Abstract Submitted
for the DFD19 Meeting of
The American Physical Society

Modeling of Marangoni corner flow with phase change in the constrained vapor bubble system [1] JAMES BARRETT, VLADIMIR AJAEV, Southern Methodist University — In the constrained vapor bubble system, designed by the group of J. Plawsky, liquid-vapor mixture inside an elongated cuvette of rectangular cross-section is subject to axial temperature gradients resulting in phase change and complex flow patterns. Experimental studies of this system have been conducted on the ground and onboard the International Space Station. A number of unexpected phenomena, most notably flooding of the hot end of the cuvette, were discovered in the microgravity experiment. In the present study, we focus on mathematical models designed to explain some of these phenomena via a study of corner flows driven by both Marangoni and an opposing capillary flow due to changes in both temperature and curvature of the menisci respectively along the wedge. Also, phase change takes place at the liquid vapor interface and, depending on the location, can be either evaporation or condensation. A model is presented for a steady state corner wedge flow and compared with experimental observations. An imposed temperature gradient gives rise to Marangoni flow in the direction of decreasing temperature. The change in total flow Q along the wedge is used to determine the mass flux from the liquid meniscus into the vapor due to phase change.

[1]This work is supported by NASA grant 80NSSC18K0332.

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Date submitted: 25 Jul 2019 Electronic form version 1.4