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Numerical Simulation of the 3D Shock-Driven Kelvin-Helmholtz Instability[1] BRIAN ROMERO, SVETLANA POROSEVA, University of New Mexico, JON REISNER, Los Alamos National Laboratory, PETER VOROBIEFF, University of New Mexico — We describe the development and structure of a three-dimensional shock-driven Kelvin-Helmholtz instability generated by the interaction of a planar shockwave with an inclined cylinder of dense gas. In simulations an inclined cylinder of gas is initially at rest, surrounded by solid boundaries. Then the gas cylinder undergoes shock acceleration, producing a Richtmyer-Meshkov instability in the radial direction of the cylinder and a Kelvin-Helmholtz instability in the axial direction. The gas is either pure sulfur hexafluoride or a mixture of sulfur hexafluoride, acetone and air. The gas column is surrounded by air resulting in a range of considered Atwood numbers of 0.61-0.67. In simulations the Mach number is in the range of 1.2-2.0 and the cylinder angle is in the range 0-30 degrees with respect to the plane of the shock. The wall effects on the Kelvin-Helmhotz instability development were studied. The initial gas density profiles in the simulations matched those acquired in experiment. Simulations were conducted using the University of New Mexico FIESTA code, which is a C++ code designed for next-generation exascale GPU architectures. FIESTA uses a fifth-order WENO scheme and a second-order Runge-Kutta scheme for spatial and temporal discretization respectively.

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