



Mapping of faults activated by the stimulation of the Basel enhanced geothermal system

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High-precision relative location procedures of the stronger seismic events ($0.7 < ML < 3.4$), based on cross-correlations of signals recorded by a six-sensor borehole array and numerous surface stations in the immediate epicentral area, show that clustering of hypocenters on different spatial scales is a dominant feature of the micro-seismicity induced by the stimulation of enhanced geothermal reservoir in Basel. In line with the fact that many of the observed earthquakes form clusters of similar events, several focal mechanisms are also nearly identical to each other. A comparison between the high-precision relative locations of the events within each cluster and the focal mechanisms often shows a good coincidence of the hypocentral distribution with one of the nodal planes of the focal mechanism. In some cases, the spatial extent of the individual clusters is limited to a few meters, which suggests that the corresponding events represent repeated slip with partial stress drop as pore pressures increase with time. In other cases, that include some of the stronger events ($ML > 2$), the dimension of the individual clusters can amount to several 100 meters, and the activity within these clusters can extend over several days. Given that the orientation of many fault segments identified in this way deviates significantly from the overall orientation of the seismic cloud, these results reveal a complex internal structure of the flow paths in the rock volume stimulated by the water injection.