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Gravity field recovery with simulated GOCE observations

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Numerical simulations of the gravity field parameter recovery using the direct method, with satellite positions as pseudo observations instead of simulated GPS Satellite-to-Satellite (SST) tracking data, and with gravity gradients (SGG data), were done and are ongoing in the framework of the European GOCE Gravity Consortium test and validation plan for GOCE mission data processing. This work shows the latest 30- and 60-day simulation results obtained with the CNES and GFZ software packages, GINS and EPOS, respectively. After the iterative least-squares orbit adjustment procedure has converged to the highest attainable precision level, the gravity field normal equations are computed in a subsequent step. These SST normal equations (to degree and order 120), representing the long and medium wavelength gravity field signal, are then reduced for arc-dependent parameters (i.e. state vector at epoch, empirical parameters) and cumulated over the entire observation period. Secondly, the gravity gradient measurements (SGG) are processed and filtered, yielding high-resolution normal equations to degree and order 230. They are combined with the SST normal equations in order to estimate a complete gravity field from degrees 2 through 230. The coloured noise in the SGG data is based on recent and realistic gradiometer specifications. The precision in the measurement bandwidth is approximately 3-5 milliEotvos, but rapidly decreasing for lower frequencies. Due to this behaviour, the observation equations have to be high-pass filtered in order to obtain the most accurate gravity field recovery. The filter algorithm, design and results are presented to considerable detail, since this particular step is the key element that will enable the achievement of

the GOCE mission objectives from the ground segment point of view.