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Drop deformation and breakup in flows with and without shear[1]

TíMEA KÉKESI, GUSTAV AMBERG, LISA PRAHL WITTBERG, KTH — The deformation and breakup of liquid drops in gaseous flows are studied numerically using the Volume of Fluid method. Fragmentation of fuel drops has a key role in combustion, determining the rate of mixing and the efficiency of the process. It is common to refer to Weber number 12 as the onset of breakup, and to define breakup mode regimes as a function of Weber number. These definitions are established for simple flows and do not take density and viscosity ratios into account. The main objective of this work is the dynamics of the drop leading to breakup. Fully developed uniform flows and flows with various shear rates are considered. A Weber number of 20, Reynolds numbers 20-200, density ratios 20-80, and viscosity ratios 0.5-50 were used. Results for uniform flows are presented in *Kékesi T.* et al. (2014). The final aim of the project is to extend existing atomization models for fuel sprays by accounting for density and viscosity ratios in addition to the Reynolds and Weber numbers already present in current models. Estimations for the lifetime of the drop are provided; furthermore, the history of the drag coefficient is compared for several cases. Examples of the observed phenomena and ideas for possible model modifications will be presented.

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