

【Grant-in-Aid for Scientific Research (S)】

Science and Engineering (Mathematical and Physical Sciences)



Title of Project : The Quest for the Ultimate Production Mechanism of Pulsating Auroras with Extremely High Time Resolution and Coordinated Observations from Space and Ground

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Research Project Number : 15H05747 Researcher Number : 00132712

Research Area : Space Plasma Physics

Keyword : Pulsating aurora, Fast modulations, Magnetosphere-ionosphere coupling

【Purpose and Background of the Research】

The purpose of the project is to elucidate the ultimate production mechanisms of the pulsating aurora (PsA, Fig. 1). The pulsating aurora is one of the most fundamental auroras that rapidly switches on and off and/or modulates its luminosity quasi-periodically (typically 5s to 40s). It inherently involves an intermittent internal modulation with a few hundred msec apart, which modulation is believed to be the fundamental element of PsA without scientific demonstration yet. The project will have comprehensive means to pursue the purpose. Observations with extremely high time resolutions for all instruments will be realized in this study, and comparative studies between the observations and their complementary simulation shed light on the cause, possibly a plasma wave-high energy electron interaction and its consequence, PsA.



Figure1. Pulsating aurora viewed from International Space Station (Credit: NASA)

【Research Methods】

This team consists of a) ground-based observation team, b) simulation team, c) satellite observation team, and d) sounding rocket observation team (Figure 2). The high-speed optical observations with the EMCCD camera observations will be done to identify main and internal modulations of PsA in Alaska and Scandinavia. The satellite observation team will measure directly the wave-particle interactions. The sounding rocket observation team will observe the precipitating electrons with the high-time resolution. The simulation team will calculate the precipitating electrons at the ionospheric altitudes using the observed plasma

waves and electron data as an initial condition.

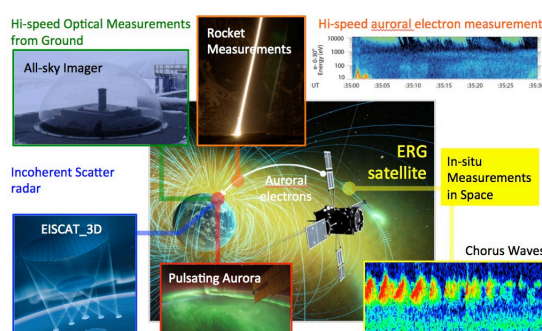


Figure2 Integrated study of pulsating aurora

【Expected Research Achievements and Scientific Significance】

The integrated studies conducted by our team will reveal the ultimate origin of the modulation associated with PsA that has never been understood for past 50 years. Moreover, our study will contribute to a comprehensive understanding of the wave-particle interactions, a fundamental physical process frequently and widely seen in the universe.

【Publications Relevant to the Project】

Fujii, et al., Conjugacies of pulsating auroras by all-sky TV observations, *Geophys. Res. Lett.*, 14, 1987.

Miyoshi, Oyama, Saito et al., Energetic electron precipitation associated with pulsating aurora: EISCAT and Van Allen Probes observations, *J. Geophys. Res.*, 120, 2015.

【Term of Project】 FY2015-2019

【Budget Allocation】 152,600 Thousand Yen

【Homepage Address and Other Contact Information】

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