



Turbulent study of the solar wind magnetic fluctuations in front of the earth's bow shock during extreme activity of the interplanetary field

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The turbulent behaviour of the solar wind in different astronomical distances from the Sun was already shown in several studies. In this paper we concentrate on the investigations of the turbulent properties of the solar wind in a special region, i.e. upstream from the earth's bow shock. For the study, the interplanetary magnetic field records of the Wind and Cluster spacecrafts are compared. The Wind spacecraft is positioned near the L1 Lagrange point, while the four satellites of the Cluster mission are circling the Earth in a polar orbit, whose plane is fixed with respect to the inertial space. The forefront of the bow shock is visited by the Cluster satellites in the winter months. In our analyses the 21st and 22nd of January records of the missions are used, from 2005. In this period the activity of the interplanetary magnetic field was extremely high due to a CME event occurred in 20th of January. Applying spectral and special turbulence (probability density function, structure function, multifractal spectrum) analyses it is shown that the magnetic fluctuations arising as a consequence of the interaction between the solar wind and the earth's magnetic field spans a temporal range between about 10 and 500 s. In this range the time record of the Cluster spacecraft exhibits self-similar turbulent fluctuations, which property is different from that observed in the Wind records.