



Geophysical investigation of the Hockai Fault Zone, Eastern Belgium

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In the frame of a regional project evaluating the geothermal potential of the Wallonian Region of Belgium, the Hockai Fault Zone has been identified as one of the most interesting targets. It is a seismically active fault zone that hosted the largest historical earthquake in Northwestern Europe, the M6-6.5 Verviers event in 1692 as well as a swarm of small earthquakes that was recorded in 1989-90. On the surface, the presence of the fault zones is marked by a series of geomorphic features, such as several landslides near the borders in the northern part, repeated NW-SE oriented scarps all along the Eastern border (over a distance of 40 km), river diversions and captures with formation of paleo-valleys.

Along the most prominent paleo-valley, the Paleo-Warche Valley crossing the fault zone over a distance of 5 km, a geophysical survey has been organized by several teams to better characterize the shallow (<150 m) subsurface of the fault zone. It included electro-magnetic sounding (frequency-based and TEM), shallow seismics (refraction, walk-away, surface waves analysis), electrical resistivity tomography as well as ambient noise recordings. To support an integrated interpretation of all geophysical results in combination with geomorphic and seismo-tectonic aspects, surface morphology, soundings and profiles were represented in a 3D model. This model clearly reveals low-resistivity and low-velocity zones near the Eastern border of the fault zone, vertically above the hypocenters of the 1989-90 earthquake swarm. Across the structure, low-resistivity zones have a limited extent while they are repeatedly identified all along Eastern border.