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Experimental Characterization of the Bjerknes Force on Microbubbles in Physiologically Realistic Flows ALICIA CLARK, MICHALAKIS AVERKIOU, ALBERTO ALISEDA, University of Washington — Ultrasound contrast agents are micron-sized bubbles used to increase contrast in ultrasound imaging. These microbubbles can be steered in the systemic circulation by the ultrasound-induced Bjerknes force, presenting a potential for highly-directed thrombolysis or cancer chemotherapy. While the dynamics of a single microbubble under ultrasound excitation are well understood, the dynamics of microbubble swarms in physiologically-realistic flows are understudied; a greater understanding of the competition between hydrodynamic and ultrasound-induced forces in this flow regime would enable clinical applications. Experiments conducted in a cylindrical tube at physiologically relevant Reynolds numbers and under various pressure amplitudes and pulse repetition frequencies (PRF) will be presented. In-house high-speed tracking characterized the forces acting on the microbubbles by calculating microbubble velocities and accelerations. When the Bjerknes force is small, the microbubbles are only affected by the shear-induced lift force in the flow. At higher pressures and PRFs, the Bjerknes force overcomes the shear-induced lift force and displaces the microbubbles in the direction of ultrasound propagation, potentially putting them in contact with the arterial wall for drug delivery.

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