2007

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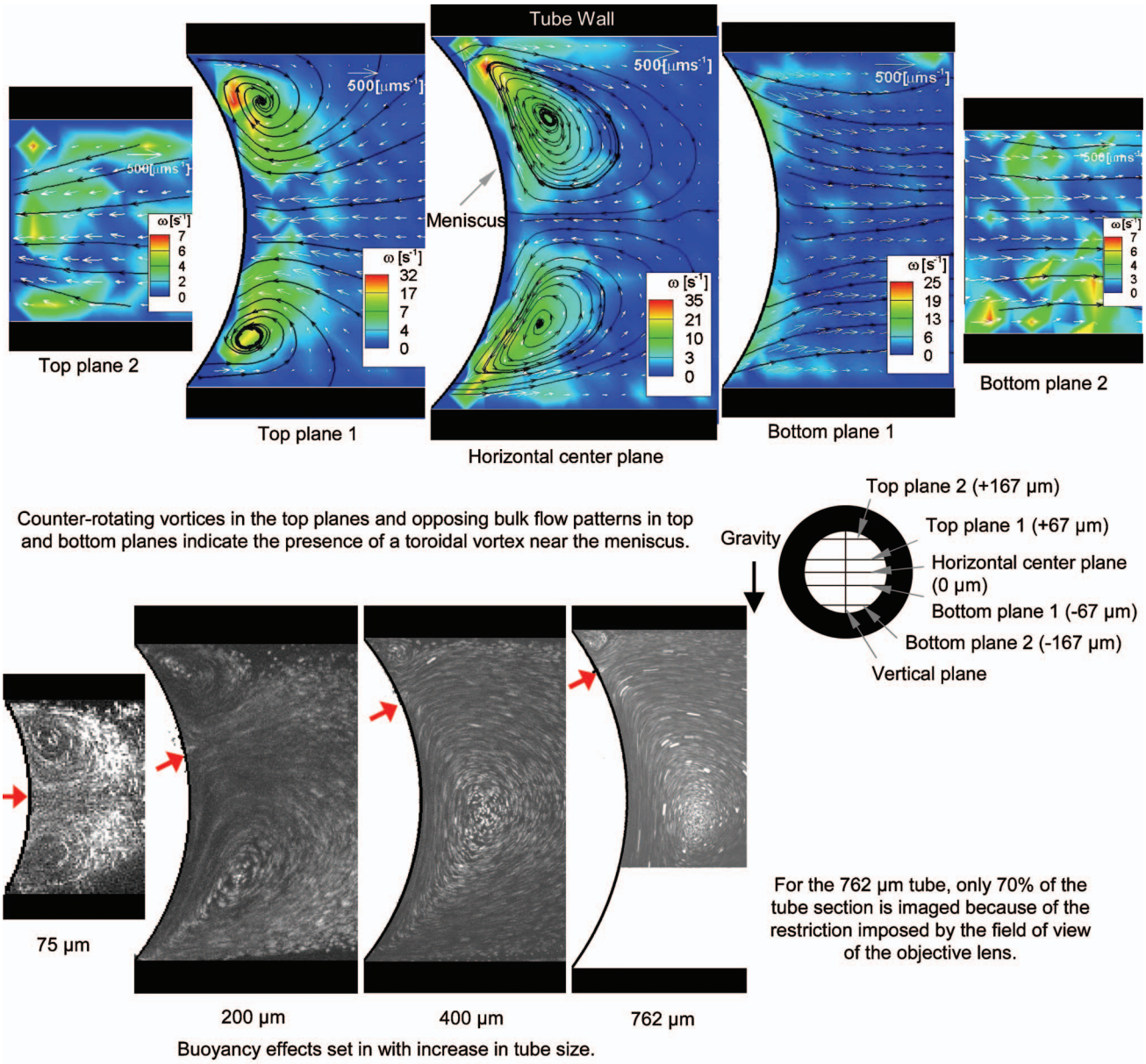
H. K. Dhavaleswarapu

P. Chamarthy

S V. Garimella
Purdue University, sureshg@purdue.edu

J. Y. Murthy

S. T. Wereley



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H. K. Dhavaleswarapu, P. Chamarthy, S. V. Garimella, J. Y. Murthy, and S. T. Wereley
NSF Cooling Technologies Research Center
School of Mechanical Engineering, Purdue University, West Lafayette, Indiana

Differential evaporation is widely known to occur at menisci which are prevalent in many two-phase cooling devices. Thin-film evaporation – the evaporation taking place near a solid-liquid-vapor junction – has long been believed to be the dominant mode of heat transfer in such systems. The intensive heat fluxes near the triple line create a temperature gradient along the meniscus. This results in a surface tension gradient which, coupled with buoyancy effects, causes buoyant-thermocapillary convection. Micro-particle image velocimetry measurements of the convection patterns generated near an evaporating meniscus in horizontally oriented capillary tubes are obtained using polystyrene particles of 0.5 μm diameter suspended in methanol. The velocity vectors at various horizontal measurement planes reveal the three-dimensionality of the flow. The relative influences of buoyancy and thermocapillarity on the flow were also qualitatively investigated by imaging the flow in vertical planes for tube diameters ranging from 75 to 762 μm. These results shed light on the role of thermocapillary convection in heat transfer enhancement in two-phase heat transfer devices.

