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Coulomb stress change inverted from the seismicity rate change in southern 2011 Tohoku earthquake's source region

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By using the analysis of seismicity rate change, we estimated spatio-temporal evolution of Coulomb stress around the upper boundary of the Pacific plate (PAC) and Philippine Sea plate (PHS) in and around the southern edge of the rupture zone of the 2011 Pacific coast of Tohoku earthquake (Mw=9.0). We used hypocenter catalog of the Japan Meteorological Agency (JMA) for the period between 1998/1/1 and 2013/3/31. Estimated stress change became large just after the 2011 Tohoku earthquake in most of rupture zone. The large stress change estimated from the seismicity reached the southern outside of the contact zone of the PHS and the PAC, while this area is located at outside of the source fault of the 2011 Tohoku earthquake. Moreover, in the October 2011 Boso slow slip event (SSE) initiation area, stress change remained large value after the 2011 Tohoku earthquake.

To estimate the effect of the mainshock and largest aftershock in our inversion result, we calculated Coulomb stress change by simulating the mainshock, afterslip and Mw7.9 aftershock for the 2011 Tohoku earthquake in an elastic half space. From similarity between the result from seismicity rate change and result of forward modeling, most of the stress change pattern in and around mainshock rupture zone after the 2011 Tohoku earthquake might be explained by the effect of the 2011 Tohoku earthquake mainshock, afterslip and the largest aftershock. On the other hand, since the result from seismicity rate change didn't correspond to the result of forward modeling in the October 2011 SSE area, this region was possibly affected by other event or closeness to break strength.

Keywords: stress change, 2011 Tohoku earthquake, aftershock, slow slip