Repetitive music and gap filling int full disc helioseismology

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Abstract

Helioseismology requires continuous measurements of very long duration, months to years. This presentation addresses the specific case of full disk solar measurements of p-mode oscillations. It can be generalized, to some extent, to the case of asteroseismology.

First, a method of mode by mode (or rather pair of modes by pair of modes) interpolation of the signal in gaps is tested, and proves to be efficient for gaps as long as two days, but limited to the frequency range in which the signal to noise ratio is good.

It is then noted that the autocorrelation function of the full disk signal, after dropping quickly to zero in 20 or 30 minutes, displays secondary quasi periodic bumps, due to the quasi-periodicity of the peak distribution in the Fourier spectrum. The first of these bumps, at 4 hours or so, is higher than 70 percent and climbs to nearly 90 percent when working in limited frequency ranges. This suggests that an easy gap filling method can be developed, with a confidence of nearly 90 per-cent across all the frequency range, as long as the gap does not exceed 8 hours, with at least 4 hours of data existing at both ends. Even a short gap of one or two periods is better filled by the data taken 4 hours earlier or later than by local interpolation. This relaxes considerably the requirement of measurements continuity in the case the full disk p-mode helioseismology.

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