An Eyring-Kramers law for slowly oscillating bistable diffusions

We consider two-dimensional stochastic differential equations, describing the motion of a slowly and periodically forced overdamped particle in a double-well potential, subjected to weak additive noise. We give sharp asymptotics of Eyring-Kramers type for the expected transition time from one potential well to the other one. Our results cover a range of forcing frequencies that are large with respect to the maximal transition rate between potential wells of the unforced system. The main difficulty of the analysis is that the forced system is non-reversible, so that standard methods from potential theory used to obtain Eyring-Kramers laws for reversible diffusions do not apply. Instead, we use results by Landim, Mariani and Seo that extend the potential-theoretic approach to non-reversible systems.

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