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Dusty plasma interactions near the Moon and in the system of Mars

Sergey I. Popel and Lev M. Zelenyi

Space Research Institute, Russian Academy of Sciences, Moscow, 117997 Russia
email: popel@iki.rssi.ru

We present results of recent self-consistent studies Popel *et al.* (2017), Popel *et al.* (2018a), and Popel *et al.* (2018b) which consider dust and dusty plasmas at the Moon and in the system of Mars. These studies are associated with the future space missions Luna-25 and Luna-27 as well as Phobos-Grunt 2 and ExoMars 2020. The dusty plasma system over the Moon includes charged dust, photoelectrons, and electrons and ions of the solar wind and Earth's magnetosphere (see Figure 1). 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. Dusty plasmas are shown to be formed in the surface layer over the illuminated part of Mars' satellites Phobos and Deimos owing to photoelectric and electrostatic processes. In view of a weak gravitational field, dust particles rising over the surfaces of Phobos and Deimos are larger than those over the surface of the Moon. In this case, the role of adhesion, which is a significant process preventing the separation of dust particles from the lunar surface, is much smaller on Phobos and Deimos. We discuss also dusty plasmas in Martian atmosphere. This work was supported by the Russian Foundation for Basic Research (project no. 18-02-00341).

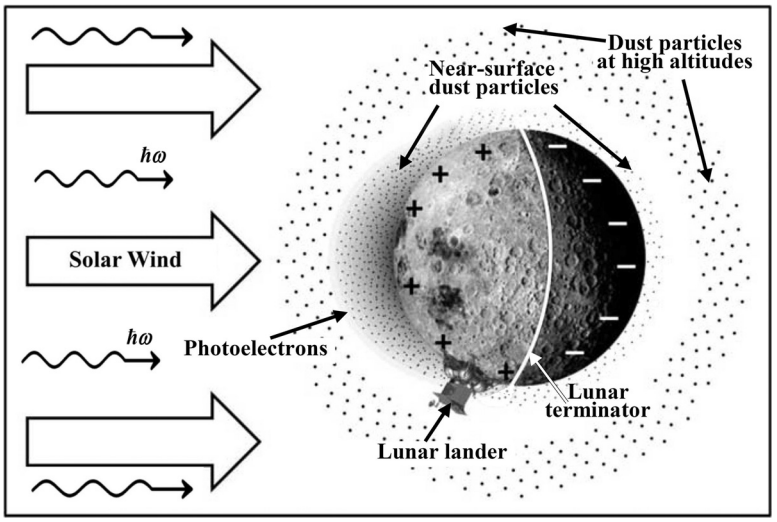

Figure 1. The main elements characterizing the dusty plasma system over the Moon (the terminator, the photoelectrons, the near-surface dust particles, dust particles at high altitudes, photons of solar radiation ($\hbar\omega$), and the solar wind) as well as the lunar lander at a high lunar latitude in the South Hemisphere.

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