Generation of auroral turbulence in the magnetosphere-ionosphere coupling

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The magnetosphere-ionosphere (M-I) coupling is unstable to the feedback instability, when the large-scale ExB convection flow velocity exceeds a critical value, where the shear (or kinetic) Alfven waves are amplified with enhancement of the field aligned current (FAC). The local development of FAC is related to enhancement of electron precipitation and spontaneous excitation of auroral arc structures with ionospheric density increase. The feedback instability has been investigated both in the linear and the weak nonlinear regimes while the full nonlinear study is limited so far. In the present study, we discuss a nonlinear evolution of the feedback instability and transition to turbulence.
Nonlinear saturation of the feedback instability growth has recently been discussed in terms of the secondary instability [2], where the Kelvin-Helmholtz type mode is generated by a sheared ExB flow. Then, one finds transition to turbulence through the M-I coupling [2], providing a theoretical understanding on spontaneous generation of Alfvenic turbulence observed in auroral regions.

[1] T.-H. Watanabe, Phys. Plasmas 17, 022904 (2010).
[2] T.-H. Watanabe, H. Kurata, and S. Maeyama, New J. Phys. 18, 125010 (2016).

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