Evaluation of waveform data processing in Wave-Particle Interaction Analyzer

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The Wave-Particle Interaction Analyzer (WPIA) is a software function installed on the Exploration of energization and Radiation in Geospace (ERG) satellite. The WPIA directly measures the quantity of energy transfer between whistler-mode chorus waves and resonant energetic electrons by using plasma wave vectors and velocity vectors of

plasma particles. The phase differences of the WPIA require accurate phase angles of waves and electrons in order to statistically evaluate the significance of the quantity of energy transfer. We propose a technical method for efficient waveform processing in order to conduct the WPIA measurement precisely. In the WPIA measurement, the various waves detected by the onboard instrument appear as noise in the calculation of the quantity of energy transfer for whistler-mode chorus waves. The characteristic frequency variation of the chorus waves makes waveform processing difficult. A chorus waveform is used for the WPIA processing through passband filtering by selecting appropriate data processing length and frequency resolution. We implement overlapping processing of wave data in order to reduce the induced error of the wave phase. The results of waveform processing indicate that the phase errors are successfully reduced and statistical fluctuations are suppressed. The proposed waveform processing method is a necessary and applicative processing for the calculations of the WPIA in the ERG mission.