

Morphometry and morphology of lunar mare domes from SELENE terrain camera

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A number of smooth low domes with gentle convex-upward profiles are distributed in lunar maria. They are called lunar mare domes, and have long held the interest of the planetary and volcanological communities.

Lunar mare domes are characterized by circular to somewhat irregular outline, a generally convex shape, relatively low slopes (generally less than 10 degrees), and diameters ranging up to 30 km. Some show summit craters, and occur in groups on mare plains. Lunar mare domes have been detected during telescopic study of the Moon since 18 century. Previous studies were used Lunar Orbiter, Apollo, Clementine, and Lunar Reconnaissance Orbiter data, and almost agree that most lunar mare domes are volcanic origin. But the details of mare domes are still not well understood, because of shortages of spatial resolution, favorable light condition, and limited coverage of imaging area.

In this research, we use Terrain Camera (TC) data of SELENE. The TC carried on SELENE is a panchromatic push-broom imager with two optical heads (TC1 and TC2) to acquire stereo data for the entire surface of the Moon when the sun elevation is higher than 30 degrees. The slant angles of TC1 and TC2 are + 15 and -15 degrees, relative to the spacecraft flight direction for the nadir vector. Each head has a linear CCD sensor of 4096 pixels. They have 10-m cross- and along-track resolutions respectively, and 10-m vertical resolution at the SELENE nominal altitude of 100 km. The TC also acquired non-stereo data when the sun elevation was lower than 30 degrees. These low sun-elevation data is powerful tool to analyze mare domes with very low slopes.

We analyze the morphometry and morphology of mare domes in Hortensius, Milichius, Cauchy, and Arago areas by the TC data, and compare with terrestrial small shield volcanoes of Hawaii, Mexico, Iceland, and NW USA. We will discuss the formation of lunar mare domes.

Keywords: SELENE (KAGUYA), Moon, Shield volcanoes, Terrain camera, Mare domes