Geophysical Research Abstracts
Vol. 20, EGU2018-9454, 2018
EGU General Assembly 2018

Solar wind interaction with the Moon surface and corresponding wave phenomena

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The Moon does not have magnetic field and significant atmosphere and on the first site its interaction with solar wind and Earth's magnetosphere seems to be very simple. However nowadays it is clear that Moon may be considered as a plasma laboratory for investigating the different kinetic processes.
The latest observation revealed that the significant deflected proton fluxes exist over magnetic anomalies at lunar surface. Such deflection implies that the magnetic anomalies may act as magnetosphere-like obstacles (mini-magnetospheres), modifying the upstream plasma and last years many models were developed to describe such formations. Also a number of different types of electric fluctuations was observed during the passage of Wind spacecraft across the lunar wake: langmuir waves, electrostatic modes above electron cyclotron frequency, whistlers. The investigations revealed emissions on plasma frequency and its first harmonic. Electron reflection at quasi-shock at leading edge of magnetic anomaly could drive the electric field oscillations. The generation mechanism is similar to that known for foreshock of planetary bow shock. In KAGUYA and Lunar Prospector missions the monochromatic whistlers near the Moon were observed as narrow band magnetic fluctuations with frequencies close to 1 Hz, and are mostly left-hand polarized in the spacecraft frame.
We aimed to review actual observations and different mechanisms of wave and magnetic disturbances generation in plasma environment around the Moon: in solar wind closely to the Moon, over the magnetic field anomalies at its surface, in the lunar wake and around its boundaries. The generating mechanisms, propagation and other characteristics of waves are presented. Particular attention is pointed on Electrostatic Solitary Waves (ESWs), monochromatic whistlers, large-amplitude monochromatic ULF waves and non-monochromatic whistler waves. However all these questions remain open and require further experimental confirmation as on the basis of already available data (the Kaguya and Chandrayaan missions) and data to be obtained in advanced scientific projects of the Moon's exploration (the project Luna_Resurs_Orbital'ny apparat).