

**Title:** Large time behavior for a nonlocal diffusion equation with absorption and bounded initial data: the subcritical case.

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### Abstract

This is a joint work with A. Salort and N. Wolanski. We continue our study of the large time behavior of the bounded solution to the nonlocal diffusion equation with absorption

$$\begin{cases} u_t = \mathcal{L}u - u^p & \text{in } \mathbb{R}^N \times (0, \infty), \\ u(x, 0) = u_0(x) & \text{in } \mathbb{R}^N, \end{cases}$$

where  $p > 1$ ,  $u_0 \geq 0$  and bounded and

$$\mathcal{L}u(x, t) = \int J(x - y) (u(y, t) - u(x, t)) dy$$

with  $J \in C_0^\infty(\mathbb{R}^N)$ , radially symmetric,  $J \geq 0$  with  $\int J = 1$ .

Our assumption on the initial datum is that  $0 \leq u_0 \in L^\infty(\mathbb{R}^N)$  and

$$|x|^\alpha u_0(x) \rightarrow A > 0 \quad \text{as } |x| \rightarrow \infty$$

This problem was studied in [1, 2] in the supercritical and critical cases  $p \geq 1 + 2/\alpha$ .

In the present paper we study the subcritical case  $1 < p < 1 + 2/\alpha$ . More generally, we consider bounded non-negative initial data such that

$$|x|^{\frac{2}{p-1}} u_0(x) \rightarrow \infty \quad \text{as } |x| \rightarrow \infty$$

and prove that

$$t^{\frac{1}{p-1}} u(x, t) \rightarrow \left( \frac{1}{p-1} \right)^{\frac{1}{p-1}} \quad \text{as } t \rightarrow \infty$$

uniformly in  $|x| \leq k\sqrt{t}$ , for every  $k > 0$ .

Of independent interest is our study of the positive eigenfunction of the nonlocal operator  $\mathcal{L}$  in the ball  $B_R$  in the  $L^\infty$ .

### REFERENCES

- [1] J. Terra, N. Wolanski, *Asymptotic behavior for a nonlocal diffusion equation with absorption and nonintegrable initial data. The supercritical case*, Proc. Amer. Math. Soc., **139** (4), 2011, 1421–1432.
- [2] J. Terra, N. Wolanski, *Large time behavior for a nonlocal diffusion equation with absorption and bounded initial data*, Discrete Cont. Dyn. Syst. A, 31 (2011) 2, 581–605.