

***Explicit-Implicit Domain Splitting for Two Phase Flows with
Phase Transition***

Ferdinand Thein (Johannes Gutenberg-Universität Mainz), Sandra May

Two phase flows that include phase transition, especially phase creation, with a sharp interface remain a challenging task for numerics. In this talk, we present recent results for the isothermal Euler equations with phase transition between a liquid and a vapor phase, see [1]. The phase interface is modeled as a sharp interface and the mass transfer across the phase boundary is modeled by a kinetic relation. Using sharp interfaces for simulating nucleation and cavitation results in the grid containing tiny cells that are several orders of magnitude smaller than the remaining grid cells. This forces explicit time stepping schemes to take tiny time steps on these cells. To overcome this issue we propose an explicit implicit domain splitting where only the neighborhood of the tiny cells is treated implicitly. We use dual time stepping to solve the resulting small implicit systems. Our numerical results indicate that the new scheme is robust and provides significant speed-up compared to a fully explicit treatment

References

1. S. May and F. Thein. Explicit implicit domain splitting for two phase flows with phase transition. *Physics of Fluids*, 35(1):016108, 2023.

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