Particle and field characteristics associated with broadband electron observed by the FAST satellite during a geomagnetic storm

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Broadband electrons are remarkable flux enhancements of precipitating electrons over a broad energy range of 0.03-30 keV near the equatorward edge of the auroral oval during geomagnetic storms. These flux enhancements were initially reported using particle data of the DMSP satellites. However, the DMSP satellites have not measured pitch angle distribution of precipitating electrons. We investigate broadband electrons using data from the FAST satellite, which measures pitch angle distribution of precipitating particles, electric field, magnetic field, and plasma waves simultaneously. Sixteen events of broadband electrons were identified from the electron energy spectra obtained by the FAST satellite from 84 geomagnetic storms between September 1996 and March 2004. Here, we show characteristics of particle energy spectra, electric and magnetic fields, and wave spectra during the broadband electron event of July 15, 2000. The broadband electrons were observed at an altitude of ˜2000 km at 2219:30-2220:55 UT at 59-61 MLAT and 21 h MLT. This broadband electron event was observed at ˜8 min after the onset of a substorm during the main phase of a geomagnetic storm. The precipitation region of the broadband electrons corresponded to a localized intensification of auroral emission observed by the POLAR UVI images at 50-60 MLAT and 20-21 MLT. This auroral intensification lasted ˜14 min, indicating that the duration of this broadband electron event was ˜14 min. These results suggest that a rapid particle acceleration was occurring in the inner magnetosphere associated with a storm-time substorm. During this event, pitch angle distribution of broadband electrons was isotropic and showed loss-cone features in the upward direction at a high energy range above 1 keV. For some cases, they fit to the Maxwellian distribution function. At a low energy range below 1 keV, field-aligned electron fluxes tended to be higher than the perpendicular fluxes. This low energy part did not fit to the Maxwellian distribution function. These results suggest that the high energy part of the broadband electrons originated from higher altitudes in the inner magnetosphere and that the low energy part was accelerated parallel to the local magnetic field at lower altitude near the satellite. The energy spectra of broadband electrons do not have monoenergetic peak, indicating that the low energy part of broadband electrons is accelerated by some kind of waves rather than by the field-aligned potential difference. Intense fluctuations of electric and magnetic field were observed during this broadband electron event. These results suggest that low energy part of broadband electrons are possibly accelerated by kinetic Alfven waves near the satellite altitude.