

Drift instability in the near-surface dusty plasma over the Moon

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The circumlunar environment is a dusty plasma consisting of small particles of lunar regolith, photoelectrons, electrons, and solar wind ions. When moving around the Earth, part of the trajectory of the Moon passes through the Earth's magnetosphere. In addition, the magnetic field is characteristic for some areas on the Moon, the so-called lunar magnetic anomalies. The magnetic field and photoelectron density gradients can lead to the development of drift turbulence. The possibility of the development of drift instability in the near-surface dusty plasma at the Moon has been considered. It is shown that the greatest effect is achieved in the regions of lunar magnetic anomalies. The origin of the instability development is the gradients in the photoelectron density in a magnetic field. Thus, the effective drift turbulence, which is formed as a result of the development of the drift-dissipative instability is expected in regions of lunar magnetic anomalies. The characteristic time for the development of turbulence is much shorter than the length of daylight on the Moon. As part of the Luna-25 and Luna-27 missions, it is planned to study a dusty plasma system in the circumlunar medium, in particular, to study plasma waves using an electrostatic sensor. Thus, it is possible to observe effects, including those associated with drift waves.