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Quantifying stretching and rearrangement in epithelial sheet migration RACHEL LEE, University of Maryland, College Park, DOUGLAS KELLEY, Massachusetts Institute of Technology, KERSTIN NORDSTROM, University of Maryland, College Park, NICHOLAS OUELLETTE, Yale University, WOLFGANG LOSERT, University of Maryland, College Park — Although understanding the collective migration of cells, such as that seen in epithelial sheets, is essential for understanding diseases such as metastatic cancer, this motion is not yet as well characterized as individual cell migration. Here we adapt quantitative metrics used to characterize the flow and deformation of soft matter to contrast different types of motion within a migrating sheet of cells. Using a Finite-Time Lyapunov Exponent (FTLE) analysis, we find that - in spite of large fluctuations - the flow field of an epithelial cell sheet is not chaotic. Stretching of a sheet of cells (i.e., positive FTLE) is localized at the leading edge of migration. By decomposing the motion of the cells into affine and non-affine components using the metric D^2_{min}, we quantify local plastic rearrangements and describe the motion of a group of cells in a novel way. We find an increase in plastic rearrangements with increasing cell densities, whereas inanimate systems tend to exhibit less non-affine rearrangements with increasing density.

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