Geophysical Research Abstracts
Vol. 16, EGU2014-5884-3, 2014
EGU General Assembly 2014

Temporal gravity field modeling based on least square collocation with short-arc approach

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After the launch of the Gravity Recovery And Climate Experiment (GRACE) in 2002, several research centers have attempted to produce the finest gravity model based on different approaches. In this study, we present an alternative approach to derive the Earth's gravity field, and two main objectives are discussed. Firstly, we seek the optimal method to estimate the accelerometer parameters, and secondly, we intend to recover the monthly gravity model based on least square collocation method. The method has been paid less attention compared to the least square adjustment method because of the massive computational resource's requirement. The positions of twin satellites are treated as pseudo-observations and unknown parameters at the same time. The variance covariance matrices of the pseudo-observations and the unknown parameters are valuable information to improve the accuracy of the estimated gravity solutions. Our analyses showed that introducing a drift parameter as an additional accelerometer parameter, compared to using only a bias parameter, leads to a significant improvement of our estimated monthly gravity field. The gravity errors outside the continents are significantly reduced based on the selected set of the accelerometer parameters. We introduced the improved gravity model namely the second version of Institute of Geodesy and Geophysics, Chinese Academy of Sciences (IGG-CAS 02). The accuracy of IGG-CAS 02 model is comparable to the gravity solutions computed from the Geoforschungszentrum (GFZ), the Center for Space Research (CSR) and the NASA Jet Propulsion Laboratory (JPL). In term of the equivalent water height, the correlation coefficients over the study regions (the Yangtze River valley, the Sahara desert, and the Amazon) among four gravity models are greater than 0.80.