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Direct Deconvolution: a method to minimize the effects of the observational window on power spectra.

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Abstract

Fourier transforms of observed light curves, obtained by ground observations or by space photometers, exhibit interference effects that are consequence of the convolution of the true Fourier transform with a spectral window (Deeming, 1974).

These interferences in the power spectra makes the analysis of them very difficult in terms of the asteroseismology techniques, specifically to identify modes of non-radial oscillation of multiple periodic variable stars.

This identification has been made by heuristic methods such as the detection of periodicities or patterns that match the "large separation" or "small separation" as used in the sun itself and solar like stars. But these frequencies patterns are not easily observed for δ Scuti stars or other types of variable stars because of their denser power spectra. In order to identify potential patterns, it is necessary to obtain a reliable list of frequencies that really belong to the star and not due to the external causes given by spurious peaks in the power spectra.

For the moment, the reliable list has been obtained using algorithms such as Period04 or SigSpec that performs a prewhitening of the light curve in the same manner as the CLEAN algorithm (Roberts, 1986) do for radio observation. But in our case this is not a solution because the frequencies found must have a physical meaning and not be just a way to recover a CLEANed radio image.

The Direct Deconvolution method is aimed to fulfill the purpose of removal or minimizing the interference in power spectra due to the observational window. Its theoretical basis are explained in this poster, as well as some issues to be addressed before the full implementation of the method regarding numeric problems that arise when testing the algorithm. (See poster).