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Turbulence analysis using Capon's method

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Multi-point measurements can separate temporal and spatial variations. In case of spacecraft experiments, the number of data points in the time domain can be large, but that in the spatial domain is simply the number of spacecraft, and is only a few at most. Since usual data analysis techniques, such as the Fourier decomposition, cannot be applied to such a dataset, more sophisticated techniques such as Capon's method or the maximum entropy method have been developed and successfully used in various applications.

On the other hand, magnetohydrodynamic (MHD) waves in space plasma often have very large amplitude and thus are subject to rapid nonlinear evolution. As a result, we often encounter MHD turbulence rather than a superposition of a few number of MHD waves in space plasma. The Capon's method cannot be applied to such situations, where the of waves exceeds the number of data points.

Recently, we have developed a method to analyze the turbulence data making use of the Capon's method, even though the number of waves is much larger than the number of data points. In the presentation, we will introduce the method and discuss how it can be applied to analyze the MHD turbulence in the solar wind.

Keywords: MHD turbulence, Capon's method