

## Evaluation of the electron energy budget in the polar ionosphere

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The electron fluxes precipitating at the top of the high latitude ionosphere contribute to the production of ionization, to the excitation of atmospheric constituents, and to the heating of the ambient electrons directly or by the secondary electrons. The precipitated electrons lose their energy by ionization creating the secondary electrons, by heating of the ambient electrons and neutrals until they are assimilated into the ambient electrons. The heated ambient electrons transport this energy to the neutral gas and ambient ions. As a result, the temperature gradient produced in the ionospheric plasma induces a heat flux. For stationary conditions, the budget equation determines the balance between the heating rate, the cooling rate, and the heat conduction. The electron energy budget in the ionosphere is important for the interaction between ionized and neutral atmosphere and have been studied theoretically, but there is almost no studies based on long, continuous observations.

We estimated the intensity of the cooling rate and the heat conduction quantitatively as a function of altitude in the ionosphere using the European incoherent scatter (EISCAT) radar data and NRLMSIS-2000 model. From the results of the analysis for the disturbed conditions, the region where the heating rate is negative exists because the cooling rate is small compared to the heat conduction. It is suggested that the some processes, such as heat advection and divergence of the electron heat flow, are neglected when assuming a quasi-steady state. In this presentation, we evaluate quantitatively the terms of these processes in this region and discuss their effects on the electron energy budget.