Abstract Submitted
for the DFD19 Meeting of
The American Physical Society

The effect of surfactant on the tail dynamics of elongated bubbles[1] OMAR MATAR, ASSEN BATCHVAROV, Imperial College London, MIRCO MAGNINI, University of Nottingham, LYES KAHOUADJI, CRISTIAN CONSTANTE-AMORES, RICHARD CRASTER, Imperial College London — Following the classical work by Bretherton and Taylor, the propagation of elongated gas bubbles in micro-channels has received a great deal of attention in the literature due to its relevance to a wide range of applications. Recent work by Magnini *et al.* Phys. Rev. Fluids, 023601 (2018) and Moran *et al.* (Bulletin of the American Physical Society, vol. 63, D09.00002) has also examined these flows (with concurrent liquid flow) with significant buoyancy and inertial effects in both vertical and horizontal configurations. The present work focuses on bubble tail undulations in the presence of surfactants whose effects merit attention. We carry out three-dimensional direct numerical simulations of the flow using a hybrid front-tracking/level-set method (Shin *et al.*, J. Comp. Phys., 359, 409-435, 2018) over a wide range of surfactant properties including diffusivity, elasticity, and solubility. The effect of these properties on the speed of bubble propagation and interfacial shape is examined, paying particular attention to the bubble tail dynamics at high Reynolds number.

[1]We acknowledge gratefully the contribution of Drs Damir Juric and Jalel Chergui (both from LIMSI, CNRS, France), and Dr Seungwon Shin (Hongkik University, South Korea), in terms of code development, and funding from EPSRC (grant EP/K003976/1), and the Royal Academy of Engineering (Research Chair for OKM).

Omar Matar
Imperial College London

Date submitted: 30 Jul 2019 Electronic form version 1.4