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Using ultrasound to steer ultrasound contrast agents: Implications for targeted drug delivery ALICIA CLARK, ALBERTO ALISEDA, University of Washington — Ultrasound can be used to manipulate ultrasound contrast agents (UCAs), micron-sized bubbles used in ultrasound imaging to increase image contrast. The Bjerknes force, resulting from the lagged response of the microbubbles to the oscillatory ultrasound pressure field, can be utilized to steer the microbubbles to a targeted area in the vasculature, with the microbubbles serving as drug delivery vectors and injectors. The response of microbubbles to ultrasound in a sheared flow has shown a complex coupling of ultrasound-induced volume oscillations with hydrodynamic forces: Saffman lift and the Bjerknes force. In this work, the relative influence of these two forces acting in the across-streamlines direction is determined as a function of the Reynolds and Womersley and the excitation to bubble natural frequency ratio. We use in-vitro experiments to study the behavior of microbubbles in physiologically-realistic pulsatile flows. Quantitative information about microbubble trajectories in physiological conditions is necessary to develop models in order to control ultrasound steering of bubble-based drug delivery vectors in the human vasculature.

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