Weir-Jones Engineering Ltd.

QuakeMonitor™

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Records of M3.6 Earthquake

Event time: 04:13:51, December 17, 2021

Sample Report

1 Executive summary

Current report is based on the earthquake parameters available at:
`https://earthquake.usgs.gov/earthquakes/`
as well as the seismic records obtained on the Weir-Jones Group's Earthquake Early Warning System (WJ-EEWS). Currently, WJ-EEWS consists of three seismic stations located at SCFP (North Vancouver), LCOC (Burnaby), and CWTP (Coquitlam).

2 Earthquake parameters

Location: 12km ENE of Ganges ,
Magnitude: M= 3.6 ,
Time: 04:13:51, (UTC-08:00),
Coordinates: Latit 48.899 °N, Longit 123.350 °W,
Depth: 17.3 km,
Epicentral distance to the closest site (LCOC): $D \approx$50 km.

P- and S-wave arrivals were computed directly from the records. The travel times for the closest site (LCOC) are: $t_{\mathrm{P}} \approx$ 10.3 sec, and $t_{\mathrm{S}} \approx$ 17 sec. The S-P time difference (maximum theoretical warning time) for LCOC is $\approx$ 7 sec.

The map in Figure 1 shows the earthquake epicenter, location of the WJ-EEWS stations, and the approximate warning times in seconds. The actual warning times are slightly different due to the deviation of the regional velocity model from the 1D reference IASP-91 Earth velocity model, and the event depth.

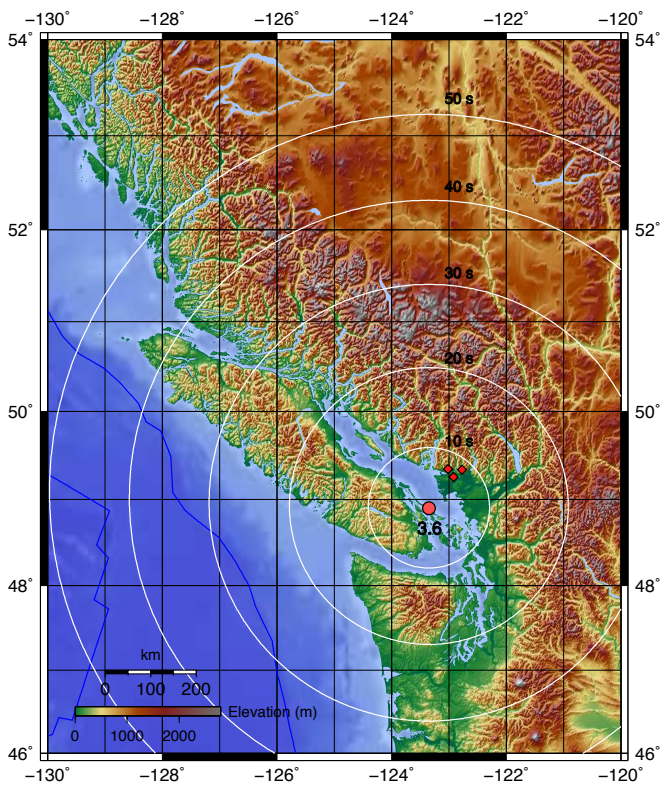

Figure 1: Map of the SW BC region. Red circle – earthquake epicenter, red squares – current WJ-EEWS stations. Circles indicate approximate maximum warning time (S-P time difference) in seconds.

Figure 2 shows the map of the expected seismic intensity distribution from the earthquake. It has been computed for firm ground conditions (NBCC soil class C). Table 1 illustrates relationship between the Modified Mercalli Intensity scale and the peak values of ground acceleration PGA and velocity PGV.

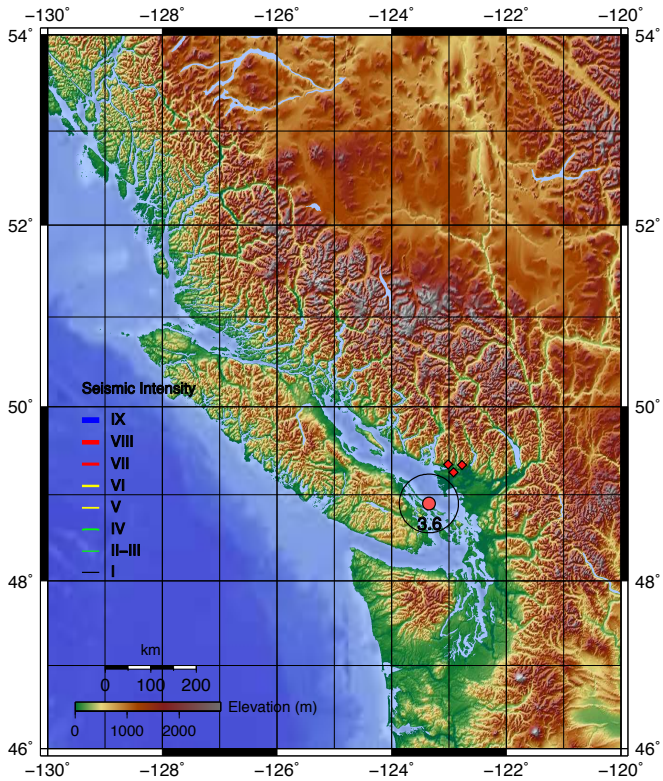

Figure 2: Map of the SW BC region: expected seismic intensity distribution. Red circle – earthquake epicenter, red squares – current WJ-EEWS stations.

Table 1: Seismic intensity scale

Intensity	I	II-III	IV	V	VI	VII	VIII	IX
Shaking	Not felt	Weak	Light	Moderate	Strong	Very strong	Severe	Violent
Damage	None	None	None	Very light	Light	Moderate	Heavy	Heavy
PGA % of g	<0.17	0.17-1.4	1.4-3.9	3.9-9.2	9.2-18	18-34	34-65	65-124
PGV cm/s	<0.1	0.1-1.1	1.1-3.4	3.4-8.1	8.1-16	16-31	31-60	60-116

3 Earthquake records obtained on the EEWS network

Figure 3 provides several records in terms of velocities obained on the WJ-EEWS network. Red lines indicate the arrival of P- and S-wave components.

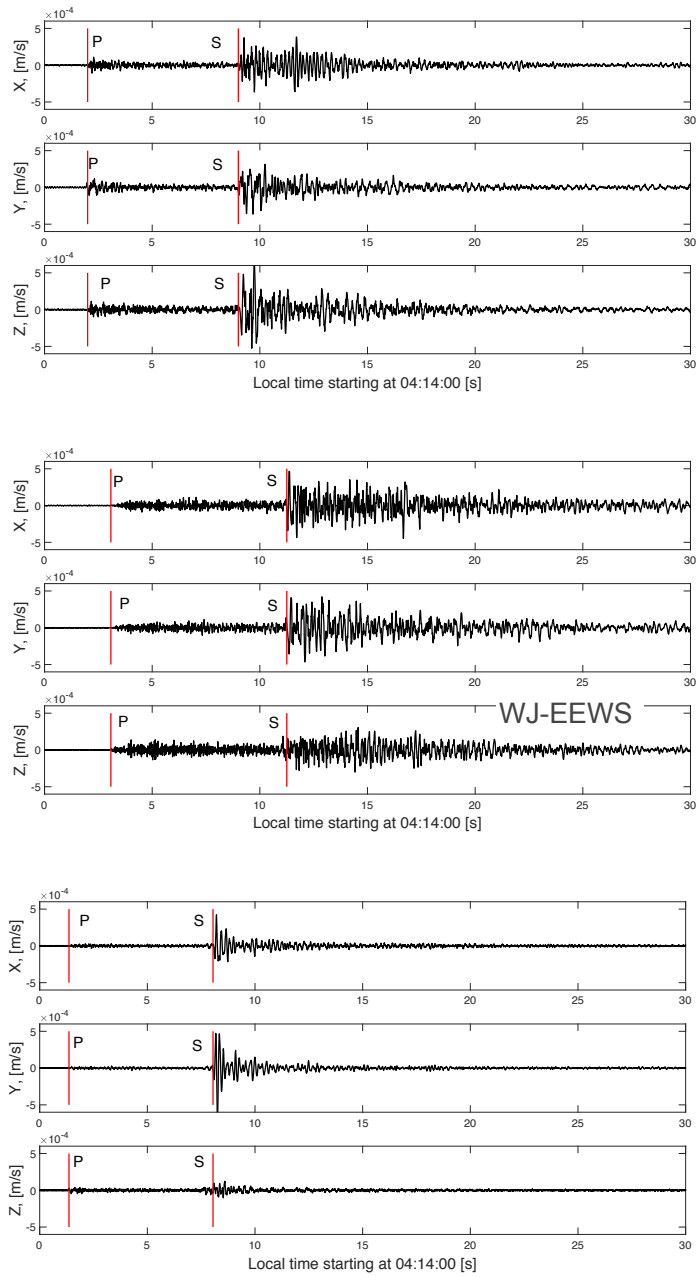

Figure 3: Seismic records obtained on the WJ-EEWS network (X,Y,Z components): SCFP, CWTP, and LCOC. The time axis begins at 04:14:00 local time.

4 Epicenter location

The P-wave arrival times are used to calculate the coordinates of the earthquake epicenter. Figure 4 shows the map of the calculated epicenter and the WJ-EEWS stations. Latitude and Longitude are transformed from degrees into kilometers using a local coordinate system. 95% confidence region marked by the dotted area is relatively large due to the small number of stations and their limited geographical coverage.

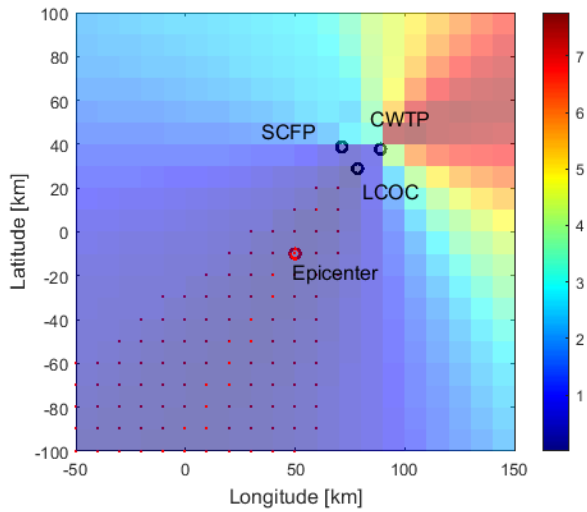

Figure 4: Map of the calculated earthquake epicenter and the WJ-EEWS stations (SCFP, CWTP, and LCOC). Colormap shows the χ^2 error of the epicenter. Dotted area indicates 95% confidence region.

Calculated and observed epicentral distances for the SCFP, LCOC, and CWTP sites are provided in Table 2.

Table 2: Calculated and observed epicentral distances

Station	Observed, km	Calculated, km
SCFP	53	55
LCOC	48	50
CWTP	61	64