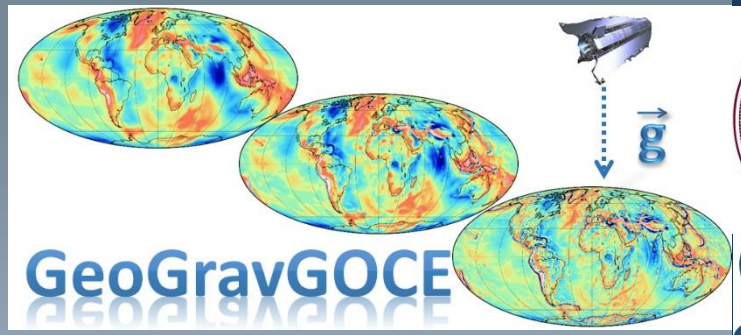


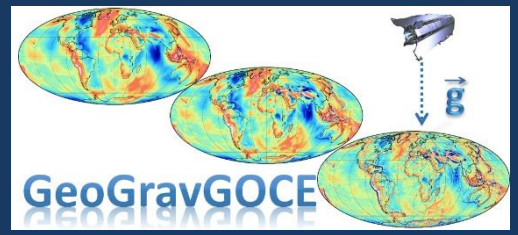
GeoGravGOCE Funding

The **GeoGravGOCE** project is funded by the General Secreteriat for Research and Technology (GSRT) within its Scientific Experiment Development Program (PRODEX) following a successful application to the General Secretariat for Research & Technology (GSRT) after an invitation to the Greek scientific community in response to the 1st PRODEX Programme Call for Greece.

The duration of the project is 24 months:
December 23, 2019 *to* ***December 22, 2021***.

The project team is composed by:

- Prof. Ilias N. Tziavos, Principal Investigator of the Project
- Assist. Prof. George S. Vergos, Co-Investigator
- Assist. Prof. Vassilios N. Grigoriadis, senior researcher
- Prof. Michael G. Sideris, senior researcher
- Dr. Dimitrios A. Natsiopoulos, PostDoc researcher
- PhD Candidate, Eleftherios Pitenis, junior researcher
- PhD Candidate Elisavet Mamagianou, junior researcher



CONTACT US

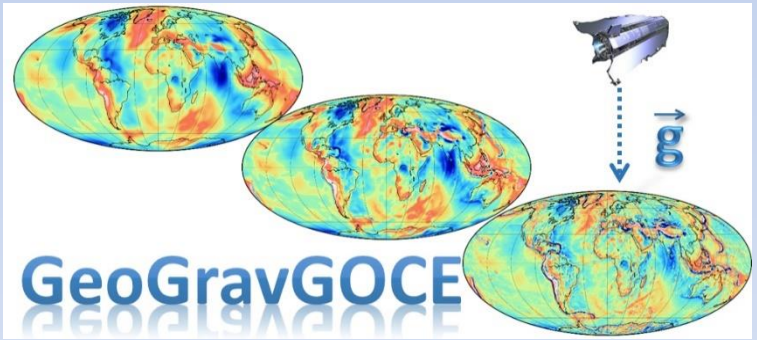
FOR MORE INFO

Laboratory of Gravity Field Research and Applications (GravLab)
Department of Geodesy and Surveying
Aristotle University of Thessaloniki
Univ. Box 440
Thessaloniki, GR 54 124
Greece

T: ++30 2310 996125
F: ++30 2310 995948
@: tziavos@olimpia.topo.auth.gr
@: vergos@topo.auth.gr

Subscribe to the ***GeoGravGoce*** *Newsletter for updated information on the project status and results*

Geoid and Gravity Field Modelling by GOCE Satellite Gradients and Terrestrial Data



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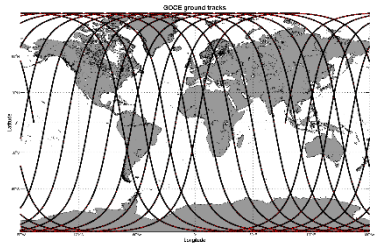

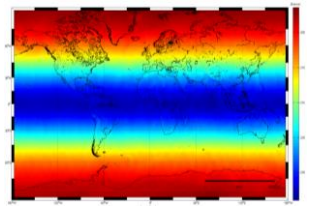

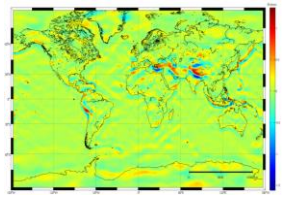

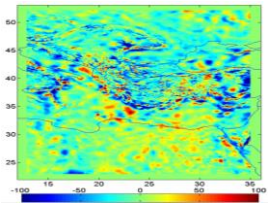

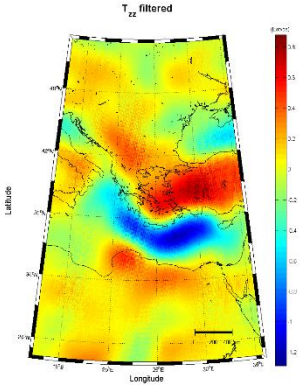

The GeoGravGoce Project

The mission of GOCE has already offered unprecedented new insights to all geosciences and geodesy in particular. In terms of gravity field approximation at a global scale, GOCE Global Geopotential Models (GGMs) provide accuracies of about 1.2 cm for spatial scales up to 90 km. While the mission contribution to medium wavelengths has been studied in great detail during the last years, its possible improvement to the shorter scales has been neglected.

GeoGravGOCE aims to tackle both issues in order to gain improved insight in the real spectral content of GOCE gradients towards improving regional geoid modeling in the Hellenic region.

Our goal is to first develop an automated GUI-based software for the initial pre-processing of the GOCE gradients and frame transformation from the gradiometric reference frame to a local north oriented frame where terrestrial observations refer. After this step, novel filtering methods for the noise and long-wavelength correlation errors reduction will be developed, based on both spatial and digital filters. Alongside, a novel methodology based on Monte Carlo simulated annealing and system theory will be developed in order to first downward continue GOCE gradients to a mean orbit and then to a mean Earth sphere. This will be based on an iterative approach during which XGM2017a will server as the ground truth potential information. Having the filtered GOCE gradients at the same level as the gravity observations, various collocation geoid solutions will be estimated. Their assessment will be performed against GNSS/Leveling data for the Hellenic region.

The GeoGravGoce Project Objectives

The first objective is to validate the spectral behavior of the entire record of GOCE SGG data in terms of their signal and error PSD and assess their accuracy with upward continued local free-air gravity anomaly data sets. In order to perform this combination scheme, first an initial pre-processing of the GOCE SGG data will be carried out. It is known that GOCE measures two gradients, namely V_{xy} and V_{yz}, with 10 times lower accuracy than the rest, therefore all pre-processing will be carried out in the GRF so that the errors of the these gradients will not be propagated to the rest. Additionally, the ESA-released official Level 2 GOCE products from the current baseline (generated from EGG_NOM_1b reprocessed with v5.06 processor and the latest v7.00 processor) will be used and refer to the SGG products (EGG_NOM), Kinematic Orbit files (SST_PKI), Rotation Matrix Files (SST_PRM) and GPS times from the SST_PSO header.

The entire GOCE SGG database spanning between 01.11.2009 to 20.10.2013 will be used, i.e., excluding only the de-orbiting phase. During the data pre-processing, gradients of the normal potential $\bar{V}_{ij}$ will be determined at the GOCE observation points and at satellite altitude in the LNOF using the GRS80 as a normal field and evaluating the first fourteen zonal coefficients. Then these gradients will be transformed from the LNOF to the GRF following the sequence of the transformation from the LNOF to the EFRF, then form the EFRF to the IRF and then form the IRF to the GRF.

The second objective is to develop a GUI for the automatic transformation of GOCE gradients from the GRF to the LNOF and novel filtering algorithms for the rigorous filtering of GOCE SGG data to the GOCE MWB. Alongside, a novel methodology based on Monte Carlo simulated annealing and system theory will be developed in order to first downward continue GOCE gradients to a mean orbit and then to a mean Earth sphere. This will be based on an iterative approach during which XGM2017a will server as the ground truth potential information.

> *"**GeoGravGoce** project is to employ GOCE data products, mainly the original SGG data, in order to: model the geoid regionally in the Mediterranean Sea and investigate the influence of topographic effects on both GOCE gradients and the gravitational potential."*

The third objective is to model the Earth's gravity field in terms of geoid model development, with high-accuracy, for the wider Greek territory with the use of GOCE data. Having the filtered GOCE gradients at the same level as the gravity observations, various collocation geoid solutions will be estimated. Their assessment will be performed against GNSS/Leveling data for the Hellenic region.