MAR17-2016-020485

Abstract for an Invited Paper
for the MAR17 Meeting of
the American Physical Society

Bistable front dynamics in a contractile medium: travelling wave and cortical advection define stable zones of RhoA signaling at epithelial adherens junctions.

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Recent studies have demonstrated that mechanical forces can lead to novel mechanisms of pattern formation such as clustering and oscillations in contractile systems. We investigate how contractile forces in mechanically active media can affect bistable front propagation. We found that contraction regulates the front speed or can fully suppress its propagation in space to create a static localized zone. We demonstrate how the interplay between biochemical signaling through positive feedback, combined with diffusion on the cell membrane and mechanical forces generated in the actomyosin cortex, can determine the spatial distribution of RhoA signaling at cell-cell junctions. The dynamical mechanism relies on the balance between a propagating bistable signal that is opposed by an advective flow generated by an actomyosin stress gradient. Experimental observations on the behaviour of the system when contractility is inhibited are in qualitative agreement with the predictions of the model.

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