Imaging of active faults from the temporal and spatial distributions of relocated seismicity induced beneath an EGS site in the Pohang region of southeastern Korea

Jer-Ming Chiu$^{1,2}$, Kwanghee Kim$^2$, Shu-Chioung Chiu$^{1,2}$, Suyoung Kang$^2$, Wooseok Seo$^2$, and Jongwon Han$^2$

$^1$University of Memphis, Center for Earthquake Research and Information, United States of America (jerchiu@memphis.edu)

$^2$Institute of Geologic Hazard & Industrial Resources, Pusan National University, Busan, Korea

The 2017 Pohang earthquake (M$_L$ 5.4) is the second largest earthquake occurred in an intraplate in modern Korea and is considered the largest induced earthquake from an EGS system around the world. The mainshock was proceeded by a few foreshocks and followed by a few thousands of aftershocks. Numerous densely distributed seismic stations in local and regional distances were deployed to monitor this earthquake sequence. Original hypocenters in the Pohang region were located using HYPODD that is independent on crustal structures. A comprehensive crustal Vp and Vs model was recently available from an invited committee of foreign experts based on well logs and regional seismic data. This model is then revised, especially the uppermost few hundred meters, based on results from a study of S to P converted waves from shallow interfaces beneath various stations, from the traditional Wadati plots analysis, and from the interpretation of two short seismic reflection/refraction profiles. From continuous data, 5 to 10 folds of additional earthquakes than the original manually picked events can be identified and located. P and S arrival times from all earthquakes are re-picked from continuous data and are relocated using the revised model and Hypoellipse program. Temporal and spatial distribution of relocated seismicity at depths range from 3 to 7 km are more clustered and confined than that from the original catalog. A few thin vertical cross-sectional views of hypocenters parallel and perpendicular to the seismicity reveal that seismicity propagates along multiple NE-SW trending faults beneath the Pohang basin and extending NE offshore into East Sea. These fault system is sandwiched between the Yongshan fault and a few other secondary faults to the south. The main shock (5.4) and the two largest aftershocks (4.3 and 4.6) as well as their associated aftershocks show predominantly NE-SW strike-slip with reverse faulting propagating along three different adjacent faults. Geometry of active faults and their tectonic implications will be presented and discussed in the meeting.