



Seismic activity in geothermal areas with supercritical conditions at depth

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The energy retrieved from the geothermal exploitation of supercritical fluids may remarkably enhance the productivity of geothermal wells. Several sites across the globe are currently being investigated to verify whether their geological settings may be suitable for the extraction of supercritical fluids. In the context of a project originally conceived to monitor the effects of passing seismic waves on the Larderello-Travale geothermal system, Italy, we could investigate the microseismic activity of such high-enthalpy geothermal system. 8 broadband stations were deployed from June 2017 to January 2018, covering an area of around 16x7km. The results indicate that the area is seismically active, with more than 200 identified events, with peaks of 10 earthquakes/day and local magnitudes ranging from -0.5 to 1.7 . We could identify major fault planes delineated by microseismic activity ranging from 1 to 4 km depth. The events tend to form clusters, often occur in (possibly fluid-driven) swarms and follow the orientation of the known geological features. Most of the hypocenters are positioned above the K-horizon, the seismic reflector thought to represent the top of the volume hosting supercritical fluids. However, some other events are instead located below the K-horizon, suggesting the possibility of a brittle behaviour in this region. Finally, more than 200 swarm-like, repeating and high-frequency signals have been recorded. The origin of such events is controversial and currently under investigation.