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Regularized Moment Equations and Shock Waves for Rarefied Granular Gas LAKSHMINARAYANA REDDY, MEHEBOOB ALAM, Jawaharlal Nehru Centre for Advanced Scientific Research, Bangalore, India — It is well-known that the shock structures predicted by extended hydrodynamic models are more accurate than the standard Navier-Stokes model in the rarefied regime, but they fail to predict continuous shock structures when the Mach number exceeds a critical value. Regularization or parabolization is one method to obtain smooth shock profiles at all Mach numbers. Following a Chapman-Enskog-like method [H. Struchtrup, 2004, Phys. Fluids], we have derived the "regularized" version 10-moment equations ("R10" moment equations) for inelastic hard-spheres. In order to show the advantage of R10 moment equations over standard 10-moment equations, the R10 moment equations have been employed to solve the Riemann problem of plane shock waves for both molecular and granular gases. The numerical results are compared between the 10-moment and R10-moment models and it is found that the 10-moment model fails to produce continuous shock structures beyond an upstream Mach number of 1.34, while the R10-moment model predicts smooth shock profiles beyond the upstream Mach number of 1.34. The density and granular temperature profiles are found to be asymmetric, with their maxima occurring within the shock-layer [Reddy & Alam, 2015, J Fluid Mech, vol. 779, R2].

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