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Micromagnetic modeling of skyrmion injection in an inhomogeneous geometry[1] OLLE HEINONEN, WANJUN JIANG, SUZANNE TE VELTHUIS, AXEL HOFFMANN, Argonne Natl Lab — Magnetic systems with broken inversion symmetry can support skyrmion structures stabilized by the Dzyaloshinskii-Moriya interaction (DMI). This can be realized in thin magnetic films, such as CoFe, on a substrate with appreciable spin-orbit interactions, e.g., Ta or Pt. Recent works have explored the creation and manipulations in such thin films using spin transfer torque or domain wall injection, which is challenging. We recently demonstrated that an inhomogeneous spin-Hall current can efficiently create and inject skyrmions, which can then be manipulated and transported. Based on this observation we will here present micromagnetic modeling of the injection dynamics of skyrmions in a geometry similar to the ones used experimentally. For small current densities, the system will inject meandering stripes that will arrange themselves along equipotential lines. For large enough current densities, a domain wall forms in the narrow part of the system and much complicated dynamical structures are sprayed into the wider part of the system. When the driving current is subsequently turned off, these structures coalesce into skyrmions. A key ingredient here is the inhomogeneous spin-Hall torque resulting from the geometry of the system.

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