

Data base from a seismic network to monitor the 2018 enhanced geothermal system stimulation in Espoo/Helsinki, Finland.

We discuss several topics associated with a stimulation experiment in the Helsinki, Finland, area. In June and July 2018 the St1 Deep Heat company stimulated a rock mass between 6 km and 7 km depth in Otaniemi/Espoo, Finland, to establish an Enhanced Geothermal System (EGS) to support district heating. Three-component instruments (10) were installed between 238 m and 1620 m depth and 7 broadband stations on surface. ISUH also installed a temporary network consisting of 100 4.5-Hz three-component geophones. The sampling rate was 400 Hz. The cube-stations operated for 106 days during the stimulation. The 100 stations were organized in 3 large arrays (100 m x 100 m) consisting of 25 stations, 3 small 4-station arrays, and 8 single stations. The large arrays were intended to resolve propagation properties of body waves from earthquakes in the ~M0.5 to ~M2.5 range. The stimulation resulted over 4000 micro-earthquakes with M -1.0 - 1.7. We compare noise levels, signal-to-noise ratios, and detection thresholds from different networks. We study source mechanisms, evaluate hypocenter locations from different methods. Using double-beamforming, we discuss further the properties of noise-based P waves propagating between arrays and the potential for monitoring the rock properties above the stimulated volume.

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