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Structure and stability of the finite-area von Karman street P. LUZZATTO-FEGIZ, University of Cambridge, C.H.K. WILLIAMSON, Cornell University — By using a recently developed numerical method, we explore in detail the equilibria for a Karman street of uniform, large-area vortices. We construct a reliable implementation of an energy argument to find superharmonic instabilities. This leads us to organize flows into families with fixed impulse I, and to construct diagrams of the flow energy E and horizontal spacing L. Families of large-I streets exhibit a turning point in L, and terminate with "cat's eyes" vortices (as also suggested by previous investigators). However, for low-I streets, the solution families display a multitude of turning points (leading to multiple possible streets, for given L), and terminate with teardrop-shaped vortices. This is radically different from previous suggestions in the literature. These two qualitatively different limiting states are connected by a special street, whereby vortices from opposite rows touch, such that each vortex exhibits three corners. Furthermore, by following the family of $I = 0$ streets to small L, we access a large, hitherto unexplored regime, involving streets with L much smaller than previously believed possible. For each solution family, our stability approach also reveals a single superharmonic bifurcation, leading to new vortex streets, which exhibit lower symmetry.

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