

Earthquake swarms in West Bohemia and Vogtland

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The West Bohemia/Vogtland earthquake swarm region is one of the unique European intra-continental areas that display present activity of geodynamic processes, in particular, degassing of CO₂ and persistent seismic activity (Fig. 1). The degassing of CO₂ of deep origin occurs in the form of CO₂-rich mineral waters and in the form of wet and dry mofettes in several degassing fields. The mineral spring water is exploited in multiple spa resorts distributed along the neighbouring regions of the Czech Republic and Germany. The high ³He/⁴He ratios point to the mantle origin of the ascending gases. Seismicity is dominated by periodically occurring earthquake swarms with seismic magnitudes not exceeding M_L 5; a culmination of seismicity is observed within the last 30 years when a single M_L 4+ swarm and multiple M_L 3+ swarms occurred (Fig. 2). These processes have been intensively studied by many Czech and German seismologists and geophysicists and from various viewpoints, which resulted in a common opinion that the seismic activity stems from the whole geodynamic activity in the region; though the triggering factors still remain undisclosed.

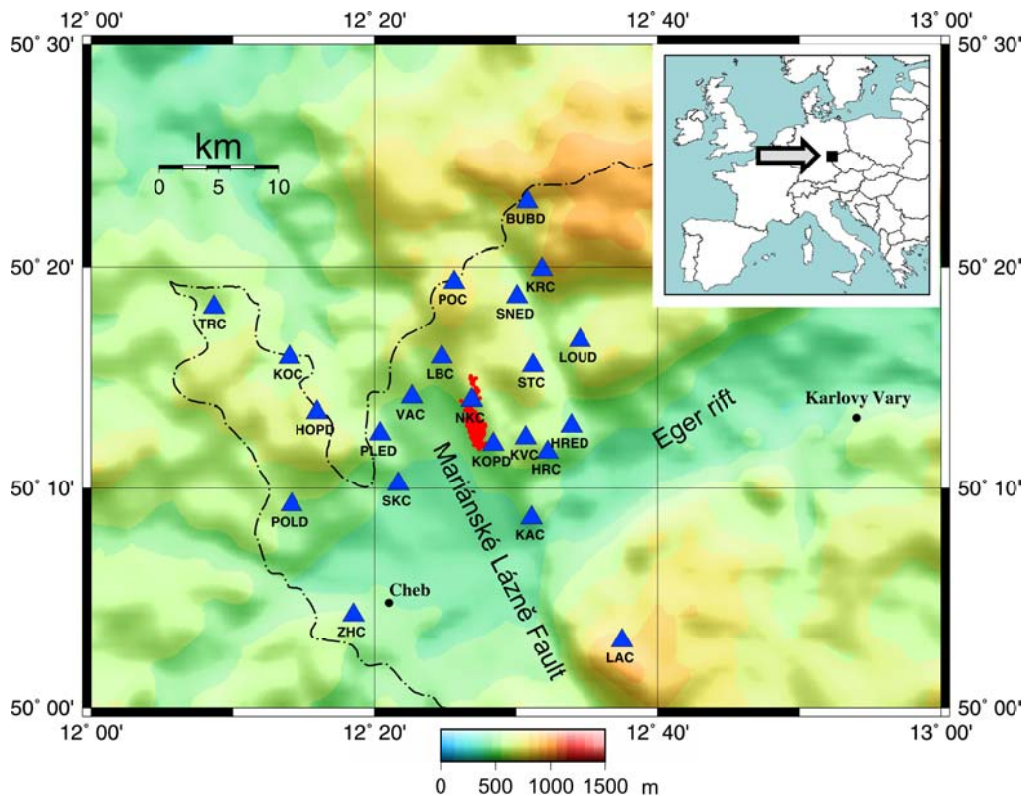


Fig. 1. Topographic map of the West Bohemia/Vogtland region. The epicenters of the 2008 swarm earthquakes are marked by red dots. The WEBNET stations are marked by blue triangles. The dashed-dotted line shows the border between the Czech Republic and Germany. After Vavryčuk *et al.* (2013).

In this presentation I summarize seismological studies carried out in West Bohemia and Vogtland during several last decades. I demonstrate the interdisciplinary nature and complexity of the problem of seismicity induced by rock-fluid interactions. I show how studies of micro-earthquakes can contribute to solving general problems of physics of earthquakes, seismic tomography and the spatio-temporal evolution of seismic energy release. Finally, I list open questions which should be addressed in future research the present geodynamic activity in this unique European natural laboratory to be better understood.

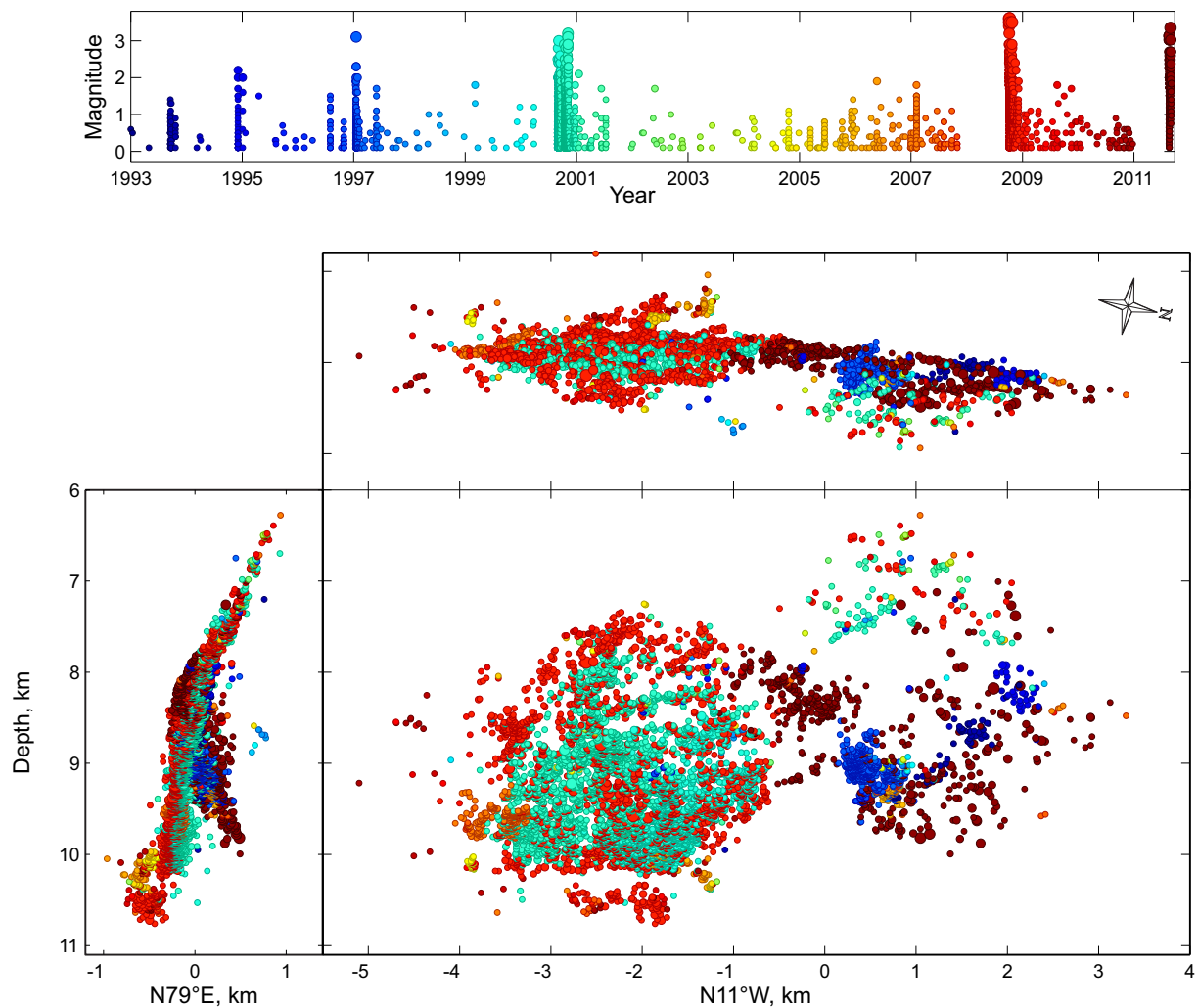


Fig. 2. Hypocentres of the seismic activity in the Nový Kostel fault zone in West Bohemia for the period from 1993 to 2011 relocated by the double-difference method. Magnitude-time plot (top) and locations (bottom). The locations are shown in the map view (upper part) and in two vertical cross-sections (lower part). Note that above the depth 8.3 km, all the activity aligns along a common steeply dipping fault plane. The hypocentres are colour-coded by origin time. After Bouchaala *et al.* (2013).