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The universal altimetry toolbox **BRAT** (**Broadview Radar Altimetry Toolbox**) is a collection of tools and tutorial documents designed to facilitate the processing of radar altimetry data. It can read all previous and current altimetry missions' data. It now incorporates the capability to read the upcoming Sentinel-3 L1 and L2 products. ESA endeavoured to develop and supply this new capability to support the users of the recently launched Sentinel-3 mission.

This project started in 2005 from the joint efforts of ESA (European Space Agency) and CNES (Centre National d'Études Spatiales). The toolbox is freely available at http://earth.esa.int/brat. The BRAT suite is mostly made of command line tools, of which the BratGUI is the front-end. BRAT can be used in conjunction with MATLAB/IDL (via reading routines) or C/C++/Python/Fortran via a programming API, allowing users to obtain the desired data, bypassing the data-formatting hassle. BRAT can also be used to simply visualise data quickly, or to translate the data into other formats such as NetCDF, ASCII text files, KML (Google Earth) and raster images from the data (JPEG, PNG, etc.).







Several kinds of computations can be done within BRAT, involving both user defined combinations of data fields that can be saved for posterior use and the BRAT's predefined formulas from oceanographic altimetry. BRAT also includes the Radar Altimeter Tutorial, which contains an extensive introduction to altimetry, showing its applications in different fields such as Oceanography, Cryosphere, Geodesy and Hydrology, among others. Use cases are also available, with step-by-step examples, covering the toolbox usage in the different contexts.

The current version is 4.2.1, released in June 2018.







A new altimetry website has been created with:

- Toolbox. Main page, for download and docs.
- Code Access. Code download, github repository.
- Data Access. How to access to altimetry data.
- Webs/Documents. Catalogue of all ESA main reference documents and websites of all ESA altimetry missions.
- LRM and SAR tutorials.
- Use Cases. Practical examples of the application of altimetry data.
- Helpdesk / Forum. Interaction between the users and the toolbox developers to answer questions and propose improvements.









The Altimetry Tutorial and Toolbox website is available in **www.altimetry.info**. Through

the Portal, users are able to:

- Download the Toolbox and its user manual
- Have access to data
- Download the Toolbox open source code
- Propose modifications and/or new contributions

(in https://github.com/BRAT-DEV/main)

- Contact the consortium through the helpdesk
- Watch video tutorials (both internal and external to the project) at http://bit.ly/1OUYYuW









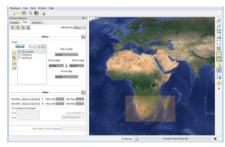
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BRAT NEW FEATURES AND DATASETS

09.2015

- CODA Library Upgrade
- NetCDF 4 Upgrade
- Porting to 64 bits
- KMZ/KML Export Update
- Python API Upgrade
- Import to GPOD analysis

- Sentinel-3 L1B and L2
- Jason-3
- CryoSat-2 Baseline C
- CryoSat-2 Ocean Products
- SARAL AltiKa
- HY-2A



10.2016

08.2017

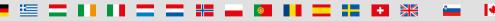
 Visualisation functions improvement

- Coastal / inland waters formulas update
- Dataset interpolation improvement
- ASCII export improvement
- · CFI libraries inclusion

- Sentinel-3 L1A and L1B-S
- ERS REAPER
- River and Lake products
- Geosat GDR
- EnviSat reprocessed
- RADS integration





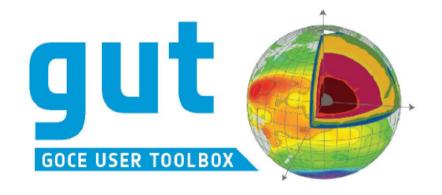




In our continuous endeavour to provide better and more useful tools:-

- We intend to develop synergies between BRAT and SNAP (SNAP = the Sentinel Application Platform).
 - This will allow our users to easily explore the all the Sentinel data together.
- Any User or Space Agency are welcome to contribute to the evolution of the BRAT and GUT couple, especially in the preparation of future Altimetric and Gravity Missions.





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GUT (GOCE User Toolbox)



GUT (GOCE User Toolbox) is a compilation of tools for the use and analysis of GOCE gravity field models. It facilitates the use, viewing and post-processing of GOCE Level 2 mission data and allows the gravity field data, in conjunction and consistent with any other auxiliary data sets, to be pre-processed by laymen on gravity field processing, for oceanographic and hydrologic as well as solid earth applications, both regionally and globally. Hence, GUT is an important tool for facilitating a wide use of the existing and future gravity data acquired from GRACE and GOCE.

GUT may be used on Windows PCs, UNIX/Linux workstations and Mac and comes as fully open source software under GNU GPL licence. GUT generates all output files in netCDF format in compliance with the CF-Conventions, and gridded results may be visualised using the BratDisplay tool from ESA's Broadview Radar Altimetry Toolbox (BRAT).

Advanced users can easily extend the toolbox in accordance with the workflow based processing design principles, and contribute these enhancements to the GUT user community. The current version of GUT is 3.1. This version has been enhanced with a newly developed graphical user interface. This interface is built on top of the command-line interface, providing a more user-friendly alternative to it.

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Author | ESRIN | 18/10/2016 | Slide 11























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GUT Abilities



With GUT a user can:

- Read the GOCE level 2 products and ancillary datasets, including a priori surfaces, calibrated gravity gradients and geoid height errors
- Read global and local gravity models in ICGEM format
- Compute geoid heights at a chosen maximum degree and order over a grid or transect
- Compute gravity and height anomalies, and vertical deflections on the surface of the terrain for a range of maximum degree and order expansions over a grid or transect
- Compute the spherical harmonic synthesis and calculate the 6 potential gradients
- Compute the ocean's mean dynamic topography and associated geostrophic velocities, kinetic energy and the vertical component of relative vorticity
- Smooth gridded fields with a wide range of spatial and spectral filters, including diffusive filtering
- Transform data between different reference ellipsoid and tide-systems
- Compute gravity disturbances, Bouguer and free-air anomalies at different heights
- Produce final output products in netCDF format
- · Develop high-level processing routines.

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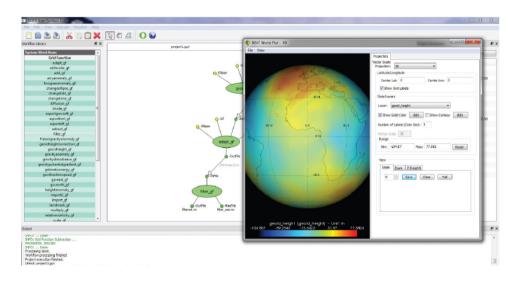


GUT Graphical User Interface



A graphical user interface (GUI) is included with GUT 3.1 for increased usability. A user can drag and drop workflows from a workflow library to a project canvas, on which multiple workflows can be easily chained together, given inputs and executed.

After execution, the output of the processing chain can be visualised by any netCDF viewer, right from the GUI. GUT is packaged with BratDisplay, which is used as the default visualiser.



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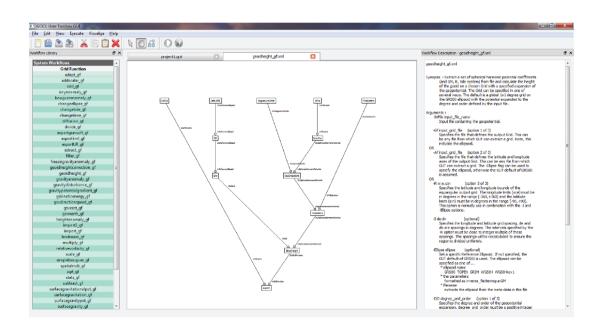




GUT Graphical User Interface



Individual workflows can be edited by manipulating automatically generated graphs, depicting structure and relations of processing units. Advanced users can create new workflows for their unique needs.



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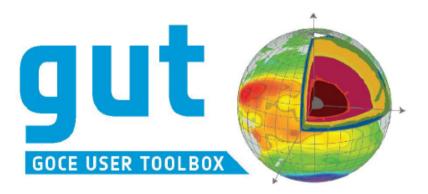


The BRAT and GUT Couple



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Http://earth.esa.int/brat

Http://earth.esa.int/gut

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