An exterior nonlinear elliptic problem with a dynamical boundary condition

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We consider the problem

$$(P) \qquad \begin{cases} -\Delta u = u^p, \quad u \geq 0, & x \in \Omega := \{x \in \mathbb{R}^N : |x| > 1\}, \ t > 0, \\ \partial_t u + \partial_\nu u = 0, & x \in \partial\Omega, \ t > 0, \\ u(x,0) = \varphi(x) \geq 0, & x \in \partial\Omega, \end{cases}$$

where $N > 2$, Δ is the N-dimensional Laplacian (in x), ν is the exterior normal vector on $\partial\Omega$, $\partial_t := \partial/\partial t$, $\partial_\nu := \partial/\partial\nu$, $p > 1$ and φ is a nonnegative measurable function on $\partial\Omega$. In this talk we discuss results on existence, nonexistence and large-time behavior of small solutions. Furthermore, we show that local solvability of problem (P) is equivalent to global solvability of problem (P) and solvability of the stationary problem.

These are joint works with M. Fila and K. Ishige.