Deep-reaching electrical resistivity tomography (ERT) methods for middle-enthalpy geothermal prospection in the Geneva Basin, Switzerland

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Geoelectrical methods have been applied to a wide variety of scientific problems such as hydrogeological and environmental studies, characterization of tectonically active areas and mud volcanic eruptions. The main drawback of classical ERT methods was the limited penetration depth. We use a recently developed ERT technology to investigate regions suitable for the development of middle-enthalpy geothermal energy.

Switzerland is promoting an energetic transition by developing geothermal energy In this framework old data are reprocessed and reused and brand new prospection methods are set up in order to characterize geothermal resources.

Previous studies have highlighted the geothermal potential of the Geneva Basin for low- to middle-enthalpy geothermal energy suggesting significant density variations in the Tertiary, Cretaceous and Jurassic units.

To investigate the shallow resistivity structure of the upper units we used the new ERT Fullwaver methodology developed by IRIS instruments. This cableless innovative methodology handles electric noise issues often associated to urbanised areas and allows the investigation of about 1000m below the surface. It enables absolute freedom for setting up acquisition geometries and avoid the use of several kilometers cables for deep acquisition arrays. Continuous acquisition permits noise removal in data processing.

Here we present a preliminary study using 25 instruments units showing how affordable deep-reaching geoelectrical methods may be used to prospect regions of potential use for geothermal energy exploitation. The workflow consists in building a synthetic model that allows us to test different acquisition arrays and their vertical and lateral resolution. Next we present the field acquisition and the interpreted results.