Abstract Submitted
for the DFD20 Meeting of
The American Physical Society

Shock wave interactions in single-bubble collapse near a corner[1]
WILLIAM WHITE, SHAHABODDIN ALAHYARI BEIG, ERIC JOHNSEN, University of Michigan — Erosion damage to neighboring surfaces due to the repeated collapse of a vapor bubble is one of the most consequential results of cavitating flows, which are found in a number of hydraulic systems. Numerous studies exist on the collapse of a bubble near a single surface. However, the dynamics and shocks produced by bubble collapse in a corner has yet to be investigated numerically. In this study, we quantify the topological parameters of the collapse as well as the pressures, temperatures, and velocities in the flow field to extend present knowledge of collapse near a single wall. For this purpose, we use an in-house, high-order accurate shock- and interface-capturing method to solve the 3D compressible Navier-Stokes equations for gas/liquid flows. We demonstrate that bubble-boundary interactions amplify/reduce pressures and temperatures produced during the collapse and increase the collapse time and the non-linearity of the bubble displacement, depending on geometric parameters.

[1]This work was supported in part by the Department of Energy grant DE-NE0008747. This research is part of the Blue Waters sustained-petascale computing project, which is supported by the National Science Foundation (awards OCI-0725070 and ACI-1238993) and the state of Illinois.

William White
University of Michigan

Date submitted: 02 Aug 2020 Electronic form version 1.4