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Characterizing Strength of Chaotic Dynamics and Numerical Simulation Relevant to Modified Taylor-Couette Flow with Hourglass Geometry[1] YU HOU, ADAM KOWALSKI, KJELL SCHRODER, ANDREW HALMSTAD, THOMAS OLSEN, Lewis & Clark College, Portland, OR, RICHARD WIENER, Pacific University, Forest Grove, OR — We characterize the strength of chaos in two different regimes of Modified Taylor-Couette flow with Hourglass Geometry: the formation of Taylor Vortices with laminar flow and with turbulent flow. We measure the strength of chaos by calculating the correlation dimension and the Kaplan-Yorke dimension based upon the Lyapunov Exponents of each system. We determine the reliability of our calculations by considering data from a chaotic electronic circuit. In order to predict the behavior of the Modified Taylor-Couette flow system, we employ simulations based upon an idealized Reaction-Diffusion model with a third order non-linearity in the reaction rate. Variation of reaction rate with length corresponds to variation of the effective Reynolds Number along the Taylor-Couette apparatus. We present preliminary results and compare to experimental data.

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