

A MAGNETOTELLURIC SURVEY IN THE SOUTHERN PORTUGAL HERCYNIAN MASSIF: A NEW INTERPRETATION APPROACH

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To investigate the geoelectric structure of the Hercynian Massif in southern Portugal, a magnetotelluric (MT) survey was performed in an area of about 60 km by 60 km. Thirty-four MT sites were occupied over an approximately regular grid. The regional geology and tectonics are complex and interpretation in terms of one- and two-dimensional electrical resistivity models is difficult. From the geology and from three-dimensional electromagnetic forward modelling, the region presents a three-dimensional character. To try to understand and interpret the MT results a new approach using impedance tensor invariants has been employed. Various invariants are related to different dimensionality characteristics and different distortion types. Seven invariants were calculated from the impedance tensor for each site and these were used to classify the sites as to their dimensionality. Maps showing zones of one-, two- and three-dimensional character have been constructed and these are consistent with what is known for the area in terms of geology and tectonics, as well as faults and an overthrust. In addition, the geologic contacts appear to be more easily identified. Furthermore, the dimensionality maps at different periods show a change in dimensional character with depth, an observation that is consistent with seismic refraction studies that show that there is no simple layered crustal model for the Hercynian Massif in southern Portugal.