

Electronic Supplementary Information

ESI 1

This figure presents the raw data used to determine the phase diagram of Figure 6 in the main text. It shows the orientation as a function of time for various frequencies and adhesion response functions.

ESI 2-7

The movies provided as ESI show simulation trajectories for a single cell under cyclic stretching. For visualization purposes, we have used the phase field, adhesion concentration field, and the magnitude of the polarization field to specify the red, green and blue channels, respectively, of the density map (see Fig.1). Note that the stretching orientation ($\theta = 0$) in the movies corresponds to the vertical direction.

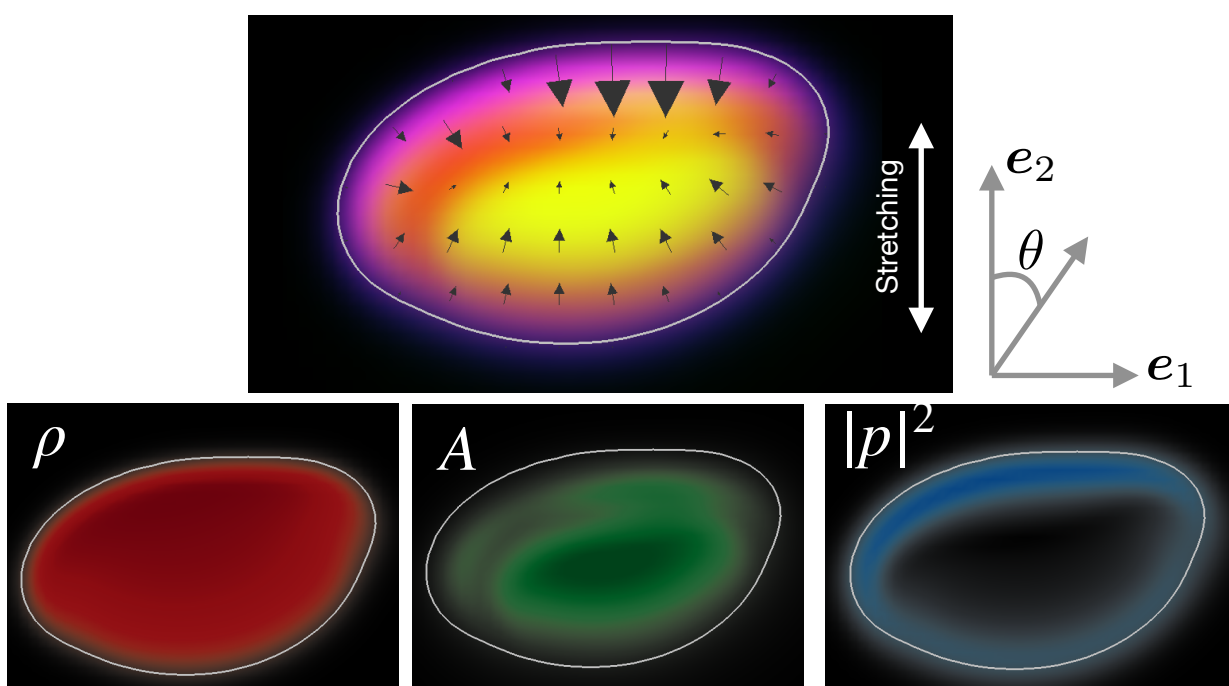


Fig. 1. Example of the colormap used in the movies. The stretching is applied in the e_2 (vertical) direction, and angles are measured with respect to this axis in a clockwise direction. Note that the polarization field, represented here with arrows in the top figure, is not displayed in the movies.

The first set of movies correspond to simulations performed at low frequencies,
 $\omega = 8.8 \cdot 10^3$ ($\chi = 0.1$)

(ESI 2) Passive response $d = 0$

(ESI 3) Active response with $d^{(+)}$

(ESI 4) Active response with $d^{(-)}$

The second set of movies correspond to simulations performed at high frequencies,
 $\omega = 2.8 \cdot 10^{-2}$ ($\chi = 0.8$)

(ESI 5) Passive response $d = 0$

(ESI 6) Active response with $d^{(+)}$

(ESI 7) Active response with $d^{(-)}$