



ULF plasma and magnetic field variations in the foreshocks of Earth and Jupiter

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One of the main features of the foreshock is the existing of large variations of solar wind plasma and interplanetary magnetic field in the ULF range. The results of our investigations of this topic are presented in this report. Systematic measurements of ion flux and field magnitude in the foreshock with time resolution of 0.06-1 s were performed onboard Interball-1 spacecraft not far from the Earth. These data shows that in average the level of plasma and field relative standard deviations on the intervals from hour to ten seconds is about 0.1-0.3 that about 5 times more than in the undisturbed solar wind and more than in the magnetosheath. The most remarkable peculiarity of plasma and magnetic field variations in the foreshock near the Earth is the high level of positive correlations between ion flux and field magnitude changes in the range 1-100 mHz with correlation coefficient about 0.7-0.8. This point strongly differs the foreshock from other space regions – solar wind and magnetosheath in which this correlation is low or negative. The same correlation was observed also in the foreshock near Jupiter by Voyager-1 measurements of plasma and field variations but for lower frequency 0.1-10 mHz. The positive plasma and field correlation in the foreshock is its unique feature and may be interpreted as an evidence of a fast mode of the magnetosonic waves. One more interesting feature of the foreshock is the existence of quasi-harmonic fast plasma and field in phase oscillations seen by our high resolution measurements. The period of these oscillations is about 2 s and duration is in average about 10-20 s.

The comparison of the plasma and field variations in the foreshock and magnetosheath shows that quasi-parallel bow shock is also a source for very intensive variations of

these parameters for the magnetosheath - several times larger than behind the quasi-perpendicular bow shock. The developed turbulence is observed in magnetosheath with power spectra slopes close to $-5/3$. These slopes in the foreshock are significantly large - up to 3.