Abstract Submitted
for the MAR17 Meeting of
The American Physical Society

Field-dependent flow patterns in a quasi one dimensional magnetic fluid JUN HUANG, University of Central Florida, TIANSHU LIU, Western Michigan University, DARIAN SMALLY, IAN HARMON, WEILI LUO, University of Central Florida — In an experiment designed to study the magnetically driven convective instability in a quasi-one-dimensional magnetic fluid, multiple intrigue phenomena occurred, including field dependent heat transfer, localized flows, possible crossover from two-dimensional to three-dimensional flows, and configuration-dependent flow patterns, etc. The gravito-thermal convective and magneto-thermal convective Rayleigh numbers, as well as Q field plots indicate the crossover from buoyancy-driven to magnetically-driven convection for field larger than 300 G. The interaction between the magnetic force and the fluid flow clearly visible at the two ends of the sample cells. These results provide the underlying mechanism for earlier observations [1] of dissimilar field dependence of temperature difference across the sample, indicating that heat transfer in a fluid can be controlled by applied magnetic field through controlling the flow structures of the system. Reference: [1] Jun Huang and Weili Luo Heat Transfer Through Convection in a Quasi-One-Dimensional Magnetic Fluid. Journal of Thermal Analysis Calorimetry, 113, p449 (2013).

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Date submitted: 11 Nov 2016 Electronic form version 1.4