

Abstract Submitted
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Stability of four point vortices in a periodic strip, the “Domm system”¹ VASILEIOS VLACHAKIS, ESM Department, Virginia Tech, HASSAN AREF², Technical University of Denmark — We approach the modeling of vortex wakes and their stability by considering a system of four vortices, two of circulation $+\Gamma$, two of circulation $-\Gamma$, in a periodic strip, a system first considered by Domm in 1956. The four-degree-of-freedom “Domm system” can be reduced to a system with two degrees of freedom by canonical transformations (Eckhardt & Aref, 1988). The reduced representation allows us to construct perturbations that preserve linear impulse (momentum) and kinetic energy (Hamiltonian) of the system improving upon earlier work by Dolaptschiev and Schmieden from the 1930’s. We show that the only translating relative equilibria of the Domm system are the vortex streets that one already finds for two opposite vortices in a periodic strip. We also find by numerical experiments that the vortex street will dissolve into vortex pairs that escape to infinity, a mode of vortex street breakdown observed numerically by Aref & Siggia (1981) and in soap film experiments by Couder & Basdevant (1986). The dissolution process is extremely sensitive to the initial perturbation, suggesting that a form of chaos is involved.

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