Figure 1:

Seminário

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The nonlinear hyperbolic-elliptic systems

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Abstract

We investigate the following system of PDEs

$$\begin{aligned} \omega_t + \operatorname{div}(g(\omega)v) &= 0, \qquad v = -\nabla h, \\ -\nabla h + h &= \omega \end{aligned}$$

in a bounded domain, which is closed by the boundary and initial conditions

$$h = a, \quad \omega|_{t=0} = \omega_0.$$

Motivated by physics, on the influx part of the boundary we consider nonzero boundary condition

$$\omega = b\left(\mathbf{x}, t, \frac{\partial h}{\partial \mathbf{n}}\right)$$

n - the outside normal to the boundary.

We prove the solvability of this system, using the kinetic method.

The system can be used for different physical situations, such as:

a) the motion of superconducting vortices;
b) the collective cell movement (the Keller-Segel model).