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Reversible Vector Ratchet Effect in Skyrmion Systems XIAOYU MA, Univ of Notre Dame, CHARLES REICHHARDT, CYNTHIA REICHHARDT, Los Alamos National Laboratory — Magnetic skyrmions are topological non-trivial spin textures found in several magnetic materials. Since their motion can be controlled using ultralow current densities, skyrmions are appealing for potential applications in spintronics as information carriers and processing devices. In this work, we studied the collective transport properties of driven skyrmions based on a particle-like model with molecular dynamics (MD) simulation. Our results show that ac driven skyrmions interacting with an asymmetric substrate provide a realization of a new class of ratchet system, which we call a vector ratchet, that arises due to the effect of the Magnus term on the skyrmion dynamics. In a vector ratchet, the dc motion induced by the ac drive can be described as a vector that can be rotated up to 360 degrees relative to the substrate asymmetry direction. This could represent a new method for controlling skyrmion motion for spintronic applications.

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