

R005-15

A 会場 : 11/27 AM1 (9:15-10:45)

10:00~10:15:00

観測ロケット搭載ラングミュアプローブにおけるウェーク影響の推定と補正

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Estimation and Correction of Wake Effects on a Sounding Rocket Langmuir Probe

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To directly observe the plasma environment in the Earth's ionosphere, sounding rockets have frequently been equipped with Langmuir probes to measure electron temperature and density. However, as the rocket travels at high velocity while spinning, the plasma becomes rarefied when the probe enters the region behind the rocket (the wake), leading to systematic errors in the estimated values of electron temperature and density. Conventionally, the common method to mitigate this wake effect has been to discard the data from the affected sections (Watanabe et al., 1989).

To improve both data utilization and analysis accuracy, it is essential to establish a method for correcting the wake effect based on a physical model. This study aims to develop a technique to quantitatively model and correct the influence of the wake on electron temperature and density estimates. The analysis uses observation and attitude data from the sounding rocket S-520-29 (apogee: 243 km), launched from the Uchinoura Space Center in 2014. A key feature of this rocket was that, in addition to its spin, it exhibited precession with a short period and large amplitude. While previous research has proposed correction methods for spin motion (Ueda et al., 2025), this study builds upon that work by constructing a new correction model that also accounts for the complex probe movements caused by the rocket's precession.

The method developed in this study demonstrates the potential for high-precision correction of data affected by a rocket's complex motion, a task that has proven difficult until now. In the future, we plan to generalize this method for application to data from other rockets, such as the S-310-46, which was launched in July 2025. Through this work, we expect to deepen the understanding of fine-scale plasma structures within the ionosphere.