

## COUPLING LOCAL AND NONLOCAL EVOLUTION EQUATIONS

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We prove existence, uniqueness and several qualitative properties for evolution equations that combine local and nonlocal diffusion operators acting in different subdomains and coupled in such a way that the resulting evolution equation is the gradient flow of an energy functional. We deal with the Cauchy, Neumann and Dirichlet problems, in the last two cases with zero boundary data. For the first two problems we prove that the model preserves the total mass. We also study the behaviour of the solutions for large times. Finally, we show that we can recover the usual heat equation (local diffusion) in a limit procedure when we rescale the nonlocal kernel in a suitable way.

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