magnitude 2.1 to 4.2 earthquakes have lit up on apparent linear zone outside the LSP in the axis of the Laurentian Channel over a 1.3-year period. The new series of twenty-seven 1989-1990 events form quite an intriguing, apparently linear, zone 40 km long and perhaps longer if taken with the few older events along

the channel to the southeast. The apparent linear zone is subparallel to the axis and to the margins of the Laurentian Channel.

The area is known to contain numerous salt diapirs in Carboniferous sedimentary rocks. It is suggested that the cause of the new earthquake swarm may be the reactivation of salt diapirism possibly of a single diapir. While these events have not been felt onshore, it is clear that a magnitude 4.2 felt event, which did occur onshore, followed by 26 smaller (aftershock?) events in rapid succession, would deserve immediate concern. It is recommended that this new area of seismic activity be included in the LSP or in the earlier suggested Laurentian Channel Experimental seismic source zone (LSX) for the proposed 1995 NBCC seismic hazard maps. An intensive sub-bottom investigation and recompilation of data for the area is recommended to possibly better define the seismic zone and to perhaps add some data to the present arbitrarily assigned 18 km hypocentre depth.