

## **Characterisation of a landslide in the Flemish Ardennes, Belgium, using geophysical and geotechnical modelling**

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In the Flemish Ardennes (Belgium), the occurrence of massive landslides has been known for a long time, mostly associated with the presence of clay belonging to the Aalbeke Member (Eocene). A recent collaboration between the Faculty of Engineering of the University of Mons (FPMs) and the Service Public de Wallonie (SPW) has focused on the characterisation of one of these landslides. The site is located along the N520 between the towns of Flobecq, Renaix and Brakel. The road is affected by the landslide and needs frequent repairs.

A geotechnical survey focused on the affected road section has been conducted by SPW. It included cone penetration tests, inclinometric measures and drillings. The results have revealed the location of the slip surface. However, the geometry of the landslide and its position relative to the geological units remained unclear.

A geophysical survey was conducted to provide observations over a broader area and try to better understand the context of the landslide. The geophysical acquisitions were made along two profiles. The first one is 232.5 metres long and the second one is 177.5 metres long. Both electrical resistivity tomography (ERT) and seismic refraction tomography (SRT) were conducted along these profiles. The acquisition geometries of ERT and SRT were designed in a way to facilitate combined processing and interpretation.

Open-source tools and in-house code were used to process and to invert electrical and seismic data independently. Discontinuities derived from the SRT inversion were then used to constrain a second inversion of the ERT datasets. The geophysical models were interpreted in the light of the geotechnical survey and regional geological, geophysical, and geotechnical data. The first aims were to try to identify the various lithologies and to locate the position of interfaces between lithological units. The location of the water table is also of interest. Based on this information, hypothesis about the landslide structure, including the position of the Aalbeke Clay were built and discussed.

Subsequently, slope stability modelling was carried out on the landslide model using Geo5 software. Information from the geophysical survey and geotechnical characterisation helped to implement the failure model. The simulations of several cases helped to better understand the mechanisms that can lead to failure.