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Nicola Garofalo, Arshak Petrosyan, Camelia A. Pop and Mariana Smit Vega Garcia*,
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We present the $C^{1,\alpha}$ regularity of the regular part of the free boundary in the obstacle problem defined by the fractional Laplacian operator with gradient perturbation, in the subcritical regime ($s \in (1/2, 1)$). More specifically, we consider

$$\min\{Lu, u - \varphi\} = 0,$$

where we denote $Lu := (-\Delta)^s u + \langle b(x), \nabla u \rangle + c(x)u$.

Our proof relies on a new Weiss-type monotonicity formula and an epiperimetric inequality. Both are generalizations of the ideas of G. Weiss, used in the classical obstacle problem for the Laplace operator, to our framework of fractional powers of the Laplace operator with drift. (Received August 26, 2016)