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Vortex formation in Daphnia swarms JÜRGEN VOLLMER, BRUNO ECKHARDT, CHRISTOPH LANGE, Physics Department, Philipps Univ., 35032 Marburg, Germany, ATTILA G. VEGH, Physics Department, Babes-Boyai Univ., 3400 Cluj Napoca, Romania — We propose a self-propelled particle model for the swarming of Daphnia, which takes into account propulsion of the particles, mutual avoidance of close encounters and attraction to a center. Various key parameters are identified in order to arrive at a phase diagram for qualitatively different steady-state motions. We find that a vertex is formed only in a finite range of propulsions, and analyze its transitions to other states. Hydrodynamic interaction between the particles can stabilize the vortex and change its velocity profile.

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