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Dynamical complexity in Dst time series using entropy concepts and rescaled range analysis

Georgios Balasis (1), Ioannis A. Daglis (1), Anastasios Anastasiadis (1), and Konstantinos Eftaxias (2)

(1) National Observatory of Athens, Institute for Space Applications and Remote Sensing, Athens, Greece (gbalasis@space.noa.gr, +302106138343), (2) University of Athens, Department of Physics, Section of Solid State Physics, Athens, Greece

Using an array of diagnostic tools including entropy concepts and rescaled range analysis (R/S), we establish that the Dst time series exhibits long-range correlations, and that the underlying stochastic process can be modeled as fractional Brownian motion (fBm). We show the emergence of two distinct patterns in the Earth's magnetosphere: (1) a pattern associated with the intense magnetic storms, which is characterized by a higher degree of organization (i.e., lower complexity or higher predictability for the system) and persistent behavior, and (2) a pattern associated with normal periods, which is characterized by a lower degree of organization (i.e., higher complexity or lower predictability for the system) and anti-persistent behavior.