Poster

Splinter Activity

Deep focusing in time-distance helioseismology

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Deep focusing in time-distance helioseismology aims to obtain high sensitivity to perturbations at a desired target point in the solar interior. We study the deep-focusing time-distance technique for travel-time and amplitude measurements using a toy model that considers acoustic waves propagating in a 3D homogeneous background medium. Three-dimensional spatial sensitivity kernels for sound-speed are derived under the first-order Born approximation. Averaged travel-time and amplitude measurements are compared. We find that selecting the pairs of points according to the ray theory leads to a maximum sensitivity shell surrounding the target location and zero at the target location for travel-time measurements which is inefficient. However, averaging amplitude measurements results in maximal sensitivity at the target point.

Considering the noise due to the stochastic excitation of solar oscillations, we compare the signal-to-noise ratio for both travel time and amplitude for different types of sound-speed perturbation. As expected from the shape of the kernels, the amplitude measurements have higher signal-to-noise ratios than the travel-time measurements for localized sound-speed perturbations. This preliminary study is promising for using amplitude measurements as a complement to travel time in time-distance helioseismology.