

I. Executive Summary

II. Modeling actomyosin dynamics in the *C. elegans* cortex

A. Introduction

1. The biology of cortical flow
2. Soft-condensed matter of biopolymer networks
3. Active matter and myosin contractility
4. The biophysics of filament recycling

B. The impact of filament recycling on cortical flow in animal cells

1. Measurements of cortical flow in *C. elegans* embryos
2. Understanding in vivo turnover rates with smPRESS
3. Disruption of flow through recycling inhibition

C. Modeling 2D active networks with recycling

methods from paper and benchmarking

D. How filament recycling shapes active and passive properties of networks

The bulk of the results from paper

E. A closer look at the distinct timescales of passive relaxation

Results from slippage

F. The role of upstream regulators in shaping activity

The modeling results from Jon's paper

G. Discussion and pilot experiments

A mention of the cell squishing experiments plus all the wonderful things that can be done with this modeling framework

III. Teaching and Broader Impacts

A. Workshop on modeling in biology

B. Reducing power consumption in high performance computing

C. An after-school program in computer programming

D. Artistic interpretations of filament recycling

IV. Appendices

A. Detailed documentation

B. TECH-VIVO: excerpts from a biotechnology blog