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Microseismic Monitoring of the northern Upper Rhine Graben – The projects SiMoN and FERRY

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SUMMARY

Monitoring of natural and induced seismicity.

The seismicity of the northern Upper-Rhine Graben and its seismic hazard have recently attracted new attention due to the potential of this region for geothermal power generation. The natural seismicity can be used to determine active fault zones and stress conditions within the crust. It also provides important background information for the estimation of seismic hazard and possible induced seismicity. The characterization of the natural seismicity in this region is one of the main goals of the project SiMoN (Seismic Monitoring of the Northern Upper-Rhine Graben), which is funded by the German Federal Ministry for the Environment, Nature Conservation and Nuclear Safety (BMU).

We present new results for the microseismic activity in an area of approximately 50 km^2 by analyzing seismogram recordings from a temporary network of up to 13 broad-band stations in combination with data from permanent stations. The network will soon be expanded by several borehole stations to accommodate for the relatively high noise levels in the densely populated Rhine-Main region. Despite these high noise levels a number of 64 local earthquakes have been recorded within the immediate vicinity of the network with magnitudes in the range between $M_L = 0.5$ and $M_L = 3.2$ since November 2010. The detection threshold is a local magnitude of approximately 1.0, the magnitude of completeness is $M_c = 1.3$.

Another project related to seismicity induced by geothermal power generation in the northern Upper Rhine Graben is the BMU funded project FERRY (Seismic remote monitoring of geothermal power plants using array technologies) which was launched in June 2013. Part of the project is to install a seismic array on the property of the Taunus Observatory. Due to its remoteness, this site offers good conditions to detect and locate even relatively weak earthquakes in the Rhine-Main region.

The main goal of the project is an independent seismic monitoring of geothermal systems from a central location. With the help of a test array, first correlation analyzes of seismic signals and background noise will be performed. By adjusting the geometry of the array to the respective characteristics of the wave fields, the signal-to-noise ratio should be optimized. In addition, the recordings of mobile seismic stations in the northern Upper Rhine Graben are used to calibrate the array. A first measurement campaign started in the area of the oil field Crumstadt. We present results of the addressed studies.