

## Magnetosphere-ionosphere coupling model for evolution of auroral arcs

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Our recent modeling studies on evolution of auroral arcs and the related nonlinear wave activities are presented. The model basically treats Alfvén wave dynamics driven by the magnetosphere-ionosphere coupling process and covers a narrow dipole flux tube in the auroral region. The magnetospheric plasma is described by the reduced-MHD equations of electric and magnetic perturbations in a background convection field. The ionospheric plasma motion is described by the compressible two-fluid equations and is characterized by the Pedersen and Hall currents. The field-aligned current of the Alfvén wave flows into the ionosphere, producing an internal uniformity of plasma density or conductivity, which in turn triggers new wave propagation to the magnetosphere. The three-dimensional simulations reproduce auroral structuring such as splitting of arc and vortices, along with field line oscillatory behaviors. In this talk, we introduce results of these simulations and provide implications to future planning observations as EISCAT-3D.

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