

---

# Influence of liquid-gas density contrast on drop fragmentation regimes

Florence Marcotte\*<sup>†1,2</sup> and Stéphane Zaleski<sup>3</sup>

<sup>1</sup>Institut Jean Le Rond d'Alembert – Sorbonne Université, Centre National de la Recherche Scientifique  
: UMR7190 – Boite 162 4 place Jussieu 75005 Paris, France

<sup>2</sup>Institut de Recherche sur les Phénomènes Hors Equilibre – Aix Marseille Université : UMR7342, Ecole  
Centrale de Marseille : UMR7342, Centre National de la Recherche Scientifique : UMR7342 –  
Technopole de Chateau-Gombert - 49 rue Joliot Curie - BP 146 - 13384 MARSEILLE cedex 13, France

<sup>3</sup>Institut Jean Le Rond d'Alembert (d'Alembert) – UPMC, CNRS – France

## Abstract

The deformation and fragmentation dynamics of a single liquid drop subject to impulsive acceleration by a unidirectional gas flow is addressed numerically, for liquid-gas density ratios in the 10 – 2000 range and low Ohnesorge numbers. We show that the liquid-gas density contrast significantly modifies the critical Weber number for the transition between bursting and stripping fragmentation regimes on the one hand, for drop fragmentation on the other hand. We suggest a simple theoretical argument to predict the transitional Weber number as a function of the density contrast and show that the stabilising influence of small contrasts can be explained by the effect of inertia in the nonlinear coupling between drop stretching and centroid acceleration.

**Keywords:** fragmentation, bag breakup, secondary atomisation

---

\*Speaker

<sup>†</sup>Corresponding author: marcotte@irphe.univ-mrs.fr