SEMINÁRIO DE EQUAÇÕES DIFERENCIAIS PARCIAIS

On the Regularity of Solutions to Degenerate Equations

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Resumo: In this talk we are going to discuss some results concerning the questions on the regularity of solutions for the following degenerate equations:

$$
\begin{aligned}
-\Delta_p u + u &= f \ \text{ in } Q = \Omega, \\
\frac{\partial u}{\partial \nu} = 0 &\quad \text{on} \quad \partial\Omega \times (0, T),
\end{aligned}
$$

(0.1)

and

$$
\begin{aligned}
u_t - \Delta_p u &= f \ \text{ in } Q = U \times (0, T), \\
\frac{\partial u}{\partial \nu} = 0 &\quad \text{on} \quad \partial U \times (0, T), \\
u(.,0) = u_0 &\quad \text{in} \quad U,
\end{aligned}
$$

(0.2)

where Δ_p denotes the p-Laplacian with $p > 2$.

These problems are somehow connected to the equations modelling certain phenomena where the dissipation is nonlinear, such as the solidification processes of certain polymers.

Anyway, in what regards the mathematical challenges to obtain further regularity to the gradient of the solutions of (0.1) or (0.2), these problems have been attracting attention from the community in the past year. For instance, the main difficulty of problems (0.1) or (0.2) arise from the lack of information on the derivatives of order greater than one of the solutions. Our strategy is to investigate the relation of such gradients to the so-called Sobolev Spaces of Fractional order.

In short, we intent to recall some past results on this subject and also to show some recent contributions by the author on the subject.