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Delineation of a geothermal reservoir using 2d seismic interpretation and electrical resistivity tomography data inversion at Hamam Sidi Maamar, Central Tunisia

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The Hammam Sidi Maamar is a well known thermal spring located in Central Tunisia. The source flows in a rudimentary basin which is frequently visited by people looking for the multiple therapeutic benefits of the sulphur water. Unfortunately H. Sidi Maamar source is not exploited as a thermal spa because of its low flow (0.5 L/s) that makes any economic investment non prolific. The aim of this study is to delineate and elucidate the geothermal reservoir at H. Sidi Maamar surrounding and to identify a suitable location for the implementation of a well that would permit tapping and improving the flow of thermal water. For this, an integrated geophysical study was performed using 2D seismic cross section interpretation and ERT Data acquisition and inversion. The seismic cross section interpretation has enabled us to follow the geometry of the Early Cretaceous levels, main reservoir of the H. Sidi Maamar source. Indeed, the thermal springs of this source are reloaded, starting from meteoric water that infiltrates, on the Hauterivian-Aptian outcrops of Jebel Mrhila (zone of refill). They are driven in depth, through the plain of Jelma and the Hajeb El Ayoun Graben, reaching 2000 m depth and growing rich in salt and sulphides. Finally, these waters emerge at the source of Hammam Sidi Maamar by vertical drainage through the network of NW-SE border faults of Hajeb Layoun Graben. The interpretation of inverted ERT models has permitted the identification of sulphured water resurgence, from the depth to the surface, soaking on its way the sand, silts and shale of the river filling. It was also noted, 10 m in-depth, the existence of a localized seep overhanging a subvertical fault. This could be interesting to establish a well that can provide a higher flow of water. According to the 2D interpretation of this data set, a promising area for geothermal drilling is highly recommended, especially around the hot spring and its neighboring areas, where there is an aerial extent and quite considerable aquifer thickness reaches more than 100 m.

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