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Unsteady Heat Transfer in Channel Flow using Small-Scale Vorticity Concentrations Effected by a Vibrating Reed PABLO HIDALGO, ARI GLEZER, Georgia Institute of Technology — Heat transfer enhancement by small-scale vorticity concentrations that are induced within the core flow of a mm-scale heated channel are investigated experimentally. These small-scale motions are engendered by the cross stream vibrations of a streamwise cantilevered reed that spans most of the channel's width. The interactions between the reed the core flow over a range of flow rates lead to the formation, shedding, and advection of time-periodic vorticity concentrations that interact with the wall boundary layers, and increase cross stream mixing of the core flow. Heating of the channel walls is controlled using microfabricated serpentine resistive heaters embedded with streamwise arrays of temperature sensors. It is shown that the actuation disrupts the thermal boundary layers and result in significant enhancement of the local and global heat transfer along the channel compared to the baseline flow in the absence of the reed. The effect of the reed on the cross flow is measured using high resolution particle image velocimetry (PIV), and the reed motion is characterized using a laser-based position sensor. The blockage induced by the presence of the reed and its cross stream motion is characterized using detailed streamwise pressure distributions. Supported by DARPA and UTRC.

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