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Vortex ring formation in starting forced plumes with negative and positive buoyancy[1] LEI GAO, Sichuan University, SIMON CHING-MAN YU, Singapore Institute of Technology — The limiting process of vortex formation in starting forced plumes, with Richardson number in the range of $-0.06 \leq \mathrm{Ri} \leq 0.06$, was studied numerically. As Ri increases, three regimes can be identified in terms of the vortex interaction patterns, i.e., the weak-interaction regime ($-0.06 < \mathrm{Ri} < -0.02$), the transition regime ($-0.02 \leq \mathrm{Ri} < 0$) and the strong-interaction regime ($0 \leq \mathrm{Ri} < 0.06$). The numerical results show that the variation trends of formation number and separation number against Ri change near the critical value of -0.02. In the weak-interaction regime, both formation number and separation number increase rapidly against Ri. In the transition and strong-interaction regimes alike, the formation number increases at a much slower rate, while the separation number declines dramatically as Ri increases. A qualitative explanation on the variation patterns of formation number and separation number is proposed based on the buoyancy effects on the dynamic properties of the leading vortex ring and the vortex interaction patterns.

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