Spatio-Spectral Maximum Entropy Method for Solar Microwave Imaging Spectroscopy

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We present so-called Spatio-Spectral Maximum Entropy Method (SSMEM), an imaging technique to exploit spectral continuation as an a priori. Standard Maximum Entropy Method (MEM) assumes maximum entropy under the observational constraints given separately to each frequency, and does not exploit available information at adjacent frequencies. On the contrary, SSMEM exploits not only the information in spatial domain but also in spectral domain under the assumption of spectral smoothness by maximizing both spatial and spectral entropy. The SSMEM is ideal for implementing imaging spectroscopy which becomes an essential tool for solar research. The algorithm is described together with relevant issues in incorporating the new dimension of frequency into the standard MEM algorithm. Superiority of the SSMEM is demonstrated by comparing the resulting spatially resolved brightness temperature spectra with those obtained from other conventional techniques, such as CLEAN and MEM.