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Turbulent processes in the Earth's magnetotail: statistical and spectral analysis

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For the analysis of turbulent processes in the Earth's magnetotail the ferroprobe measurements from four space vehicles of Cluster-2 mission (6 events from 2005 to 2015) were used.
The fractal, multi-fractal, spectral, and wavelet analysis have been done. In particular, in the frame of fractal and multi-fractal examinations the following investigations were carried out: analysis of tails and evolution on different scales of probability distribution function of the magnetic field fluctuations; kurtosis determination; extended self-similarity analysis (analysis of distribution function momentums of magnetic field fluctuations on different scales – ESS-analysis).
The comparison of high order structure functions of magnetic field fluctuations during dipolarization with models of Kolmogorov, Kraichnan, Politano-Pouquet and 3D isotropic log-Poisson model with She-Leveque parameters is carried out.
During carrying out of ESS-analysis the coefficients of intermittency and singularity of the turbulent processes were found, and power view of the general diffusion coefficient on scale (power exponent is varied in 0.02 – 0.71) was obtained, which points to the presence of super-diffusion processes.
Significant difference of a spectral index for moments before and during dipolarization of magnetic field in the Earth's magnetotail is noted: before the dipolarization a spectral index was varied in the range from 1.674 ± 0.005 to 1.916 ± 0.019 (close to Kolmogorov's model), and during dipolarization from 2.257 ± 0.037 to 2.422 ± 0.042 ($\sim 7/3$ – electron-magnetohydrodynamics theory).
Wavelet analysis demonstrated the presence of both direct and reverse cascade processes and Pc pulsations.

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