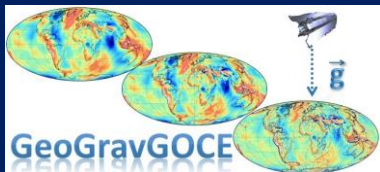


## GeoGravGOCE

The GeoGravGOCE project is funded by the Hellenic Foundation for Research and Innovation (HFRI), General Secretariat for Research and Technology (GSRT) following a successful application within the 1st Call for Research Projects to University Professors and Research.

Contract: 3488

Duration: December 2019–  
December 2021



*The GeoGravGOCE project logo*

## THE GEOGRAVGOCE PROJECT

The GOCE satellite mission 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. Moreover, GOCE gravity gradients are most commonly used either through a spherical harmonics expansion of the Earth's potential or as tensor grids at satellite altitude. The former acts as a low-pass filter hence smoothing any high-frequency information in the original gradients and the latter outlines an attenuated signal due to the satellite altitude. 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.

The main overall goal of the GeoGravGOCE project, i.e., to utilize the original GOCE SGG data and combine them with local free-air gravity anomaly data towards the estimation of an improved geoid model for the wider Hellenic region bounded between  $22^{\circ} \leq \varphi \leq 53^{\circ}$  and  $12^{\circ} \leq \lambda \leq 36^{\circ}$ .

## GEOGRAVGOCE OBJECTIVES

The overall goal of the scientific work to be carried out within the GeoGravGOCE research pro-posal is to employ GOCE (Gravity field and steady-state Ocean Circulation Explorer) data products, mainly the original SGG (Satellite Gravity Gradiometry) data, in order to model the geoid in the Hellenic area and the surrounding regions and investigate the effect of topographic masses on both GOCE gradients and the gravitational potential. More specifically, the objectives of the research are summarized as follows:

- Validate the spectral behavior of the entire record of GOCE SGG data in terms of their signal and error Power Spectral Density (PSD) functions.
- Assess the accuracy of GOCE data with upward continued surface free-air gravity anomaly data sets.
- Develop a Graphical User Interface (GUI) for the automatic transformation of GOCE gradients from the Gradiometer Reference Frame (GRF) to the Local North Oriented Frame (LNOF).
- Develop novel filtering algorithms for the rigorous filtering of GOCE SGG data.
- Model the Earth's gravity field in terms of a high-accuracy geoid solution for the wider Hellenic territory by the optimal combination of GOCE and surface data.

The results of the GeoGravGOCE project will be of importance both to geodesists and geoscientists, in terms of the development of new methodologies for the efficient treatment of GOCE satellite gradiometry data,

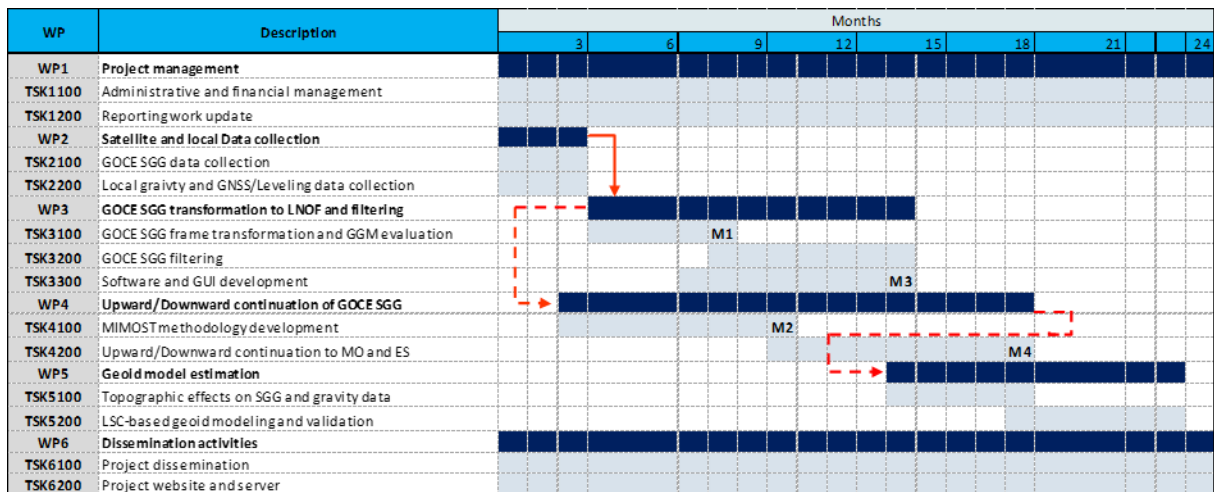
their reduction at the Earth’s surface and, consequently, their optimal combination with surface gravity data for the optimal determination of a high-accuracy and resolution geoid model.

The development of the methods within GeoGravGOCE will allow the evaluation of current practices of physical and satellite geodesy, will provide the basis for further studies and will be easily applied in other scientific areas with significant computational savings. The estimated geoid model can considerably contribute to the establishment of an updated vertical reference system for the wider Hellenic area and offer valuable tools and know-how to a broader scientific audience. Additionally, the modernization of the national vertical system will have significant impact in engineering projects and applied studies, where the accurate and homogeneous height information is needed. Hence, the results of the proposed research will confer a number of benefits to several branches of economy and the society as well.

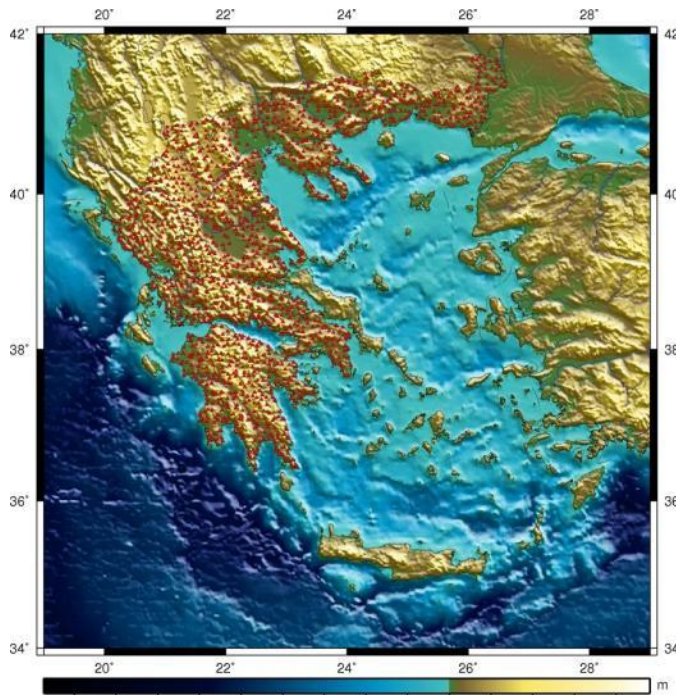
*“GeoGravGOCE aims at the utilization of the original GOCE SGG data and combine them with local free-air gravity anomaly data so as to estimate an improved geoid model for the wider Hellenic region bounded between  $22^{\circ} \leq \varphi \leq 53^{\circ}$  and  $12^{\circ} \leq \lambda \leq 36^{\circ}$ .”*

## GEOGRAVGOCE WORKPACKAGES

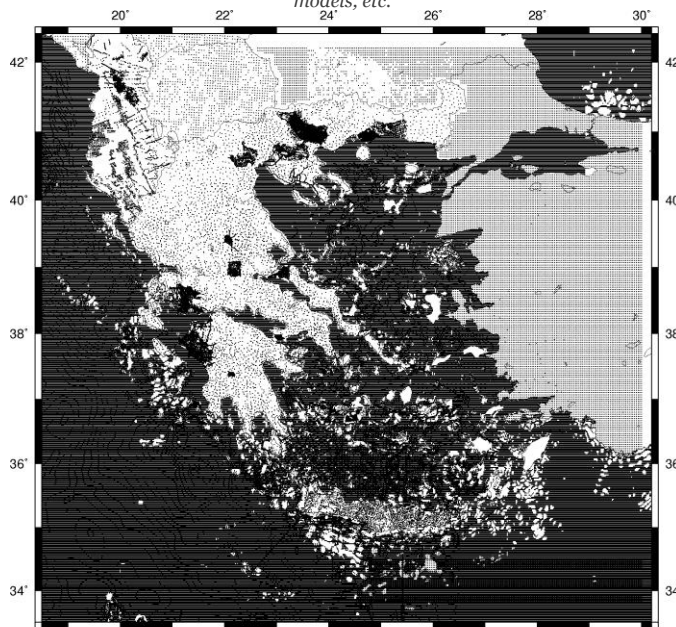
For the successful completion of the GeoGravGOCE project, eight (8) Work Packages (WPs) have been identified, which are further analyzed in Tasks (TSK) as given in the planning below. The latter outlines the Work Breakdown Structure (WBS) for the entire activity.



The GeoGravGOCE Project planning.



GPS/Leveling data to be used for the validation of GOCE observables, geoid models, etc.



Gravity data to be used for the validation of GOCE observables, geoid models, etc.

## FUNDING

The GeoGravGOCE project is funded by the Hellenic Foundation for Research and Innovation (HFRI), General Secretariat for Research and Technology (GSRT) following a successful application within the 1st Call for Research Projects to University Professors and Research.

The duration of the project is 24 months between **December 23, 2019 and December 22, 2021**. Its total funding by the HFRI office is set to **198,825.00 €**.

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
- PhD Candidate, junior researcher
- PhD Candidate, junior researcher
- PhD Candidate, junior researcher

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