

# Large time behavior of solutions of a semilinear elliptic equation with a dynamical boundary condition

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We consider the following initial value problem for a semilinear elliptic equation with a dynamical boundary condition:

$$(P) \quad \begin{cases} -\Delta u = u^p, & x \in \mathbb{R}_+^N, \quad t > 0, \\ \partial_t u + \partial_\nu u = 0, & x \in \partial\mathbb{R}_+^N, \quad t > 0, \\ u(x, 0) = \varphi(x') \geq 0, & x = (x', 0) \in \partial\mathbb{R}_+^N, \end{cases}$$

where  $N \geq 2$ ,  $\mathbb{R}_+^N := \{x = (x', x_N) : x' \in \mathbb{R}^{N-1}, x_N > 0\}$ ,  $u = u(x, t)$ ,  $\Delta$  is the  $N$ -dimensional Laplacian (in  $x$ ),  $\partial_t := \partial/\partial t$ ,  $\partial_\nu := -\partial/\partial x_N$ , and  $p > 1$ . In this talk we prove that there is a critical exponent for the existence of positive solutions of problem (P). Furthermore, we show that small solutions behave asymptotically like suitable multiples of the Poisson kernel.

This is a joint work with Marek Fila (Comenius University) and Kazuhiro Ishige (Tohoku University).

## References

- [1] *M. Fila, K. Ishige, T. Kawakami*: Large-time behavior of solutions of a semilinear elliptic equation with a dynamical boundary condition, *Adv. Differ. Equ.* *18* (2013), 69–100.
- [2] *M. Fila, K. Ishige, T. Kawakami*: Large-time behavior of small solutions of a two-dimensional semilinear elliptic equation with a dynamical boundary condition, preprint.