

## Influence of the 2011 Tohoku, Japan earthquake on the Korean peninsula

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The 2011 Tohoku, Japan earthquake (M9.0) not only produced catastrophic damage in Japan but influenced on the Korean peninsula in terms of the seismicity, tsunami and crustal deformation. Seismic waves were large enough to be saturated in broadband seismic stations equipped with STS-2 seismometer which were located in the eastern part of the peninsula. Also small tsunami waves were observed along the southern and eastern coast. We have analyzed the tsunami as well as the seismic activity and crustal movement to understand the influence of the Tohoku earthquake on the Korean peninsula which is located about 10~15 degrees far from the fault plane.

Tsunami generated by the Tohoku earthquake propagated to the Korean peninsula as well. Tsunami with the height of less than 30 cm was observed about 3~5 hours later at the water level stations in southern and eastern coast of the peninsula, as can be expected by numerical tsunami simulation. However, some water level changes occurred even a few minutes after the earthquake at the several water level stations in north-eastern part of South Korea. We calculated horizontal displacements as well as vertical ones in the surrounding seas of the peninsula using the slip distribution obtained by the seismic waveform inversion (Baag et al., submitted). Then the tsunami was calculated considering the bathymetry effect or the effect of the horizontal displacement and the seafloor slope, following Murotani et al. (2015). As the result, the unexpected tsunami observed a few minutes later seems to have a coincidence with the tsunami generated by the bathymetry effect. The level of seismicity was changed by the Tohoku earthquake. Even though only three earthquakes with magnitude greater than 2 were reported by the Korea Meteorological Administration (KMA) within 5 days since the event, 53 events including micro earthquakes were identified using continuous waveforms only in the day of the earthquake (Park, 2012). Unusually large increase of seismic events was observed rather in 2013. Those events include three moderate earthquakes of M~5 and intensive swarm in the Yellow Sea region. Hong et al. (2015) interpreted that this phenomenon was induced by the fluid diffusion during the transient tension field and pore pressure increase during the ambient compressional-stress field recovery.

Crustal deformation was determined using the GNSS data densely distributed in the Korean peninsula. The displacements induced by the earthquake were about 1.5~4 cm. The crust moved toward the direction of the fault, which was to the east and it differs from the general movement of this region before the Tohoku earthquake. And the trend of eastward movement continued at least until 2012. The annual velocity of crustal deformation showed that the movement was recovered to the general direction since 2013.

These analyses indicate that the Tohoku earthquake has directly influenced on the Korean peninsula. And it may be necessary to consider the influence of another large earthquake that can be expected around the Japanese islands, like expected Nankai earthquake.

Keywords: 2011 Tohoku, Japan earthquake, tsunami, crustal deformation, seismicity, Korean peninsula