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Mapping of near surface fold structures with GPR and ERT near Steinbrunn (Northern Burgenland, Austria)

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In the transition zone between the southern Vienna Basin and the Eisenstadt basin, close to Wr. Neustadt, spectacular fold structures are exposed in the former sand pit of Steinbrunn. The succession of Upper Pannonian age consists of decimetre to meter thick sandy, silty and clayey beds, which are overlain by sandstone beds (Grundtner et al., 2009). The anticline and syncline structures were interpreted as of gravitational origin by Exner et al. (2009), and reinterpreted as of tectonic origin by Häusler (2012a). In order to gain a more detailed insight to the three dimensional distribution and orientation of the folds high resolution geophysics such as electrical resistivity tomography (ERT), ground penetrating radar (GPR) and electromagnetics (EM) were applied to map the surroundings of the sandpit.

The ERT- and EM-profiles show that the uppermost layer is more clayey northwest and sandier southeast of the sandpit. This is important for the GPR because clay attenuates the radar signals and therefore no clear layering of the subsurface could be mapped in these areas. In order to directly compare ERT and GPR results with the lithology of the fold structures observed in the sandpit, a reference profile on top of the 140 m long wall of the sandpit was performed. Both methods clearly reveal fold structures paralleling the folded Pannonian strata of the outcrop. While the GPR data displays boundaries and their geometry in the succession, the resistivities in the ERT portrays a more smoothened image of the observed fold structure.

In almost all GPR profiles wavelike structures are visible with axes in northern direction and dome-shaped structures with axes in eastern direction, deepening towards the west. In conclusion this pattern is comparable to sections of rounded buckle folds. Although there are clayey areas wave-like and dome-like reflections can be followed in the GPR profiles over a distance of several hundred meters. This is confirmed by the ERT profiles. Therefore we assume that the mapped fold shape structures underlie almost the entire investigation area of about one square kilometre in size. Considering the very shallow facies of the Upper Pannonian deposits and compared to fold structures documented in the neighbouring coal mine of Neufeld (Häusler, 2012b), the geophysical investigations of these buckling structures support the hypothesis of a tectonic origin.

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