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Space plasma/particle experimental suite for the Japanese Geospace exploration mission "ERG"

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The Japanese mission for the Geospace exploration was formally approved by JAXA in 2012, which is now under development toward the launch in 2016. The satellite is named "ERG", standing for the satellite observing "Energization and Radiation in Geospace", and will carry six sensors for the space plasma/particle experiment (PPE), four for electrons and two for ions. This presentation is devoted to an overview of PPE.

The space plasma/particle experimental suite (PPE) consists of XEP-e, HEP-e-H&L, MEP-e, LEP-e for the electron measurements in a wide energy range from 10 eV to 20 MeV, and MEP-i, LEP-i for the magnetospherically typical composition of ions with energies of 10 eV - 180 MeV. The first letter of each sensor name means the energy range, i.e., extremely high (X), high (H), medium (M), low (L) energy ranges. HEP-e has two types of sensor configuration to cover the higher (0.7 - 2 MeV) and lower (0.07 - 1 MeV) energy ranges of electrons with appropriate geometrical factors (larger for higher energy and smaller for lower), which are correspondent to HEP-e-H and -L. All of sensors except for XEP-e could cover most of 4-pi sr in a satellite spin motion because of their wide field-of-views over more than pi rad. The energy analysis techniques for higher and lower energy particles are the pulse height analysis using scintillator and/or solid state detectors and the energy sweep method with electrostatic energy analyzers, respectively. We will also apply some countermeasures based on double/triple coincidence methods, sufficient passive shielding, and miniaturized detection areas, against the background noises due to the radiation-belt particles.

One of the prominent properties of the ERG mission is the first challenge to directly and quantitatively evaluate the energy transfer process between plasma waves and particles (electrons) based on the wave-particle interaction analyses using the wave form measurements and the three-dimensional velocity information for each incident electron. Individual data for each particle measured by XEP-e, HEP-e, and MEP-e are sent to a data storage device for the science instruments and statistically analyzed together with the plasma wave data in a high time accuracy (10 micro sec.) in the mission data processor.

We will report the basic characteristics of ERG-PPE and the current plan/status.

Keywords: Geospace, Space Storm, Particle Acceleration, Space Plasma, Plasma Wave, Exploration Mission