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# The parabolic p-Laplacian revisited

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**Resumo**

Despite being one the most vastly researched nonlinear equations, the theory for parabolic $p$-Laplacian equations still lacks information in regards to the gain or loss of regularity for their solutions depending on the variation of the data. Due to its highly nonlinear profile, most of the regularity properties for solutions to this sort of equation are lost, when contrasted to semilinear or even a class of quasilinear cases.

In this talk we address the fractional and classical regularity in vector valued Banach spaces for the solutions of a family of evolutive $p$-Laplacian-like equations subject to Neumann boundary conditions. The equations which will be considered are the following:

$$\begin{aligned} u_t - \Delta_p u &= fQ = \Omega \times (0,T), \\ \frac{\partial u}{\partial \nu} = 0 \quad &\text{on} \quad \partial\Omega \times (0,T), \\ u(.,0) = u_0 \quad &\text{in} \quad \Omega, \end{aligned} \tag{1}$$

where $\Delta_p^\epsilon$ denotes a convenient approximation of the $p$-Laplacian with $p > 2$, which we intent to allow the pure degenerate case $\epsilon = 0$.

Global space-time regularity to the solution and its time derivative in Nikolskii and Slobodeckii spaces will be discussed and improved as well as $C^1$-weak regularity for a class of intermediate dual spaces is obtained.