Evaluation of the Wire Probe Antenna (WPT) and Electric Field Detector (EFD) of Plasma Wave Experiment (PWE) aboard ARASE: The data qualifications and cautions from the first-year observations

*笠羽 康正[1]、小路 真史[2]、中川 朋子[3]、堀 智昭[2]、新堀 淳樹[2]、松田 昇也[2]、三好 由純[2]、栗田 怜[2]、寺本 万里子[2]、石坂 圭吾[4]、笠原 禎也[5]、八木谷 聡[5]、小嶋 浩嗣[6]、能勢 正仁[6]、西村 幸敏[7]、高橋 直子[8]、松岡 彩子[9]、野村 麗子[9]、熊本 篤志[1]、土屋 史紀[1]、三澤 浩昭[1]
*Yasumasa Kasaba[1], Masafumi Shoji[2], Tomoko Nakagawa[3], Tomoaki Hori[2], Atsuki Shinbori[2], Shoya Matsuda[2], Yoshizumi Miyoshi[2], Satoshi Kurita[2], Mariko Teramoto[2], Keigo Ishisaka[4], Yoshiya Kasahara[5], Satoshi Yagitani[5], Hirotsugu Kojima[6], Masahito Nose[6], Yukitoshi Nishimura[7], Naoko Takahashi[8], Ayako Matsuoka[9], Reiko Nomura[9], Atsushi Kumamoto[1], Fuminori Tsuchiya[1], Hiroaki Misawa[1]

1. 東北大、2. 名古屋大・宇宙地球環境研、3. 東北工大、4. 富山県立大、5. 金沢大、6. 京都大、7. ボストン大、8. 東京大、9. 宇宙航空研究開発機構
1. Tohoku Univ., 2. ISEE, Nagoya Univ., 3. Tohoku Inst. Tech., 4. Toyama Pref. Univ., 5. Kanazawa Univ., 6. Kyoto Univ., 7. Boston Univ., 8. Univ. Tokyo, 9. JAXA

This paper shows the evaluation results of Wire Probe Antenna (WPT) and Electric Field Detector (EFD), which are one of the key parts of Plasma Wave Experiment (PWE) aboard the Arase (ERG) Satellite. The data qualifications and cautions from the first-year observations are shown for the scientists who expect to utilize this data sets.
WPT consists of the two sets of dipole antennas as electric field sensors with 32m tip-to-tip length, with a sphere probe (6cm diameter) attached at each end of wires (length: 15-m), extended orthogonally in the spin plane of the spacecraft which is roughly perpendicular to the Sun. WPT enables the PWE to measure the E-field in the frequency range from DC to 10 MHz. EFD is the 2-channel low frequency electric receiver as a part of EWO (EFD/WFC/OFA) and connected to the WPT for the measurement of 2ch electric field in the spin-plane with the sampling rate of 512 Hz (dynamic range: +-200 mV/m, +-3 V/m) and the 4ch spacecraft potential with the sampling rate of 128 Hz (dynamic range: +-100 V), respectively, with the the bias control capability for the WPT probes. The electric field in DC - 232Hz provides the capability to detect (1) the fundamental information of the plasma dynamics and accelerations and (2) the characteristics of MHD and ion waves with their Poynting vectors with the data measured by MGF and PWE/WFC-B connected to PWE/SCM (Search Coil Magnetometer) in stable and active magnetosopheric status. The spacecraft potential provides the basic electron density information with the upper hybrid resonance (UHR) frequency provided by PWE-HFA.
It is well known that the potential and electric field measureed by WPT and EFD has the tricky characteristics, which is common in the similar instruments aboard the MMS, Themis, and many previous spacecraft. In this paper, we summarize the status of their calibrations. Including the subtraction of spacecraft Velocity x B field, we introduce the potential problems for the data analyses of electric field in low frequency range caused by the effects of surrounding electron plasma characteristics on the spacecraft potential, wake effect caused by the spacecraft motions, and possible artificial contaminations, in order to support the fruitful scientific results from this valuable data sets with careful treatments.

キーワード：あらせ (ERG)、電場計測、ポテンシャル計測
Keywords: Arase (ERG), electric field, spacecraft potential

