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Tissue mechanics and dynamics during development

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The fly wing is an important model system for the study of tissue dynamics during development. During pupal stages, the early fly wing undergoes a spectacular dynamic reorganization that involves cell flows, cell divisions and cell shape changes. In this dynamic process, the final shape of the wing is generated. We characterize tissue remodelling by the contributions of specific cellular processes such as cell shape changes and cell neighbour exchanges to macroscopic shear at different times. We discuss the dynamics and the mechanics of this dynamic tissue using an active medium theory that captures the essential physics of tissue remodeling. Our work suggests that local tissue contraction together with anisotropic active processes drive tissue remodelling in the fly wing. This process is guided by external stresses mediated via elastic attachments of the tissue to an external scaffold. We test our model by experiments in which perturbations are imposed by laser ablation or by mutant conditions.