



Hunting remnants of maar-diatreme-volcanoes

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In the area of the Rostock-Leipzig-Regensburg fault zone (Germany) several centres of seismic activity are found with seismicity manifesting itself in swarm earthquakes. The occurrence of these earthquakes is globally linked to ascending magma and magmatic fluids. Information is scarce regarding the depth and geometry of the magmatic source, dynamics in the sub-Moho/lower crust region and fluid-tectonic processes in the upper crust in this area. From studies of maar structures located in the seismic active section of the fault zone magma-tectonic phenomena can be reconstructed. For this purpose two relicts of maar volcanoes of different age within a distance of 60 km are investigated by geophysical surveys. Both structures are located in a distance of a few 10 km from recent swarm earthquake centres.

The diatreme structure near Ebersbrunn/W-Saxony which is probably of tertiary age is known for several years, the late Quaternary, volcanic palaeo-lake near Mýtina close to the Czech-German border was only recently discovered. Both structures are characterized by distinct gravimetric and magnetic anomalies of about -2 mGal and several 100 nT resp. indicating steeply dipping structures as well as electrical conductivity anomalies. The magnetic total field anomaly of the Ebersbrunn structure has an uncommon rugged appearance. The hypothesis of an origin related to a redistribution of material with high magnetic susceptibility values and saponification of magnetic minerals due to melt water run-off after the last glacial period could not be confirmed. Thus the heterogeneous anomaly character appears to be mainly associated with the degree of weathering of the volcanic material within the diatreme with depth.

From 3D gravimetric and magnetic modelling information is gained on geometry and structural composition. Drilling results were used as additional boundary conditions. In both cases modelling reveals an inner zone of significantly reduced density and increased magnetic susceptibility. For both structures the geometry can clearly be associated with a maar-diatreme-volcano. While at Mýtina a maar filled with sediments exists, only the root zone of a diatreme is left at Ebersbrunn.

A third structure, the so-called Trias slab of Greiz located roughly 16 km NW of Ebersbrunn, has been surveyed recently as it might also be of volcanic origin. The results so far, however, are inconclusive. An elongated gravimetric anomaly of about -1.5 mGal and an indistinct magnetic total field anomaly of 20 nT are found. The anomaly fields do not contravene but also do not corroborate the hypothesis of a carbonatitic breccia. Further investigations are necessary.

The two structures unequivocally identified to be of volcanic origin bear the potential to contribute to the reconstruction of the palaeovolcanologic evolution and thus provide additional constraints to the evaluation of the hazard potential for the tectonically active section of the Regensburg-Leipzig-Rostock fault zone.