Comparative study of the spatiotemporal scaling behavior of the ground geomagnetic field fluctuations and auroral UV emissions.

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Numerous studies have addressed the multiscale nature of the complex high latitude auroral phenomena manifested, for example, in terms of auroral substorms. Also, a number of different schemes have been proposed to explain the observed multi-scale features. To conclusively track the source(s) for these features, it is clear that multiscale multi-instrument approaches capable of addressing different aspects of the plasma physical processes driving the complexity of the system are required.

Here, the spatiotemporal scaling properties of the auroral region ground horizontal magnetic field fluctuations and UV emissions are investigated in terms of the structure function analysis. The aim of this (tentative) comparative investigation is to begin to address the multiscale electrodynamics (involving the currents, the electric field and the conductivity) of the auroral ionosphere. The ultimate goal is to move toward comprehensive multiscale description of the ionospheric electrodynamics coupled to the solar wind-magnetosphere system. Initial results of the analysis indicate that both the spatial and the temporal scaling features of the the ground geomagnetic field fluctuations and auroral UV emissions are very similar. Implications of this and some theoretical results regarding the possible coupling to the electric field scaling behavior are discussed.