The application of Bayesian spectral analysis in photometric time series

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Abstract
The present paper introduces the Bayesian spectral analysis as a powerful and efficient method for spectral analysis of photometric time series. For this purpose, Bayesian spectral analysis is programmed in Matlab software for XZ Dra photometric time series which are non-uniform containing large gaps. Then, the power spectrum of this analysis is compared with the power spectrum obtained from the Period04 software, designed for statistical analysis of astronomical time series, which uses artificial data for unifying the time series. Although in the power spectrum of this software, the main spectral peak which represents the main frequency of XZ Dra variable star oscillations in the $f = 2.09864$ (day -1) is well detected, but false spectral peaks are also seen. Also, in this software, it is not clear how to generate the synthetic data. These false peaks have been removed in the power spectrum obtained from the Bayesian analysis; also this spectral peak around the desired frequency has a shorter width and is more accurate. It should be noted that in Bayesian spectral analysis, it is not necessary to unify the time series for obtaining a desired power spectrum. Moreover, the researcher also becomes aware of the exact calculation process.

Keywords: Bayesian spectral analysis, Bayes' theorem, Period04 software, power spectrum, variable star, light curve

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