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THEMIS衛星データを用いたオーロラ粒子に伴う磁気圏-電離圏結合過程の研究

Study of magnetosphere-ionosphere coupling processes through auroral particles using the THEMIS satellite data

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We investigate electron density, temperature, thermal current, and conductivity in the nightside plasma sheet using the data from the electrostatic analyzer (ESA) onboard the THEMIS satellite. The thermal current and conductivity are obtained from the electron density and temperature using the adiabatic equation by Knight (Planet. Space Sci., 1973) for auroral electron acceleration. The thermal current (jth) represents the field-aligned current that can be carried by magnetospheric electrons without field-aligned potential difference. The conductivity (K) represents the efficiency of the field-aligned current (j) that the field-aligned potential difference (V) can produce (j=KV). Therefore, estimating jth and K in the plasma sheet is important to know the ability of plasma sheet electrons to carry the field-aligned current which is driven by various magnetospheric processes such as flow shear and pressure gradient. Similar study was done by Shiokawa et al. (2000) based on the auroral electron data obtained by the DMSP satellites above the auroral oval and the AMPTE/IRM satellite in the near Earth plasma sheet at 10-18 Re on February-June 1985 and March-June 1986 during the solar minimum. In the present study, we use THEMIS data inside 12 Re where Shiokawa et al. (2000) did not investigate well. From a preliminary analysis using the THEMIS D data from Dec. 15, 2007 to Apr. 15, 2008, we found that the comparable average densities (0.35-0.45 /cm3) between THEMIS and AMPTE at 9-12 Re. The temperatures at THEMIS (-2000 eV) were much higher than those at AMPTE (600-700 eV). The thermal current at THMIES (0.35-0.45x10^-6 A/m2) was also little higher than that at AMPTE (0.25-0.35x10^-6 A/m2), but was still not enough for typical auroral current (1.0x10^-6 A/m2). The conductivity at THEMIS (3-5x10^-10 S/m2) was little lower than that at AMPTE (5-6x10^-10 S/m2). In the presentation, we show the results with more extended data periods, and will try to remove the radiation belt particle contamination that is apparent inside 9 Re. We will also consider the electron pitch angle distribution to estimate the density and temperature for the field-aligned electrons that contribute to the magnetosphere-ionosphere coupling processes.

キーワード: auroral particle, magnetosphere-ionosphere coupling, THEMIS

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