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Shallow inland earthquakes in NE Japan possibly triggered by the 2011 Off the Pacific Coast of Tohoku Earthquake

Tomomi Okada[1*], Keisuke Yoshida[1], Sadato Ueki[1], Junichi Nakajima[1], Naoki Uchida[1], Toru Matsuzawa[1], Norihito Umino[1], Akira Hasegawa[1], Group for the aftershock observations of the 2011 Tohoku Earthquake[2]

[1]RCPEV, Grad. Sch. of Sci., Tohoku Univ., [2]Group for the aftershock observations

After the occurrence of the 2011 Mw 9.0 Off the Pacific Coast of Tohoku Earthquake, not only aftershocks near the source fault along the plate boundary, but also many shallow earthquakes occurred at several locations in the overriding plate. It is important to understand the cause of this distinctive seismicity change. We precisely relocated earthquake hypocenters for several earthquake sequences that occurred just after the Tohoku earthquake by the double-difference method. The obtained hypocenter distributions were used to discriminate the fault plane from the auxiliary plane of the focal mechanisms for those earthquake sequences. Some of them in the central part of NE Japan are the strike-slip type with steeply (dip angle $>$ 60 degrees) dipping fault planes and NE-SW oriented P-axes. Then, we calculated coulomb stress change on those fault planes caused by the 2011 Mw9 earthquake. In all cases, the estimated coulomb stress changes at the plausible fault planes for those post-mainshock sequences are positive. The positive coulomb stress change is mainly due to the reduction of normal stress on the steeply dipping fault plane of the earthquake sequences which are located to the west of the large reverse-fault source area of the 2011 Mw9 earthquake. The present observations suggest the static stress transfer possibly triggered those post-mainshock earthquake sequences.

We also find that the post-events tend to be distributed above the edge of the seismic low-velocity zone in the lower crust. This suggests that inhomogeneous structure of viscoelastic structure and fluid distribution in the lower crust are spatially related with the spatial distribution of the post- events.