

3D Modeling of the crustal structure of the Gulf of Cadiz using gravity and seismic data

M. Salas*

*Institute of Earth Sciences "Jaume Almera". mak.salas@gmail.com

Abstract

The Gulf of Cadiz, is located in the southwestern Iberian margin along the present day diffuse plate boundary between Eurasia and Africa. Its gravity signal is characterized by the presence of prominent positive and negative anomalies that from its wavelength are likely indicating significant density variations in the crust and uppermost mantle. To that purpose a 3D gravity modeling (forward and inverse) has been performed. Besides, to acquaint training in the processing of the gravity signal a semi-quantitative approach has been followed along a wider region that covers the entire Iberian Peninsula and its margins. First, the processing of the Free Air gravity anomaly is presented and compared with the G_{zz} gravity gradient component. Both data sets show similarities in the distribution of the gravity highs and lows that are interpreted as the presence of density anomalies at crustal and uppermost mantle level. Second, a 3D gravity study (forward and inverse modelling) has been performed along the Gulf of Cadiz region. The forward modelling consists of calculating the 3D gravity contribution of the sediments, crystalline crust and uppermost lithospheric mantle to separate the observed Free-Air gravity anomaly into its regional and local components followed by the inversion of the residual gravity anomalies to highlight lateral average density variations within the crust. The residual gravity anomalies show: two negative anomalies located along the continental shelf of the South Iberian margin and in the southern region, with maximum values of about -40 mGal, and a prominent NE-SW positive residual anomaly with values up to 80 mGal. 3D inversion of the obtained residual shows that to fully saturate the gravity signal an increase in the average crustal density of 0.20 g/cm^3 is needed in the NE-SW oriented high, while the gravity lows require a decrease from -0.05 to -0.15 g/cm^3 .

Keywords: Gulf of Cadiz, 3D gravity modeling, Residual gravity anomalies.
