Regional earthquake induction around the Korean Peninsula after the 2011 M9.0 Tohoku-Oki megathrust earthquake

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Megathrust earthquakes produce large permanent lithospheric displacements as well as strong transient ground shaking up to regional distances. The lateral permanent displacements construct stress shadows in a wide backarc region. The Korean Peninsula is placed in the far-eastern Eurasian plate that belongs to a stable intraplate region with a low earthquake occurrence rate and diffused seismicity, and is located in the backarc at ~1300 km in the west from the epicenter of the 11 March 2011 M9.0 Tohoku-Oki earthquake. The seismicity around the Korean Peninsula was increased significantly after the 2011 M9.0 Tohoku-Oki earthquake. Strong seismic waves cause large dynamic stress changes, incurring fluid migration and increasing pore fluid pressure in the media. The lithospheric displacements directing to the epicenter on the convergent plate boundary develop transient radial tension field over the backarc lithospheres. The seismic velocities in the lithosphere changed abruptly up to 2 % after the megathrust earthquake, which recovered gradually with time for several years. A series of moderate-sized earthquakes and earthquake swarms occur as a consequence of medium response to the temporal evolution of stress field. In particular, two strike-slip earthquakes with magnitudes of M_L5.1 and 5.8 occurred in the southeastern Korean Peninsula on September 12, 2016. The two events occurred within 48 minutes. The M_L5.8 earthquake was the largest event in the Korean Peninsula since 1978 when national seismic monitoring began. More than 500 aftershocks with local magnitudes greater than or equal to 1.5 followed the events for two months. The long-term evolution of seismicity is expected to continue until the ambient stress field is fully recovered.

