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Auto Image Recognition of Chaotic Vortex Creation in Taylor-Couette Flow[1] NICHOLAS CARROLL, RICHARD WIENER, Pacific University, Forest Grove, OR 97116, THOMAS OLSEN, Lewis & Clark College, Portland, OR 97219 — We partially automated the detection and tracking of phase-slips (i.e. vortex creation events) for fluid flow in the gap between a rotating inner hourglass and a fixed outer cylinder (a modified Taylor-Couette system). Using a gray scale digital camera, we recorded static images of the vortex pattern at set time intervals. The recorded images were saved as a single array of pixels corresponding to a 1D slice of the pattern. Vortex centers are lighter than their boundaries, making the array into a waveform with maximum values representing the centers of vortices. Using a correlation function between subsequent frames we could detect frames that had more vortices than previous ones. This allowed for the recognition of a phase slip. The resulting correlation values can be graphed versus time, and the time interval between sharp drops in correlation indicated the time between phase slips. The peak of our correlation waveform would drift in accordance with the drift of the vortices, making possible the determination of overall drift direction between phase slips. The time intervals and drift directions determined by our detection and tracking method compared well with previously observed chaotic pattern dynamics for this system.

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