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Inter-scale transfer entropy in the turbulent magnetic field of the Earth's Magnetospheric Cusp

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The technique of transfer entropy calculation, which is new in the field of magnetospheric physics, is applied to investigate the inter-scale dynamical coupling for the turbulent fluctuations of the magnetic field in the Earth's Magnetospheric Cusp. Given two time series representing the evolutions of two processes, the transfer entropy should quantify the degree of dynamical influence exerted by the first on the other and vice-versa.

In the present study total magnetic field intensity data from the POLAR spacecraft crossing the Cusp are used. The evolution of fixed scale fluctuations is described by the time series of the square modulus of wavelet coefficients of these data. Studying the transfer entropy between nearby scales and between a fixed scale and all the others, an analysis of the inter-scale coupling as a function of the scale may be done, and different scale intervals with defined verse of prevailing cascade processes singled out.