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Abstract Title: Inverse problems for evolution equations with p-Laplacian and damping

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Inverse problems for nonlinear evolution equations with p-Laplacian and damping

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In this work we study the inverse problems for the following nonlinear parabolic and pseudoparabolic equations perturbed by p-Laplacian and damp-ing term

$$u_t - \mathrm{div}\left(|\nabla u|^{p-2}\nabla u\right) = \gamma\,|u|^{\sigma-2}u + F(u, x, t) \text{ in } Q_T, \tag{1}$$

and

$$u_t - \Delta u_t - \mathrm{div}\left(|\nabla u|^{p-2}\nabla u\right) = \gamma\,|u|^{\sigma-2}u + F(u, x, t) \text{ in } Q_T, \tag{2}$$

where the function F considered in two cases: $F(u, x, t) = f(t)u(x, t) + g(x, t)$ or $F(u, x, t) = f(t)g(x, t)$. The inverse problems consist of finding $f(t)$ and $u(x, t)$ in (1) and (2) under the following initial and boundary conditions

$$u(x, 0) = u_0(x) \text{ in } \Omega \text{ and } u(x, t) = 0 \text{ on } \Gamma_T. \text{ and the given} \tag{3}$$

integral measurement

$$\int_\Omega u(x, t)\omega(x)dx = e(t), t \in [0, T]. \tag{4}$$

Here $Q_T = \{(x, t) : x \in \Omega, 0 < t \leq T\}$ is a bounded cylinder and $\Omega \subset \mathbb{R}^d\, d \geq 2$, is a bounded domain with a smooth boundary $\partial\Omega$, $\Gamma_T = \partial\Omega \times [0, T]$, $T < \infty$. The functions g, u_0, ω, and e are given. The coefficient γ is a given real number with the sign that might be positive $\gamma \geq 0$ either negative $\gamma \leq 0$. The exponents p and σ are also given numbers, such that

$$1 < p, \sigma < \infty. \tag{5}$$

Under suitable assumptions on the data, we establish global and local int time existence and uniqueness of weak generalized solutions of the inverse prob-lem (1)-(4).

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