Caption List (Supplementary material)

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Abstract

Movie 1 Trajectory-based colouring is used to highlight the motion of scattered Lagrangian fluid parcels as they are depleted from a post-stenotic recirculation region. Steady and pulsatile flows in a pure liquid are compared at $Re = 9600$ over the period of a single pulse of the unsteady flow. The pulsatile flow ($\lambda = 0.50$ and $St = 0.08$) periodically forms and sheds a large vortex that entrains fluid from the recirculation region. Depletion in the steady case is associated with Kelvin-Helmholtz instabilities.

Movie 2 Three pulsatile flows in a 5% (dilute) suspension are compared at $Re = 9600$ and $St = 0.15$ for increasing amplitude ratio (λ). The flows are shown over the course of two pulses and the roll-up of a vortex ring is clearly seen in the $\lambda = 0.50$ and 0.95 cases. No vortex formation occurs in any of the $\lambda = 0.25$ flows investigated. Furthermore, this difference is consistent for all volume fractions up to $\Phi = 20\%$.

Movie 3 The influence the Strouhal number has on depletion and depletion efficiency is highlighted by comparing pulsatile flows at $Re = 4800$ and $\lambda = 0.50$. St has no observable effect on the vortex strength but increases depletion efficiency by increasing the pulsation frequency. Here, one pulse at $St = 0.04$ is compared to two and four pulses at $St = 0.08$ and 0.15, respectively, over the same period of time. Note that a large vortex structure is not formed during the acceleration phase of the $St = 0.04$ (and $\lambda \leq 0.50$) case and depletion is associated with Kelvin-Helmholtz instabilities. The observed flow behaviours were not found to change in pure liquid or suspensions.

Movie 4 Periodic vortex formation is observed in dilute ($\Phi = 5\%$) and dense ($\Phi = 10 - 20\%$) suspensions over the course of two pulses for pulsatile flow at $Re = 14400$, $\lambda = 0.50$ and $St = 0.15$. Volume fraction has no observable effect on the vortex formation and shedding processes, or depletion efficiency.