

KERNEL ESTIMATES FOR KOLMOGOROV EQUATIONS WITH UNBOUNDED DIFFUSION COEFFICIENTS

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ABSTRACT. Using time dependent Lyapunov functions, we prove pointwise upper bounds for the heat kernels of a large class of Kolmogorov operators with possibly unbounded drift and diffusion coefficients. As an application we show that the kernel p_t of the semigroup generated by the operator

$$(A\varphi)(x) = (1 + |x|^m)\text{Tr}(Q^0(x)D^2\varphi(x)) - b(x)|x|^{p-1}x \cdot \nabla\varphi(x)$$

satisfy

$$0 < p_t(x, y) \leq t^{-\beta} e^{-\delta_0 t^\alpha |y|^{p+1-m}}, \quad t \in (0, 1], x, y \in \mathbb{R}^d,$$

where $m \geq 0$, $p > \max\{m - 1, 1\}$, $\alpha > (p + 1 - m)/(p - 1)$ and δ_0, β are suitable positive constants. Here Q^0 and b are, respectively, a matrix valued function and a scalar function satisfying appropriate conditions. This generalizes the examples in [1] and [2].

REFERENCES

- [1] A. Aibeche, K. Laidoune and A. Rhandi: Time dependent Lyapunov functions for some Kolmogorov semigroups perturbed by unbounded potentials, Arch. Math. (Basel) **94** (2010), 565-577.
- [2] S. Fornaro, N. Fusco, G. Metafuno and D. Pallara: Sharp upper bounds for the density of some invariant measures, Proceedings of the Royal Society of Edinburgh. Section A. Mathematics **139** (2009), 1145-1161.

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