GeoGravGOCE: A GOCE SGG processing software for datum transformations and filtering

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Whilst GOCE SGG data have been widely processed and used in geodetic research, one of the key points of their use is to have a one-stop software for their pre-processing and basic manipulations in terms of frame transformations and filtering operations. Within the GeoGravGOCE project, funded by the Hellenic Foundation for Research Innovation, the main goal is the optimal combination of GOCE Satellite Gravity Gradiometry (SGG) data with in-situ observations for geoid determination. During the project development, it became apparent that GOCE SGG data after using the GOCEPARSER, had to be pre- and post-processed via several own-developed routines in order to perform data quality checks, data consistency tests, reference frame transformations, data reductions and filtering. With that in mind, a standalone open-source software has been developed in MATLAB consisting of a Graphical User Interface (GUI) to perform the aforementioned operation. The software is divided in four tabs and is designed to process the original GOCE gravity gradients, which are the second-order derivatives of the gravitational potential. The first tab of the software is designed to allow the pre-processing of the Level 2 Electrostatic Gravity Gradiometer nominal gravity gradients (EGG_NOM) and Satellite to Satellite Tracking Precise Science Orbits (SST_PSO) products. The second tab enables the transformation of gravity gradients from a Global Geopotential Model (GGM) from the Local North Oriented Frame (LNOF) to the Gradiometer Reference Frame (GRF). The third tab provides filtering options for the reduced SGG observations and encompasses three different methods: Finite Impulse Response (FIR), Infinite Impulse Response (IIR), and Wavelet Multi-Resolution Analysis (WL-MRA). Finally, the fourth tab allows the transformation of SGG data from the GRF to the LNOF and vice versa. In this work, we present the basic software development procedure and outline its basic functionality and results.