

Abstract

Title: Upscaling interpretation of nonlocal fields, gradients and divergences

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The interrelations between weight-function upscaling (measurement) and the definition of various nonlocal operators is explored. Let $\langle f \rangle = f * g$ where $f * g$ is the convolution product which represents the effect of upscaling via an instrument (defined by g) on a field variable f and its localized counterpart. Nonlocal field variables are defined and employed for upscaling. In this talk it will be shown via Fourier transform, for judicious choice of the arbitrary function ρ , that $G_\rho f(x) = \langle \nabla f \rangle(x)$, where $G_\rho f(x)$ is the nonlocal gradient of f and ∇f is the classical gradient. Upscaled representations for the adjoint of G_ρ and the nonlocal divergence are obtained. A nonlocal self-diffusion equation is upscaled and written in terms of nonlocal operators.