



Deep Low-Frequency Seismicity and Magmatic Processes below the East Eifel Volcanic Field, Germany

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The last volcanic eruptions in the Eifel Volcanic Fields (Germany) occurred just 11.000-13.000 years ago. Today degassing, microseismic activity, uplift and a partial melt reservoir in the upper mantle are observed. The improvement of the seismic network in the Eifel region in recent years significantly lowered the detection threshold and enhanced location accuracy of microseismic earthquakes. This technical improvement allowed the surprising discovery of deep low-frequency (DLF) micro-earthquakes beneath the Laacher See Volcano (Hensch et al., GJI, 2019).

So far, eight DLF earthquake sequences were observed in four distinct clusters between 10 km and 40 km depth. These clusters of weak events (ML less than 2) align along an approximately 80 degree southeast-dipping line south of the Laacher See Volcano. Moment tensor solutions of these events have large shear components, and the irregular dispersion and long coda of body waves indicate interaction processes between shear cracks and fluids. We find a rotation of P-axes orientation for shallow tectonic earthquakes compared to DLF events, indicating that the stress field in the depth interval of DLF events might favour a vertical migration of magma or magmatic fluids. The observed DLF earthquake activity and continuous volcanic gas emissions around the LSV indicate an active magmatic system, possibly connected with an upper mantle melt zone.