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Detection of Impact Ejecta on the Lunar Surface

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One of the highest-priority issues for a future human or robotic lunar exploration is the lunar dust. This problem should be studied in depth in order to develop an environment model for a future lunar exploration. The impact ejecta of interplanetary meteoroids is one of the source mechanics of the lunar dust environment. A dust detector placed on the lunar surface is exposed to strong variations in the impact ejecta environment. The purpose of this article is a study of the speed and trajectory information of ejecta created by micrometeoroid impacts. Autodyn14.0/2D software was used to simulate the impacting by micrometeoroids bombarding the lunar surface. The projectiles were selected as 10 μm spheres in diameter with the speed of 17 km·s^{-1}. We used impact angles of 30°, 45°, 60° and 90°. A part of impact ejecta grains created in the early stage of impact process can be captured by a sensor placed on the lunar surface (e.g. Lunar Ejecta and Meteorites (LEAM) experiment) or mounted on a lunar lander (e.g. Lunar Dust eXplorer (LDX)). Most of the detectable ejecta grains have very-low-speeds ($<$ 100 m·s^{-1}) together with a few of high-speed ejecta grains ($>$ 1 km·s^{-1}). Comparing with the most recently analysis of LEAM data, the impact ejecta grains are considered as one of the most possible sources for the recorded events. Furthermore, a sensor mounted on a lander instead of directly placed on the lunar surface has more chances to measure high-speed ejecta. A new developed instrument, such as LDX, will be a powerful tool to study the lunar dust environment.