

New Interpretation of PBI: Can the ionospheric polarization FAC induce explosive electron acceleration?

Akimasa Yoshikawa[1]; Shinichi Ohtani[2]

[1] ICSWSE/Kyushu Univ.; [2] The Johns Hopkins University Applied Physics Laboratory

A new idea for interpretation of the poleward boundary intensification(PBI) of aurora emission is proposed by Ohtani and Yoshikawa [2016]. In their model, as the polar cap flow approaches the auroral oval, field aligned currents (FACs) are induced by the polarization effect at the poleward boundary of auroral oval because of divergence of ionospheric current accompanied by the polar cap flow at the steep gradient of conductivity. Their model could explain some features of PBIs summarized by Zou et al., [2014] such as horizontal extension of PBIs along the boundary of auroral oval. According to the Ohtani and Yoshikawa [2016], ionospheric polarization can produce upward FACs enough to explain the PBIs in amplitude of current density. However, the ionospheric E-layer is filled with cold and dense plasma, an expected downward electron velocity accompanied by polarization FAC of an upward shear Alfvén wave is only the order of several tens of m/sec, which alone has a difficulty in explaining auroral emission of PBIs. To understand a generation process of PBIs of auroral emission, we need to clarify the acceleration process of downward electrons during shear Alfvén wave excited by the polarization effect, is propagating to the magnetosphere from the ionosphere. In this study, we consider the kinetic process of electron acceleration during shear Alfvén wave crossing the density cavity region just above the ionosphere, which are characterized by the steep gradients of the Alfvén velocity and electron inertial length. We will discuss how the generation process of super Alfvénic electrons by the inertial Alfvén wave at the electron cavity region can be applied to the PBIs of auroral emission.