A Performance Comparison Between a Level Set Method and an Unsplit Volume of Fluid Method OLIVIER DESJARDINS, ROBERT CHIODI, Cornell Univ, MARK OWKES, Montana State Univ — The simulation of high density ratio liquid-gas flows presents many numerical difficulties due to the necessity to track the interface and the discontinuities in physical properties associated with the interface. Two main categories of methods used to track the interface are level set methods and volume of fluid (VOF) methods. In particular, conservative level set methods track and transport the interface using a scalar field, with the interface profile represented by a hyperbolic tangent function of a finite thickness. Volume of fluid methods, on the other hand, store the percentage of each fluid in the computational cells. Both methods offer distinct advantages, however, the strengths and weaknesses of each method relative to each other have yet to be thoroughly investigated. This work compares the accuracy and computational efficiency for an accurate conservative level set method and an unsplit VOF method using canonical test cases, such as Zalesak's disk, the deformation of a circle, and the deformation of a sphere. The mass conservation and ability to correctly predict instability for a more complex case of an air-blast atomization of a planar liquid layer will also be presented.

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