

DUSTY PLASMAS IN LUNAR ENVIRONMENTS: EFFECTS OF METEOROIDS

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Effects of impacts of high-speed meteoroids with the lunar surface are considered from the viewpoint of formation of a plasma-dust system over the Moon. A possibility of dust particle release from the lunar surface owing to impacts of micrometeoroids on the surface of the Moon is discussed. It is shown that this effect is significant and should be taken into account when determining the number of particles rising over the surface of the Moon at the formation of a plasma-dust system. The average number of regolith particles leaving the surface of the Moon owing to the impacts of fast meteoroids is determined for various altitudes over the Moon. The size distribution function of particles leaving the surface of the Moon because of impacts of meteoroids is found. It is shown that impacts of meteoroids constitute an important source of dust microparticles in the plasma-dust system over the surface of the Moon. A possibility of the formation in the lunar exosphere of dust cloud at high altitudes due to meteoroid impacts onto the lunar surface is studied. The cloud was observed in the measurements performed within the NASA LADEE mission. From the viewpoint of the formation of dust cloud at high altitudes over the Moon, the most important zone formed by the meteoroid impact is the zone of melting of substance. Only the droplets originated from this zone have the speeds between the first and second astronomical velocities (for the Moon). Correspondingly, only such droplets can perform finite movement around the Moon. The liquid droplets harden when rising over the lunar surface. Furthermore, they acquire electric charges due to the action, in particular, of the solar wind electrons and ions, as well as of the solar radiation. Thus dusty plasmas exist in the lunar exosphere at high altitudes with the characteristic number density less or of the order of 10^{-2} m^{-3} of dust particles with the sizes from 300 nm to 1 μm which is in accordance with the results of measurements performed by LADEE.

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