OBSERVATION OF RADIATION PRESSURE EFFECTS IN THE DISTANT MAGNETOSPHERE

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ABSTRACT

Strong turbulence as well as other nonlinear processes involve coupling between different scales and so different dynamical regimes.Large scale modulation of the amplitude of high frequency waves give rise to the new forcing term - radiation pressure force for background low frequency motion. We present an example of space plasma data that contain signatures of above mentioned phenomena. Data are taken on the Polar satellite in the day-side high-latitude distant magnetosphere, during plasma injection from the solar wind associated with the reconnection process.

CASE STUDY

The data analyzed are DC electric and magnetic field components sampled at 8.33 Hz, and satellite potential that is used to calculate plasma density.
We show, that in accordance with relationship between ponderomotive force of a wave and lowly varying electric field [1], large amplitude wave packets envelope is very well correlated with large scale plasma density cavities. In an attempt to identify plasma modes involved, the ratio of Fourier amplitudes of electric and magnetic field is computed. This quantity has proven to be, in some cases, a good indicator of plasma modes [2].
However, proper data analysis requires techniques that do not assume homogeneity of data and are able to capture features both in time and frequency. For that purpose we have used the wavelet transform which has proven to be suitable tool in such cases. Plasma modes involved are probably kinetic Alfven waves. The wavelet analysis reveals fine structure of spectral electric to magnetic field ratio, which is manifestation of nonlinear Alfven wave coupling to background density fluctuations.

REFERENCES

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[2] K. Stasiewicz, Y. Khotyaintsev, M. Berthomier, J.-E. Wahlund, “Identification of widespread turbulence of dispersive Alfvén waves”, Geophys. Res. Lett., 27, 173, 2000