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Earthquake statistics, spatiotemporal distribution of foci and source mechanisms - a key to understanding of the West Bohemia/Vogtland earthquake swarms

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Earthquake swarms are sequences of numerous events closely clustered in space and time and do not have a single dominant mainshock. A few of the largest events in a swarm reach similar magnitudes and usually occur throughout the course of the earthquake sequence. These attributes differentiate earthquake swarms from ordinary mainshock-aftershock sequences. Earthquake swarms occur worldwide, in diverse geological units. The swarms typically accompany volcanic activity at margins of the tectonic plate but also occur in intracontinental areas where strain from tectonic-plate movement is small. The origin of earthquake swarms is still unclear. The swarms typically occur at the plate margins but also in intracontinental areas. West Bohemia-Vogtland represents one of the most active intraplate earthquake-swarm areas in Europe. It is characterised by a frequent reoccurrence of $M_L <$ 4.0 swarms and by high activity of crustal fluids. West Bohemia-Vogtland is one of the most active intraplate earthquake-swarm areas in Europe which also exhibits high activity of crustal fluids. The Nový Kostel focal zone (NK) dominates the recent seismicity, there were swarms in 1997, 2000, 2008 and 20011, and a striking non-swarm activity (mainshock-aftershock sequences) up to magnitude M_L= 4.5 in May to August 2014. The swarms and the 2014 mainshock-aftershock sequences are located close to each other at depths between 6 and 13 km. The frequency-magnitude distributions of all the swarms show bimodal-like character: the most events obey the b-value = 1.0 distribution, but a group of the largest events depart significantly from it. All the $M_L > 2.8$ swarm events are located in a few dense clusters which implies step by step rupturing of one or a few asperities during the individual swarms. The source mechanism patters (moment-tensor description, MT) of the individual swarms indicate several families of the mechanisms, which fit well geometry of respective fault segments. MTs of the most events signify pure shears except for the 1997-swarm events the MTs of which indicates a combine sources including both shear and tensile components. The origin of earthquake swarms is still unclear. Nevertheless, we infer that the individual earthquake swarms in West Bohemia-Vogtland are mixture of the mainshock-aftershock sequences which correspond to step by step rupturing of one or a few asperities. The swarms occur on short fault segments with heterogeneous stress and strength, which may be affected by pressurized crustal fluids reducing normal component of the tectonic stress and lower friction. This way critically loaded faults are brought to failure and the swarm activity is driven by the differential local stress.