

## Global "strong" ground motions from the 2013 Sea of Okhotsk great deep earthquake

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This study presents the characteristics of global ground motions caused by the Sea of Okhotsk deep earthquake (Mw8.3) of May 24, 2013. The earthquake occurred at a depth of 609 km in the subducting Pacific plate, and it is now the largest deep earthquake ever recorded. According to reports in NEIC, the earthquake was felt at very long distances in the world, including Dubai (~76 degrees) and Moscow (~58 degrees). In this study, by using global broadband seismic data from IRIS DMC, we examine ground motions from the earthquake. For the 1994 Bolivia deep earthquake (Mw8.3), which was formerly the largest and were felt in North America, the distant ground motions were examined by Anderson et al. (1995) from the perspective of strong motion seismology. Due to the location, the 2013 Sea of Okhotsk earthquake was recorded by a much better coverage of global stations, compared to the 1994 Bolivia earthquake. This study is an opportunity for exploring the distant "strong" ground motions from the perspective of Anderson et al. (1995).

Peak ground accelerations (PGA) from the 2013 Sea of Okhotsk earthquake decrease as distance increases out to 120 degrees, and have a peak at a distance of approximately 140 degrees. The variation as a function of distance is similar to that of Anderson et al. (1995) for the 1994 Bolivia earthquake. The values of PGA are a few times larger than those from the Bolivia earthquake. At distances between 30 and 80 degrees, PGA are associated with vertical components of direct P waves, and the values of PGA are often in a range from 0.1 to 1 gal. Peak ground velocities (PGV) vary with distance in a similar way to PGA. The values of PGV at distances between 30 and 80 are lower than 0.1 cm/s.

Large PGA at distances between 30 and 80 degrees are observed in the Eurasian continent. The values of PGA in the western part of the continent are larger than those in the eastern part. Because this difference is also observed for PGA of P waves from an outer-rise shallow earthquake near the Kurile trench, it can be attributed to regional structure in the Eurasian continent. PGA from the 2013 deep earthquake are not low in the southern part of the continent, although from a deep earthquake beneath Sea of Okhotsk that has a different focal mechanism from that of the 2013 earthquake, PGA decrease toward the south as distance increases. The focal mechanism of the 2013 earthquake represents that the P wave radiation is the maximum along a ray toward Karachi, Pakistan. This P wave radiation can account for the observations of PGA in the southern part. Global "strong" ground motions from the 2013 Sea of Okhotsk deep earthquake are thus likely to be affected by regional structure and P wave radiation, as suggested by Anderson et al. (1995).