An estimate of crustal heat flow on the lunar surface

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Heat flow is a key for estimating a thermal state within the moon. We estimate a global map of the lunar heat flow due to radioactive elements (Th, U and K) within the lunar crust.

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

Abundances of major radioactive elements on the lunar surface are estimated by using both a global map of Thorium abundance data taken with the Lunar Prospector gamma ray spectrometer (Lawrence et al., 2000) and abundance ratios of Th and K, K and U within the lunar samples. For vertical distributions of radioactive elements, we use the both models independent of depth and exponentially decayed. We investigate our global maps of the crustal heat flow by using the heat flow data obtained by Apollo 15 and 17 missions (Langseth et al., 1976).