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沿磁力線電流の 3 次元分布に対する降下電子の影響

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Influence of precipitating electrons on three-dimensional distribution of field-aligned current

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We used three-dimensional Hall-magnetohydrodynamics simulations to investigate influence of precipitating electrons in the upward field-aligned current region. To excite the Alfvén waves, electric field perturbation is applied to the upper boundary of the simulation box located at 1000 km altitude. The ionospheric ion density is enhanced to incorporate the influence of precipitating electrons. First, we calculated the upward field-aligned potential drop on the basis of the magnitude of the upward field-aligned currents with conductance previously suggested. Secondly, we calculated the characteristic energy precipitating electrons by using empirical equations. Thirdly, assuming energy flux of precipitating electrons, we calculated the ionization rate by using the empirical atmospheric model MSIS-E90. Fourthly, we increased the ion density in accordance with the ionization rate. The distribution of the upward field-aligned currents appears to be modulated by the precipitating electrons. We discuss the influence of the precipitating electrons on the temporalspatial evolution of the field-aligned current.