

れいめい衛星画像・粒子データに基づくサブストームオンセット前後のオーロラ加速プロセス

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Auroral acceleration processes in the vicinity of substorm onset time based on Reimei image-particle data

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We focus on the precise characteristics of auroral acceleration processes obtained in the vicinity of substorm onset time with the Reimei satellite. Recent satellite data showed that kinetic (inertial) Alfvén waves contribute to the field-aligned auroral acceleration. However, the characteristics, such as their relationship to substorm onset and auroral morphological types, are not well-understood. After the successful launch in 2005, Reimei still continues auroral measurements at 650-km altitude in the post-midnight sector. MAC measures N₂⁺ 1N (427.8 nm), OI (557.7 nm) and N₂ 1P (670 nm) simultaneously with spatial and time resolutions of 1 km and 120 ms, respectively. ESA and ISA measure electrons and ions, respectively, in the energy range of 10 - 12000 eV/q with time (spatial) resolution of 40 ms (300 m), respectively, although ESA was failed at August in 2008. We searched the conjunction events between substorm onset and Reimei measurement during the period of 200509 - 200808 using substorm onset lists based on measurement data with IMAGE/FUV (Frey et al, JGR, 2004), Polar/UVI (Liou et al., JGR, 2010) and Themis ground-based observatories. In addition, we used the Wp index to confirm the substorm onset time. We finally found 35 substorm events measured by Reimei which occurred at distances closer than 2000 km to the onset location within 5 min to onset time. Results are summarized as follows.

- In the vicinity of the onset time and several min after the onset, significant supra-thermal electrons (with energies up to several keV) are observed. This fact suggests that strong Alfvénic waves play important role on the electron acceleration during this period.

- These supra-thermal electrons are usually accompanied with mono-energetic electrons. This is consistent with the recent study by A. Ieda based on measurement data with FAST data [private comm., 2011].