Fully-coupled compressible multiphase formulation using the Equilibrium Eulerian method[1] F. NAJJAR, A. HASELBACHER, CSAR, University of Illinois at Urbana-Champaign, S. BALACHANDAR, MIE, University of Illinois at Urbana-Champaign — In the Equilibrium Eulerian method of Ferry and Balachandar (IJMF 27:1199, 2001), the particle velocity is expressed as a perturbation of the local fluid velocity. The main advantages of the method compared to conventional Eulerian approaches are that the stiffness for small particles is removed and that polydisperse systems can be solved very efficiently. The Equilibrium Eulerian method has been carefully validated for incompressible flows. The goal of the present work is to develop a fully-coupled multiphase formulation for compressible flows based on the Equilibrium Eulerian method. We address the fundamental question about the accuracy of the Equilibrium Eulerian method relative to Lagrangian tracking for expansion fans and shock waves. This allows the quantification of errors for a given particle size. The fully-coupled formulation is applied to several compressible flow problems.

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