Mês de: Janeiro 2008

SEMINÁRIOS DE ANÁLISE

Dia 30 de Janeiro (quarta-feira), às 16h, na Sala B3-01

Localized Solutions of Anisotropic Parabolic Equations

(Joint work with S. Shmarev, University of Oviedo, Spain)

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Abstract:

Let $\Omega \subset \mathbb{R}^n$ be a bounded domain with Lipschitz-continuous boundary Γ and $Q = \Omega \times (0, T]$. We study the degenerate parabolic equations with anisotropic nonuniform degeneracy

$$u_t - \sum_i D_i \left[a_i(z,u)|u|^{\alpha_i(z)}|D_i u|^{p_i(z)-2} D_i u + b_i(z,u) \right] + \sum_i d_i(z,u) D_i u + d(z,u) = 0 \qquad (1)$$

($z = (x,t) \in Q = \Omega \times (0,T]$), under the boundary and initial conditions

$$u = 0 \text{ on } \Gamma, \qquad u(x,0) = u_0(x) \text{ in } \Omega. \qquad (2)$$

The coefficients a_i, p_i, b_i, d_i, d are given functions of their arguments. 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 inhomogenenous anisotropic media.

We prove the existence and uniqueness of weak solutions of problems (1), (2) and study the localization (alias vanishing) properties of weak solutions. A special attention is paid to the latter issue. We show that, besides the typical localization properties, the solutions of equations with anisotropic nonlinearity possess additional localization properties intrinsic only to the solutions of such equations. Roughly speaking, we show that the anisotropy of the diffusion part of the equation may play the same role that the absorption.

The study of the localization properties is performed with the method of local energy estimates [1]. The detailed proofs can be found in [2].

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, *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.

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