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## SEMINÁRIOS DE ANÁLISE

**Dia 27 de Novembro (quinta-feira), às 14h15, na Sala B3-01**

# Blow up for parabolic and hyperbolic equations with nonstandard growth conditions

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**Abstract:**

Let $\Omega \subset \mathbb{R}^n$ be a bounded domain with Lipschitz-continuous boundary $\Gamma$ and $Q_T = \Omega \times (0,T]$. We consider parabolic and hyperbolic equations in the following forms

$$v_t = Lv \quad \text{and} \quad u_{tt} = Lu, \quad (x,t) \in Q_T = \Omega \times (0,T), \Omega \subset \mathbf{R}^n. \tag{1}$$

where

$$Lu = div\left(|\nabla u|^{p(x,t)-2}\nabla u\right) + a(x,t)\,|u|^{\sigma(x,t)-2}\,u. \tag{2}$$

The coefficients $p$, $\sigma$, $a$ are given measurable functions of their arguments satisfying

$$1 < p_- \le p(x,t) \le p_+ < \infty, \; 1 < \sigma_- \le \sigma(x,t) \le \sigma_+ < \infty, \tag{3}$$

$$0 \le a_- \le a(x,t) \le a_+ \le \infty. \tag{4}$$

Such equations occur in the mathematical modelling of various physical phenomena, e.g., the flows of electro-rheological fluids or fluids with temperature–dependent viscosity, processes of filtration through a porous media.

We consider weak solutions of equations (1) under the boundary

$$v|_{\Gamma_T} = 0 \text{ and } u|_{\Gamma_T} = 0, \; \Gamma_T = \partial\Omega \times (0,T) \tag{5}$$

and initial conditions

$$v(x,0) = v_0(x) \text{ and } u(x,0) = u_0(x), \; u_t(x,0) = u_1(x), \; x \in \Omega. \tag{6}$$

We discuss blow up of such solutions concentrating our attention on problems which caused by nonstandard growth conditions.

Several applications to the parabolic and hyperbolic equations with nonlocal nonlinearities are presented also.

The study uses methods and approachs stated in [1, 3, 2, 4].

## References

[1] S. N. Antontsev, J. I. Díaz, and S. Shmarev, *Energy Methods for Free Boundary Problems:Applications to Non-linear PDEs and Fluid Mechanics*, Bikhäuser, Boston, 2002. Progress in Nonlinear Differential Equations and Their Applications, Vol. 48.

[2] S. N. Antontsev and S. I. Shmarev, *Extinction of Solutions of Parabolic Equations with Variable Anisotropic Nonlinearities*, Proceedings of the Steklov Institute of Mathematics, Moscow, Russia, Volume 61, Number 1/July (2008), 11-21, Pleiades Publishing, Ltd.

[3] S. N. Antontsev and S. I. Shmarev, *Anisotropic Parabolic Equations with Variable Nonlinearity*, Preprint 2007-013, pp.1-34. CMAF, Universidade de Lisboa, http://cmaf.ptmat.fc.ul.pt/preprints/preprints.html.

[4] S. N. Antontsev and S. I. Shmarev, *Existence and uniqueness theorems for parabolic equations with anisotropic non-standard growth conditions*, Publicacions Matematiques de l'Universita Autónoma de Barcelona, in press.

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