An estimate of lunar crustal structure

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A global structure of the lunar crust is presented by using gravity and topography data (Konopliv et al., 2001; Smith et al., 1997). We assume that the Bouguer gravity is consequence of variations in the thickness of a crust. In the previous lunar crustal thickness model (Zuber et al., 1994; Neumann et al., 1996; Wieczorek and Phillips, 1998), horizontal crustal density distributions are not considered although the heterogeneity of a crustal composition inferred from the VIS and NIR multispectral properties on the lunar surface (e.g. Lucey et al., 1998) is obvious.

There are correlations between the iron abundances of lunar samples and those inferred normative densities. Therefore we model a horizontally heterogeneous density model of lunar crust by using both iron abundances on the lunar surface as measured by the Lunar Prospector gamma-ray spectrometer (Lawrence et al., 2001) and iron abundance-normative density relations of lunar samples. For the vertical distribution of crustal density, we use the pressure dependence of elastic velocities of lunar rocks (e.g. Mizutani et al., 1974) and consider the effect of porosity changes.

In taking into account the gravitational attraction of surface basalt flow, we use the mare models of Solomon and Head (1980) and Williams and Zuber (1998).The crustal models are constrained to match the seismically determined structure (Toköz et al., 1974; Khan et al., 2000).