



**Fig. S4** Alignment dispersion of cytoskeletal molecule F-actin at each radial location across the channel cross-section. Endothelial cells under 120 rpm flow conditions exhibited lower dispersion of F-actin alignment, indicating a stronger alignment along a dominant angle. Cells under 60 rpm flow conditions displayed higher dispersion, reflecting greater variability in alignment. Under static conditions, F-actin directionality was nonspecific, with no dominant alignment observed.