Abstract Submitted
for the DFD15 Meeting of
The American Physical Society

Thermodynamic Phase Transitions and Creeping Flows in Cavities MIRON KAUFMAN, PETRU S. FODOR, Cleveland State University — We discuss the analogy between the stream line function of creeping flows in rectangular cavities and the thermodynamic potential at critical points and at phase transitions. Assuming no-slip boundary conditions, the corners of the rectangular cavity are stationary (fixed) points. We analyze two such points: 1. Corner where one wall is moving and the other is stationary; 2. Corner where both walls are stationary. The first one is analogous to a to a first-order transition (discontinuity) point while the second one is analogous to a thermodynamic critical point (second-order transition). Moffatt eddies, which impede mixing [P. S. Fodor, M. Kaufman, Proceedings of PPS-30, AIP Conf. Proc. 1664 (2015)], are present in the neighborhood of the second stationary point. The results discussed here are based on numerical solutions of the Navier-Stokes equations combined with analytical work valid in the vicinity of the stationary points.

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Date submitted: 24 Jul 2015 Electronic form version 1.4