Geophysical Research Abstracts,
Vol. 11, EGU2009-4397, 2009
EGU General Assembly 2009

Statistical analysis of the scales of mirror modes observed in the Earth's magnetosheath

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Mirror modes are large amplitude compressive structures characteristic for high-beta magnetosheath plasmas. Previous experimental studies have established that mirror structures appear in the form of quasi-sinusoidal magnetic field oscillations, local enhancements of magnetic field (peaks) or profound magnetic decreases (dips). We performed a detailed study of two months of Cluster magnetosheath observations to statistically evaluate the properties of each type of mirror modes. In this study we focus on the analysis of the width of these structures, the periodicity of their occurrence and on the properties of the quasi-sinusoidal mirror modes. It is shown that the quasi-sinusoidal mirror waves are more frequently observed close to the bow shock and that the estimated wavelength of these structures is consistent with the predictions of linear theory. For the other two types of mirror structures (peaks and dips), the distribution of their spatial scales is different and both types of structures are found to be systematically wider than the quasi-sinusoidal waves. These results are compared with recent theories and numerical simulations.