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Smooth invariant densities for switching systems on the torus

We consider a random dynamical system governed by two smooth vector fields on the two-dimensional torus, with switches between these vector fields happening according to a Poisson process. If the vector fields are transversal to each other at every point on the torus and if their flows are smoothly conjugated to flows without periodic orbits, the invariant measure of the associated Markov semigroup has a smooth density for any switching rate. This talk is based on work with Yuri Bakhtin, Sean Lawley and Jonathan C. Mattingly.