Abstract Submitted
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Capturing the internal dynamics of flow discontinuities[1] JOSEPH THALAKKOTTOR, KAMRAN MOHSENI, University of Florida — We extend Gibbs' concept of dividing surface to model flow discontinuities beyond that of just the phase interface. This is done by providing an alternative derivation for the dividing surface. Here, this extended definition of a dividing surface is referred to as the hypersurface. This hypersurface is a continuum approximation of a diffused region with fluid properties and flow parameters varying sharply, but continuously, across it. Here we show that the properties and equations describing a hypersurface can be derived from the equations describing the diffused region by integrating it, in the directions normal to the hypersurface. This is equivalent to collapsing the diffused region in the normal direction. Hence, ensuring that the hypersurface is both kinematically and dynamically equivalent to that of the diffused region, in a constrained zero thickness limit. The ability of our approach to model different forms of discontinuities and hypersurfaces is demonstrated by looking at various canonical problems such as material interface, vortex sheet, shock front, and expansion wave.

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