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Comparing Different Approaches for Processing GRACE Level-1 Data

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Three different approaches for determining global gravity field solutions from GRACE satellites are presented and compared. Gravity field solutions - the so-called GRACE level-2 data - are mainly spherical harmonic expansions of the Earth's gravitational potential and are widely used by the geosciences community. Level-2 data are obtained via the functional modeling of GRACE level-1 data which are in principle the GRACE orbit, observed by GPS high-low and K-band low-low satellite-to-satellite tracking as well as on-board accelerometry. There are several approaches to connect the Earth's gravitational potential to the level-1 observations. In this research study we compare three different approaches using simulated GRACE level-1 data. The methods being considered here are the acceleration approach, the energy balance approach and the integral equation method. This work is part of the cooperation between Institut für Erdmessung (IfE) and Albert Einstein Institut (AEI) at Leibniz Universität Hannover, Deutsches Geodätisches Forschungsinstitut (DGFI) and Bayerische Kommission für die Internationale Erdmessung (BEK) in Munich and Deutsches GeoforschungsZentrum (GFZ) in Potsdam. Each institution will apply one of the above mentioned methods. Features and typical characteristics of each approach are discussed.