

## Polarization Analyses and Direction Finding of Plasma Waves via the Continuous Cross-Spectrum Measurement by Arase/PWE

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Exploration of energization and Radiation in Geospace (ERG) is a mission for understanding particle acceleration, loss mechanisms, and the dynamic evolution of space storms in the context of cross-energy and cross-regional coupling [Miyoshi et al., 2012]. The Plasma Wave Experiment (PWE) is one of the science instruments on board the ERG (Arase) satellite to measure electric field and magnetic field in the inner magnetosphere. OFA/WFC (Onboard Frequency Analyzer and Waveform Capture), which is a sub-system of PWE, measures electric and magnetic field spectrum and waveform from a few Hz to 20 kHz. The PWE/OFA subsystem calculates and produces three kind of data; OFA-SPEC (power spectrum), OFA-MATRIX (spectrum matrix), and OFA-COMPLEX (complex spectrum). They are continuously processed 24 hours per day and all data are sent to the ground. OFA-MATRIX measures ensemble averaged complex cross-spectra of each two components ( $E_x E_x^*$ ,  $E_x E_y^*$ , and  $E_y E_y^*$  for the electric field, and  $B_x B_x^*$ ,  $B_x B_y^*$ ,  $B_x B_z^*$ ,  $B_y B_y^*$ ,  $B_y B_z^*$ , and  $B_z B_z^*$  for the magnetic field) in every 8 seconds in the nominal mode. OFA-COMPLEX measures instantaneous complex spectra of electric and magnetic fields in every 8 seconds in the nominal mode. We can derive polarization and wave propagation direction of observed plasma waves for 24 consecutive hours by applying cross-spectrum analyses method (e.g., Means' method [Means, 1972], wave distribution function method [Storey and Lefeuvre, 1980] and SVD method [Santolik and Lefeuvre, 2003]) to these products measured by PWE/OFA. After we finished the initial check-out process and appropriate signal calibration, we successfully obtained clear polarization characteristics and wave propagation direction of observed plasma waves (e.g., whistler-mode chorus waves, magnetosonic waves, and plasmaspheric-hiss). We have been used the continuous cross-spectra obtained by PWE/OFA for the selective downlink of the observed raw waveforms. In this presentation, we introduce onboard processing techniques for continuous cross-spectrum calculation and its initial results.