Abstract

Title: *Correlation properties of magnetosheath fluctuations*

Author: *Olga Gutynska*

Department: *Department of Surface and Plasma Science*

Supervisor: *Prof. RNDr. Jana Šafránková, DrSc.*

e-mail address: *Jana.Safrankova@mff.cuni.cz*

Abstract: *This thesis deals with fluctuations of the magnetic field (MF) and plasma density in different magnetosheath locations. The statistical study of the correlation length of these quantities has shown that these lengths are surprisingly low for both the ion flux and MF (approx. 1 R_E). However, the correlation length increases with an increasing correlation between the magnetosheath and interplanetary magnetic fields (IMF). Further, we have found that the correlation length of MF fluctuations depends on the solar wind speed, on a correlation between IMF and magnetosheath MF fluctuations, and on the amplitude of fluctuations. The statistical study of radial profiles of cross-correlations between MF and plasma density at the subsolar and flank regions based on Cluster and THEMIS magnetosheath observations revealed better correlations toward the magnetopause. A study of the modification of the IMF direction in the magnetosheath has shown that a reliable prediction of the magnetosheath B_Z sign requires $|IMF\ B_Z| > 2\ nT$ and that this prediction is more precise during solar minimum. Finally, we compared fluctuations in different sheaths: 1) slow or mirror wave modes prevail in all sheaths except the heliosheath; 2) correlated variations of the magnetic field and plasma density increase with the distance from the Sun; 3) the typical cross-correlation coefficients are ~ 0.3 in the Earth's magnetosheath; ~ 0.9 in the sheaths of magnetic clouds; ~ 0.5 in the Jupiter's magnetosheath; and ~ 0.6 in the heliosheath.*

Keywords: *heliosheath, planetary sheath, magnetosheath, magnetic field, plasma, fluctuations, correlation analysis*