

# GOCE-GEODESY ACTIVITIES IN GERMANY

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## INTRODUCTION

Under the umbrella of the European GOCE Gravity Consortium (EGG-C) a host of activities have started in most ESA member states that will eventually lead to the official level 2 GOCE product. Many of these activities are so-called core tasks, to be financed by ESA. Others are optional, to be funded by national programs.

In Germany a number of GOCE activities are likely to be funded through the *Geotechnology Programme* by the federal science ministry. Through this program a group of geodetic institutions has joined forces to set up a GOCE processing chain, that will be able to process the calibrated gravity gradients (level 1b) into a calibrated and validated geoid and gravity field (level 2). This processing chain is seen as the German contribution to the European GOCE consortium.

Geodetic level 3 activities (scientific use of GOCE products) are also funded by the Geotechnology Programme. In particular, the GOCE geoid will be combined with terrestrial data to provide a uniform height system.

Moreover, the German Aerospace Center (DLR) has initiated a German GOCE-project office. Its tasks are the organization of a German GOCE user community (level 2 and 3), the stimulation of GOCE-related science, and the communication of information between GOCE user community, DLR and ESA. The project office has assumed its duties beginning this year.

## THE GERMAN GOCE PROJECT OFFICE

Funded by the German Aerospace Center (DLR: Deutsches Zentrum für Luft- und Raumfahrt e.V.) the *German GOCE Project Office* has been initiated. It started January 2001 and is located at the Institut für Astronomische und Physikalische Geodäsie (IAPG) at the Technical University Munich. For the full duration of Phase B until the end of the Commissioning Phase the GOCE Project Office will remain active. Its main goal is to assure that a broad scientific user community in Germany will be prepared for GOCE at satellite launch.

This goal is to be reached by several tasks:

**Coordination of GOCE level 2 activities.** The aim of this task is mainly to organize the German contribution to the EGG-consortium, that will produce the GOCE level 2 products geoid and gravity field. To a large extent this will be realized by the GOCE-GRAND proposal in the Geotechnology Programme, cf. below.

**Concept for GOCE level 3 use.** The GOCE level 2 product will open up a range of new applications in several geoscientific disciplines. From Fig. 1 it becomes clear that the GOCE geoid—or gravity field—is only one of several

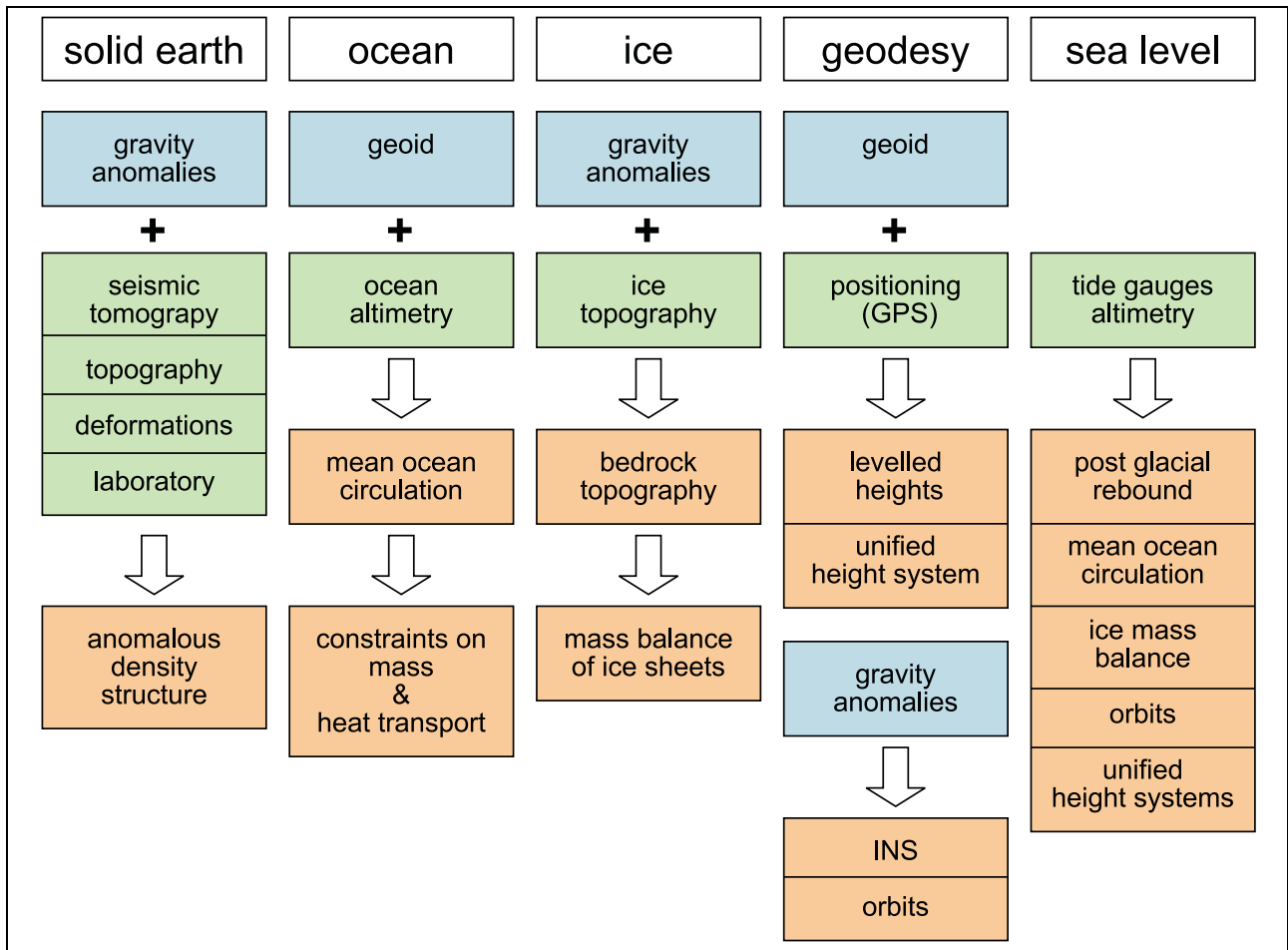


Fig. 1. Level 3: GOCE applications in the geosciences

data sources for level 3 use. The assimilation of GOCE products into the several geoscientific models is therefore a major effort and an area of ongoing research. A second aim of the project office, therefore, is to stimulate and organize GOCE-related projects at level 3. In particular, the project office will take action to enlarge the acceptance of the GOCE level 2 product by a wider geoscience community.

**Point of Contact.** The project office serves as an interface between—and consequently as a provider of information to—the scientific community, the national and European agencies DLR and ESA and industry involved in GOCE. In the latter case, it is worth mentioning that Astrium (Friedrichshafen) is member of the industrial GOCE team under the prime contractor Alenia (Turin). Astrium is responsible for the GOCE satellite platform, including the drag-free control (DFC) and attitude and orbit control (AOC) systems. It has gained ample experience in gravity field missions by building the CHAMP and GRACE satellites. The project office will furthermore act as a point of contact to similar user groups, e.g. to the satellite missions CHAMP, GRACE and CRYOSAT or to the altimetry community.

**Public Relations and Outreach.** As an extension to the aforementioned role of information provider the project office will develop outreach activities. It will provide a wider public community with information on GOCE, either by means of a GOCE-website, by brochures and flyers, or otherwise.

It is intended that each year a German GOCE workshop will be organized by the project office. These workshops will facilitate discussion between level 2 and level 3 scientists. In this way the German GOCE user community can be established during Phase B and C/D.

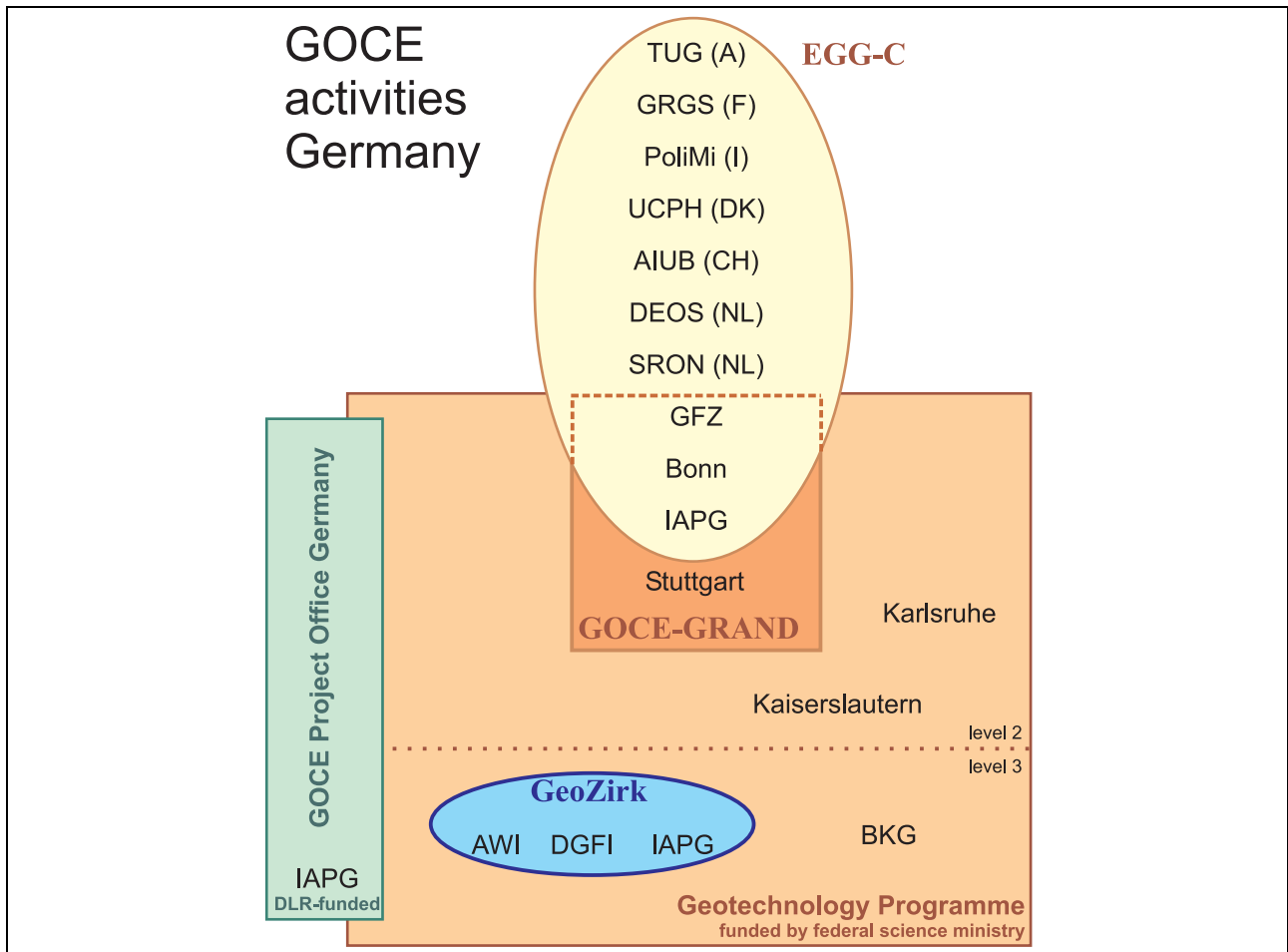


Fig. 2. German contribution to the EGG-Consortium and further level 2 and 3 activities in Germany.

## GEOTECHNOLOGY PROGRAMME

In a joint effort between the German federal science ministry (BMBF: Bundesministerium für Forschung und Bildung) and the German research foundation (DFG: Deutsche Forschungsgesellschaft), geoscience research in Germany will be stimulated by a 10-year funding plan, endowed with an annual 50 MDM. The funding of this so-called *Geotechnology Programme* is spread over 13 subjects. A number of gravity field related research proposals have been submitted to the subject *Observing System Earth from Space* earlier this year. These include proposals for data processing activities for CHAMP, GRACE and GOCE respectively.

A decision about the approval of these proposals is expected mid 2001.

### Level 2 activities

**GOCE-GRAND.** The proposal for GOCE data processing is coined GOCE GRavity field ANalysis Deutschland (GOCE-GRAND). It exists of contributions from the IAPG in Munich (project coordination), the Geoforschungszentrum (GFZ) in Potsdam, the Institute for Theoretical Geodesy of the University Bonn and from the Geodetic Institute of the University Stuttgart. Its specific goal is to build up GOCE data processing capability as the German contribution to EGG-C. This is displayed in Fig. 2.

Further geodetic projects in the Geotechnology Programme deal with mathematical representations of the GOCE level 2 product, cf. Fig. 2. Two such projects have been submitted by the Geodetic Institute of the University Karlsruhe and by the Geomathematics Group of the University Kaiserslautern, cf. (Freeden, this issue).

### **Level 3 activities**

At level 3, i.e. the application of the GOCE geoid and gravity field to other geosciences, the intensity of activities still needs improvement. Nevertheless two projects in the Geotechnology Programme can be mentioned: one geodetic (see 4<sup>th</sup> column of Fig. 1) and one oceanographic (2<sup>nd</sup> column).

The German federal surveying and mapping agency (BKG: Bundesamt für Kartographie und Geodäsie) has proposed a project for establishing a unified European height system. The measurement of geometric heights has improved tremendously over the last decade, due to GPS. Measurements of physical heights have been restricted by insufficient knowledge of the geoid, though. In this project the results of GOCE and GRACE will be used to define a height system in Germany and neighbouring countries, consistent with GPS accuracy.

The project **GeoZirk**, cf. Fig. 2, aims at assimilating the GOCE geoid and altimetry into oceanographic models of the Antarctic Circumpolar Current. It is an oceanographic level 3 project with a strong geodetic component, cf. (Schröter, this issue).