



Assessment of the Latest Release of GOCE Satellite-Only Global Geopotential Models over the Red Sea

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The GOCE (Gravity field and steady-state Ocean Circulation Explorer) mission launched on March 2009 has successfully concluded its mission on October 2013 after collecting leading gravity gradient measurements. Such unprecedented GOCE data made it possible to improve the determination of the geoid over our study area, namely the Red Sea. The performance of GOCE global gravity field models (GGMs), at the end of its mission that lasted for 42 months, is evaluated using shipborne free-air gravity anomalies over the Red Sea.

Seven recent GOCE-based GGMs, namely the DIR_R5, ITU_GGC16, SPW_R5, TIM_R5, NULP_02S, GOCO05C and GGM05G are assessed by means of the Spectral Enhancement Method (SEM) as well as the EGM2008 model. The evaluation focused the light on spherical harmonics degree/order (d/o) ranging from 100 to the maximum degree of the model with an incremental step of 20 d/o.

SEM has been exploited in order to fill in the existing spectral gap between satellite and terrestrial data. Then, the combined model resulted from integrating GOCE data with EGM2008 is enhanced by accounting for the very high frequency components, associated with the terrain effects, the so-called Residual Terrain Model (RTM).

The results show that GOCE-based GGMs can improve the free-air gravity anomalies over the Red Sea, where such improvements are highly evident between d/o 140 and 160, where the performance of EGM2008 surpasses GOCE GGMs beyond these d/o. The best GOCE-only GGMs results were delivered by the SPW_R5 at d/o 160 with a mean and standard deviation of 2.06 and 9.90 mGal, respectively.