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Discussions of Electrode Contamination Effects on a Retarding Potential Analyzer on-board Sounding Rocket

Hui-Kuan Fang[1*], Koichiro Oyama[1], Chio Z. Cheng[1]

[1]Plasma and Space Science Center, NCKU

Electrode contamination of a Langmuir probe in space is a serious problem even now although laboratory experimenters were aware of this problem for a long time. Surface contamination layer form extra capacitances and leads to a I-V curve distortion, which leads erroneous measurements, especially of electron temperature. Similar effects exist on electro-static analyzers, such as a retarding potential analyzer (RPA). Error caused by contaminations of a RPA is considered small for satellite experiments because satellite velocity is high (7 km/sec), and plasma density is low. While for sounding rocket experiments, error caused by contamination gets larger when we try to measure low ion temperature of 200-300K. We discussed several contamination effects on a RPA based on the experiments performed in a space plasma chamber. And development of a contamination-free RPA for rocket missions is also demonstrated.

Keywords: Retarding Potential Analyzer, Electrode Contamination, Sounding Rocket, Ion Temperature