Development of an auroral electron analyzer for RockSat-XN rocket mission

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In the Earth’ s magnetosphere, relativistic-energy (>MeV) electrons are trapped in the region called radiation belt. It is well known that these high-energy electrons rapidly drop out during the geomagnetic storm main phase, but the physical mechanism to be responsible is not exactly known. Although several hypotheses are proposed, they have not been well quantified. Therefore it is unclear which is the major cause of the loss of the radiation belt electrons.One candidate is the electron precipitation by pitch angle scattering via cyclotron resonance with whistler mode chorus waves. In order to evaluate this mechanism quantitatively, the amount of precipitating high energy electrons should be measured. Nevertheless, in the magnetosphere, where the scattering occurs, it is difficult to identify precipitating electrons because of the small size of the loss cone. On the other hand, in the ionosphere, where the precipitating electrons can be directly measured, it is not easy to identify chorus waves that correspond to the precipitating electrons, since chorus waves do not propagate in exactly parallel to the geomagnetic field, and not always reach the ionosphere with the sufficient intensity. Here we suggest another method, to observe the pulsating aurora (PsA) in the ionosphere instead of the chorus waves, since this type of aurora is driven by chorus wave in the magnetospheric equator. In order to put this idea into practice, we are planning to launch some instruments onboard RockSat-XN rocket into a PsA in January 2019 and observe a PsA and associated precipitating electrons. We develop medium-energy (20-100 keV) electron detector (MED) to measure the electrons responsible for the pulsating-auroral illumination. We present and discuss the results of laboratory experiments we have done so far.

