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Stochastic Terminal Dynamics in Epithelial Cell Intercalation STEPHAN EULE, JAKOB METZGER, LARS REICHL, Max Planck Institute for Dynamics and Self-Organization, DEQING KONG, YUJUN ZHANG, JOERG GROSSHANS, Institute for Developmental Biochemistry, Medical School, University of Göttingen, FRED WOLF, Max Planck Institute for Dynamics and Self-Organization — We found that the constriction of epithelial cell contacts during intercalation in germ band extension in Drosophila embryos follows intriguingly simple quantitative laws. The mean contact length $\langle L \rangle$ follows $\langle L \rangle (t) \sim (T-t)^{\alpha}$, where T is the finite collapse time; the time dependent variance of contact length is proportional to the square of the mean; finally the time dependent probability density of the contact lengths remains close to Gaussian during the entire process. These observations suggest that the dynamics of contact collapse can be captured by a stochastic differential equation analytically tractable in small noise approximation. Here, we present such a model, providing an effective description of the non-equilibrium statistical mechanics of contact collapse. All model parameters are fixed by measurements of time dependent mean and variance of contact lengths. The model predicts the contact length covariance function that we obtain in closed form. The contact length covariance function closely matches experimental observations suggesting that the model well captures the dynamics of contact collapse.

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