【Grant-in-Aid for Specially Promoted Research】

Science and Engineering (Mathematics/Physics)

Title of Project : Study of dynamical variation of particles and waves in the inner magnetosphere using ground-based network observations

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Research Project Number : 16H06286 Researcher Number : 80226092
Research Area : Aeronomy
Keyword : Magnetosphere and Ionosphere, Aeronomy, Space Science, Upper Atmosphere, Geospace

【Purpose and Background of the Research】

The dynamical variation of particles and waves in the inner magnetosphere is one of the most important research topics in recent space physics. The inner magnetosphere contains plasmas in wide energy ranges from below electron volts to Mega-electron volts. These plasmas (electrons and ions) interact with ULF/ELF/VLF waves at frequencies of 0.1 Hz to 10 kHz to cause their energization in the equatorial plane of the magnetosphere and loss into the ionosphere. The objectives of this project is to provide global distribution and quantitative evaluation of the dynamical variation of plasmas and waves in the inner magnetosphere.

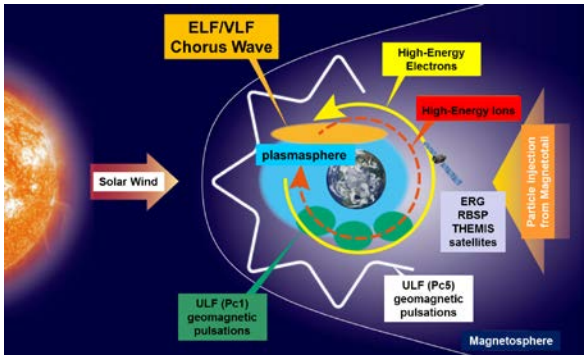

Figure 1. Particles and waves in the inner magnetosphere (looking down from the north pole).

【Research Methods】

We construct a longitudinal observation network at 8 ground-based stations at subauroral latitudes (magnetic latitudes: ~60 degree) to monitor 2-dimentional images of particle precipitation and ULF/ELF/VLF waves at frequencies of 0.1Hz – 10 kHz. We combine these longitudinal network observations with the ERG satellite, which will be launched in fiscal year 2016, and global modeling. Using these comprehensive observations and modeling, we provide global distribution and quantitative evaluation of the dynamical variation of plasmas and waves in the inner magnetosphere at L~4 Re near the plasmapause.

【Expected Research Achievements and Scientific Significance】

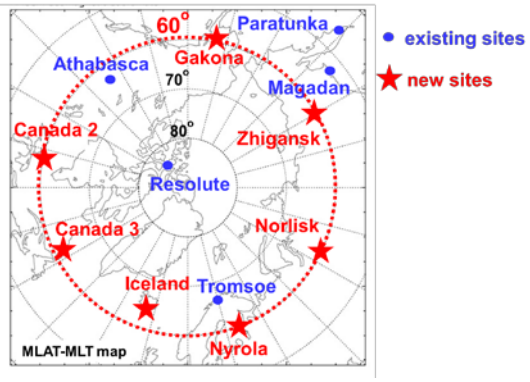

Figure 2. Ground network sites which will be deployed in this project.

The MeV-energy electrons in the inner magnetosphere forms the radiation belts around the Earth, which are continuous thread for space vehicles and human bodies in space. The outcome from our project will increase the accuracy of forecasting the variations of radiation belt particles in the inner magnetosphere and contribute to the safe operation of human activities in space. The results of our project are applicable to any astronomical bodies which have dipole magnetic field and atmosphere, and will increase the basic understanding of physical processes on the energization and loss of plasmas in space.

【Publications Relevant to the Project】

Miyoshi et al., The Energization and Radiation in Geospace (ERG) Project, in Dynamics of the Earth's Radiation Belts and Inner Magnetosphere, Geophys. Monogr. Ser., 199, pp.103-116, AGU, doi:10.1029/2012BK001304, 2012.

【Term of Project】

FY2016-2020

【Budget Allocation】

376,100 Thousand Yen

【Homepage Address and Other Contact Information】

http://www.isee.nagoya-u.ac.jp/dimr/PWING/