Abstract Submitted
for the DFD15 Meeting of
The American Physical Society

Realistic simulations of coaxial atomisation STEPHANE ZALESKI, DANIEL FUSTER, TOMAS ARRUFAT JACKSON, YUE LING, UPMC Univ Paris 06, d'Alembert Institute, MATTEO CENNI, UPMC Univ Paris 06, d'Alembert Institute and University of Bologna, RUBEN SCARDOVELLI, University of Bologna, GRETAR TRYGGVASON, University of Notre Dame — We discuss advances in the methodology for Direct Numerical Simulations of coaxial atomization in typical experimental conditions. Such conditions are extremely demanding for the numerical methods. The key difficulty seems to be the combination of high density ratios, surface tension, and large Reynolds numbers. We explore how using a momentum-conserving Volume-Of-Fluid scheme allows to improve the stability and accuracy of the simulations. We show computational evidence that the use of momentum conserving methods allows to reduce the required number of grid points by an order of magnitude in the simple case of a falling rain drop. We then apply these ideas to coaxial atomization. We show that in moderate-size simulations in air-water conditions close to real experiments, instabilities are still present and then discuss ways to fix them. Among those, removing small VOF debris and improving the time-stepping scheme are two important directions.The accuracy of the simulations is then discussed in comparison with experimental results and in particular the angle of ejection of the structures. The code used for this research is free and distributed at http://parissimulator.sf.net.

Stephane Zaleski
UPMC Univ Paris 06

Date submitted: 31 Jul 2015 Electronic form version 1.4