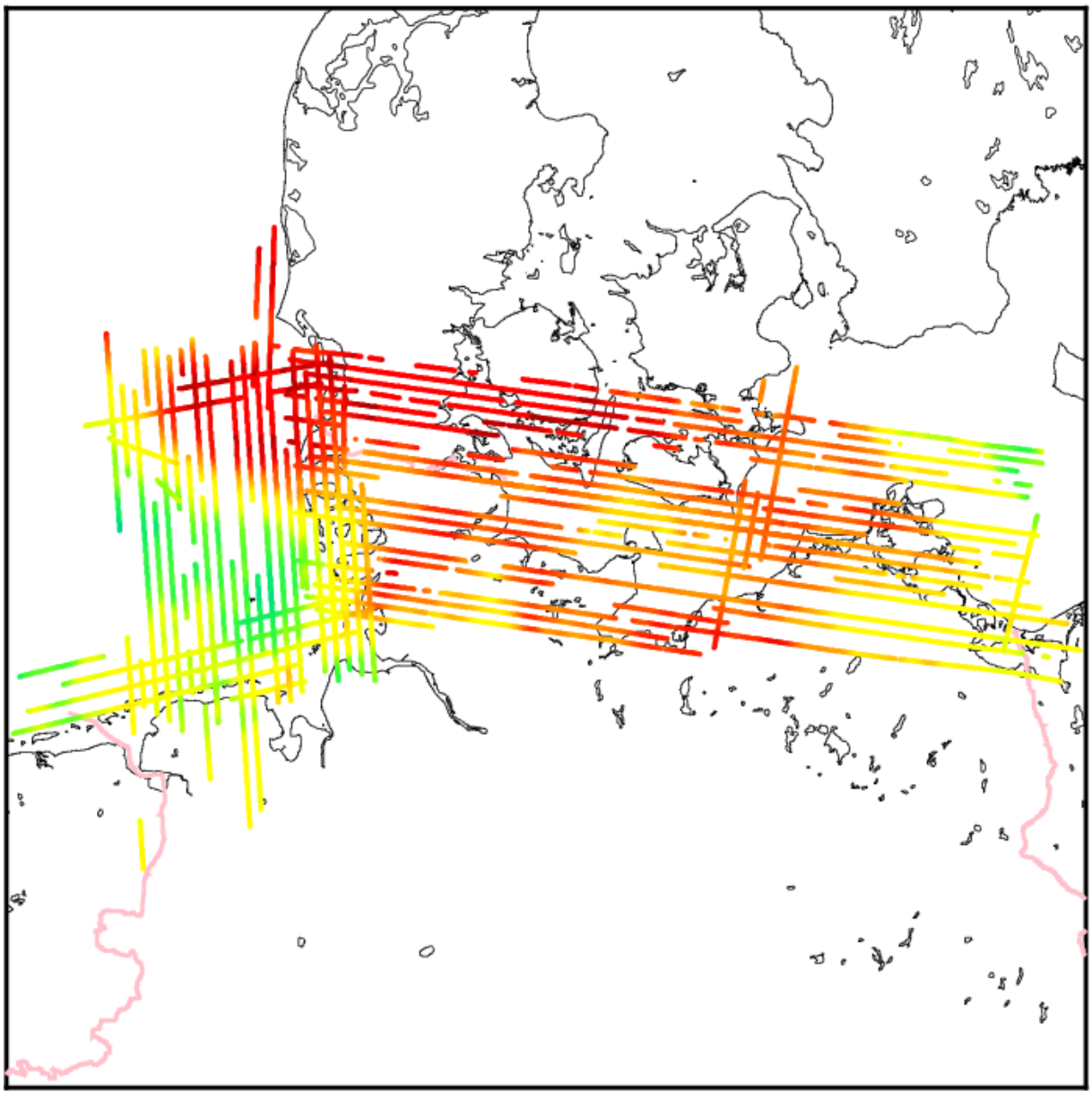
# Gravity data from aerogravimetry

**Airborne gravity survey over the German and Danish North Sea and Baltic Sea (2006-2008)**

## *BalGRACE / NorthGRACE*



Status of documentation: August 11, 2020

# CONTENTS:

page


| | | |
|---|---|---|
| **1** | **Dataset overview** | **3** |
| **2** | **Description of the dataset** | **3** |
| **3** | **Data sizes** | **4** |
| **4** | **Format description** | **4** |
| **5** | **Ordering and other sercives** | **5** |

# 1 Dataset overview

| | |
|---|---|
| **Product:** | Aerograv_BKG-DNSC_gesamt |
| **Contents:** | Airborne observations of the gravity acceleration |
| **Area:** | North Sea, Baltic Sea and mainlands of Germany and Denmark, with maximum extent as follows:<br>5,965° - 14,724° eastern longitude and 52,859° - 56,000° northern latitude |
| **Spatial classification:** | 3-d profile data |
| **Georeferencing:**<br>originally observed:<br>derived: | <br>3-d position (latitude, longitude, ellipsoidal height): ETRS89 / GRS80<br>levelling heights: normal heights above EGG08 quasigeoid (EVRS/NAP) |
| **Source:** | gravity measurements |
| **Production method:** | relative gravimetry (LaCoste&Romberg S series) with DGPS positioning |
| **Resolution:** | average point distance ca. 860 m (min. point distance ca. 600 m, max. point distance ca. 1100 m) according data recording interval 10 s<br>2-d position: 1 m<br>Height: 0,01 m<br>Gravity: 0,1 mGal (equivalent to $10^{-6}$ $ms^{-2}$) |
| **Accuracy:** | Lage: 0,1 m<br>Höhe: 0,1 m<br>Schwere: 2-3 mGal (equivalent to 2-3 ($10^{-5}$ $ms^{-2}$))<br>(estimated values) |
| **Data format:** | ASCII (whitespace-delimited with fixed column width) |
| **Data carrier:** | online (download via BKG web shop) |
| **Data licence:** | Data licence Germany – attribution – version 2.0 (dl-de/by-2-0)<br>https://www.govdata.de/ld-de/by-2-0<br><br>© Federal Agency for Cartography and Geodesy (BKG)/Danish National Space Center (DNSC) Data 2006-2008, post-processed by BKG<br>UID 26a498e9-af8b-4eba-9a7a-052cd2708c73 |

# 2 Description of the dataset

The gravimetric surveys were conducted in three partial campaigns (BalGRACE 2006, NorthGRACE season 2007 and season 2008, respectively) using different aircraft. Different serial numbers of a specialized gravimeter type for measurements on dynamic platforms (LaCoste & Romberg model S) were used. The raw aerogravimetric data were processed and analysed at the Danish National Space Center (DNSC, now DTU Space) using proven techniques („original data“). An overview of the setup and the processing (e.g. corrections, reductions, filter) is presented in Skourup et al. (2009). Due to turbulences on some of the flight segments and their instrumental impact on the measurements, the original data were classified in three categories.

At BKG, additional quality analysis and editing was done. In the process, profile segments labeled as „heavy“ turbulence, or „medium“ turbulence and showing a large mean deviation to the rest of the dataset, were discarded (data selection). Additionally, the whole dataset of the campaign NorthGRACE 2007 (overall adverse technical and weather conditions) was releveled against the dataset of the

campaign NorthGRACE 2008 (overall better technical and weather conditions, and thus higher data quality) by applying an empirically derived offset correction of -0.7 mGal (Schäfer et al. 2010).

For this compulation, the underlying reduction of the height data to an internal EGM96 quasigeoid grid in the original data was undone, thereby restoring the ellipsoidal heights originally observed with differential GNSS. Subsequently, normal heights were derived using the gravimetric quasigeoid model EGG08 (Denker et al. 2008) for the whole dataset. For the purpose of computing (free-air) gravity anomalies this model is , Zum Zwecke der Berechnung von Schwereanomalien ist dieses Modell sufficiently consistent with the official height reference surface to be used with GNSS and the German leveling network DHHN (the “AdV quasigeoid”, current version GCG2016).

**References**

Skourup, H., Forsberg, R., Sandberg Sorensen, S.F., Andersen C.J., Schäfer, U., Liebsch, G., Ihde, J., Schirmer, U. (2009): Strengthening the Vertical Reference in the Southern Baltic Sea by Airborne Gravimetry. In: Sideris M.G. (eds) Observing our Changing Earth. International Association of Geodesy Symposia, vol 133. Springer, Berlin, Heidelberg, https:// doi.org/10.1007/978-3-540-85426-5_16.

Schäfer, U., Liebsch, G., Schirmer, U., Ihde, J., Olesen, A.V., Skourup, H., Forsberg, R., Pflug, H. (2010): Improving Gravity Field Modelling in the German-Danish Border Region by Combining Airborne, Satellite and Terrestrial Gravity Data. In: Mertikas S. (eds) Gravity, Geoid and Earth Observation. International Association of Geodesy Symposia, vol 135. Springer, Berlin, Heidelberg, https://doi.org/10.1007/978-3-642-10634-7_59.

Denker, H., Barriot, J.P., Barzaghi, R., Fairhead, D., Forsberg, R., Ihde, J., Kenyeres, A., Marti, U., Sarrailh, M., Tziavos, I.N. (2008): A new European Gravimetric Quasigeoid EGG2008. Poster, IAG International Symposium on “Gravity, Geoid and Earth Observation 2008”, 23-27 June 2008, Chania, Crete, Greece.

# 3 Data sizes

The data volume of the whole dataset amounts to 1524 KB.

# 4 Format description

ASCII file with one row per record (single point observation), whitespace-delimited data fields in fixed columns as follows:

| column | format | unit | field | description |
|---|---|---|---|---|
| 1- 30: | %30s | | PNR | point number in the dataset (Profil * 10000 + Sequenz) (**) |
| 32- 42: | %11.8f | deg | B | geographic latitude (ETRS89, GRS80 ellipsoid) |
| 44- 54: | %11.8f | deg | L | geographic longitude (ETRS89, GRS80 ellipsoid) |
| 56- 63: | %8.3f | m | h | Height above ellipsoid (ETRS89, GRS80 ellipsoid) |
| 65- 72: | %8.3f | m | H | Normal height above EGG08 quasigeoid (EVRS/NAP) (*) |
| 74- 83: | %10.3f | mGal | g | absolute gravity value |
| 85- 98: | EMPTY | | | |
| 100-105: | %4d%02d | | Date | year and month of observation in the format YYYYMM |
| 107-109: | %3s | | ID | dataset/campaign<br>„BGA“ = BalGRACE 2006<br>„NGA“ = NorthGRACE 2007/2008 |
| 111-114: | %4s | | Track | internal track identifier |

Remarks:
(*) Considering the total error margin of GNSS positioning, of the geoid models and of the gravity observations combined, the derived normal heights are consistent with the official German levelling heights of the DHHN network („heights above NHN“).
(**) PNR can be assigned once at a time for the „BGA“ and the „NGA“ campaign, respectively!

# 5 Ordering and other sercives

The dataset can be retrieved via the BKG web shop

→ www.gdz.bkg.bund.de (in German)
→ *Open Data (bottom of navigation menu on the right)*
→ *Screen search results for „Schweredaten" (turn over pages if necessary)*

free of charge.

Information about further services on www.gdz.bkg.bund.de can be obtained via the following address:

Bundesamt für Kartographie und Geodäsie
Dienstleistungszentrum
Karl-Rothe-Straße 10-14
D-04105 Leipzig

Tel.: +49(0)69 6333 - 2995
E-Mail: dlz@bkg.bund.de