



## **Reflection seismic investigation of the geodynamically active West-Bohemia/Vogtland region**

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The West Bohemia-Vogtland region in central Europe attracts much scientific interest due to recurrent earthquake swarms and continuous exhalation of CO<sub>2</sub> dominated fluid from the subsurface. Seismological and geochemical studies reveal 1) significant upper mantle derived content of the emitted fluid, 2) an updoming of the MOHO below that area 3) possible existence of a magmatic fluid reservoir in the upper mantle and 4) fluid activity as a possible trigger for the swarm earthquakes. In this study the subsurface structure beneath the region is investigated by reprocessing the deep reflection seismic profile 9HR, which runs almost directly across the swarm area. The migrated image confirms the upwelling of the MOHO known from receiver function studies. Directly below one of the major gas escape centres, channel like fault structures are observed which seem to have their roots at the MOHO. They may represent deep reaching degassing channels that allow direct transport of mantle-derived fluid. The middle and lower crust appears highly fractured below the swarm area. This may result in mantle fluid ascending through the crust and then getting blocked in the crust. Such blockage could result in building up of an over-pressured fluid zone at the bottom of near surface rocks. After a critical state is reached, the over-pressured fluid may have sufficient energy to force its way above into near surface rocks and to trigger seismicity. Since the swarm seismicity is found to be restricted along a plane only, such intrusion might have taken place along a semi-permeable zone that extends from the fractured lower crust into the near surface rocks. A comparison of the spatio-temporal evolution of the recent swarms in the years 2000 and 2008 with the subsurface reflectivity shows that in both cases the swarm activity initiates at the upper edge of a highly diffuse reflectivity zone, moves upward, bends at a bright spot above and finally stops after travelling a few kilometers along the bright spot. This correlation indeed resembles movement of an overpressured trapped fluid forcing its way into a less permeable volume above it and thereby generating a swarm of earthquakes. These observations and in particular their joint interpretation give new insight into the causes and driving mechanisms of the West Bohemia-Vogtland earthquake swarms.