XVIII INTERNATIONAL CONFERENCE ON HYPERBOLIC PROBLEMS
THEORY, NUMERICS, APPLICATIONS
Málaga, June 20-24, 2022

A poroelastic model for cell motility

Rafael González-Albaladejo [*], Ana Carpio [†]

Numerical simulation of models for single cell movement and cell migration is essential to understand processes such as wound closure and metastasis. These models combine various types of equations, in particular conservation laws. In this line, much work has been done with biphasic fluid models (one component more viscous than the other). However, experimental evidence indicates that the poroelastic approach (fluid for the cytoplasm and an elastic solid for the actin network) is the correct one, see [1]. Therefore, we have developed a model that combines poroelastic constitutive laws and conservation laws from the theory of incompressible solid-fluid mixtures. A dimensional reduction by means of a perturbation analysis leads to integrodifferential equations. We have studied the solutions of these equations both analytically and numerically, obtaining a description of the onset of motion of an individual cell.

Acknowledgements

This research has been partially supported by the FEDER /Ministerio de Ciencia, Innovación y Universidades - Agencia Estatal de Investigacin grants MTM2017-84446-C2-1-R and PID2020-112796RB-C21 (AC, RG) and by fellowship PRE2018-083807 (RG).

References

[1] Alex Mogilner and Angelika Manhart Intracellular Fluid Mechanics: Coupling Cytoplasmic Flow with Active Cytoskeletal Gel. *Annual Review of Fluid Mechanics*, 2018 50:1, 347-370

[*] Address first author. Email: rafael09@ucm.es
[†] Address second author. Email: carpio@mat.ucm.es