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A nonlinear Riemann solver for non-conservative two-phase flow models VINCENT DELEDICQUE, MILTIADIS PAPALEXANDRIS, Departement de Mecanique, Universite catholique de Louvain — Hydrodynamic models for two-phase flows of gas – solid particle mixtures typically consist of the mass, momentum, and energy balance equations for each phase, supplemented by an evolution equation for the solid volume fraction. Such models are non- conservative due to the so-called nozzling terms that appear in the expressions for the interactions between the two phases. In this talk we present a non-linear (exact) Riemann solver for such flow models. In general, the solution of this Riemann problem consists of 6 distinct nonlinear waves (the solid phase velocity is a double eigenvalue): shocks, rarefactions and contact discontinuities. Therefore, for given end-states there exists a large number of possible wave configurations. Our numerical method is based on a suitable grouping of them into 4 principal families of configurations. Numerical solutions are obtained via an iterative procedure in which these families are examined sequentially. Comparisons between numerical and exact solutions are presented to demonstrate the efficacy of the proposed method. Finally, the issue of the non-uniqueness of solution to the Riemann problem is briefly discussed.

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