WAVEFRONTS IN RANDOM MEDIA

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Determining the effects of material spatial randomness on the distance to form shocks from acceleration waves in random media has been subject of several studies [1,2]. A very general class of random media is modeled by two random fields - the dissipation and elastic nonlinearity. The reason for considering the randomness of said material coefficients is the fact that a wavefront's lenght scale is not necessarily greater than the Representative Volume Element - a condition tacitly assumed in deterministic continuum mechanics. There are two entirely new aspects considered in the present study [3]. One is the explicit consideration of nonlinearity and dissipation as functions of four more fundamental material properties, and themselves random fields: the instantaneous modulus, the dissipation coefficient, the instantaneous second-order tangent modulus, the mass density in the reference state. The second new facet is the coupling of the four-component random field to the wavefront amplitude, because as the amplitude grows, the wavefront gets thinner tending to a shock, and thus the material random heterogeneity shows up as a random field with ever stronger fluctuations. In effect, the wavefront is an object which is more appropriately analyzed as a Statistical Volume Element, and therefore to be treated via a stochastic rather than a deterministic dynamical system. This approach forms basis for analysis of stochastic evolution of shock waves in random media.

References

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