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Recent results on fractional-order operators

The fractional Laplacian $(-\Delta)^a$, $0 < a < 1$, is currently of great interest in probability and finance, and has applications also in differential geometry and mathematical physics. A difficulty is that it acts non-locally, in contrast to differential operators, so that problems on domains with boundary are harder to set up. Clearly, it is a pseudodifferential operator, but the theory for such operators has not always been used; rather potential-theoretic and probabilistic methods. We shall give a survey of how one can deal with this and related operators by pseudodifferential methods, reporting on some of the most recent results.