Spatial evolution of intermediate filaments organization in astrocytes

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Intermediate filaments (IF) constitute cytoskeletal networks which interacts with other structural networks such as filamentous actin network. While the actin organization has been studied for decades and proven to be very dynamic and varying within the cell, the organization of intermediate filaments remains mainly descriptive. In the present work, we investigate the organization of two IF proteins, vimentin and Gliary Fibrillary Acidic Protein (GFAP) in relationship to the organization and movement of the actin network. To this end, we develop mathematical model of transport for which one can tune different interactions between networks. Based on the actin flow speed, the model will evolve over time to "steady state" organizations of IF networks which we compare to experimental data. In order to gather a large number of data, we base our work on the average IF spatial distribution in rat astrocytes which are forced to a square shape, obtained by micro-patterning of the cells. Moreover, keeping the same overall shape, we are able to tune the adhesion points of cells by changing the shape of the pattern, namely using X shape or H shape.