Generation of dispersive Alfvenic turbulence in magnetosphere-ionosphere feedback coupling

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Magnetosphere-ionosphere (M-I) feedback coupling is considered to provide possible explanations to self-excitatation of auroral arc structures with enhancements of the ionospheric density and the field-aligned current. Recent theoretical and numerical studies have revealed generation of Alfvenic turbulence in the nonlinear evolution of the feedback instability, following the Kelvin-Helmholtz instability accompanied with curl structures of the ionospheric density.
Our recent study has extented to include effects of the electron intertia in the magnetospheric dynamics, where the dispersive Alfven waves with the parallel electric field play a key role in the M-I coupling. The linear stability analysis incuding the electron inertia term has shown the stabilization effect while the mean parallel acceleration of electrons is self-consistently included in the model of auroral arc growth. Nonlinear simulations of the feedback instability have also demonstrated generation of the Alfvenic turbulence with finite parallel electric fields, where a power law energy spectra are obtained for the parallel and perpendicular wavenumbers. The physical picture of Alfvenic turbulence obtained in the persent study is consistent to FAST spacecraft observations of the dispersive Alfven waves and the electron acceleration in the Alfvenic aurora.

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