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CONTRIBUTION OF CHARLES UNIVERSITY TO INVESTIGATIONS OF SOLAR-TERRESTRIAL RELATIONS

Abstract

Investigations of Solar-Terrestrial relations started at Charles University in a close cooperation with Space Research Institute, Moscow about 40 years ago. The Space Physics Laboratory participated in a development of plasma spectrometers for numerous space missions - Active, Apex, Prognoz 8, Intershock, Interball, etc. The data collected by these missions being complemented with observations of other international projects represent still a valuable base for investigations of the processes in the near-Earth space.

Despite the fact that the contribution reviews the history, it is organized according to physical topics rather than by a time. It allows us to emphasize the progress in understanding of different aspects of solar wind - magnetosphere interactions. The chain of processes starts with propagation of discontinuities through the solar wind, formation of the bow shock, interaction of the solar wind and embedded discontinuities with it and their following modification in the magnetosheath. The main part of the contribution is devoted to the latest results on magnetopause and cusp processes and their implications for a plasma transport to the inner magnetosphere. We will discuss the processes suggested in course of the years for this transport - impulsive penetration, diffusion (potentially enhanced by surface waves), and magnetic reconnection at the magnetopause. We will show that a global magnetospheric topology is consistent with magnetic reconnection as a leading mechanism, whereas others processes are important under particular circumstances. It is well established by observations in the space, in laboratory experiments, as well as by MHD modeling that reconnection is sensitive to the mutual orientation of the magnetic fields on both sides of the magnetopause. Whereas the orientation of the magnetospheric magnetic field is known, the orientation of the magnetosheath field is estimated from measurements in the interplanetary space. This estimation can be a source of large errors and it returns the attention to studies of the solar wind propagation and modification within the magnetosheath.