Geophysical Research Abstracts
Vol. 12, EGU2010-5004, 2010
EGU General Assembly 2010
© Author(s) 2010

Ocean tide loading effects on new gravity tide measurements made at south of Spain

Jose Arnoso, Maite Benavent, and Fuensanta G. Montesinos
Institute of Astronomy and Geodesy (CSIC-UCM), Madrid, Spain (jose_arnoso@mat.ucm.es)

Tidal gravity observations have been made recently in Algodonales (ALG) site located in the region of Andalucía, at the south of Spain. Other former gravity tide observations around this region were made in Granada and San Fernando (Vieira et al., 1983), which are 165 km northeast and 85 km southwest distant from ALG, respectively. It is planned to make shortly new gravity measurements in Melilla, which is a Spanish city placed at the other side of the Strait of Gibraltar (north of Morocco). In this way, we will dispose of an interesting gravity profile for studying the elastic response of the Earth at tidal periods in this important area of geodynamic activity. In fact, this broad region is situated around the interaction area of the Eurasia and Africa plates, where various geological structures are present, as the Alboran Sea basin, the Betico-Rifean chain, the Gulf of Cádiz and the Atlas mountain range. Also, the area is affected by occurrence of moderate magnitude earthquakes, mostly focused at shallow and intermediate depths ($<$ 40 km) although exist records of very deep earthquakes located at the south of Granada. The two tectonic plates that interact have different movements slightly, which originates an accumulation of efforts in the fault line, that contributes to the earthquake occurrence in the zone (see e.g. Stich et al., 2006; Buforn et al., 2004; Fullea et al., 2006).

The gravity observations made in ALG site, which is situated about 55km far from the coast, are considerably affected by ocean tide loading produced by the effect of the nearest Atlantic Ocean and Mediterranean Sea. Thus, the gravity effect induced by the ocean masses contributes up to 9% of the observed signal, for the main tidal constituents. The ocean loading effects have been calculated following the Farrell's (1972) procedure through the convolution between gravity Green's functions and the ocean tide distribution given by global oceanic models (TPXO7.1, FES2004, GOT00, GOT4.7,..). To improve the loading predictions in the area, we have used the recently developed regional oceanic model named IBER01 (Benavent et al., 2009). The model was constructed by assimilating satellite altimeter data and tide gauge measurements into a hydrodynamic model and is extended through the domain given by 48˚.0N to 34˚.0N and 6˚.0E to 16˚.0W, having a resolution of $5\prime \times 5\prime$. Thus, the contribution of IBER01 to the tidal loading calculated at ALG site represents about 72% and 55% of the total load for semidiurnal and diurnal waves, respectively. Results obtained show that precise calculations of ocean tide loading improves the interpretation of the gravity tide models obtained in the area and also allow us to assess the efficiency of the global oceanic models around the Strait of Gibraltar where the Mediterranean and Atlantic waters converge.