

Development of the Suprathermal Plasma Analyzer and its performance verification

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Processes of energy transfer from suprathermal to thermal electrons have been poorly understood mainly due to a lack of observations, though they significantly affect the thermal structure of the lower ionosphere and play an important role in the energy budget. In this presentation, the development of suprathermal plasma analyzer and the results of its performance test are shown.

A completely new development of instrument based on the original concept to measure an energy distribution of thermal to suprathermal electrons (0.01-5 eV) is made. The innovative combination of a second harmonic method and a channel electron multiplier makes it possible to measure an energy distribution of both thermal and suprathermal electrons with high energy resolution. Outstanding points of this instrument are 1) accurate calibration of electron energy within the order of 0.01 eV, and 2) the energy resolution smaller than 0.15 eV.

We have also carried out a laboratory simulation in order to investigate the energetics of lower ionosphere as well as to confirm ability of the developed instrument. Several specific structures in the energy distribution are found to exist at a certain energy range and identified as the products of inelastic collisions of electrons with neutral particles.