

Estimation of electron density with the spacecraft potential in the near tail region

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The electron density can be obtained with the following three methods, directly measured with LEP, estimated from the plasma wave observed with PWI, and estimated from the spacecraft potential observed with EFD. These three methods have each problem. For example, the electron density measured with LEP (NLEP) dose not contains electrons with less energy than the measurable range of LEP. The objective of this study is to improve the precision in estimating the electron density from the spacecraft potential.

We have the empirical formula to estimate the electron density from the spacecraft potential [Ishisaka et. al., 2001]. The electron density estimated from the spacecraft potential (Ns/c) contains low energy electrons which cannot measure with LEP. On the other hand, Ns/c is often overestimated in the region with high electron temperature, such as the near tail region. This is because the spacecraft potential is a function of the electron temperature.

To eliminate this overestimation, we try to add the compensation term about the electron temperature to this empirical formula. Since the spacecraft potential can always be obtained during all the observation time, we can always obtain accurate electron densities, when this compensation succeed. In addition, we can find the existence of very low energy electrons by comparing accurate Ns/c with NLEP. This will clarify the distribution of very low energy electrons in the near tail region.