Development of ISEE_Wave; Interactive Plasma Wave Analysis Tool

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In this study, we developed ISEE_Wave, which is an interactive plasma wave analysis tool for electric and magnetic field waveforms observed by the plasma wave experiment aboard the Arase satellite. ISEE_Wave provides an end-to-end wave analysis environment on a graphical user interface, where users can visualize advanced wave properties, such as the electric and magnetic field wave power spectra, wave normal polar angle, polarization ellipse, planarity of polarization, and Poynting vector angle. Users can simply select a time interval, and ISEE_Wave automatically downloads the waveform data, ambient magnetic field data, and spacecraft attitude data from the ERG Science Center, and performs coordinate transformation and spectral matrix calculation. Singular value decomposition is used as the core technique for the wave property analysis of ISEE_Wave. Users can freely specify the parameters of the wave property analysis and as well as the plot styles using the graphical user interface of ISEE_Wave. The results can be saved as image files and/or a tplot save file. The proposed tool aids in the identification of fine-structures of observed plasma waves, wave mode identification, and wave propagation analysis. These properties can be used to understand plasma wave generation, propagation, and wave-particle interaction in the inner magnetosphere. ISEE_Wave can also be applied to waveform data observed by other spacecrafts by replacing the data loading procedures.

Keywords: Plasma waves, Direction finding, Arase satellite

