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Lunar gravity anomaly recovery with the GRAIL level-1b and level-2 data

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First, we will talk about the lunar gravity anomaly recovery with the GRAIL level-1b data. Among several global lunar gravity field models available now, GRAIL offers the highest resolution. The Doppler tracking between Earth-based stations and lunar satellites can directly observe gravity field of the lunar nearside. SELENE could measure the farside, for the first time, by inter-satellite tracking using the high-altitude relay satellite. GRAIL employs the low-low inter-satellite tracking method, often called as ″ Tom and Jerry ″ . This is similar to GRACE, the twin satellites for the gravimetry of the earth. It observes the gravity field by ranging between the satellites using microwave. In this way, GRAIL got the global lunar gravity anomaly map. In our study, we use the GRAIL level-1b and level-2 data. Both data have become open to public at the PDS Geoscience Node at the Washington University, Saint Lewis. The level-1b data include satellite position data compiled as the GNV1b files, and inter-satellite ranging data (ranges, range rates, and range accelerations every five seconds) are compiled in the KBR1b files. In this study, we used these two data sets and estimated the mass distribution on the moon. We remodeled the moon ' s gravity anomaly program of the Lunar Prospector developed by Sugano and Heki (EPS 2004; GRL 2005). Using this program, we estimated the gravity anomaly of the specific parts of the lunar surface. We found the Level-1b data are able to recover them clearly. Then, we will introduce the next-stage study by using the GRAIL level-2 data set, and explain the scientific targets of our study. Recent study (Miljkovi?, K. et al., 2013) suggested that the size and depth of the crater depends on the mantle temperature as well as the size and speed of the projectile. We here study the gravity signatures of small to medium sized craters, and will find systematic difference between the lunar near and far sides.