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Bifurcation analysis of an infinite array of von Karman Streets BABAK GHAEMI OSKOUEI, EVA KANSO, PAUL K. NEWTON, University of Southern California, UNIVERSITY OF SOUTHERN CALIFORNIA TEAM — This research investigates the behavior of an infinite array of (inverse) von Karman streets. Primary motivation is to model the wake dynamics in large fish schools. Ignoring the fish we focus on the dynamic interaction of multiple wakes. In particular, we investigate the problem of fluid transport between adjacent vortex streets for its relevance to understanding the transport of oxygen and nutrients to inner fish in large schools as well as understanding flow barriers to passive locomotion. We prove that the configuration of vortices is in relative equilibrium, meaning that the streamline pattern remains steady in the frame moving with vortices. We look at the topology of these streamline patterns plotted in the moving frame which lends insight to fluid transport through the mid-wake region. Fluid is advected along different paths depending on the distance separating two adjacent streets. When the streets are far apart, the dynamics is decoupled and fluid is transported globally between two adjacent streets. When the streets get closer to each other, the number of streets that enter into partnership in transporting fluid among themselves increases. This observation motivates a bifurcation analysis which links the distance between streets to the maximum number of streets transporting fluid among themselves.

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