R006-40
Zoom meeting B ：11/4 AM1 (9:00-10:30)
9:00〜9:15

センサ間のノイズレベルの差異を考慮したプラズマ波の到来波識別手法に関する研究

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A Study of Identification Method of the Arriving Wave Model for Plasma Waves Considering Different Sensor Noise Levels

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The analysis of plasma waves measured by scientific satellites is an effective method to investigate the plasma environment in space. Direction finding of plasma waves provides important clues for understanding not only local plasma environment but also the global features along the propagation paths of the waves. Several kinds of direction finding methods are proposed and each method has its own advantages and disadvantages. In order to obtain fast and accurate direction finding results, it is necessary to identify the nature of the arriving waves and apply proper direction finding methods.

In order to identify the nature of the arriving waves, the planarity [Santolik+, 2003] is widely used. The planarity is calculated from the spectral matrix, which includes information on the amplitudes and phase differences of the electromagnetic field. The planarity is used to identify whether the arriving wave is one plane wave or not under the assumption that the noise levels of all electromagnetic field sensors are equal. In general, however, the noise levels of the sensors on board a scientific satellite are not always equal due to the degradation of the sensors during long-term operation period.

In this study, we propose a new identification method for the arriving wave model using the spectral matrix, which can be accurately classified with different noise levels among sensors. Our proposed method realizes robust classifications by introducing the prior information about the sensor noise level and likelihood ratio tests. We verified the effectiveness of the proposed method.

Reference

[Santolik+, 2003] Santolik, O., M. Parrot, and F. Lefeuvre, Singular value decomposition methods for wave propagation analysis, Radio Sci., 38(1), 1010, doi:10.1029/2000RS002523, 2003.