Comparative study of compensation mechanism of lunar impact basins

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On the basis of the gravity model of the Moon developed by SELENE (Kaguya), we propose new classification and compensation mechanism of lunar impact basins. Impact basins on lunar far side and limb are classified into Type I and II basins depending on the magnitude of central gravity high in free-air and Bouguer gravity anomalies. Topographic depression and rim of both Type I and II basins show good correlation between topography and free-air gravity anomaly suggesting elastic support of lunar lithosphere. Central gravity high of Type I basin is inferred to be a result of mantle uplift at the time of basin formation, and is elastically supported, too. On the other hand, free-air anomalies at the center of Type II basins are lower than Bouguer anomalies indicating brittle deformation of the basins. Little to no free-air anomalies of topographic depression and rim of primary mascon basins on near side of the Moon is a result of elastic relaxation that occurred probably after eruption of mare basalts. Plateau-like signature of gravity anomalies of primary mascon basins implies viscous relaxation at crust-mantle boundary beneath the basins and significant heat (or volatile) transport by basaltic magma.