Geoid and MDT in the Mediterranean area: the GEOMED2 project

Introduction

In the framework of the GEOMED2 project, the geoid over the Mediterranean area has been estimated based on the available gravity data. Land and ship-borne data have been collected and edited to derive a homogeneous and reliable database. Different Global Geopotential Models have been used when reducing for the low frequency component of the gravity signal and different approaches have been as well considered in accounting for the terrain effect. In estimating the geoid, Collocation, Stokes-Wong&Gore and the KTH methods have been applied to gravity data that has been gridded on a regular 2° × 2° geographic grid in the area 30° S < ϕ < 48°, 10° < λ < 40°. The geoid estimates have been provided over the same regular grid and then compared with GPS/levelling data over Italy and Greece. The results obtained using the different methods are here presented and discussed.

The available solutions

POLIMI

Solution produced at Politecnico di Milano with Fast-collocation algorithm (Bottone and Barzaghi, 1993).

AUTH

Solution produced at Aristotle University of Thessaloniki with a tapered version of the Wong-Gore (Wong and Gore, 1969) modification of Stokes' kernel function (truncated at degree 1000), through the SPFOUR software of the GRAVSOFT package (Forberg and Tscherning, 2008).

GCM

Solution produced at the General Command of Mapping (Ankara, Turkey) with KTH method based on the least-squares modification of Stokes' formula (Sjöberg, 2003).

UNIZG

Solution produced at University of Zagreb with RCR approach with Stokes integration, using Heck and Grüniger kernel, with modification degree 300. Two additional corrections on geoid undulations were applied: 1. Tide free to mean tide geoid undulation (after Ekman, M. 1989), 2. Topographic bias (after Sjöberg, 2018).

Conclusions

The results show a substantial agreement among solutions. Comparisons with GPS/levelling over Italy and Greece prove that the solutions are statistically equivalent.

Still, there are some biases and high frequency discrepancies that need to be further analyzed. Particularly, high frequency patterns in the differences over the Mediterranean Sea must be understood and reduced. This could be done by comparing the different solutions with an altimetry based geoid, namely those coming from e.g. DTU15.

References