
Mathematical modelling of cell adhesion forces : from delay to friction, an instantaneous limit.

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Abstract

This is a joint work with Dietmar OELZ from the Courant Institute, NYU

In this talk we present the starting mechanical model of the lamellipodial actin-cytoskeleton meshwork. The model is derived starting from the microscopic description of mechanical properties of filaments and cross-links and also of the life-cycle of cross-linker molecules [2]. We introduce a simplified system of equations that accounts for adhesions created by a single point on which we apply a force. We present the adimensionalisation that led to a singular limit that motivated our mathematical study. Then we explain the mathematical setting and results already published [2, 3]. In the last part we present the latest developments : we give results for the fully coupled system with unbounded non-linear off-rates [1]. This leads to two possible regimes : under certain hypotheses on the data there is global existence, out of this range we are able to prove blow-up in finite time.

References :

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3. V. Milisic and D. Oelz. On a structured model for the load dependent reaction kinetics of transient elastic linkages mediating nonlinear friction. 2015. Accepted for publication in *SIAM SIMA*.

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