

## **ABSTRACT**

Switzerland uses more energy per capita than neighboring European countries, with nuclear and hydrocarbon plants providing over 40% of Swiss energy. Switzerland recently voted to phase out nuclear power completely in the coming decades. The development and utilization of geothermal power could partially mitigate the sizeable energy production deficit from phasing out nuclear and hydrocarbon-sourced energy. Hydrothermal springs are known in the Greater Geneva Basin from the 15<sup>th</sup> century, giving reason to suspect geothermal potential at depth. The Canton of Geneva in partnership with the Geneva Industrial Services and with the support of the University of Geneva launched the GEothermie 2020 program, with the goal of exploring (and possibly exploiting) the geothermal potential in the Canton of Geneva. In order to reduce uncertainty in the subsurface and aid in the exploration of geothermal targets, this study uses affordable geophysical methods to investigate one of the targets of the geothermal campaign in the canton of Geneva (i.e. Laconnex). In particular, horizontal to vertical spectral ratio analysis (HVSR) from ambient noise measurements and deep electrical resistivity tomography (DERT) are the affordable geophysical methods utilized in this study. This project focuses on identifying subsurface faults, estimating local thickness of sediment cover, and approximating location of fluid in the subsurface. The combination of HVSR and DERT imaged the major and minor stratigraphic horizons, subsurface fluids, and potential faults to a depth of 700 m. Furthermore, this study compares the new data against information derived from previously acquired 2D seismic data. The results of this study suggest there is potential for geothermal energy applications in Laconnex.

***Keywords: Geothermal Energy, Geneva Basin, Subsurface Investigation, Horizontal to Vertical Spectral Ratio, HVSR, Electrical Resistivity Tomography, ERT, Seismic Reflection Survey***