Long-period (10-30s) ground motions from the 2003 Tokachi-oki earthquake

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We study characteristics of long-period ground motions from the 2003 Tokachi-oki earthquake (Mj8.0), a large interplate earthquake, based on spatial distribution maps and attenuation relationships for four kinds of PGV (peak ground velocity) value.

The first kind (PGV(WB)) is obtained from a maximal value of vector sum of the three-component, wide-band velocity seismograms, and the other three kinds (PGV(BP10), PGV(BP20) and PGV(BP30)) are obtained from a maximal value of vector sum of the three-component, narrow band-pass filtered velocity seismograms (the central periods are 10, 20 and 30 s).

The spatial distribution maps for all kinds of PGV value show azimuth dependence; the PGV values in Hokkaido, northern side of the epicenter are larger than those in Tohoku, southwestern side of the epicenter, when compared at a comparable distance.

We find that the features result from the radiation pattern of long-period surface waves; that is, the source effect.

The attenuation relationships show the following trends: the PGV(WB) values are larger than the sum of the PGV(BP10), PGV(BP20) and PGV(BP30) at distances (D) less than 200 km, while the PGV(WB) values are comparable to the sum of the PGV(BP20) and PGV(BP30) at D larger than 200 km.

This indicates that the PGV(WB) values at D less than 200 km are affected by ground motions with periods less than 10 s, while long-period surface waves mainly contribute to the PGV(WB) values at D larger than 200 km.

The basin site effects generate a patchy pattern in the spatial distribution maps and a large scattering in the attenuation relationships for the PGV(WB) and PGV(BP10) values.

Finally we conclude that the PGV(WB) values from the 2003 Tokachi-oki earthquake are controlled by the radiation pattern of long-period S and surface waves, and various basin site effects.