Geophysical Research Abstracts,
Vol. 11, EGU2009-2850, 2009
EGU General Assembly 2009

Investigating dynamical complexity in the magnetosphere using various entropy measures

G. Balasis (1), I. A. Daglis (1), C. Papadimitriou (2), M. Kalimeri (2), A. Anastasiadis (1), and K. 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, Faculty of Physics, Department of Solid State Physics, Athens, Greece

The complex system of the Earth's magnetosphere corresponds to an open spatially extended non-equilibrium (input - output) dynamical system. The non-extensive Tsallis entropy has been recently introduced [*Balasis et al. (2008), Geophys. Res. Lett., 35, L14102, doi:10.1029/2008GL034743*] as an appropriate information measure to investigate dynamical complexity in the magnetosphere. The method has been employed for analyzing D_{st} time series and gave promising results, detecting the complexity dissimilarity among different physiological and pathological magnetospheric states (i.e., pre-storm activity and intense magnetic storms, respectively). This paper explores the applicability and effectiveness of a variety of computable entropy measures (e.g. Block entropy, Kolmogorov entropy, T-complexity and Approximate entropy) to the investigation of dynamical complexity in the magnetosphere. We show that as the magnetic storm approaches there is clear evidence of significant lower complexity in the magnetosphere. Overall, Approximate entropy and Tsallis entropy yield superior results for detecting dynamical complexity in the magnetosphere in comparison to the other entropy measures presented herein. Ultimately, the analysis tools developed in the course of this study for the treatment of D_{st} index can provide convenience for space weather applications.