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Geoelectric investigation of a multidirectional fissure system in a karstic area

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There are various geophysical methods (e.g. VLF and its variants) to investigate parallel systems of subsurface fissures, but so far there have been no geophysical techniques to tackle multidirectional fissure systems, although such complex systems occur quite frequently in nature. In the area where we carried out field measurements, locally two, regionally three different fissure directions occur. Debris accumulated on the original karstic surface during decades caused the interpretation of the geophysical measurements even more difficult.

The VES apparent resistivity values measured in several directions indicated a strong anisotropy, but the 1D inversion did not give significant differences between the hypothetical layer depths. On basis of the VES sounding curves we determined, at what AB lengths it is possible to detect fissures at large enough depth, and with a good resolution. Then, by using the selected AB length, we carried out Wenner array measurements, along two systems of parallel profiles. The direction of the two profile systems were selected on basis of apriori information. The Wenner results were compared to those obtained by using a new array, the so-called midpoint-null- or MAN one. (In the case of this array, it was interesting to realize characteristical differences between measurements after rainy- and dry periods.)

The greatest problem in the interpretation steps was how to identify the corresponding anomalies on the parallel profiles. In order to reduce the ambiguity, the

fissure directions were determined also by using azimuthal apparent resistivity measurements, namely by both the classical Schlumberger array- and with the so-called Schlumberger null-array techniques (Szalai S., Szarka L., Prácser E., Bosch F., Müller I., Turberg P., 2002: Geoelectric mapping of near-surface karstic features by using null-arrays. Geophysics, 67, 1769-1778).

Finally the fissure system could be mapped with a sufficient resolution.

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