Regional Dependence of Lunar Lithospheric Thickness

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We had made lunar free-air gravity anomaly map from Lunar Prospector Line-of-Sight (LOS) acceleration data of low altitude extended mission. Next, we perform terrain correction for the raw LOS data using Clementine grid topography data and assuming uniform crustal density of 2,900 kg/m^3. The terrain corrected LOS data are processed in the same procedure of obtaining free-air gravity anomaly map, and produce Bouguer gravity anomaly map. Accuracy of these maps are 0.8 degree x 0.8 degree (about 24 km x 24 km at lunar surface), equivalent to conventional gravity model using spherical harmonics up to 225th degree/order with less spurious signatures than past models based on spherical harmonic expansion of gravity field (e.g. LP165P; 165th degree/order).

In order to study compensation state of lunar craters, here we calculate mass deficits of medium-sized craters (about 60 - 260 km in diameter) and mascons (about 200 - 1,100 km in diameter) from these gravity anomaly maps. Comparing with mass deficits inferred from Moho topography based on elastic plate model, we estimate lithospheric thickness beneath these craters and mascons. The lithospheric thicknesses is found to depend little on the ages. Rather, it highly depends on the location.