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Model of Yeast Actin Cable Distribution and Dynamics HAOSU TANG, DIMITRIOS VAVYLONIS, Lehigh University — The growth of fission yeast relies on the polymerization of actin filaments at the cell tips. These filaments are nucleated by formin proteins that localize at tip cortical sites. These actin filaments bundle to form actin cables that span the cell and guide the movement of vesicles toward the cell tips. Since fluorescence microscopy shows the structure and dynamics of actin cables, we are able to compare the results of the theoretical models of actin cables to experiment, thus enabling quantitative tests of the mechanisms of actin polymerization in cells. We used computer simulations to study the spatial and dynamical properties of actin cables. We simulated individual actin filaments as three-dimensional semiflexible polymer, composed of beads connected with springs. Formin polymerization was simulated as filament growth out of cortical sites located at cell tips. Actin filament severing by cofilin was simulated as filament turnover. We added attractive interactions between beads to simulate filament bundling by actin cross-linkers such as fimbrin. Comparison of the results of the model to prior experiments suggests that filament severing, nucleation and crosslinking are sufficient to describe the many features of actin cables. We found bundled and unbundled phases as cross-linking strength was varied and propose experiments to test the model predictions.

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