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Global properties of transition kernels
associated to second order elliptic operators

We study global regularity properties of transitions kernels associated with second order differential operators in $\mathbf{R}^N$ with unbounded drift and potential terms. Under suitable conditions, we prove Sobolev regularity of transition kernels and pointwise upper bounds. We use time dependent Lyapunov function techniques allowing us to gain a better time behaviour of such kernels. As an application, we obtain sufficient conditions implying the differentiability of the associated semigroup on the space of bounded and continuous functions on $\mathbf{R}^N$.