Long time behavior of the solution of the Dirichlet problem for the porous medium equation in exterior domains

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Abstract

I will present recent results on the long time behavior of the solution to the Cauchy-Dirichlet problem in an exterior 1 or 2 dimensional domain with integrable and compactly supported initial datum.

I will begin by stating the corresponding result by Brandle, Quiros and Vazquez in the case of exterior $N-$dimensional domains, $N \geq 3$ (cf. [1]).

In small dimensions the long time behavior is more involved since the rate of decay of the solutions in compact sets differs from the global one.

Global results are known in 1 dimension (cf. [3]) but they don't give the right decay rate nor the final profile in compact sets.

On the other hand, in dimension 2, the long time behavior is known only in "exterior" domains of the form $\{|x| \geq \xi t^{1/2m}(\log t)^{(m-1)/2m}\}$ (cf. [2]).

I will present recent work in collaboration with Carmen Cortazar and Fernando Quiros where we found both the decay rate (which depends on the spatial scale) and the final profile in dimensions 1 and 2 (cf. [4, 5]).

References

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[3] Kamin, S.; Vázquez, J. L. *Asymptotic behaviour of solutions of the porous medium equation with changing sign.* SIAM J. Math. Anal. 22 (1991), no. 1, 34–45.

[4] Cortázar, C.; Quirós, F.; Wolanski, N. *Near field asymptotic behavior for the porous medium equation on the half-line.* To appear in Advanced Nonlinear Studies, `arXiv:1603.05936 [math.AP]`.

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