Abstract Submitted
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The Dynamics in Epithelial Cell Intercalation in Drosophila Morphogenesis[1] FRED WOLF, LARS REICHL, Max Planck Institute for Dynamics and Self-Organization, DEQING KONG, YUJUN ZHANG, Institute for Developmental Biochemistry, Medical School, University of Göttingen, STEPHAN EULE, JAKOB METZGER, Max Planck Institute for Dynamics and Self-Organization, JÖRG GROßHANS, Institute for Developmental Biochemistry, Medical School, University of Göttingen — Epithelial cell rearrangement is important for many processes in morphogenesis. During germband extension in early gastrulation of Drosophila embryos, exchange of neighbors is achieved by junction remodeling that follows a topological T1 process. Its first step is the constriction of dorsal-ventral junctions and fusion of two 3x vertices into a 4x vertex a process believed to be junction autonomous. We established a high throughput imaging pipeline, by which we recorded, segmented and analysed more than 1000 neighbor exchanges in drosophila embryos. Characterizing the dynamics of junction lengths we find that the constriction of cell contacts follows intriguingly simple quantitative laws. (1) The mean contact length decreases approximately as a square root of time to collapse. (2) The time dependent variance of contact lengths is proportional to the square of the mean. (3) The time dependent probability density of the contact lengths remains close to Gaussian during the entire process. These observations are sufficient to derive a stochastic differential equation for contact length that captures the non-equilibrium statistical mechanics of contact collapse.

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