Initial results of HFA onboard the ARASE satellite: Observations of plasmasphere evolution and AKR from the both hemisphere

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High Frequency Analyzer (HFA) is a subcomponent of the Plasma Wave Experiment (PWE) onboard the ARASE (ERG) satellite for observation of radio and plasma waves in a frequency range from 0.01 to 10 MHz. In ERG mission, HFA is expected to perform the following observations: (1) Observation of upper hybrid resonance (UHR) waves in order to determine the electron number density around the spacecraft. (2) Observation of magnetic field component of the chorus waves in a frequency range from 20 kHz to 100 kHz. (3) Observation of radio and plasma waves excited via wave particle interactions and mode conversion processes in storm-time magnetosphere.

HFA is operated in the following three observation modes: EE-mode, EB-mode, and Plasmapause-mode. In far-Earth region, HFA is operated in EE-mode. Spectrogram of two orthogonal or right and left-handed components of electric field in perpendicular directions to the spin axis of the spacecraft are obtained. In the near-Earth region, HFA is operated in EB-mode. Spectrogram of one components of electric field in perpendicular direction to the spin plane, and one component of the magnetic field in parallel direction to the spin axis are obtained. In EE and EB-modes, the frequency range from 0.01 to 10 MHz are covered with 480 frequency steps. The time resolution is 8 sec. We also prepared Plasmapause mode to measure the locations and structures of the plasmapause at higher resolution. In Plasmapause-mode, spectrogram of one electric field component in a frequency range from 0.01-0.4 MHz or 0.1-1 MHz can be obtained at time resolution of 1 sec.

In initial check after the successful deployment of the wire antenna and search coils mast, we could start routine observations and detect various radio and plasma wave phenomena such as upper hybrid resonance (UHR) waves, electrostatic electron cyclotron harmonic (ESCH) waves, auroral kilometric radiation (AKR), kilometric continuum (KC) and Type-III solar radio bursts. In the presentation, we will report the initial results based on the datasets obtained since January 2017 focusing on the analyses of plasmasphere evolution by semi-automatic identification of UHR frequency, and AKR from the both hemisphere based on polarization measurement.