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Locomotion gaits of a rotating cylinder pair WIM M. VAN REES, School of Engineering and Applied Sciences, Harvard University, GUIDO NOVATI, PETROS KOUMOUTSAKOS, Chair of Computational Science and Engineering, ETH Zurich, L MAHADEVAN, School of Engineering and Applied Sciences, Harvard University — Using 2D numerical simulations of the Navier-Stokes equations, we demonstrate that a simple pair of rotating cylinders can display a range of locomotion patterns of biological and engineering interest. Steadily counter-rotating the cylinders causes the pair to move akin to a vortex dipole for low rotation rates, but as the rotational velocity is increased the direction of motion reverses. Unsteady rotations lead to different locomotion gaits that resemble jellyfish (for in-phase rotations) and undulating swimmers (for out-of-phase rotations). The small number of parameters for this simple system allows us to systematically map the phase space of these gaits, and allows us to understand the underlying physical mechanisms using a minimal model with implications for biological locomotion and engineered analogs.

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