

Laser altimetry and photogrammetry of impact craters based on circumlunar orbital observations

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Measurements on the lunar surface have been carried out for a long time. Started by Galileo back in 1610, they make up a unique series of observations lasting 415 years! Lunar craters and mountains turned out the first elements of the lunar relief to be included in the measurements composition. Today, measurements on the Moon have become purely practical, as spacecrafts are now flying to the Moon, satellites and stations are orbiting the Moon, and "automatic geologists" are digging on the Moon itself in search of the richest mineral deposits. The achieved results make a strong impression. However, some issues of accurate measurements on the Moon and its surroundings remain unresolved. Such issues include orbital photogrammetric and laser altimetric measurements on the Moon. In particular, we are talking about such tasks as the spacecraft's coordinate reference to the lunar coordinate system, the topography and state of matter of impact craters, navigation on the Moon and its surroundings, soft landing, and others. Some researchers set more ambitious goals. For example, lunar craters, seas, and mascons are considered as a natural laboratory for studying the physics of extreme states of matter. Using specific examples, the report examines high-precision measurements on the Moon, the problems that arise and some prospects for their solution. Examples are included: Maander crater in the Orientale Mare, volcano and ring in Tsiolkovsky crater, secondary impact craters in the "bulbous fields" of the Aitken main crater.