Supplementary Information

Long-range electrothermal fluid motion in microfluidic systems

Yi Lu [†], Qinlong Ren[†], Tingting Liu [†], Siu Ling Leung[‡], Vincent Gau[||], Joseph C. Liao[⊥], Cho Lik Chan[†] and Pak Kin Wong[*,†]

[†] Department of Aerospace and Mechanical Engineering, The University of Arizona, Tucson, Arizona, 85721, USA.

[‡] College of Medicine, The University of Arizona, Tucson, Tucson, 85724, USA

|| GeneFluidics Inc., Irwindale, California, 91010, USA

⊥ Department of Urology, Stanford University, Palo Alto, California, 94304, USA

*Correspondence should be addressed to Dr. Pak Kin Wong. Tel: +1-520-626-2215; Fax: +1 520-621-8191; E-mail: pak@email.arizona.edu

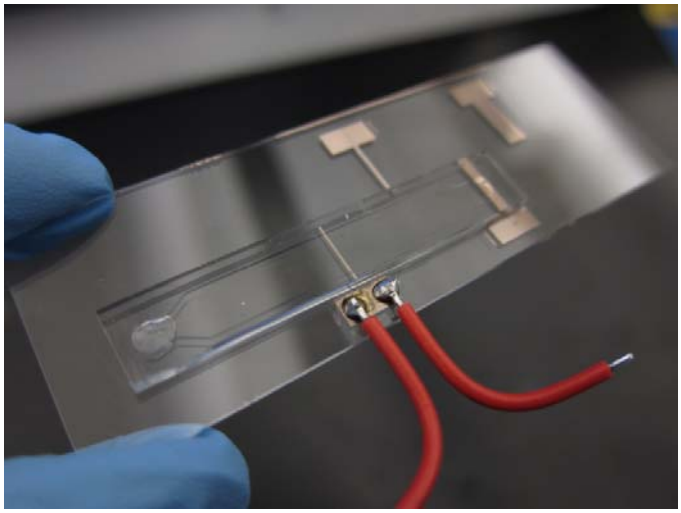

Fig. S1. An assembled PDMS microchannel with integrated parallel electrodes for investigating the long range electrothermal fluid motion.

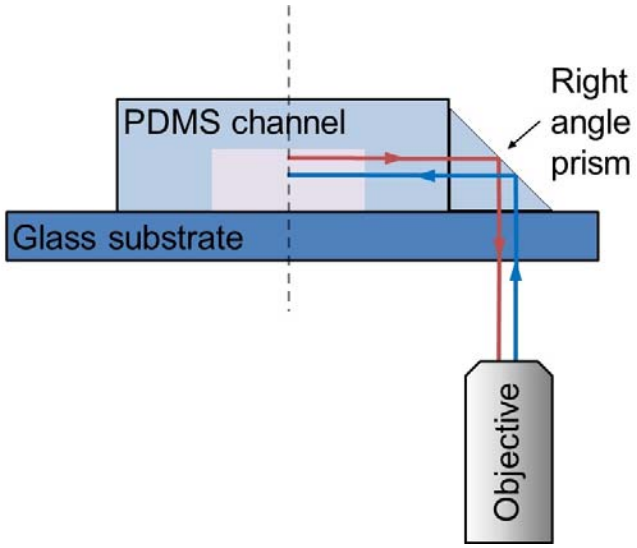

Fig. S2. Schematic illustration of the experimental setup for measuring the flow motion in the channel cross section. The dotted line indicates the focal plane.

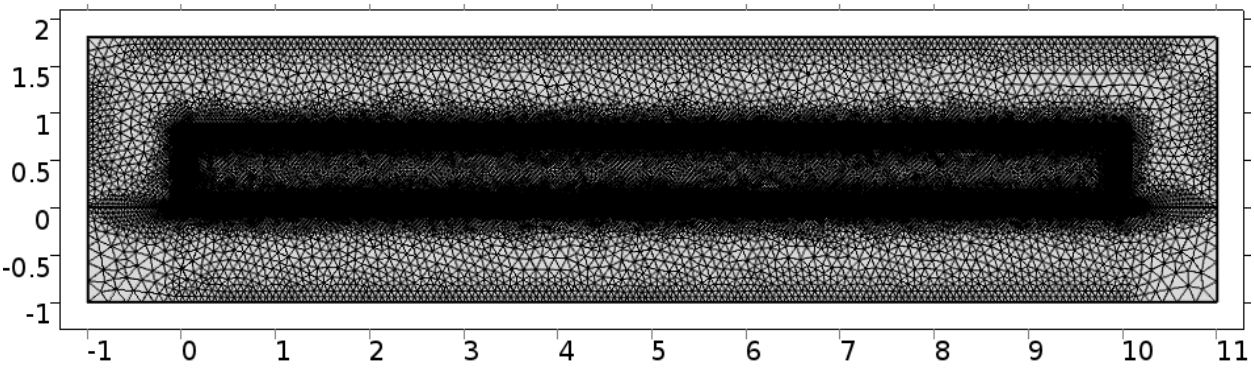

Fig. S3. The entire domain was mashed by free triangular. Total number of elements: 53,087. The number of element for fluid dynamic simulation: 27,117.

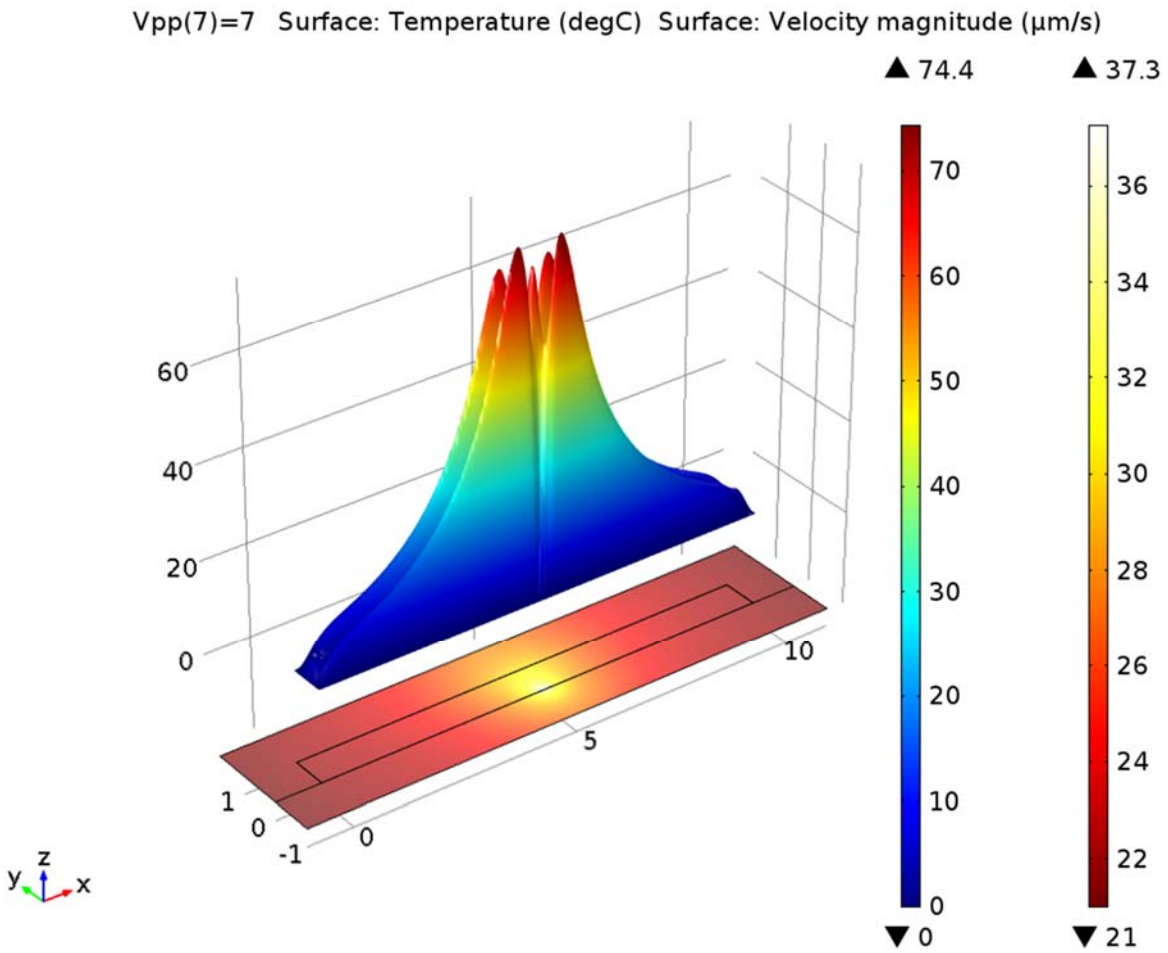

Fig. S4. Velocity and temperature profiles in an 800 µm channel with 1 MHz square wave with 7 V peak-to-peak. The units of fluid velocity and temperature are µm/s and °C.

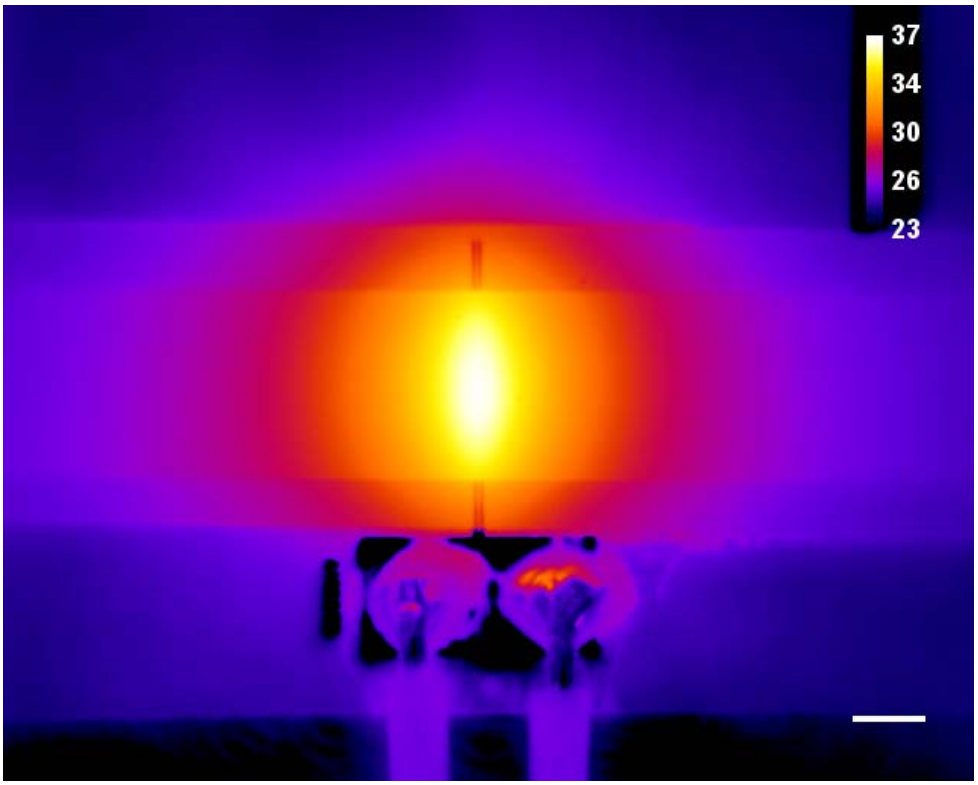

Fig. S5. The surface temperature of the PDMS channel measured by infrared thermometry. The channel height was 800 μm. The voltage applied to the parallel electrode was 7V peak-to-peak voltage with 1MHz square wave.

Supplementary videos

Video S1. Fluid motion at the bottom of a 300 μm height microchannel. Two pairs of counter vortices were observed near the electrode. A pair of small vortices were generated from the gap to the surface of the parallel electrodes. Two large vortices were created from the channel to the electrodes. A square wave potential of 7V peak-to-peak at 1MHz was applied. The video is 2 times faster than real-time.

Video S2. Fluid motion at the top of a 300 μm height microchannel. A pair of large vortices were observed from the center to the size. A square wave potential of 7V peak-to-peak at 1MHz was applied. The video is 2 times faster than real-time.

Video S3. Long-range fluid motion from the side view of a 700 μm height microchannel. Only one side of the vortices is shown. A square wave potential of 7V peak-to-peak at 1MHz was applied. The video is 5 times faster than real-time.

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Video S4. Long-range fluid motion from the side view of a 700 μm height microchannel. Two pairs of vortices are generated when the potential is switched on. A square wave potential of 7V peak-to-peak at 1MHz was applied. The video is 5 times faster than real-time. The video was taken using a 4x objective.

Video S5. Long-range fluid motion from the side view of a 700 μm height microchannel. Two pairs of vortices are generated when the potential is switched on. A square wave potential of

7V peak-to-peak at 1MHz was applied. The video is 5 times faster than real-time. The video was taken using a 10x objective.