Abstract Submitted
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Nonlinear Dynamics Analysis of a Flapping Filament in a Flowing Soap Film[1] HAMID AIT ABDERRAHMANE, MICHAEL P. PAIDOUSSIS, McGill University, Montreal, Canada, MOHAMED FAYED, HOI DICK NG, Concordia University, Montreal, Canada — In this study we investigate the nonlinear dynamics of the flapping regime of a filament placed in a two-dimensional soap film flow for different filament lengths and flow speeds. The results show that the onset of flapping at very high Reynolds numbers is quasi-periodic, with the main flapping amplitude and frequency modulated by low-amplitude, low-frequency oscillation. At higher flow velocities, chaotic oscillation is observed. The transition to chaos occurs via the quasi-periodic route to chaos. A new bistability phenomenon is discovered in which the system alternates between the stretched-straight and oscillatory states, and is referred in this study to as "switching oscillation." Unlike some previously reported forms of bistability, in this case the system alternates between the two states continuously, without any external perturbation.

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