Abstract Submitted
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Integrability and Chaos in Body-Vortex Interactions[1] JOHAN ROENBY, HASSAN AREF[2], Technical University of Denmark — We explore the class of dynamical systems consisting of a rigid body and N point vortices in an ideal, unbounded, 2D fluid. The body is represented by a closed curve and is free to move in response to the fluid motion. It may have a prescribed circulation about it, which is conserved. The vortices have fixed strengths and are intended to model vortices that have been shed by the body or elsewhere in the flow field. The flow at any given time and position is determined by the instantaneous vortex and body positions together with the instantaneous linear and angular velocity of the body. The equations of motion may be cast in Hamiltonian form. We analyze the equations of motion using techniques from the theory of dynamical systems. The simplest such system, a single point vortex and a circular body, is integrable. As we add vortices, or change other features of the system such as the body shape, the motion may become chaotic. Numerical solutions are shown and analyzed with an emphasis on the transition to chaos and its physical meaning. This class of systems provides a rich family of few-degree-of-freedom systems that capture essential fluid-body interaction physics.

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