Geophysical Research Abstracts
Vol. 14, EGU2012-12529-1, 2012
EGU General Assembly 2012
© Author(s) 2012

Using 3D Axisymmetric model to analyze topography effects on Lunar surface heat flow and subsurface temperature

H. Li, W. Zuo, G.-L. Zhang, and Y. Su
National Astronomical Observatories, Chinese Academy of Sciences, Beijing, China (lih@nao.cas.cn)

Surface heat flow is an important physical factor characteristic of the thermal state and thermal history of a planet; while near surface temperature affects crustal seismic wave velocities and rheological properties. Surface topography and heat source density both influence surface heat flow significantly [Seiferlin, 2009]. Using a 3D axisymmetric finite element model (FEM) and topographic and geochemical data collected by China's Chang'E-1 (CE-1) and Change'E-2 (CE-2) spacecraft, we investigate the effects of topography and crustal heat sources on the surface heat flow of the Moon. CE-1 and CE-2 were launched on October 24, 2007 and October 1, 2010, respectively. The Gamma ray spectrometers (GRS) onboard both orbiters returned data on the distribution of U, K, and Th on the lunar surface, based on which we derive the crustal radionuclide heat source density [Zhang et al., 2011; Rybach, 1976]. Data collected by CE-1 CCD stereo camera and laser altimeter (CCD & LAM) were employed to produce a global DEM with a spatial resolution of 3 km; resolution of CE-2 DEM was improved to <10 m. Our results quantitatively show that surface topography, such as craters, basins, and ridges, significantly change measured surface flow and temperature field. Compared with previous 2D model, 3D model represents a more realistic situation; 2D and 3D Axisymmetric models have large variations in heat flow and near surface temperature calculation results both with and without regolith filling. We also present our modeled estimation of the global surface heat flow and crustal temperature field, taking into consideration of the topographical effects.

References:
Rybach L., Radioactive heat flow production in rocks and its relation to other petrophysical parameters. Pure Appl. Geophys., 114: 309-318, 1976.

Seiferlin, K., Topography effects on the surface heat flow and subsurface temperature, EPSC Abstracts, Vol. 4, EPSC2009-530, 2009.

Zhang L.-Y., et al, Time series data correction for the Chang'E-1 gamma-ray spectrometer, Res. Astron. Astrophys. 11 737, 2011.