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Evaluation of type II error of the Identification Method of Arriving Wave Model Based on Likelihood Ratio Tests

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k-vector direction determined by propagation characteristics is crucial for understanding the global features of space plasma. Identifying the arriving wave model is a major factor in obtaining fast and accurate results in the direction finding of various plasma waves. If we can determine whether the observation data contain a significant natural wave or not, we can reduce the computational time for direction finding analysis by excluding noise-only data. We have proposed and developed a new method based on two likelihood ratio tests [1]. The proposed method introduces the noise integration kernel using information about noise level ratios [2], and can correctly derive the arriving wave model, according to the significance level even with different sensor noise levels, where the conventional method planarity [3] cannot identify. However, we only examined the type I error of the likelihood ratio tests in the proposed method by conducting the Monte Carlo simulation, and we have not evaluated the type II error yet. Evaluating the type II error is important to clarify the detection accuracy of arriving waves, especially the case when arriving multiple waves. In this study, we evaluated the type II error in the proposed method by the Monte Carlo simulation. The simulation verified that the proposed method can lower the type II error with different sensor noise levels, which contributes to detecting accurately both a single plane wave and multiple waves with different sensor noise levels. This study also discussed the condition of reducing both the type I error and the type II error of the proposed method.

References

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