Analysis and simulations of a stochastic phase-field model for tumour growth

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Abstract

We consider a stochastic phase-field model for tumour growth, coupling a Cahn-Hilliard equation for the order parameter, i.e. the difference in volume fractions between the healthy and tumour cells, with a reaction-diffusion equation for the nutrient. Both equations take into account the possible unpredictable model-oscillations via suitable stochastic forcing terms. First, the mathematical analysis of the system is performed in wide generality, including non-constant mobilities and chemotaxis. Secondly, numerical computations are performed in order to visualise the effect of the noise on the tumour growth and shape. In conclusion, possible developments towards optimal control problems are discussed.

This study is based on a joint work with Marvin Fritz (Johann Radon Institute, Linz, Austria).