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Shock propagation in media with non-uniform density DANIEL LIVESCU, Los Alamos National Laboratory, YIFENG TIAN, FARHAD JABERI, Michigan State University — Flow resolving shock-capturing and shock-resolving simulations are conducted to study the shock propagation in media with non-uniform density. Shock propagation in a simplified one-dimensional configuration is first examined for various types of density profiles. Both shock-capturing and shock-resolving simulations predict the same results, when there is a separation of scales between the shock width and flow scales. The numerical results agree well with theoretical solutions in the case of weak shocks and linearly varying density fields. In the strong shock limit, better agreement with previous results obtained by the method of characteristics is observed when compared with the theoretical solutions. The differences can be attributed to the effects of re-reflected waves immediately behind the shock, which are not considered in the theoretical solutions. For fluctuating density profiles, the numerical results further deviate from the theoretical solutions and exhibit additional long-wavelength oscillations, which are shown to be related to the re-reflected waves. Three dimensional density variations, with and without turbulent velocity fluctuations, are also considered to examine the shock propagation in flows with strongly variable complex density fields.

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