Contribution ID: **4** Type: **Poster**

Characterizing the hydro-structural setting of the Einstein Telescope site of Sardinia (Italy): insights from Electrical Resistivity Tomography

Wednesday, 10 November 2021 19:00 (1 hour)

Characterizing the geological subsurface setting of a stratified aquifer and the structures that guide the flow paths is crucial for the realization of underground infrastructures such as the Einstein Telescope (ET), that is the European third-generation underground interferometric detector of gravitational waves. The triangular setting of this infrastructure (10 km long sides) has vertices located near the villages of Lula, Bitti and Onanì in Sardinia (Italy).
In order to trace the fractures and fault paths at these sites we have applied the Electrical resistivity tomography (ERT), which helped us tracing the structural data collected at depth.
In this contribution, we present the first results of 2D ERT surveys along with the structural and morphostructural analysis of the brittle structures affecting the crystalline basement to more accurately interpret the geophysical anomalies representative of the underground geology of the aquifer. The deep interpretation is also supported by the drilling performed at the Onanì and Bitti vertices (ca. 250 m total depth).
The tomographies show a complex internal resistivity stratification, that consists of up to three electrolayers with variable distribution and thickness. As supported by field observation, we have interpreted the more conductive electrolayers as regolith and alluvial units, while the most resistive electrolayers correspond with the less-altered granitoids.
The tomographies of the Onanì vertex, show that the conductive layer occurs either as: i) a discontinuous and well-localized layer near the surface (up to 20 m thick), or as ii) a broader anomaly zone of values around 1000 Ωm that locally occurs at a depth of 30-90 meters. On the base of the sudden trend of the isoresistivity lines, we identify three fault zones, NNW-, NNE- and WSW-oriented, that locally connect top to bottom the uppermost conductive electro-layer with the deeper resistivity anomalies. The tomography of the Bitti vertex shows a stratified resistivity array composed of: i) a near-surface resistive electrolayer; ii) an intermediate conductive layer and iii) a resistive deep electrolayer, which is characterized by a large deep conductive anomaly that is bounded by suddenly graded resistivity drop and corresponds to two fault systems that are broadly WSW-striking. In conclusion, the hydro-structural setting of the granodiorite of the Bitti vertex consists of a more complex internal structure of the aquifer with respect to the orthogneiss of the Onanì vertex. Provided that ERT is a low-cost, non-invasive and rapid tool that has allowed characterizing the hydro-structural setting of the ET vertices, survey will be conducted also on the tunnel traces.

Primary authors: LONGO, Vittorio (Università di Sassari); OGGIANO, Giacomo (Istituto Nazionale di Fisica Nucleare); CARDELLO, Giovanni Luca

Presenter: LONGO, Vittorio (Università di Sassari)

Session Classification: Poster Session @ Sos Enattos Mine