

Spectral Properties of the vortices in the magnetotail and fractal Structures

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Vortex structures are often detected in the plasma media, for instance in the magnetosheath, in the magnetotail and in the ionosphere. Large scale vortices may correspond to the injection scale of turbulence, so that understanding their origin is important for understanding the energy transfer processes in the geospace environment. In a recent work, the THEMIS mission has detected vortices in the magnetotail in association with the strong velocity shear of a substorm plasma flow (Keiling et al., *J. Geophys. Res.*, 114, A00C22 (2009), doi:10.1029/2009JA014114), which have conjugate vortices in the ionosphere. The THEMIS data is analyzed for that event, the spectral properties of the vortex solution and of the network of such vortices is investigated. The model dipole vortex structures have equal spectral features as the observation data at substorm event. The spectrum includes the size of the vortex as well as the distance between the vortices. The kinematic model of interaction of the vortices with nonstationary flows is considered. Possibility of generation of the fractal structures is shown.