Abstract Submitted
for the DFD07 Meeting of
The American Physical Society

Cavitation inside high-speed liquid droplet impacting on the solid surface MASAO WATANABE, Kyushu University, TOSHIYUKI SANADA, Shizuoka University, MASAO YAMASE, Aqua Science Corporation — The growth and collapse of cavitation bubble inside a high-speed droplet, which impacts on the solid surface are investigated numerically, using Ghost Fluid Method with TVD-ENO-LLF to solve pressure propagation in two phase compressible flow. Upon the impact on the surface, strong compression wave is generated on the contact surface inside liquid droplet. This wave propagates upward to the free surface and is reflected normal to the surface as an expansion wave, which propagates downward. This expansion wave focuses inside liquid droplet, which results in the generation of low pressure region. We discuss the condition of cavitation bubble growth in this low pressure region, with the effects of thermal environment of liquid droplet taken into account. We evaluate the magnitude of the attainable pressure during bubble collapse, by solving equation of radial motion of single bubble with ambient pressure change, and compare this bubble collapsing pressure to the high-speed liquid droplet impact pressure in order to discuss the contribution of cavitation bubble to the erosion of solid surface.

Masao Watanabe
Kyushu University

Date submitted: 29 Jul 2007 Electronic form version 1.4