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Dynamics of Actin Cable Polymerization in Fission Yeast HUI WANG, DIMITRIOS VAVYLONIS, Lehigh University — In fission yeast, formin for3p nucleates actin filament bundles (cables) at cell tips which contribute to polarized cell growth. Actin cables reach a steady state of dynamic turnover involving for3p-mediated actin polymerization at the barbed ends near the plasma membrane, retrograde flow of polymerized actin toward the cell center, and cable disassembly. Formin for3p associates with actin at the cable tip where it transiently polymerizes actin filaments and subsequently follows the retrograde actin cable flow (Martin and Chang, Curr. Biol. 16, 1161, 2006). Because of the small number of formin nucleators, the actin cable dynamics are subject to spatial and temporal fluctuations. We studied actin cable dynamics with simple analytical models and whole cell computational models which combine deterministic simulation of actin diffusion with stochastic simulation of formin reaction and diffusion. Our model successfully explains a large number of experimental observations, such as density of formin speckles and variance of actin cable density. The model predicts significant spatial gradient of actin and formin molecules in the cytoplasm, powered by the retrograde flow of actin cables.

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