Summary of deliverable D1.8: Compressible Validation

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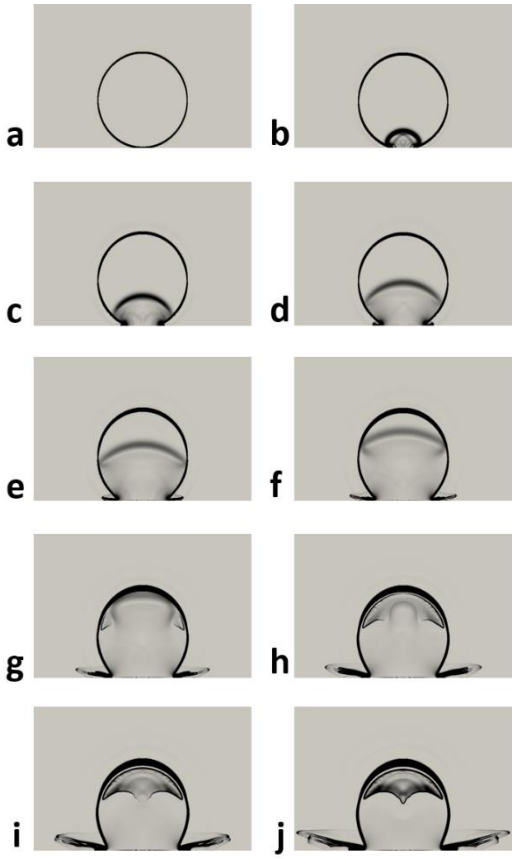
A compressible two-phase flow model with phase-change has been developed and validated in OpenFOAM [1]. The thermodynamic closure is based on a barotropic Equation of State (EoS) for the liquid, gas and vapour phases. A hybrid numerical flux, based on approximate Riemann solvers, is proposed in order to avoid spurious oscillations at the phase boundaries, where there is a rapid change in the acoustic impedance. The numerical method is firstly validated against the Riemann problem, comparing with the exact solution and secondly against available experimental data for the droplet impact case. The impact of a liquid water droplet on a solid surface at conditions inducing cavitation inside its volume is investigated. The results are found in good agreement with the experimental data depicting the evolution of the shock wave generated upon impact and the rarefaction waves which are also captured reasonably well.



Evolution of the droplet impact case: *Contour fields of the density gradient magnitude demonstrate the shock wave which is traveling upwards (frames b-g), the expansion wave upon the reflection of the shock wave (frames e-j) and the cavity formation (e-j). The interframe time is t=1 μs.*