

## Rapid acceleration of relativistic electrons associated with pressure pulse: Simulation and Arase and Van Allen Probe observations

# Masahiro Hayashi[1]; Yoshizumi Miyoshi[1]; Shinji Saito[2]; Yosuke Matsumoto[3]; Satoshi Kurita[1]; Mariko Teramoto[4]; Tomoaki Hori[1]; Shoya Matsuda[1]; Masafumi Shoji[1]; Shinobu Machida[5]; Takanobu Amano[6]; Kanako Seki[7]; Nana Higashio[8]; Takefumi Mitani[9]; Takeshi Takashima[10]; Yoshiya Kasahara[11]; Yasumasa Kasaba[12]; Satoshi Yagitani[11]; Keigo Ishisaka[13]; Fuminori Tsuchiya[14]; Atsushi Kumamoto[15]; Ayako Matsuoka[16]; Iku Shinohara[17]  
[1] ISEE, Nagoya Univ.; [2] Nagoya Univ.; [3] Chiba University; [4] ISEE, Nagoya University; [5] ISEE, Nagoya Univ.; [6] University of Tokyo; [7] Dept. Earth & Planetary Sci., Science, Univ. Tokyo; [8] JAXA; [9] ISAS/JAXA; [10] ISAS, JAXA; [11] Kanazawa Univ.; [12] Tohoku Univ.; [13] Toyama Pref. Univ.; [14] Planet. Plasma Atmos. Res. Cent., Tohoku Univ.; [15] Dept. Geophys, Tohoku Univ.; [16] ISAS/JAXA; [17] ISAS/JAXA

Relativistic electron fluxes of the outer radiation belt rapidly change in response to solar wind variations. One of the shortest acceleration processes of electrons in the outer radiation belt is wave-particle interactions between drifting electrons and fast-mode waves induced by compression of the dayside magnetopause caused by interplanetary shocks. In order to investigate this process by a solar wind pressure pulse, we perform a code-coupling simulation using the GEMSIS-RB test particle simulation (Saito et al., 2010) and the GEMSIS-GM global MHD magnetosphere simulation (Matsumoto et al., 2010). As a case study, an interplanetary pressure pulse with the enhancement of  $\sim 5$  nPa is used as the up-stream condition. In the magnetosphere, the fast mode waves with the azimuthal electric field (negative  $E_{\phi}$  :  $|E_{\phi}| \sim 10$  mV/m, azimuthal mode number :  $m \leq 2$ ) propagates from the dayside to nightside, interacting with electrons. From the simulation results, we derived effective acceleration model and condition : the electrons whose drift velocities are greater than  $(3.14 / 2)$  times fast mode speed are accelerated efficiently.

Recently, the Arase (ERG) satellite and Van Allen Probes observed the rapid enhancement of electron fluxes for hundreds of keV to MeV associated with storm sudden commencement (SSC) on July 16, 2017. During the period, the sharp enhancement of the solar wind dynamic pressure from 1 nPa to 15 nPa was observed. In this event, drift echoes after the flux enhancement and magnetic field variations due to the fast mode wave propagation were observed. We will compare our simulation results with observations from Arase and Van Allen Probes, and investigate the acceleration condition of relativistic electrons associated with the SSC.