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Recovery of the Earth gravity field on the basis of accelerations derived from the GOCE positions

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Series of the GOCE accelerations derived from the satellite's positions simulated along a perturbed orbit were used as pseudo-observations for the determination of harmonic coefficients of the Earth's gravitational potential. The observation model has been formulated in arbitrary reference frame for each component of the acceleration vector separately. The formula of central numerical differentiation with an arbitrary number of nodes was used to derive the accelerations. Errors of the accelerations were analyzed with various numbers of nodes and various sampling rates. The recursive filter has been applied to handle a colored noise in the derived accelerations. The impact of gravitational and non-gravitational perturbing factors as well as various behaviors of noise in the GOCE positions on the recovery of the Earth gravity field with the used technique has been estimated. Finally, the results of the Earth gravity model determination were compared with those obtained by means of the direct approach based on the integration of variational equations.