

NEW TOOLS FOR MULTI-SPACECRAFT DATA ANALYSIS: THE WAVE SURVEYOR TECHNIQUE AND PLANAR RECIPROCAL VECTORS

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In the preparation phase of the Cluster mission, reciprocal vectors were introduced into the space physics community as a generic and convenient tool to estimate spatial gradients from four-point measurements. They have been used also in other applications such as discontinuity analysis and error estimation. In the recently developed wave surveyor technique, we take the reciprocal vector concept to ease the formulation of a direct wave identification method based on the eigendecomposition of the cross spectral density matrix. The wave analysis scheme extracts only the dominant wave mode but is much faster to apply than existing techniques, hence it is expected to ease survey-type detection of waves in large data sets. For three-spacecraft configurations where the tetrahedral reciprocal vector approach fails, we define a set of planar reciprocal vectors that allows to address key multi-point analysis problems such as gradient estimation, wave identification, and discontinuity analysis in the same way as in the four-spacecraft case. The new multi-point analysis tools are demonstrated using synthetic data and Cluster measurements.

Multi-point measurements, plasma wave identification, three-spacecraft techniques

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