Geophysical Research Abstracts
Vol. 14, EGU2012-12198, 2012
EGU General Assembly 2012

Lunar gravity field recovery: sensitivity studies from simulated tracking data

A. Maier and O. Baur

Space Research Institute, Austrian Academy of Sciences, Austria (andrea.maier@oeaw.ac.at)

The lunar gravity field is essential for understanding the structure and the thermal evolution of the Moon. Typically, the gravity field is inferred from tracking data to satellites orbiting the Moon. Due to the fact that the Moon is in the state of synchronous rotation with the Earth, direct tracking to the farside is impossible. NASA's Lunar Reconnaissance Orbiter (LRO), launched in 2009, is equipped with various instruments whose purpose is to prepare for save robotic returns to the Moon. To geolocate LRO, the spacecraft is tracked by means of radiometric techniques (ranges, range rates, angles) and optical laser (laser ranges). We analyzed tracking data to LRO with respect to various aspects, such as the number of observations, their spatial distribution on the lunar surface, and the present noise level. We used these real-data characteristics to simulate tracking data to LRO. We generated three different simulation scenarios: observations were simulated (1) during the exact time spans when LRO was tracked from a specific ground station, (2) whenever the spacecraft was in view from a station, and (3) for the nearside as well as for the farside of the Moon. Based on the resulting trajectories, we estimated three sets of spherical harmonic coefficients representing the lunar gravity field. Moreover, we varied the maximum degree of estimated coefficients and investigated the effect of noise on the estimated parameters. Observation simulation and parameter estimation was accomplished with the software packages GEODYN and SOLVE.