Energetic electron precipitations during magnetic storms of 7-8 September, 2017 using LF/VLF standard radio waves

*Miyashita Takuya[1], Hiroyo Ohya[1], Fuminori Tsuchiya[2], Kazuo Shiokawa[3], Yoshizumi Miyoshi[3], Hiroyuki Nakata[1], Toshiaki Takano[1]

1. Chiba University, 2. Tohoku University, 3. Nagoya University

During geomagnetic storms, a lot of studies have been reported energetic electrons precipitate into the atmosphere at the high latitudes. It is known that the low-latitude limit of the particle precipitations is L ~ 4.0 (Berkey et al., 1974). However, several studies reported that the particle precipitations occurred at the mid and low latitudes (L ~ 1.3-2.8) (Kikuchi and Evans, 1989; Clilverd et al., 2008). In this study, we investigate the precipitations of energetic electrons into the atmospheres during the geomagnetic storms of 7-8 September, 2017, using a network of LF/VLF standard radio waves from the low and high latitudes. The transmitters are NRK (Iceland, 37.5 kHz), NPM (Hawaii, 21.4 kHz), and JJI (Japan, 22.2 kHz), while the receivers are NYA (Ny-Alesund, L = 15.55) and PKR (Poker Flat, L = 5.95). The geomagnetic storms occurred on 7-8 September, 2017. The minimum Dst value was -142 nT at 02:00 UT on 8 September, 2017. A substorm onset was 19:40 UT on 7 September, 2017. On the NRK-NYA propagation path (the path length: 2002.2 km, night propagation), variations in the LF intensity and phase due to precipitations were seen from 23:20 UT on 7 September to 01:00 UT on 8 September. The amplitudes of the variations in the intensity and phase were about 7 dB and 70 degrees, respectively. Based on wavelet spectra, the NRK-NYA intensity and phase had periods of 10 min. and 30-40 min. The periods of 10 min. would correspond to Pc5 modulation. At the mid-point of the NRK-NYA path (jan: Jan Mayen, Norway), magnetic D component had similar period of 30-40 min. during the LF variations, while the H and Z components had 50-80 min. Similarly, on the NRK-PKR path (4999.0 km, night-day propagation), variations in intensity and phase were seen from 23:24 UT on 7 September to 01:00 UT on 8 September. The amplitudes of the intensity and phase were about 4 dB and 40 degrees, respectively. The periods of the intensity and phase were same (10 min. and 30-40 min.) with those of the NRK-NYA path. At the mid-point of the NRK-PKR path (thl: Qaanaaq, Greenland), magnetic H, D, and Z components had 30-80 min. In the presentation, we will show LF/VLF variations on other paths of NPM-NYA and JJI-NYA in more detail.

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