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Comparison of GOCE-GPS gravity fields derived by different approaches

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The restricted sensitivity of the Gravity field and steady-state Ocean Circulation Explorer (GOCE) gradiometer instrument requires satellite gravity gradiometry to be supplemented by orbit analysis in order to resolve long-wavelength features of the geopotential. Several approaches have been proposed to exploit the kinematic GPS-derived GOCE orbit information for this purpose. These methods include the (i) energy balance approach, (ii) celestial mechanics approach, (iii) short-arc approach, (iv) averaged acceleration approach, and (v) point-wise acceleration approach. Although there is a general consensus that, except for energy balance, these methods theoretically provide equivalent results, real data GOCE-GPS solutions have never been compared with each other within a consistent data processing environment so far. This contribution strives to close this gap. We compare gravity field solutions based on the aforementioned approaches as computed at the Graz University of Technology, University of Bern, Delft University of Technology, and the University of Stuttgart/Austrian Academy of Sciences. Consistency concerns the input data sets, period of investigation, spherical harmonic resolution, a priori gravity field information, etc. Performance measures include formal errors, errors with respect to GRACE gravity fields, (cumulative) geoid height errors, and orbit residuals from precise orbit determination of SLR satellites.