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Sub-Hinze scale bubble production in turbulent bubble break-up[1] ALIÉNOR RIVIÈRE, WOUTER MOSTERT, Department of Mechanical and Aerospace Engineering, Princeton University, STÉPHANE PERRARD, Department of Mechanical and Aerospace Engineering, Princeton University; Département de Physique, ENS, PSL Université, CNRS, LUC DEIKE, Department of Mechanical and Aerospace Engineering, Princeton Environmental Institute, Princeton University — Through direct numerical simulations we study the dynamic of bubble break-up under isotropic and homogeneous turbulence. We create the turbulent flow by forcing in physical space and inject a bubble of initial radius d_0 once a stationary state is reached. We investigate the effect of the Weber number (ratio of turbulent and surface tension forces) on the break-up dynamics and statistics from large ensemble of simulations. We identify three regimes depending on the bubble size: below the critical size, d_H, the Hinze scale, bubbles are stable; close to the critical conditions $d_0 \approx d_H$ we observe binary and tertiary break-ups, leading to bubbles mostly between $0.5d_H$ and d_H, a signature of a production process local in scale. Finally for bubbles much larger than d_H numerous bubbles much smaller than the critical size are produced: typically between $0.1d_H$ and $0.3d_H$. We show that their formation relates to rapid large deformations and successive break-ups: the first break-up in a sequence leaves highly deformed bubbles which will break again, without recovering a spherical shape and creating an array of much smaller bubbles.

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