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Turbulence modulations induced by a swarm of surfactant-laden droplets GIOVANNI SOLIGO, ALESSIO ROCCON, ALFREDO SOLDATI, TU Wien; University of Udine — We use direct numerical simulations of turbulence coupled with a two-order-parameter phase-field method to describe the complex dynamics of a swarm of surfactant-laden droplets in turbulence.Two separate Cahn-Hilliard (CH) equations define the dynamics of the interface and of the local surfactant concentration. An interfacial term, based on the Korteweg tensor, accounts for the effect introduced by a surfactant-laden, deformable interface on the flow field. In particular, the interfacial term accounts for both normal (capillary) and tangential (Marangoni) stresses at the interface. The former originate from the presence of the interface, while the latter arise whenever surface tension gradients along the interface are present. These surface tension gradients originate from a non-uniform surfactant distribution. The presence of a surfactant-laden interface thus affect the local flow field and turbulence and modulates exchanges of momentum between the droplet fluid and the carrier fluid. Here we will present the effects of different reference (clean interface) surface tension values and different types of surfactant on these exchanges.

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