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**Camelia A Pop\*** (cpop@math.upenn.edu), Department of Mathematics, University of Pennsylvania, 209 South 33rd Street, Philadelphia, PA 19104-6395, **Charles L Epstein** (cle@math.upenn.edu), Department of Mathematics, University of Pennsylvania, 209 South 33rd Street, Philadelphia, PA 19104-6395, and **Arshak Petrosyan** (arshak@math.purdue.edu), Department of Mathematics, Purdue University, West Lafayette, IN 47907. *Regularity results for the fractional Laplacian with drift.*

We study the elliptic obstacle problem defined by the fractional Laplacian with drift in the subcritical regime. With the aid of a new monotonicity formula, we establish the optimal regularity of solutions, and the Lipschitz regularity of the free boundary in neighborhoods of regular points. In the supercritical regime, the symbol associated to the operator defined by the fractional Laplacian with drift is no longer elliptic, because the drift is of higher order than the diffusion component. In this case, we establish the local regularity in Sobolev spaces of solutions to the linear equation defined by the fractional Laplacian with drift. This is joint work with Charles Epstein and Arshak Petrosyan. (Received July 30, 2013)