



Magnetotelluric study in the western transect of the Rif Cordillera

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The Gibraltar Arc, formed by the alpine Betic and Rif Cordillera, surrounds the western Alborán Sea and is located on the Eurasian-African plate boundary. In a region with a complex geological setting, several tectonic models have been proposed up to present, but they are not fully supported due to the absence of detailed geophysical data on the deep structure. In this setting the crustal structure of the Rif Cordillera is poorly known. We applied the magnetotelluric method to make out structural features in the crust and upper mantle, using four ADU-07 (Metronix) devices in 18 MT measurement sites using five measurement channels (two electric and three magnetic) with frequencies ranging from 4Hz to 32 kHz. The acquisition time on each site ranges from two to three days. These sites extend along a NE-SW profile orthogonal to the main geological structures in approximately 110 km, from Oued Laou, close to the Mediterranean coast, located in the Internal Zones, to the Gharb foreland basin, up to Mechra- Ben- Ksiri town. The combination of magnetotelluric data with other geophysical and geological data allows to constrain the relationships between deep and shallow crustal structure of the western Rif Cordillera.

The magnetotelluric model shows heterogeneous upper crust that agrees with the geological structures observed in surface. The Internal Zones correspond to resistive (metamorphic rocks) and conductive (peridotites) bodies while the External Zones and the foreland basin are characterized by important conductive structures. In depth, the most relevant feature corresponds to a large resistive body located below the frontal part of the Rif. The presence in surface of exotic gneiss blocks in some tectonic units of the frontal part of the Cordillera suggests that this large body may correspond to a gneissic or granitic basement surrounded by metapelitic rocks.