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Entropy- and kinetic-energy stable discontinuous Galerkin schemes for multi-phase and multi-component flows

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Gassner et al. [1] extended the ideas of entropy- and kinetic-energy stable finite difference (FD) schemes to high order split form discontinuous Galerkin (DG) schemes for the compressible Euler equations. In this work we show how to generalize the framework to multi-phase and multi-component equation systems. In this context we first extend the split-DG framework to multi-component flows. Due to the use of real equations of state (EOS), one may face much more challenging problems, e.g. numerical stability or loss of hyperbolicity, compared to the single component, ideal gas case. At material and/or phase interfaces spurious oscillations may arise. To address this issue, in a further step, we combine the numerical split flux formulation with the ideas of non-conservative double fluxes presented by Abgrall and Karni in [2]. The double flux method is generalized in the context of tabulated general EOS. The advantage of the new framework is shown in different multi-phase and multi-component simulations.

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