

TEMPLE UNIVERSITY
Department of Mathematics

Applied Mathematics and Scientific Computing Seminar

Room 617 Wachman Hall

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Sub-grid Accuracy in Fluid Flows with Interfaces

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Abstract.

This talk will focus on two problems we face when solving the discontinuous coefficients multi-phase Navier-Stokes Equations: the tracking of the interface and the accurate solution of the Poisson equation with sub-grid interface conditions.

We will review the required ingredients to solve such problems with high order of subgrid accuracy by incorporating the discontinuities within the discretization. First, we will present a semi-Lagrangian gradient-augmented level set method for interface tracking based on a Hermite interpolation framework. Second, we will show appropriate discretization of the Laplacian operator in the presence of jump discontinuities based on the same Hermite polynomial framework. The presented approach leads to several desirable computational features: 1) high order, 2) optimally local stencils, 3) minimal modification of existing linear solvers 4) sub-grid accuracy.