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The 15 November 2017, Mw 5.4, Pohang earthquake in Korea: fluid-induced?

Kwang-Hee Kim (1), Wooseok Seo (1), Jongwon Han (1), Su Young Kang (1), Jeen-Han Ree (2), Tae-Seob Kang (3), Junkee Rhie (4), and YoungHee Kim (4)

(1) Department of Geological Sciences, Pusan National University, Busan 46241, Korea (kwanghee@pusan.ac.kr), (2) Department of Earth and Environmental Sciences, Korea University, Seoul 02841, Korea, (3) Division of Earth Environmental System Science, Pukyong National University, Busan 48513, Korea, (4) School of Earth and Environmental Sciences, Seoul National University, Seoul 08826, Korea

The Pohang area in southeastern Korea was shocked by a magnitude 5.4 earthquake in 15 November 2017. It was the most damaging earthquake in her modern history with more than 90 people wounded and ∼55 billion Korean Won property damage (approximately comparable to 52 million USD). As soon as the Pohang earthquake occurred, there have been considerable controversy over two issues: Which fault is responsible for the Pohang earthquake sequence? The earthquake also provoked a considerable controversy over the potential for a causal connection between the destructive earthquake and industrial activities to develop enhanced geothermal system (EGS) in the area. Although the injection activity and earthquake sequence correlate each other in space and time, the reasonable suspect still requires a closer investigation. Here, we demonstrate that the destructive earthquake may have been triggered by industrial activities to develop enhanced geothermal system (EGS) using precisely determined earthquake hypocenters, the geometry of the ruptured fault, their spatial relation with well-bottoms, and the local history of developing EGS and accompanying micro-seismicity. The earthquake also presents an unprecedented case and knowledge to answer the long-standing question: what do limit maximum magnitudes of fluid-induced earthquakes? Magnitudes of foreshocks increased with the net-amount of fluid injected. Magnitude of the mainshock is, however, an obvious outlier considering the net amount of fluid injected less than a 6,000 m3. Extremely small amount of additional fluid might have triggered a critically loaded fault system. Once the ruptures initiated, their destined magnitudes are mostly confined by the potency of the fault.