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Parabolic Singular Integrals and Quantitative Rectifiability

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We present two recent results about the relationship between boundedness of parabolic singular integral operators and parabolic uniform rectifiability. The first result shows that parabolic Ahlfors-David regular sets on which a large class of parabolic singular integrals are bounded from L^2 to L^2 , and which satisfy an additional necessary condition involving the transportation distance to a class of pathological measures, are necessarily uniformly rectifiable in the parabolic sense. The second result shows that parabolic Lipschitz graphs with small Lipschitz constant on which the parabolic Riesz transforms are bounded from L^2 to L^2 are necessarily uniformly rectifiable in the parabolic sense. We will take time to emphasize the connections between L^2 boundedness of the Riesz transforms and elliptic PDE. The aforementioned results are joint work with Jaye and Bortz, respectively.