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Interface-resolved evaporating droplets in homogeneous shear turbulence[1] NICOLO SCAPIN, GIANDOMENICO LUPO, CHRISTOPHE DUWIG, LUCA BRANDT, KTH Royal Institute of Technology — We perform interface-resolved simulations of evaporating droplets in homogeneous shear turbulence (HST) using a recently developed volume of fluid method for phase-changing flows. First, we present a simple yet efficient variant of the Adams-Bashforth time integration method able to tackle in a robust manner numerical simulations in the HST configuration, both in single and multiphase conditions. Next, we consider an array of five isolated droplets, whose initial size is bigger than the Kolmogorov scale, immersed in a statistically steady-state field characterized by $Re_\lambda \approx 75$ and the dimensionless shear number $\mathcal{S}^* \approx \in.\forall$ and we allow them to exchange mass, momentum and energy across the interface. The simulations are conducted by varying two dimensionless parameters: the shear-based Weber number $We_{\mathcal{S}}$ and the ratio between the initial gas temperature and the saturation temperature $T_{g,0}/T_{sat}$. Results will be presented in a two-parameter space diagram and the effects of turbulence on the Sherwood and Nusselt numbers analyzed for the single droplets. Finally, by relaxing the assumption of uniform and constant gas density, the impact on the evaporation rate of weakly-compressible effects is assessed.

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