

A spatial slip distribution of the 2005 Miyagi-oki earthquake derived from spatial distribution of the aftershocks

Takaki Iwata[1]; Shinji Toda[2]; Yoshiko Ogata[3]

[1] ISM; [2] Active Fault Research Center, GSJ/AIST; [3] Inst. Stats. Math.

We estimate a spatial slip distribution of the 2005 Miyagi-oki earthquake based on its on-fault aftershock activity and rate- and state-dependent constitutive friction law [Dieterich, 1994]. Recent several studies estimate spatial and/or temporal distribution of stress quantitatively based on spatio and/or temporal variation of seismicity [Dieterich et al., 2000; Toda and Matsumura, 2006]. Following these studies, we can estimate a suitable spatial slip distribution which causes a spatial distribution of stress which can explain well that of aftershocks.

We divide the fault plane of the Miyagi-oki earthquake into 81 subfaults and optimize slips of each subfault for which the expected spatial distribution of aftershocks fits well to the observed distribution using the Dieterich's friction law and point-process modeling. Since we have a large number of parameters in this optimization, to make the optimization stable, we construct a Bayesian model incorporating a constraint as a smoothness prior of spatial slip distribution. The weight of the smoothness constraint is determined by the Akaike's Bayesian Information Criterion. Also concerning parameters included in the friction law, we assume an exponential distribution as a prior distribution. As a result of the estimation, we can find a slip distribution which is consistent with ones derived from the waveform and/or geodetic inversion [Yagi, 2005; Yaginuma et al., 2006].

References

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