

SPACE EXPLORATION SYMPOSIUM (A3)
Moon Exploration – Part 1 (2A)

Author: Mr. Jianfeng CAO

1)Science and Technology on Aerospace Flight Dynamics Laboratory, China,2)Beijing Aerospace Control Center, China, China, jfcao@foxmail.com

Dr. Songjie HU

1)Science and Technology on Aerospace Flight Dynamics Laboratory, China,2)Beijing Aerospace Control Center, China, China, husongjie@gmail.com

Dr. Lei LIU

1)Science and Technology on Aerospace Flight Dynamics Laboratory, China,2)Beijing Aerospace Control Center, China, China, 15810340789@139.com

Dr. Liu Ye

Beijing Aerospace Command and Control Center (BACCC), China, liuye_new@sina.com

A NEW LUNAR TOPOGRAPHIC MODEL BASED ON CHANG'E-1 LASER ALTIMETER DATA

Abstract

The Chang'E-1 (CE-1) laser altimeter have worked for almost ten months around the moon, and more than 9 million range measurements were obtained. All the effective range measurements from Chang'E-1 laser altimeter (LAM) are used to construct a global topographic model of the Moon with accuracy and resolution. In order to improve the accuracy of the topographic model from CE-1, we reprocessed the tracking data and reconstructed the orbit of CE-1. The accuracy of the new orbit solution is about a few tens of meters better than the orbit solution during the mission according to a overlap comparison. Pre-processing with instrumental calibrations is applied on raw laser ranges. Combined ranging data with new reconstructed orbit and attitude measurements with an along-track elevation filtering, we obtain a set of lunar surface elevation values referenced to a mean radius of 1738 km. Finally, we use the coordinates of lunar laser reflector to calibrate the systematic errors of the model, which may be introduced from the satellite orbital error or the laser altimeter. The new topographic model we obtained has an absolute vertical accuracy of approximately 17 m and a spatial resolution of 0.125. From the model, the center of mass (COM) and center of figure (COF) offset to be (238m, -1777m, -730m) along the x, y and z directions, respectively.