

The obstacle problem for the p -fractional Laplacian and its limit as $p \rightarrow \infty$

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ABSTRACT: In this Lecture (see [2]) we investigate an inhomogeneous obstacle type problem involving the fractional p -Laplacian operator (cf. Korvenpää *et al* [3] and [4]). Firstly, we establish existence and uniform estimates for any family of solutions $\{u_p\}_{p \geq 2}$ which depend on the data of the problem and universal parameters. Finally, we analyse the asymptotic behaviour of such a family as $p \rightarrow \infty$. At this point, we prove that $\lim_{p \rightarrow \infty} u_p(x) = u_\infty(x)$ there exists (up to a subsequence), verifies a limiting obstacle type problem in the viscosity sense, and it is an s -Hölder continuous function up to the boundary (cf. da Silva & Rossi [1] for similar estimates in other free boundary problem with non-local diffusion).

References

- [1] J.V. DA SILVA & J.D. ROSSI - *The limit as $p \rightarrow \infty$ in free boundary problems with fractional p -Laplacians*. Trans. Amer. Math. Soc. 371 (2019), no. 4, 2739-2769.
- [2] J.V. DA SILVA & A.M. SALORT - *A limiting obstacle type problem for the inhomogeneous p -fractional Laplacian*. Calc. Var. Partial Differential Equations 58 (2019), no. 4, 58:127.
- [3] J. KORVENPÄÄ, T. KUUSI & G. PALATUCCI - *The obstacle problem for nonlinear integro-differential operators*. Calc. Var. Partial Differential Equations 55 (2016), no. 3, Art. 63, 29 pp.
- [4] J. KORVENPÄÄ, T. KUUSI & G. PALATUCCI. *Hölder continuity up to the boundary for a class of fractional obstacle problems*. Atti Accad. Naz. Lincei Rend. Lincei Mat. Appl. 27 (2016), no. 3, 355-367.