Investigation of the November 15, 2017, Pohang earthquake (South Korea) leveraging on seismic data and space borne DInSAR

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ABSTRACT

On 15 November 2017 a Mw 5.5 earthquake struck the southeast part of the Republic of Korea (South Korea), injuring many people and causing extensive damage in and around the city of Pohang. This event was preceded by the September 2016 Mw 5.5 Gyeonju earthquake, occurred ~30 km farther south on one of the largest fault of the region, the Yangsan Fault. These two earthquake were the largest earthquake ever recorded since the last century in Korea. The November 2017 earthquake has triggered intense public debate in South Korea about its potential link with geothermal stimulation operations at a nearby EGS site. The proximity of this industrial facility with the epicentre of the earthquake has raised public concerns in South Korea.

In the absence of data from a local seismic network, we use advanced full-waveform seismological techniques, applied to regional and teleseismic network data, to locate the Pohang earthquake sequence and determine the source parameters of the largest events. We also use space borne radar interferometry to quantify the coseismic deformation and obtain an independent estimate of the mainshock source parameters. Seismicity and geodetic results are in agreement regarding location, depth and fault geometry. The hypocentral depths are shallower than the characteristic background seismicity of the area and mainly in the range 3-7 km, similar to the depth of injection (~4 km). Moreover, the mainshock and most of the aftershocks occurred within 2 km of the EGS site. Our seismological and geodetic analysis rules out a re-activation of the Yangsan fault; however, we found that the earthquake transferred static stress to its northern branch, potentially increasing the seismic hazard in the area. Our results demonstrates the extent to which a suspected case of induced seismicity can be investigated without local data from site operators.