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abstract		The purpose of this paper is to study the smoothing properties (in L^p Sobolev spaces) of operators of the form $f\mapsto \psi(x) \int f(\gamma_t(x)) K(t)\: dt$, where $\gamma_t(x)$ is a C^∞ function defined on a neighborhood of the origin in $(t,x)\in\mathbb{R}^N\times \mathbb{R}^n$, satisfying $\gamma_0(x)\equiv x$, ψ is a C^∞ cut-off function supported on a small neighborhood of $0\in \mathbb{R}^n$, and K is a "multi-parameter fractional kernel" supported on a small neighborhood of $0\in \mathbb{R}^N$. When K is a Calder\'on-Zygmund kernel these operators were studied by Christ, Nagel, Stein, and Wainger, and when K is a multi-parameter singular kernel they were studied by the author and Stein. In both of these situations, conditions on γ were given under which the above operator is bounded on L^p ($1<p<\infty$). Under these same conditions, we introduce non-isotropic L^p Sobolev spaces associated to γ. Furthermore, when K is a fractional kernel which is smoothing of an order which is close to 0 (i.e., very close to a singular kernel) we prove mapping properties of the above operators on these non-isotropic Sobolev spaces. As a corollary, under the conditions introduced on γ by Christ, Nagel, Stein, and Wainger, we prove optimal smoothing properties in isotropic L^p Sobolev spaces for the above operator when K is a fractional kernel which is smoothing of very low order.
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decision	id
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