

電場観測における光電子と衛星帯電による影響の除去について

Removal of spurious sunward electric field components generated by photoelectrons and spacecraft charging

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In general, space borne measurement of the magnetospheric electric field employing the double probe technique suffers from a spurious pseudo-sunward electric field component induced by spacecraft charging and photoelectrons. The Electric Field Detector (EFD) of the Plasma Wave Experiment (PWE) instrument onboard the Arase [TH1] satellite observed a distorted waveform of spin modulation in the electric potential difference between the probes and the spacecraft. The distorted waveform suggests that the spurious electric field can be represented by a combined electric potential applied by two model charges each representing the photoelectron cloud and spacecraft charging. An attempt was made to separate the spurious electric field component from the observed field to deduce the natural magnetospheric electric field by fitting some parameters of the two charges to the observed waveforms. The resultant fitted parameters successfully reproduced the observed distortion in the waveforms of the potential difference. However, in some cases, the fitting procedure overestimated the spurious component, resulting in an over-subtraction of the sunward component and thereby an erroneous electric field. That is [TH2] because the spurious electric field component has a sinusoidal component with the spacecraft spin period. To prevent the over-subtraction, a higher harmonic component was then employed to estimate the model charges. The new method works in a model calculation, but does not work well for Arase observations, due to inaccuracy of the positions of the model charges, and the spin modulation in the sunlit area of the spacecraft, from which photoelectrons are emitted.

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