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Numerical Simulation and Artificial Study of a Reaction-diffusion Model of Atherosclerosis

Hidalgo, Arturo

SUMMARY

We study an diffusion-reaction mathematical model for the evolution of atherosclerosis as an inflammation disease. A high order finite volume formulation in the context of ADER approach is developed to approximate the time-dependent solutions of the model proposed by El Khatib et al. (2007).

Concerning the asymptotic behaviour of the solutions, the numerical examples show that a small perturbation of a healthy steady state makes the system evolve to a disease equilibrium for some choice of the parameters. We apply our numerical scheme to determine if each initial datum in a huge family of initial data is attracted by a disease equilibrium or by a healthy steady state. Simultaneously we compute the steady states. This is a joint work with L. Tello (Universidad Politécnica de Madrid) and E.F. Toro (Universitá degli Studi di Trento).

Keywords: finite volume formulation, reaction-diffusion models, asymptotic behaviour, steady states, atherosclerosis

AMS Classification: 35B40, 35K57, 35Q92, 65M08, 92C50

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[1]Dept. Matemática Aplicada y Métodos Informáticos.
E.T.S.I. Minas y Energía, Univ. Politécnica de Madrid.
C. Rios Rosas, 21. E-28003 Madrid, Spain.
arturo.hidalgo@upm.es