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# Double-Difference Tomography in the West Bohemia Seismic Zone: A Study of the 2011 Earthquake Swarm

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Fluid migration, gas springs and particularly earthquake swarms are indications of ongoing geodynamic processes in the Bohemian Massif. This tectonically active region can be subdivided into several microplates, such as the Moldanubian and Saxothuringian and the block of the Teplá–Barrandian, which formed a complex sutured crust during the Variscian collision.
Beyond this subdivision, the geological situation of the Bohemian Massif is further defined by the Eger Rift, the Cheb basin and the Smrčiny pluton. Moreover a thinned crust and lithosphere is typical for the region, whereby the seismic activity is controlled by the Mariánske Lázně Fault and the Počatky-Plesná Shear Zone. Former investigations have shown a relationship between the activated fault and the occurrence of swarm earthquakes.
In this study, the analysis of the 2011 earthquake swarm was in the focus of the consideration, following previous findings from the 2008 earthquake swarm. Here, the aim is to improve the understanding between the mantle fluids and the generation of earthquake swarms in the West Bohemia Seismic Zone. Thereby double-difference tomography (tomoDD) was applied to the 2011 earthquake swarm data, leading to an enhanced location accuracy of the hypocenters and a sharper image of the fault system, which can be further controlled by hypoDD relocations. The rupture time series and clustering are also investigated. Additionally, a 3D velocity model for the P- and S-wave are derived and evaluated by considering the results of synthetic tests. The P- to S- wave velocity ratio, which is sensitive to the presence of fluids, is calculated directly from the P- and S-wave model and interpreted in relation to the potential presence of mantle fluids.
In summary, this study combines the past knowledge about the fault systems and swarms, with the newly calculated velocity model, source migration pattern and cluster analysis. Moreover the earthquake characteristics are investigated in relation to the role of fluid migration as a possible periodic trigger of seismic energy release.