Cell-centered Lagrangian scheme for multi-material flows with pressure equilibration

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Abstract. A cell-centered Lagrangian scheme is presented for the multi-material hydrodynamics model with equal pressure assumption. The scheme is conservative in mass, momentum and total energy while being entropic per material. This last point is critical for various engineer applications but remains in general not addressed. The entropy dissipation of each material is taken as an arbitrary portion of the global entropy dissipation hence mimicking different viscosity operators and the underlying vanishing viscosity solution. The scheme is confronted with different 1 or 2-dimensional test cases where materials have highly different equations of state. These test cases attest the robustness of the scheme and show that pressures are kept equal up to the scheme order or even strictly if an additional relaxation procedure is added.

Key words. Cell-centered Lagrangian scheme, multi-material flows, entropy dissipation, equal pressure closure.

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