



The preprocessing method of K band range rate measurements and impact on recovering gravity field model

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In this paper, based on simultaneous solution approach, using Gravity Recovery and Climate Experiment (GRACE) onboard GPS observations and K band range rate measurements to achieve the precise orbit of GRACE satellite and monthly temporal gravity field solutions to degree and order 60 successfully. The most significant part of the GRACE mission is the precise K band ranging (KBR) system to measure the ranges between the twin satellites. We analyze the characteristics and the observation error of K band range rate measurements which is critical to recovering the earth gravity field. A nine-points sliding window of least-squares fitting method is put forward to preprocess K band range rate measurements. This method is applied to recover the gravity field model to study the influence on recovering the Earth gravity field model. The results showed that: (1) RMS of fitting residual has been improved from $0.235\mu\text{m/s}$ to $0.182\mu\text{m/s}$ by using the K band range rate measurements in 2007. The results demonstrate that this method can eliminate outlier of KBRR observation data effectively. (2) This method is applied to recover the gravity field model. Comparisons of the degree variance and the spatial distribution of time-varying signal demonstrate that our model is comparable with the other existing models, i.e. the Centre for Space Research RL05, Jet Propulsion Laboratory RL05, and GeoForschungsZentrum RL05a models. Our model is very close to those from other three models and with similar spatial patterns of signals. The results indicate the preprocessing method in this paper can be effectively applied to the recovery of the earth gravity field model.