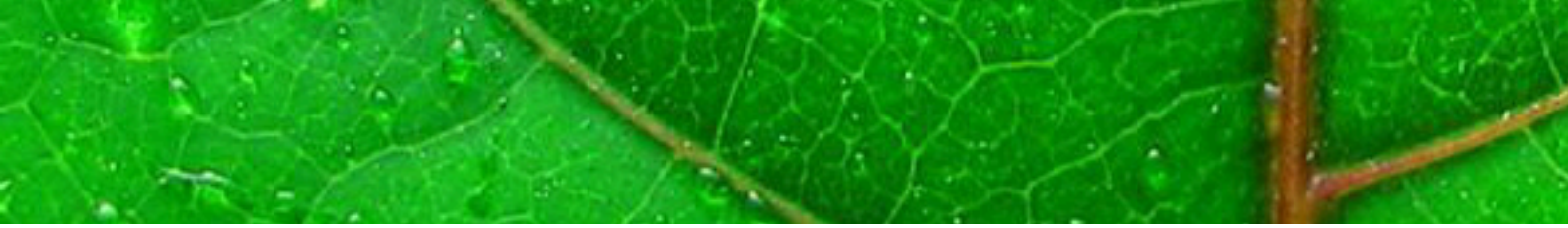

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Title: Droplet shock-induced cavitation using a multiphase modelling approach

Abstract: Investigations of shock-induced cavitation within a droplet is highly challenged by the multiphase nature of the mechanisms involved. Within the context of heterogeneous nucleation, we introduce a thermodynamically well-posed multiphase numerical model accounting for phase compression and expansion, which relies on a finite pressure-relaxation rate formulation. We simulate the interaction of a cylindrical water droplet with a planar shock wave, and the high-speed impact of a gelatin droplet onto a solid surface. The determination of the finite pressure-relaxation rate is done by comparing the numerical results with the corresponding experiments of Sembian et al. (2016) and Field et al. (1989), respectively. Upon validation of the determined pressure-relaxation rate, we run parametric simulations to elucidate the critical Mach number from which cavitation is likely to occur. Complementing simulations with a geometrical acoustic model, we provide a phenomenological description of the shock-induced cavitation within a droplet, as well as a discussion on the bubble-cloud growth effect on the droplet flow field. The modelling used is implemented in the open-source software ECOGEN which will be briefly presented.