source characteristics of interplate earthquakes in northeast Japan inferred from the analysis of broadband strong-motion records

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Abstract

Observed broadband strong-motion records can be simulated assuming a relatively simple distinctive source model, which consists of large dip-slip velocity within the total fault area with no explicit heterogeneity inside it, called "strong motion generation area (SMGA)" using the empirical Green's function (EGF) method. Scaling relationship of SMGAs is examined for crustal earthquakes (Miyake et al., 2003) and intraslab earthquakes (Kowita et al., 2000). In order to investigate the intraslab source characteristics of SMGAs of 15-71 earthquakes which occurred along the Japan Trench (2002 Miyagi-oki earthquake and 2003 Kii-oki earthquake) and the Fuchuan-oki (8 earthquakes which occurred in the off-shore area of Hokkaido from 2002 to 2005) trenches.

Target earthquakes

We classified ten earthquakes and study in this three groups. Miyagi-oki, Kii-oki and Usui-oki (Boso) events. Hypocenters are determined by JMA. Two earthquakes are considered to be local events (i.e. moment tensor solution) shown that they have nodal plane which corresponds to a substantial postcoseismic slip.

Examples of estimated SGMa and waveform fittings

Tokachi-oki event (M: 2003/10/08 18:07 Depth=51.4km)

| EGF: 2003/10/08 18:07 | Depth=51.4km
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<tbody>
<tr>
<td>N=7, C=3, 0.07 Hz</td>
<td>1.30 s Length=15.5km Width=15.5km Rise-time=0.24, 55-46PPa</td>
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Miyagi-oki event (M: 2005/05/16 11:46 Depth=41.6km) This result has been revised in 2006

| EGF: 2005/05/16 11:46 | Depth=41.6km
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</tr>
</tbody>
</table>

Kujiro-oki event (M: 2005/08/16 23:09 Depth=49.8km)

| EGF: 2005/08/16 23:09 | Depth=49.8km
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<td>N=7, C=3, 0.07 Hz</td>
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Conclusion

We estimated source model which is comprised of SMGAs for ten interplate earthquakes along Northeast Japan. Such models could explain main characteristics of broadband strong motions. SMGAs are roughly corresponding to the large slip regions. Inversion of the large slip region using high-frequency waveforms can be estimated. We can see that SMGA size and stress drop of SMGA can be estimated from the analysis of stress drop. As for the size of SMGAs, we also observed the regional characteristics between Tokachi-oki events and Kii-oki events. Usui-oki events tend to have larger stress drop than Tokachi-oki events on the SMGA. Although the amount of the analyzed earthquake is small, Miyagi-oki events may also have larger SMGA stress drop.

Acknowledgments

We used strong-motion data of K-NET, K-net, NIED, and JAMSTEC ocean bottom seismometers. We referred to JMA hypocenter catalog and F-net moment tensor catalog for source information. We thank them for providing the valuable data.

References

Kowita, K., and H. Kase, 2000, JMSJ, 44(4), 243-252.