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An Analogy to Phase Transitions for Fluid Flows in Rectangular Cavities. PETRU FODOR, MIRON KAUFMAN, Cleveland State University, Cleveland, Ohio — Using computational fluid dynamics we analyze the flow in rectangular cavities in which the fluid is driven by the motion of one of the boundaries defining the cavity. The high resolution mapping of the flow structures formed within the cavity reveals that in the vicinity of the stationary points corresponding to the cavity corners the streamline function, velocity fields and shear rates, follow scaling laws similar with those found for critical phenomena. In particular the behavior near corners defined by stationary walls is analogous to second order transitions. On the other hand at corners defined by one stationary and one moving wall the behavior corresponds to a first order transition. These analogies provide a new perspective on analyzing the solutions of the Navier-Stokes equations for cavity flows.

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