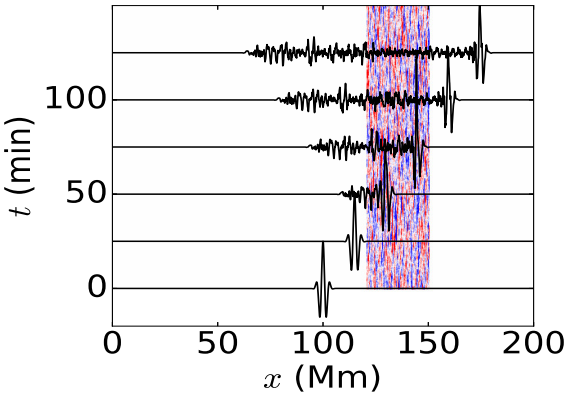
Helioseismic diagnostics of solar dynamics in the near-surface layers



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In a first study, we discuss how acoustic waves are affected by small-scale turbulent convection. We numerically model the propagation of an acoustic wave packet through a medium that is random in space and time, and compare the answer to various effective medium theories. The Keller approximation is found to be best suited to estimate the effective wave speed and the attenuation. We find that the temporal evolution of solar granulation may be ignored when modeling the effective wave speed, but not the attenuation. We also see multiply scattered waves (coda waves) in the variance of the wave field.
In a second study, we examine flows associated with solar active regions. The north-south component of these flows contributes to the observed solar-cycle variation of the longitudinal average of the meridional flow. Using measurements of horizontal flows from granulation tracking, we compute helioseismic travel times to estimate the contribution of these flows to the solar-cycle variation of the travel times. We find that active-region flows do not explain in full the solar-cycle variations observed in the helioseismic travel times.

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