

Relativistic effect on dispersionless injection associated with substorms

*Tzu-Fang Chang^{1,2}, Chio-Zong Cheng², Chih-Yu Chiang², Sunny Wing-Yee Tam², Yoshizumi Miyoshi¹, Tomoaki Hori¹, Takefumi Mitani³, Takeshi Takashima³, Ayako Matsuoka³, Mariko Teramoto¹

1. Institute for Space-Earth Environmental Research, Nagoya University, Japan, 2. Institute of Space and Plasma Sciences, National Cheng Kung University, Tainan, Taiwan, 3. Institute of Space and Astronautical Science, Japan Aerospace Exploration Agency, Japan

Substorm dispersionless energetic particle injection to inner magnetosphere has been investigated on the basis of a classical electromagnetic pulse model [Zaharia et al., 2000]. In order to consider the effect of disturbed event on particle transport, relativistic effect is considered in our study to improve non-relativistic calculation results to get better agreement with satellite observation. We combine the ground-based observations and in situ magnetic field and particle data observed from satellites in the inner magnetosphere to investigate the transport of energetic particles associated with the substorms. In this study, the particle drift motion, the adiabatic invariant and particle magnetic moment differ from the previous non-relativistic particle motion model. We simulate the evolution of energetic particle injections during substorms and discuss the difference among non-relativistic, relativistic, and observational results.

Keywords: particle injection, dispersionless, substorm, relativistic effect