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Vortex pairing in the wake of an oscillating bubble rising in a thin-gap cell PATRICIA ERN, AUDREY FILELLA, VÉRONIQUE ROIG, IMFT, Toulouse University and CNRS, France — We investigate experimentally the oscillatory motion and wake of a bubble rising in a counter flow in a thin gap cell (3 mm) by shadowgraphy and PIV. The equivalent diameter d of the bubble in the plane of the cell is used to define the Archimedes number $Ar = \frac{\sqrt{gd^3}}{\nu}$ (ν is the kinematic viscosity and g the gravitational acceleration). The counter flow is characterized by the Reynolds number Re_{cf} based on the mean liquid velocity and the gap thickness. For $500 \leq Ar \leq 5500$ and $0 \leq Re_{cf} \leq 200$, the mean vertical velocity of the bubble relative to the counter flow, V_{br}, corresponds to the mean rising velocity in liquid at rest; and the frequency and the amplitude of the oscillatory motion superpose for all Re_{cf} when normalized with V_{br} and the timescale d/V_{br}. For a given size of the bubble ($d \approx 9.5$ mm and $Ar \approx 2800$) corresponding to a Reynolds number based on V_{br} and d of about 1900, we then investigate in detail the wake associated to the bubble in several counter flows. As Re_{cf} increases, the number of vortices released increases. Furthermore, the wake of the bubble undergoes vortex pairing for $0 \leq Re_{cf} \leq 110$), whereas no vortex pairing is observed for $Re_{cf} \geq 140$.

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