SPACE EXPLORATION SYMPOSIUM (A3)
Poster Session (P)

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LUNAR BASINS WITH AND WITHOUT MASCONS: A WAVE INTERPRETATION

Abstract

Basins and marea with strong mass concentrations (higher gravity) prevail on the near lowland side with thinner crust. Basins and marea with mass deficit (or restricted positive anomalies in their centers), on the contrary, prevail on the far highland side with comparatively thick crust. Nearside basins are larger than farside ones [Miljkovic et al., 2013]. An impact origin of the basins possibly could explain this peculiarity by different depths of impact penetrations reaching the dense mantle in the case of thinner crust. But known regular antipodean disposition of basins and recent discoveries of the GRAIL mission compel to consider also an alternative point of view at their origin, namely a wave one. The record of lunar basins on which is based the early impact flux may warrant revision [Miljkovic et al., 2013, LPSC 44, abstract 1926 elsewhere]. Surfaces of all celestial bodies are warped by interfering inertia-gravity waves of four ortho- and diagonal directions (look at crossing planetary waves of MOONKAM-GRAIL images). The warping inertia forces arise due to moving bodies in elliptical keplerian orbits with alternating + and - accelerations. This interference produces five sorts of roundish tectonic blocks-craters: uplifting moderately and strongly, subsiding moderately and strongly, and neutral. The strong subsidence causing loss of angular momentum brings about an intensive compensating (even overcompensating) uplift of dense mantle that is a mass concentration on the nearside. A moderate subsidence causes smaller mascons. Intervening uplifting blocks have subsiding mantle and masdefs. The thicker highland crust responds less to wave warpings and does not show significant uplifts and subsidences of the deeper than on nearside dense mantle (masdefs). The Bouguer gravity of the lunar hemispheres [Zuber et al., 2013] really shows that the lowland nearside is positively anomalous (a dense mantle is uplifted) and the highland farside is negatively anomalous (a dense mantle is subsided). A broad bulls-eye pattern of basins with alternating free-air gravity positive and negative ring zones is well reproduced by a model of intersecting waves [Kochemasov, 1992-2012]. Of particular interest are two chains of four large craters (basins and marea) long 90-100 on the near- and farsides at latitudes 0-40 N. They are parallel and strike NE-SW. Such pattern rejects their random impact origin. The outer ring zone of complex large craters is often built of a regular chain of smaller craters obviously of non-impact origin [Zuber et al., 2013, the Moon's free-air gravity map].