Night-E layer appearance throughout the over Japanese archipelago during severe geomagnetic storm in March 1989

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We found in ionograms that night-E layer had been observed during a severe geomagnetic storm on March 1989 at five sites in Japan; Wakkanai, Akita, Kokubunji, Ogimi, and Okinawa. According to magnetic field observation at Kakioka, Japan, sudden storm commencement occurred at 01:28 UT on 13 March, maximum range of H component magnetic field variation reached 644 nT, and it recovered to moderate level at 22 UT on 15 March. Night-E layer was observed almost all the night time of JST from 13 to 14 March. The appearance period corresponds to the main phase of geomagnetic storm. Generally, night-E layer appears as a consequence of auroral particle precipitation in high latitudes. During the March 1989 storm, the auroral oval extremely expanded to lower latitudes, and aurora could be seen as far south as Florida, USA of which magnetic latitude is about 35 degrees. On the other hand, aurora could not be watched in Japan because of cloudy weather. However, the magnetic latitudes about 15–35 degree of Japan is too low to interpret that night-E layer was caused by auroral particle precipitation. The possible explanation that cause ionization in the E layer is precipitation of energetic neutral atoms from the ring current rapidly developing and recovering. Energetic neutral atoms are created by charge-exchange interaction with geo corona. In the presentation, we show more details of night-E layer evolution in relation with geomagnetic storm development and discuss possible generation mechanism of night-E layer over Japan.