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Riesz transform on non-compact Riemannian manifolds and heat kernel estimates

Let M be a complete non-compact Riemannian manifold. Under which conditions on M and $p \in]1, +\infty[$ can one compare the two semi-norms $\|\|\nabla f\|\|_p$ and $\|\Delta^{1/2}f\|_p$, where ∇ is the Riemannian gradient and Δ the Laplace-Beltrami operator? several partial answers have been given recently to this question in terms of heat kernel estimates on M . We shall survey these results, which are due to a number of authors including Auscher, Carron, Coulhon, Duong, Hassell, Hofmann, Li H-Q and Li X-D.