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PERSPECTIVES OF DUST AND DUSTY PLASMA OBSERVATIONS IN THE FUTURE LUNAR
MISSIONS

Abstract

A renaissance is being observed currently in investigations of the Moon. The Luna-25, Luna-26, Luna-27, and Luna-28 missions are being prepared in Russia. At the same time, in connection with the future lunar missions, theoretical and experimental investigations related to dust and dusty plasmas at the Moon are being carried out. Here, the corresponding results are reviewed briefly. We present the main results of these investigations concerning the lunar dusty plasmas and discuss perspectives of dust observations in the future lunar missions. We show, in particular, the absence of the dead zone near a lunar latitude of 80° where, as was assumed earlier, dust particles cannot rise over the surface of the Moon. This indicates that there are no significant constraints on the Moon landing sites for future lunar missions that will study dust in the surface layer of the Moon. We present estimates of the influence of a lander on measurements of parameters of dusty plasma near the lunar surface in the vicinity of spacecraft. We demonstrate that the electrostatically ejected dust population can exist in the near-surface layer over the Moon while the dust appearing in the lunar exosphere owing to impacts of meteoroids present everywhere. The calculated values of number densities at high altitudes of the particles formed as a result of the impacts of meteoroids with the lunar surface are in accordance (up to an order of magnitude) with the data obtained by the recent NASA mission LADEE. Finally, we formulate new problems concerning the dusty plasma over the lunar surface.