

Delayed triggering process of the $M_{JMA}6.4$ Eastern Shizuoka earthquake on March 15, 2011 by analyses of stress changes and detection of foreshocks

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We investigated the triggering process of the $M_j6.4$ Eastern Shizuoka earthquake on March 15, 2011, which occurred 4 days after the 2011 $M_w9.0$ Tohoku-Oki earthquake and about 4 minutes after the $M_j6.2$ Fukushima-Oki earthquake. We obtained a static Coulomb failure stress change on the fault of the Eastern Shizuoka earthquake by the Tohoku-Oki earthquake, which was about 21 kPa, and the largest dynamic stress change by the passing surface waves was about 200 kPa. The largest dynamic Coulomb failure stress change from the Fukushima-Oki earthquake and tidal stress change after the Tohoku-Oki and before the Eastern Shizuoka earthquake were about 0.3 kPa and 1.2 kPa, respectively, while those at the onset of the Eastern Shizuoka earthquake were negative values of about -0.01 kPa and -0.2 kPa. We also tried to detect earthquakes immediately preceding the Eastern Shizuoka earthquake using a matched filter technique and found one $M1.0$ event that located about 2 km NNE from the mainshock and occurred about 17 hours before it. However, this event may not be identified as a foreshock according to the background seismicity before 2011 in this region. We propose that delayed triggering (clock advance) might have occurred for the Eastern Shizuoka earthquake, where the frictional stress had rapidly built up due to these static, dynamic, and tidal stress changes when the eventual earthquake was ready to occur.

Keywords: Eastern Shizuoka earthquake, Delayed triggering, Coulomb failure stress change, Foreshock