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A finite-volume contact-capturing scheme ARPIT TIWARI, RATNESH SHUKLA, CARLOS PANTANO, JONATHAN FREUND, University of Illinois at Urbana-Champaign — Finite-volume schemes have been remarkably successful at capturing shock waves. Here, the local characteristics, of course, move into the shock, so in a sense these shock capturing schemes have the task of adding sufficient dissipation so that the captured shock remains relatively sharp but also sufficiently resolved to be compatible with the underlying discretization. In a similar spirit, we have developed a scheme for capturing contact discontinuities, with our particular interest being phase or material boundaries. These are fundamentally different than shocks because the characteristics are parallel to the contact, so a capturing scheme needs to counter the numerical diffusion (as needed for shocks) that thickens the contact in time. In analogy to the well-placed dissipation in shock capturing, terms are added to the equations that also capture these contacts over long times as sharp near-jumps, similar to captured shocks. These terms preserve both sharp mass and material jumps and are compatible with various equations of state, including interfaces between perfect gas and Mie-Grüneison materials. The algorithm is demonstrated in various bubble and pore collapse scenarios.

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