



# Charlevoix-Kamouraska

by Maurice Lamontagne

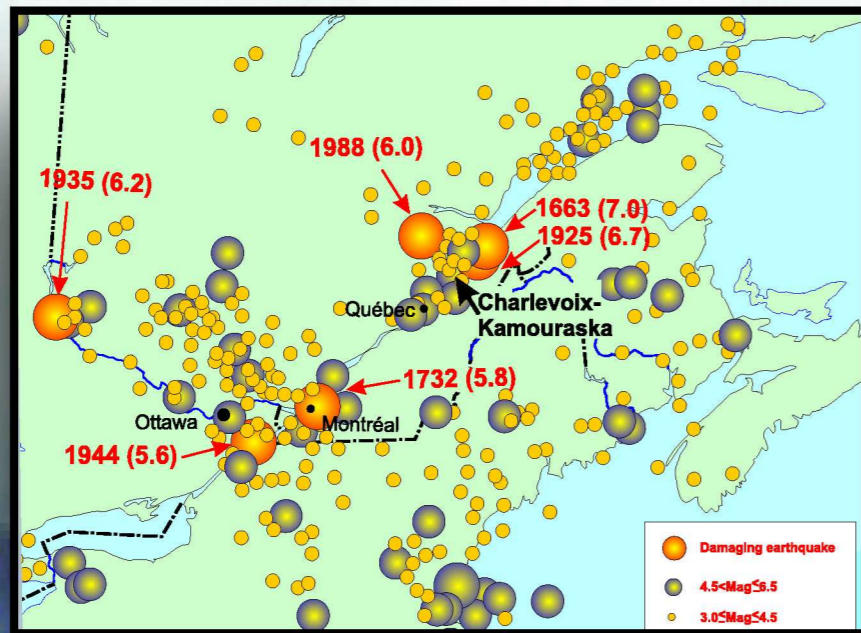


[www.seismo.nrcan.gc.ca](http://www.seismo.nrcan.gc.ca)

Since 1978, the Geological Survey of Canada has operated seven seismographs that are positioned on both sides of the St. Lawrence, in the Charlevoix-Kamouraska region. These highly sensitive devices record ground vibrations, with data sent throughout the day and night to the offices of the Geological Survey of Canada in Ottawa. Recordings are used to locate the focus (hypocentre) of the earthquake and calculate its magnitude on the Richter Scale, which is used to measure the strength of earthquakes.

Each year, the network of seismographs registers over 250 earthquakes in this seismic zone. Of this number, only an average of five are felt by the public (magnitude 2.5 and higher on the Richter Scale). Between 1978 and 1999, only one earthquake that originated locally reached a magnitude of 5.0 and caused minor damage (to chimneys). Six others measured over 4.0 on the Richter Scale and caused no damage.

## Charlevoix-Kamouraska: the highest-risk area in eastern Canada



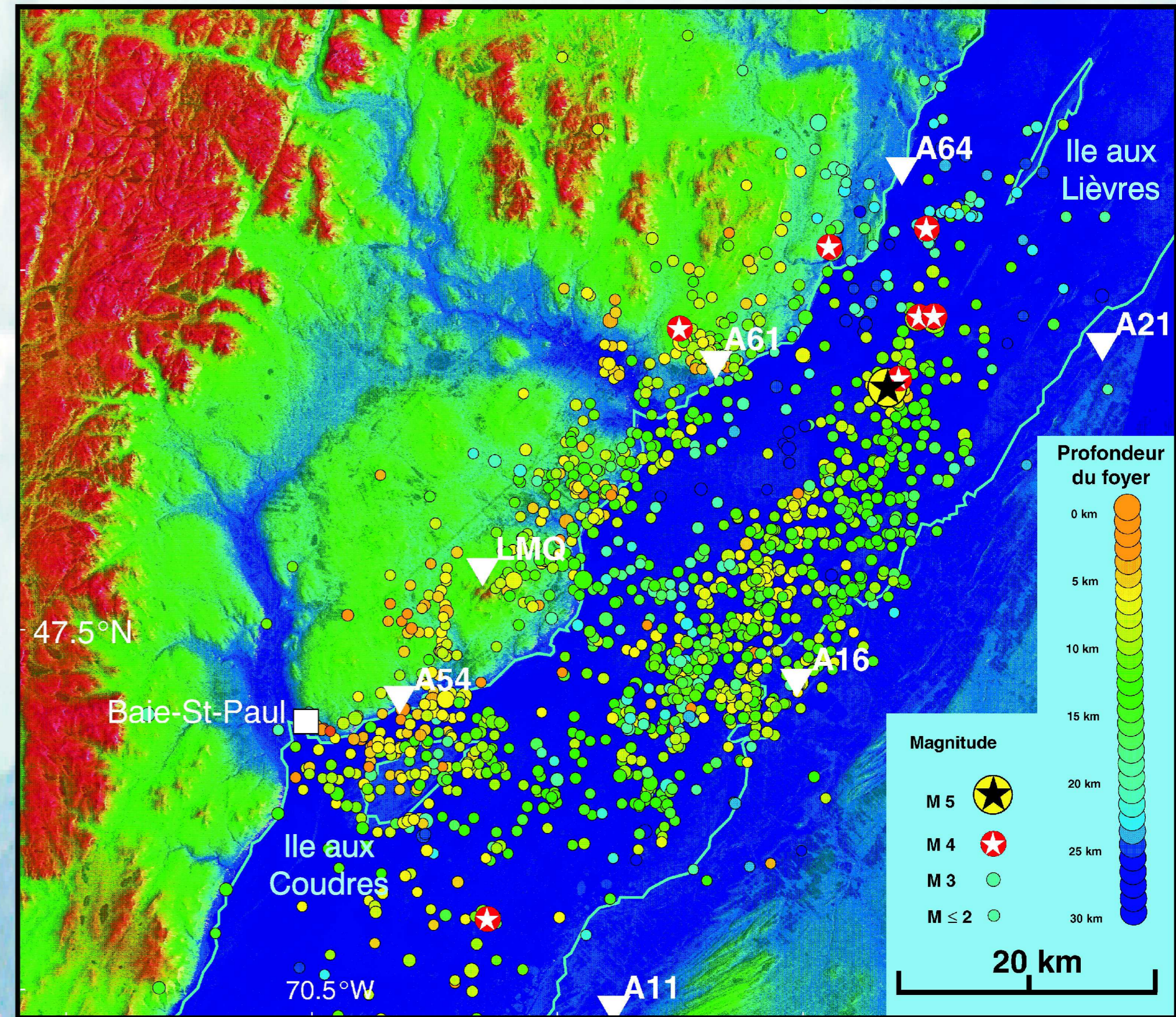
The map on the left shows the positions of the major earthquakes that occurred in eastern Canada between 1600 and 1999. Many regions are particularly seismically active, but the frequency of earthquakes of magnitude greater than 6.0 is highest in the Charlevoix-Kamouraska region. Because of the lack of precision in the positions of earthquakes that occurred before 1978, they cannot be reported on the map on the right.

### Earthquakes from 1600 to 1999

In the past, major earthquakes in the Charlevoix-Kamouraska region have caused damage as far away as 150 km and more, in places such as Quebec City and Shawinigan

Year	Magnitude	Comments
1663	approx. 7	Several landslides in Charlevoix, the Saguenay Region and La Mauricie
1791	approx. 6	Some damage at Baie-Saint-Paul and Les Éboulements
1860	approx. 6	Minor damage at Rivière-Ouelle
1870	approx. 6.5	Minor damage at Baie-Saint-Paul
1925	6.5	Damage along both shores of the St. Lawrence, at Quebec City and Shawinigan

Note: In 1988, an earthquake of magnitude 6.0 that occurred outside the Charlevoix area (in the Saguenay) caused damage in the Charlevoix-Kamouraska region



Map: The above map shows the locations of some 2,000 earthquakes (circles) recorded between 1978 and 1999. The colour of each circle is keyed to the depth of the focus of the earthquake. Since 1978, earthquakes have been monitored by a network of seven seismographs (white triangles). The base map is a combination of a RADARSAT image (texture) and a digital terrain model (colours). For additional remotely sensed images, visit the web site of the Canada Centre for Remote Sensing ([www.ccrs.nrcan.gc.ca](http://www.ccrs.nrcan.gc.ca)).

## DAMAGE CAUSED BY THE 1925 EARTHQUAKE CHARLEVOIX-KAMOURASKA

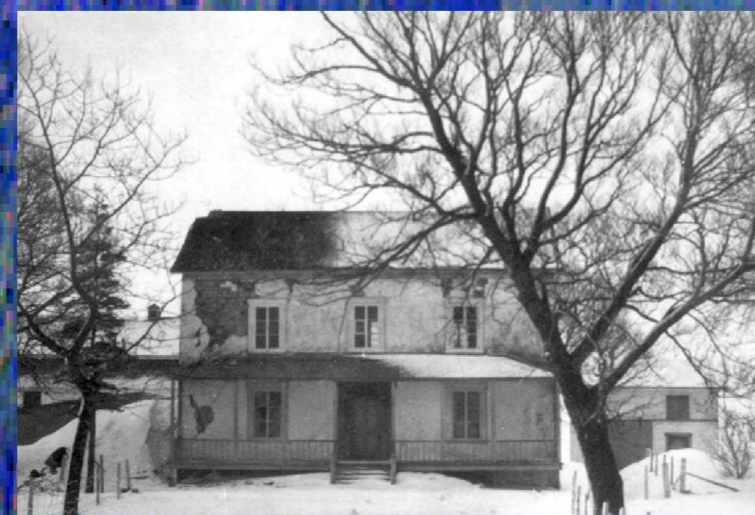
Near the epicentre, considerable damage was caused on both sides of the St. Lawrence.



At Rivière-Ouelle, the church was damaged and gravestones were toppled.



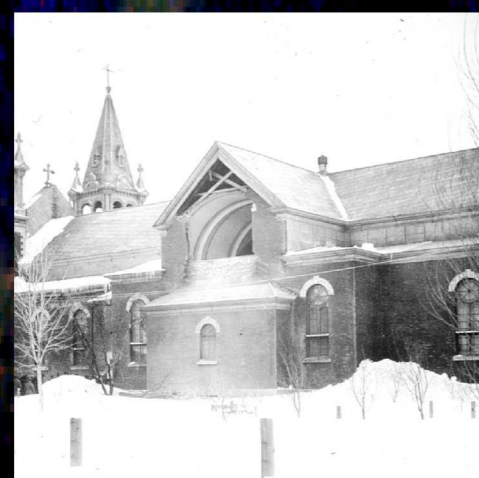
At Saint-Urbain, the church was heavily damaged and had to be demolished.



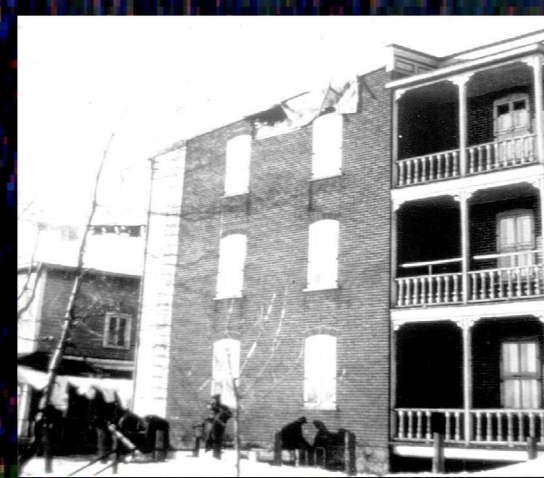
Several homes developed cracks in their masonry walls.



In Shawinigan, some 300 km from the epicentre, there was considerable damage to many buildings (note the missing rows of bricks).



St-Marc's Church



Residential building



Row house

### Earthquakes are unpredictable

No one can predict where or when an earthquake will occur because no reliable earthquake prediction method exists for Canada or any other place on Earth. The approach adopted by the Geological Survey of Canada relies more on prevention on the part of organizations and individuals, than on specific forecasts. Building codes also provide protection against ground movements.

### Be prepared!

As an individual, you have a responsibility to know what to do if an earthquake occurs. Before an earthquake happens, find out about possible risks and be prepared for an emergency situation. If you are inside a building when an earthquake starts, protect yourself against falling debris by getting under a solid desk or table.

### For more information

On earthquakes:  
Geological Survey of Canada  
7 Observatory Crescent  
Ottawa, Ontario  
K1A 0Y3

Web site: [www.seismo.nrcan.gc.ca](http://www.seismo.nrcan.gc.ca)

On preventive measures:  
Emergency Preparedness Canada  
Communications Directorate  
122 Bank St., 2nd Floor  
Ottawa, Ontario  
K1A 0W6

Web site: [www.epc-pcc.gc.ca](http://www.epc-pcc.gc.ca)

### Another major earthquake is possible.

The numerous historical earthquakes and the seismic activity recorded annually indicate a geologically unstable situation.

### The occurrence of earthquakes suggest that the zone is weak

Two factors may promote the occurrence of earthquakes: weakened faults and high geological pressures. Faults in the Canadian Shield are reactivated by earthquakes in the Charlevoix-Kamouraska region. Many faults are over tens of kilometres in length and may extend below the surface to depths where earthquakes originate. On the surface, some of these faults coincide with major relief features seen on the map above. However, not all of the faults are active, which is confirmed by the fact that earthquake occurrence is concentrated in a corridor along the St. Lawrence River.

Faults are found throughout the Canadian Shield in eastern Canada, including the Charlevoix-Kamouraska region. The faults in this region may be particularly weak because of a meteorite that struck the area some 400 million years ago, producing the 55-km diameter circular structure seen on the map above. Logan's Line plays no role in the earthquakes. This line, which marks the location of the Appalachian Front, runs along the north shore to the west of l'Île aux Coudres and l'Île aux Lièvres. In fact, all the earthquakes occur well below Logan's Line.

The presence of fluids under pressure in the depths of the Canadian Shield may weaken some of the faults. Geological pressures—plate-tectonic forces on the North American continent, the density differences between rock masses, the retreat of the glaciers 10,000 years ago—may also contribute to this instability. Because the earthquakes occur at depths of between 5 and 30 kilometres below the surface, it is difficult to state categorically why they happen in this seismic zone.

## Charlevoix-Kamouraska

