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Multiple Long-Time Solutions for Intermediate Reynolds Number Flow past a Circular Cylinder with a Nonlinear Inertial and Dissipative Attachment[1] ANTOINE B. E. BLANCHARD, LAWRENCE A. BERGMAN, ALEXANDER F. VAKAKIS, ARNE J. PEARLSTEIN, University of Illinois at Urbana-Champaign — We consider two-dimensional flow past a linearly-sprung cylinder allowed to undergo rectilinear motion normal to the mean flow, with an attached "nonlinear energy sink" consisting of a mass allowed to rotate about the cylinder axis, and whose rotational motion is linearly damped by a viscous damper. For Re <50, where the flow is expected to be two-dimensional, we use different inlet transients to identify multiple long-time solutions, and to study how they depend on Re and a dimensionless spring constant. For fixed values of the ratio of cylinder density to fluid density, dimensionless damping coefficient, and ratio of the rotating mass to the total mass, we find that different inlet transients lead to different long-time solutions, including solutions that are steady and symmetric (with a motionless cylinder), time-periodic, quasi-periodic, and chaotic. The results show that over a wide range of the parameters, the steady symmetric motionless-cylinder solution is locally, but not globally, stable.

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Arne J. Pearlstein
University of Illinois at Urbana-Champaign

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