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A numerical study of vorticity-enhanced heat transfer[1] XIAOLIN WANG, Georgia Tech, SILAS ALBEN, University of Michigan — The Glezer lab at Georgia Tech has found that vorticity produced by vibrated reeds can improve heat transfer in electronic hardware. Vortices enhance forced convection by boundary layer separation and thermal mixing in the bulk flow. In this work, we simulate the heat transfer process in a 3-dimensional plate-fin heat sink. We propose a simplified model by considering flow and temperature in a 2-D channel, and extend the model to the third dimension using a 1-D heat fin model. We simulate periodically steady-state solutions. We determine how the global Nusselt number is increased, depending on the vortices' strengths and spacings, in the parameter space of Reynolds and Peclet numbers. We find a surprising spatial oscillation of the local Nusselt number due to the vortices.

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