On a PDEs system with gradient dependent chemotactic coefficient

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Abstract

We consider a second order PDEs system of Parabolic-Elliptic type with chemotactic terms. The system describes the evolution of a biological species "u" moving towards a higher concentration of a chemical stimuli "v" in a bounded and open domain of $\mathbb{R}^N$. In the system considered, the chemotaxis sensitivity depends on the gradient of v, i.e., the chemotaxis term has the following expression

$$-div\left(\chi u|\nabla v|^{p-2}\nabla v\right),$$

where χ is a positive constant and p satisfies

$$p \in (1,\infty), \quad \text{if } N=1 \quad \text{and} \quad p \in \left(1, \frac{N}{N-1}\right), \quad \text{if } N \geq 2.$$

We obtain uniform bounds in $L^\infty(\Omega)$ and the existence of global in time solutions. For the one-dimensional case we prove the existence of infinitely many non-constant steady-states for $p \in (1,2)$ for any χ positive and a given positive mass.

This is a joint work with M. Negreanu.