Gravity Recovery and Climate Experiment (GRACE) observations have been used to detect the gravity field variations due to the Mw = 9.3 Sumatra-Andaman earthquake that occurred on December 26, 2004. However, most of the present studies are confined in the detection of near-field effects of the large earthquake. As the spherical earth dislocation model provides the prediction of the global co-seismic gravity changes due to earthquakes, in this study using monthly GRACE data we focus on the detection of the far-field effects caused by the 2004 Sumatra-Andaman earthquake. We calculate the co-seismic gravity variations by the difference between the 2-year-mean fields before and after the earthquake following the approaches of some previous scholars, but with a much larger Gaussian smoothing radius (around 3000 km) in the spatial averaging of the GRACE-monthly fields, and truncate the spherical harmonic (SH) coefficients to degree 20. This processing would highlight the large-scale signature of the temporal gravity field, which dominates in the far-field deformations caused by the earthquake. The results from the SH solutions released by the Center for Space Research (CSR) at the University of Texas reveal a negative gravity anomaly region in the co-seismic medium-far field, with the area of 80° × 80° and magnitude of around -0.3 μgal, which agrees with the results of model prediction after removing the near-field variations and averaging with equivalent smoothing as for GRACE data. The consistency between the GRACE observations and the model prediction validates the medium-far field computation of the spherical earth dislocation theory from satellite geodesy. This study is supported by Natural Science Foundation China (Grant No. 40974015).