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Antivortex complexes and intrinsic ratchet dynamics in superconductors with progressive magnetic topology[1] ANDRAS LIBAL, MILORAD MILOSEVIC, Departement Fysica, Universiteit Antwerpen, Belgium, FRANCOIS PEETERS, Deaprtement Fysica, Universiteit Antwerpen, Belgium, W. GILLIJNS, A.V. SILHANEK, V.V. MOSHCHALKOV, INPAC - Institute for Nanoscale Physics and Chemistry, Katholieke Universiteit Leuven, Belgium — Theoretically and experimentally, we analyze characteristic properties of a superconducting (Sc) film deposited on parallel arrays of ferromagnetic (Fm) dots with gradually increasing diameter in a periodic saw-tooth manner. Due to their perpendicular magnetization, dots induce vortex-antivortex molecules in the sample, with number of constituent (anti) vortices growing with magnet size. Resulting gradient of antivortex density between the dots predetermines local nucleation of superconductivity in the sample as a function of applied external field and temperature. In applied drive however, antivortices act collectively in an asymmetric potential of the dots and pinned vortices, and exhibit unique ratchet dynamics intrinsic to the Sc-Fm hybrids.

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