Satellite gravimetry observations from GRACE (Gravity Recovery and Climate Experiment) and GRACE Follow-On are widely used to study the co-seismic and post-seismic deformations caused by large earthquakes. Temporal gravity changes from GRACE provide good constraints to investigate the fault slips of large earthquakes especially for oceanic areas. However, reliable retrieval of seismic signals is still challenging due to large uncertainties and limited spatial and temporal resolutions of GRACE observations. To extract the co- and post-seismic signals from GRACE, the time series fitting method based on least squares is commonly used. In the time series fitting, the earthquake occurrence time parameter (t0) is usually set at the mid-month point, since most available GRACE time-variable data are monthly solutions. Nevertheless, a lot of large earthquakes did not occur exactly at mid-month. By simulative tests, we demonstrate that the commonly used mid-month approximation for the fitting parameter t0 can cause noticeable bias for the seismic signal extraction. The several-days deviation in the parameter t0 leads to obvious difference for the time series fitting of seismic signals, since the post-seismic changes are rapid and significant within a short period after the earthquake. With the case study of the 2004 Mw9.1 Sumatra-Andaman earthquake (which occurred on December 26), we indicate that the bias due to the commonly used mid-month t0 approximation reaches above 10 percent amplitude of the extracted co-seismic signals. Thus the exact date for the fitting parameter t0 should be used for more reliable separation of the co- and post-seismic signals from GRACE observations.