



Sub-meter Precision Lunar Figures from Chang'E-1 and SELENE Laser Altimetry

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The selenocentric radial footprint radial distances of 8.8 million Chang'E-1, and 8.5 million SELENE laser altimetry measurements were used to estimate improved triaxial, biaxial and spherical lunar figure parameters together with their geometric centers with respect to the center of mass of the Moon. The estimated equatorial semi-major, minor, and polar axes of the triaxial ellipsoid's shape parameters from the Chang'E-1 and SELENE solutions differ by 143 m, 3 m and 49 m and -186 m, -3 m, and -52 m in their geometric center positions with respect to the lunar center of mass. The new missions' laser altimetry measurements data reveals a more spherical lunar figure and are in better agreement with each other compared to the ULCN 2005's geometrically best fitting lunar figure. The RMS misclosures calculated for Chang'E-1 and SELENE data using all the estimated parameters were used to assess the goodness of fit of each solution. The estimates for geometrically best fitting solution from Chang'E-1's data give the smallest RMS misclosures for both Chang'E-1 and SELENE data. Overall, the spherical harmonic topographical models' RMS misclosures are larger than those best fitting solutions.