The Fisher-KPP equation with nonlinear fractional diffusion

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Abstract.

We study the propagation properties of nonnegative and bounded solutions of the class of reaction-diffusion equations with nonlinear fractional diffusion:

$$u_t + (-\Delta)^s(u^m) = f(u).$$

For all $0 < s < 1$ and $m > m_c = (N - 2s)_+/N$, we prove that the level sets of the solution of the initial-value problem with suitable initial data propagate exponentially fast in time, in contradiction to the traveling wave behaviour of the standard KPP case, which corresponds to putting $s = 1$, $m = 1$ and $f(u) = u(1 - u)$.

This problem is part of my PhD thesis and it is a joint work with professor Juan Luis Vázquez (UAM).

References

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