Abstract Submitted
for the DFD20 Meeting of
The American Physical Society

Breakage, coalescence and droplet size distribution of surfactant-laden droplets GIOVANNI SOLIGO, TU Wien, ALESSIO ROCCON, University of Udine, ALFREDO SOLDATI, TU Wien — The effects of surface tension modifications on the dynamics of surfactant-laden droplets in wall-bounded turbulence are numerically investigated: direct numerical simulations of the Navier-Stokes equations are used to compute the flow field, while a phase-field method in a two-order-parameter formulation is adopted to track the interface (first-order parameter) and the surfactant concentration (second-order parameter). The surfactant acts on the interface reducing the local surface tension according to its strength and local concentration. To investigate surface tension effects, here we change the reference value of the surface tension (i.e. that of a surfactant-free interface) and the strength of the surfactant. Enhancement of both the coalescence and breakage rate is observed as the average surface tension over the interface is reduced. We also compute the droplet size distribution and find a fair agreement with available analytic scaling laws and experimental measurements in the breakage-dominated regime.

Giovanni Soligo
Vienna Univ of Technology

Date submitted: 03 Aug 2020 Electronic form version 1.4