

# The BRAT and GUT Couple: Broadview Radar Altimetry and GOCE User Toolboxes

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# BRAT (Broadview Radar Altimetry Toolbox)



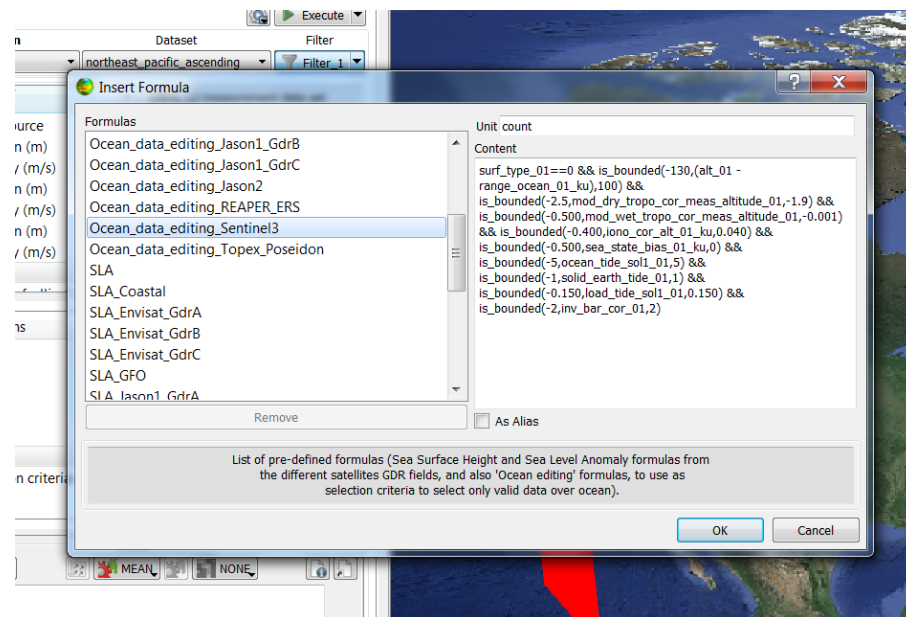
- Project started in 2005 from the combined efforts of ESA and CNES.
- Objective of creating a **collection of tools and tutorials**, useful to novices as well as experts, to facilitate the **processing of radar altimetry data**.
- Goals met with the creation of the toolbox **BRAT** and the companion tutorial **RAT** (Radar Altimetry Tutorial @ <http://altimetry.info/>).
- **BRAT** enables you to **read, manipulate** and **plot altimetry data** from **ERS-1 (1991)** to **Sentinel-3 (2016)**. **Any NetCDF can be ingested** and the **IO layer is easily expandable through XML**.
- Since **BRAT 4.1.0** (April 2017), it's possible to have access to the **Radar Altimeter Database System (RADS)** from within BRAT: **altimeter data since 1985 directly at your fingertips**.



# BRAT (Broadview Radar Altimetry Toolbox)



- **BRAT** is mostly focused on the application of altimetry for **Oceanography** and **Hydrology**. As such, BRAT already comes with **pre-built formulas** for those fields.
- Nonetheless, users can **create their own formulas** using **simple operators** or even **Python**, from within BRAT.
- Also, BRAT can be **used with MATLAB/IDL** (through reading functions) or **C/C++/Python/Fortran** (via programming APIs).
- The current version is **BRAT 4.2.1**.



# BRAT (Broadview Radar Altimetry Toolbox)



- While **BRAT** provides users the **capabilities**, the tutorial **RAT** (Radar Altimetry Tutorial @ <http://altimetry.info/>) provides them the **knowledge**.
- Users can find **uses cases** with **practical examples** of the application of altimetry data on **different scenarios**, together with tutorial material on altimetry from **LRM** to **SAR**.
- **All material** can be consulted **directly on the website** or downloaded **as a book (PDF)**.
- We also provide a **forum**, where you can talk with us or other members of the altimetry community.
- If you visit our **YouTube channel**, you can see videos that will guide on how to use BRAT through several operations (<http://bit.ly/bratvideo>).

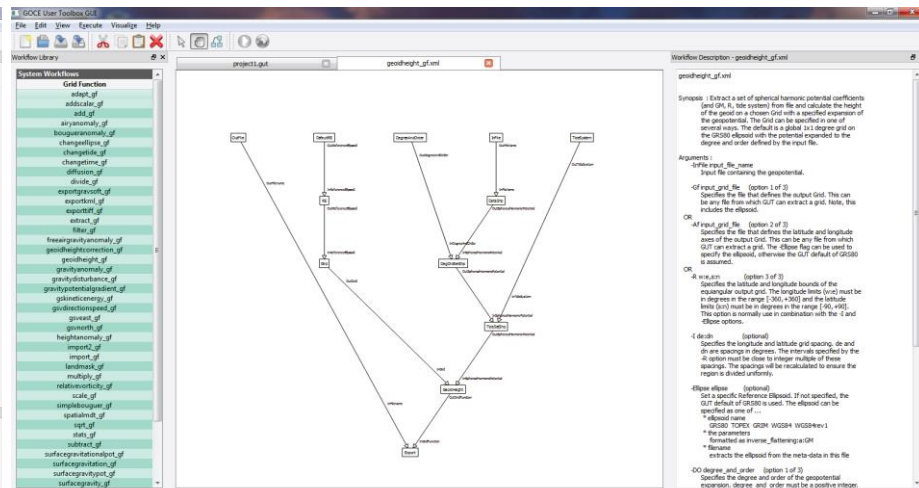
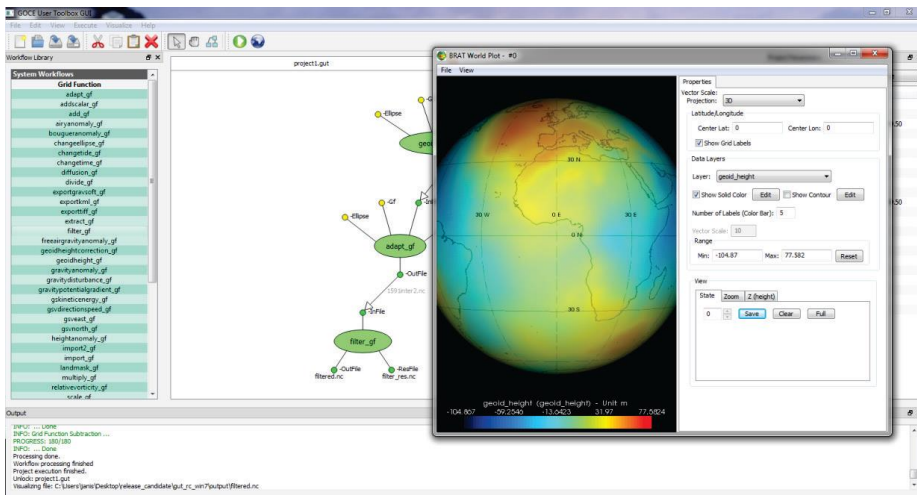


- **GUT** is a compilation of **open-source tools** for the inspection and analysis of **gravity field data** products.
- Made specifically for **GOCE Level 2** products, now also supports **GRACE Level 2** products, as well as any **gravity models in the ICGEM** format.
- Provides users with **140 processing units**, from computing gravity anomalies to calculating mean dynamic topographies.
- The processing units can be combined by means of **workflows** allowing users to create more and more **complex operations from simple blocks**.
- GUT comes with **70 prebuilt workflows** oriented to **Geodesy, Solid Earth Physics**, and **Oceanography**.
- Expandable by **user-built workflows** and **processing units** (C, C++, Fortran).

# GUT (GOCE User Toolbox)



- The **last version 3.2** has been improved with a **GUI** that allows users to create data processing workflows by **visual programming**, able to run on Linux, Windows, or macOS.





# GUT (GOCE User Toolbox)



- The toolbox comes with two companion documents:
  - a **User Guide** that describes all the **algorithms** used in GUT, plus some of the **theoretical background**;
  - a **Tutorial** with **42 use cases**, with all the used files included with **GUT**, guiding a user through a multitude of scenarios. **Perfect for the classroom!**

The screenshot displays several overlapping windows from the GUT software. The top window is the 'GUT Tutorial' document, showing metadata: Reference: ESA/XGCE-DTEX-EOPS-SW-07-0001, Version: 8.8, Date: 10 March 2016, Page: 95 of 126. Below it is the 'GUT' document, showing metadata: Reference: ESA-GUT-AD-001, Version: 8.8, Date: 10 March 2016, Page: 90 of 126. The main window shows the 'simplebouguer\_gf' script with the following content:

```
gut simplebouguer_gf -InFile
GO_CONS_EGM_GOC_2_20091101T000000_20131020T235959_0001.IDF
DO 200 -Ftg 0.5 -InDemFile GUT_ANCE2_BATHY_5M.nc -R 0:20,40:50 -I 0.25:0.25 -
OutFile Simple_Bouguer_gravity_anomaly_GOCE5_alps.nc
BratDisplay Simple_Bouguer_gravity_anomaly_GOCE5_alps.nc
```

The two command lines above produced the following plot (using the BratDisplay GUI):

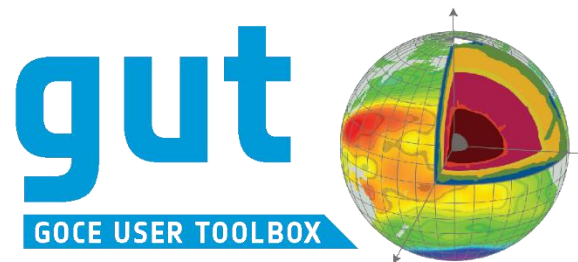
The plot shows a geographical map of the Alps region with a color-coded gravity anomaly. The anomalies are represented by a color scale from blue (low) to red (high). The plot is titled 'Simple\_Bouguer\_gravity\_anomaly\_GOCE5\_alps.nc'.

Thank you!



<http://earth.esa.int/brat>  
<http://altimetry.info/>

For any questions  
[altimetry.info@esa.int](mailto:altimetry.info@esa.int)



<http://earth.esa.int/gut>  
<https://earth.esa.int/eogateway/tools/goce-user-toolbox>

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