

Generation of dispersive Alfvénic turbulence in magnetosphere-ionosphere feedback coupling

*Tomo-Hiko Watanabe¹, Masatoshi Kaneyama¹, Shinya Maeyama¹

1. Graduate School of Science, Nagoya University

Magnetosphere-ionosphere (M-I) feedback coupling is considered to provide possible explanations to self-excitation of auroral arc structures with enhancements of the ionospheric density and the field-aligned current. Recent theoretical and numerical studies have revealed generation of Alfvénic 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 extended to include effects of the electron inertia in the magnetospheric dynamics, where the dispersive Alfvén waves with the parallel electric field play a key role in the M-I coupling. The linear stability analysis including 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 Alfvénic turbulence with finite parallel electric fields, where a power law energy spectra are obtained for the parallel and perpendicular wavenumbers. The physical picture of Alfvénic turbulence obtained in the present study is consistent to FAST spacecraft observations of the dispersive Alfvén waves and the electron acceleration in the Alfvénic aurora.

Keywords: aurora, magnetosphere-ionosphere coupling, turbulence, electron acceleration, Alfvén waves