Supporting Appendix 2

From the kinetics analysis of furrow thinning from wild-type and *myosin II* mutant cells, we can now determine the amount of active radial stress generated by myosin II in the cleavage furrow.

From the wild-type furrow-thinning decay rate ($k = -0.012$ s^{-1}) and viscosity ($\mu = 0.35$ nN•s/µm^2; ref. 1):

$$k = -\frac{\Delta\sigma}{6\mu} \qquad [1]$$

$$\Delta\sigma = 0.025 \text{ nN/}\mu\text{m}^2$$

To determine the σ_{rr} generated by myosin II, we use the resistive stresses ($\sigma_{zz} = 0.08$ nN/µm^2) that account for the furrow-thinning dynamics observed in the *myosin II* mutant cells.

$$\Delta\sigma = \sigma_{rr} - \sigma_{zz}\,. \qquad \textbf{[2]}$$

$$\sigma_{rr} = \Delta\sigma + \sigma_{zz}\,. \qquad \textbf{[3]}$$

Thus, the radial stresses generated by myosin II are

$$** \ \sigma_{rr} = 0.1 \text{ nN/}\mu\text{m}^2.$$

This value can be compared with the amount of myosin II found in the cleavage furrow. From our previous quantification (2), there are ≈60,000 myosin II motor domains in the cleavage furrow at the time of D_x.

Therefore, the number of heads•force/head•duty ratio (see ref. 2 and references therein for explanation of the chosen values) of *Dictyostelium* myosin II provides the force F:

$$F = \approx 60{,}000 \text{ heads}\bullet 3\text{pN/head}\bullet 0.6\% = 1 \text{ nN} \qquad \textbf{[4]}$$

The surface area (SA) of the furrow at wild-type $D_x = 2.7$ µm is

$$SA = \pi dl = 23 \ \mu\text{m}^2 \text{ where } d = l = D_x. \qquad \textbf{[5]}$$

Thus, the radial stress (F/SA; 1 nN/23 µm^2) predicted from myosin II amounts are

$$** \ \sigma_{rr} = 0.04 \text{ nN/}\mu\text{m}^2.$$

**Thus, the radial stresses ascribed to myosin II from the kinetics analysis agree closely with the radial stresses predicted from the actual amounts of myosin II in the furrow.

1. Feneberg, W., Westphal, M. & Sackmann, E. (2001) *Eur. Biophys. J.* **30,** 284-294.
2. Robinson, D. N., Cavet, G., Warrick, H. M. & Spudich, J. A. (2002) *BMC Cell Biol.* **3,** 4.