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Size distribution of droplets undergoing phase transition in homogeneous isotropic turbulence BRITI SUNDAR DEB, BERNARD J. GEURTS, HERMAN J.H. CLERCX, A.K. KUCZAJ, HANS KUERTEN, Multiscale Modeling and Simulation, Faculty EEMCS, University of Twente, The Netherlands — We investigate the dynamics of an ensemble of discrete aerosol water droplets undergoing phase transition, expressed by evaporation and condensation, in a turbulent flow. Our focus is on the stationary distribution of droplet sizes that develops as a result of these phase transitions in forced, homogeneous, isotropic turbulence. For this purpose we perform direct numerical simulation (DNS) using a de-aliased pseudo spectral method in a domain with periodic boundary conditions. We solve the Navier-Stokes equations and additional equations for the temperature and background humidity against which the size of the droplets evolves by exchanging heat and mass. The motion of the droplets under Stokes drag force is time-accurately tracked. The responsiveness of the droplets to small turbulent scales is directly related to the size of the individual spherical droplets. The latter is changing due to evaporation and condensation, which in turn depends on the unique trajectory of the droplets in the unsteady flow. We compute the natural size distribution at various heat and mass transfer parameters and observe its dependency on the Reynolds number.

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