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Pulsatile flow transport in microscale cavities DEREK RINDERKNECHT, MORTEZA GHARIB, California Institute of Technology — Critical to the impact of microfluidics is the ability to transport fluids and biomolecules effectively, particularly at the size scales involved. In this context a bio-inspired pumping mechanism, the valveless impedance pump, was explored for applications in microfluidics ranging from micro total analysis systems to microchannel cooling with the aim of using the pulsatile flow output of the pump to augment transport at low Reynolds numbers. Micro PIV was used to study the affect of both steady and pulsatile flows on transport in microscale rectangular cavities. Ventilation of the cavity contents was examined in terms of the residence time or average time a particle remains in the cavity region. Empirical velocity fields were analyzed using Lagrangian Coherent Structures to determine the impact of unsteadiness on time dependent boundaries to fluid transport present in the flow. Experimental results show that there are both frequencies which are beneficial and detrimental to cavity ventilation as well as certain frequencies which more evenly distribute particles originating in the cavity throughout the freestream.

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