# Driver effects on the evolution of fractality in the Earth's magnetosphere: an MHD Shell Model study

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Studies on complexity are of great interest in plasma physics, providing new insights and revealing possible universalities on issues such as geomagnetic activity, turbulence in laboratory plasmas, solar wind physics, etc.

We have studied the temporal evolution of geomagnetic activity, by calculating a fractal dimension from *Dst* data. [1] The fractal dimension decreases during magnetic storms, effect which is consistently observed across several time scales, from individual storms to a complete solar cycle.

On the other hand, shell models are low dimensional dynamical models describing the main statistical properties of magnetohydrodynamic (MHD) turbulence [2]. These models allow to describe extreme parameter conditions hence reaching very high Reynolds numbers. Here an MHD shell model is used to describe the dissipative events taking place in the Earth's magnetosphere and causing geomagnetic storms.

Recently, we calculated the box-counting fractal dimension for the time series of the magnetic energy dissipation rate obtained in an MHD shell model [3]. For some values of the viscosity and the diffusivity, the fractal dimension and the occurrence of bursts present correlations similar to those observed in geomagnetic and solar data [1].

In Refs. [2,3], the forcing terms of the shell model are obtained by solving a Langevin equation. However, Ref. [1] suggests that it would be interesting to study the effect of a driver whose fractal features vary over time. Here we present preliminary results obtained by using other time series as forcing terms in the model. In particular, we study the model response under two forcing regimes, related to quiet and active states of geomagnetic activity.

Using this modified shell model, the fractal dimension of the magnetic energy dissipation rate time series is calculated, and results are compared with previous works.

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