Unusual "Love Waves" Recorded Above the Cascadia Subduction Zone

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SHORT NOTE

On January 11, 1996 an extremely unusual recording was made by the Geological Survey of Canada's seismograph network. We have identified the source, and, to our knowledge, this is the first recording of its type. The purpose of this short note is to document this extremely rare seismogram.

On January 11, 1996 at approximately 3:45 PM local time (23:45 UT), the emergent onset of a significant seismic event was noticed at the station ALB of the Western Canadian Telemetered Network (WCTN). This seismic station, operated by the Geological Survey of Canada, is located on central Vancouver Island, above the Cascadia subduction zone. It consists of a short-period vertical seismometer buried in a concrete vault, in a quiet wooded setting (Figure 1a). The instrumentation is not far from a local school on the outskirts of Port Alberni, British Columbia. The digital seismic signals are telemetered to the Pacific Geoscience Centre (PGC) in Sidney, 125 km to the SE, where they are monitored continuously by scientists and technicians (Figure 1b) of the Geological Survey of Canada.

This seismograph station records approximately 150 local earthquakes, 100–200 teleseisms, and several dozen local blasts each year; however, it was obvious to the technical and scientific staff at PGC, that although the earth was moving in Port Alberni this was no ordinary earthquake. There were several enigmas. The large-amplitude signal was only present at ALB—not on any of the other seismograph stations of the WCTN, even those within 20 km of this station. Furthermore, after one-half hour the signal showed no sign of abating. Seismologists computed a coda magnitude in excess of M_L = 6.8, yet the amplitude of the signal indicated a body-wave magnitude of only 1.2, and the moment magnitude was only 0.2! Seismologists noted that the dominant frequency of the signal was nearly 1 Hz, and after correcting for the instrument response, computed a peak vertical acceleration of 10 cm/sec^2 (0.01 g) and a peak ground velocity of 1 cm/sec. Waveform modeling suggested a single-couple source. And still the signal showed no sign of abating.

At 4:15 PM the intensity of the disturbance increased significantly (Figure 2). The staff, recalling that the station at ALB had been vandalized a number of times over the years, became concerned that someone might be trying to break into the concrete vault that protected the seismometer. The decision was made to phone the local detachment of the Royal Canadian Mounted Police (RCMP). Officers were dispatched to the scene immediately. As the seismograph station was located very near to a public school, a phone call was also made to the school office. Fearing vandals, the school principal enlisted the help of the janitor and the secretary; all rushed to the scene. At the Pacific Geoscience Centre, an ever-increasing number of technicians, scientists, and even a few passers-by, watched in amazement as the signal increased in amplitude. At 4:28 PM, just when it looked like the seismograph needle might break, the signal suddenly stopped (in stark contrast to the very emergent onset of this event). Scientists later confirmed that 4:28 PM was the exact time that the RCMP officers and the school staff arrived at the site, where they found a young couple (oblivious to the fact that their every move was being monitored by the staff at PGC, some 125 km to the southeast) generating mad passionate "Love waves" on the flat surface of the seismic vault, in the quiet wooded setting located above the Cascadia subduction zone. ■

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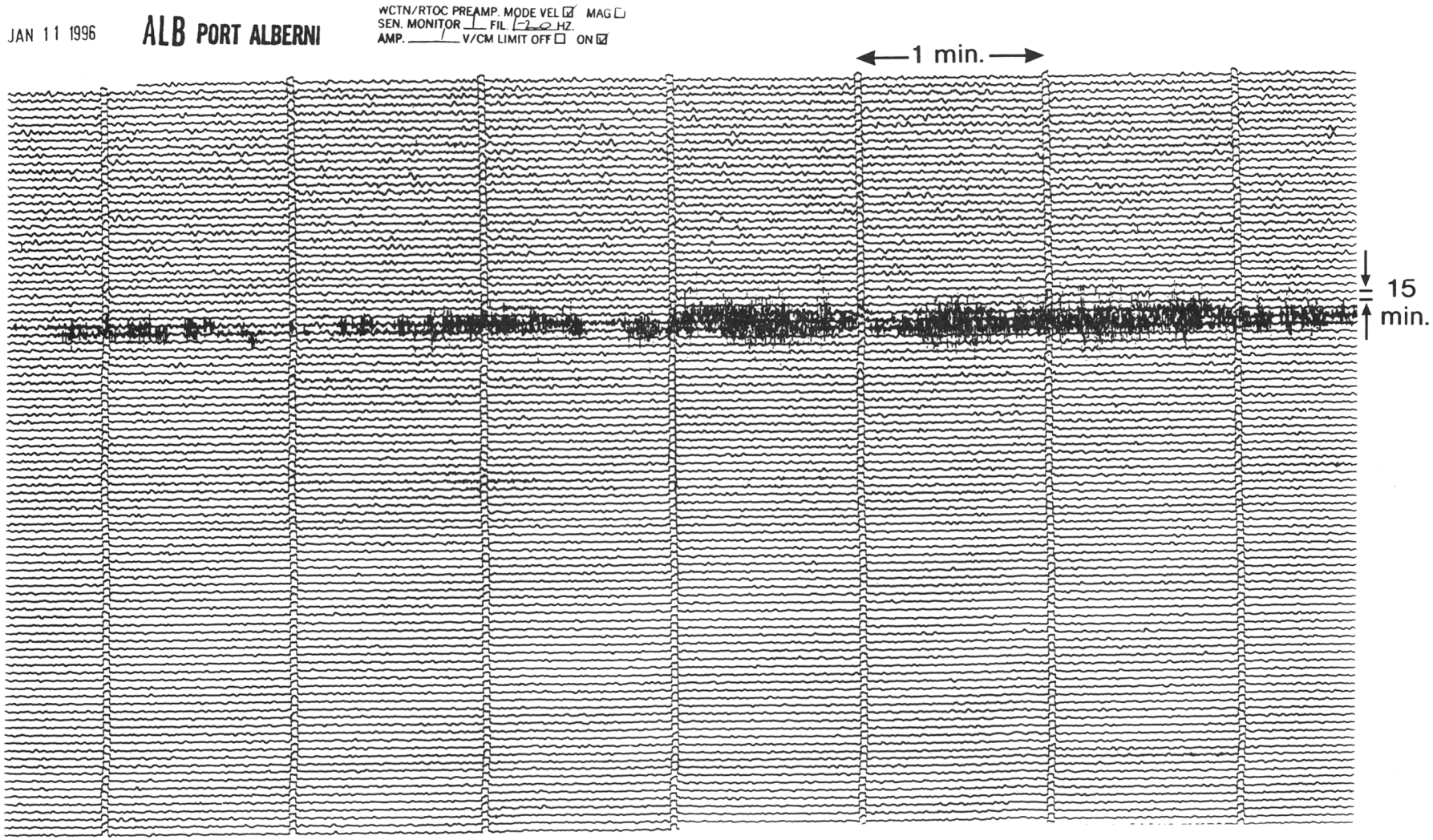
▲ **Figure 1.** a) Quiet, wooded setting of the seismograph station, ALB. The flat surface represents the top of the vault—the short-period vertical instrument is located on bedrock, about 1 m below this surface. b) Foyer of the Pacific Geoscience Centre, where the seismic signals are constantly monitored.



▲ **Figure 2.** Seismogram showing a very small segment of the unusual seismic disturbance. The lines are 15 minutes apart, and the small ticks are minute marks.