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Sharp spectral asymptotics for metastable diffusions trapped in a temperature-dependent domain

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In this work, we revisit the problem of finding asymptotic estimates for the mean metastable exit time and spectral gap of a reversible diffusion absorbed at the boundary of a bounded domain, in the small noise limit, considering here the case in which the boundary of the domain varies with the asymptotic parameter. We derive sharp asymptotics for the eigenvalues of the generator, yielding a modified Eyring-Kramers formula, and giving insight into a state-optimization problem for the accelerated sampling of transition events between metastable states.

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