

Supplementary data

Supplementary movie 1. Cytosolic Ca^{2+} oscillations during tip growth of an *Arabidopsis* root hair. Cytosolic Ca^{2+} was monitored in plants expressing the soluble Ca^{2+} sensor YC3.6 as described in the Materials and Methods. Images were taken every 3 s. Movie duration 3.5 min. Ca^{2+} levels have been pseudocolor-coded according to the scale in Figure 1.

Supplementary Figure 1. Regression analysis of the relationship between peak Ca^{2+} levels during each oscillation and the preceding or following peak in growth rate. Peak Ca^{2+} level and preceding and following growth rate were plotted for 8 separate root hairs over 4-5 min of observation each equating to between 12 and 18 growth and Ca^{2+} peaks. Regression analysis was performed using Excel. Note that when plotting amplitudes of growth peaks versus subsequent Ca^{2+} peaks, the slopes of all trend lines are positive, whereas slopes are more variable for Ca^{2+} peaks versus subsequent growth peaks. However, in all cases, the regression coefficients are low, suggesting that either a poor relationship exists between these factors, or that the relationship between them is not a simple linear one. Alternatively, variability in the data likely related to making such measurements in Ca^{2+} levels and especially growth rate at the limits of resolution of current technology may also be obscuring the relationship.

Supplementary Figure 2. Ca^{2+} levels at the apex of a non-growing root hair. Root hairs that had ceased undergoing tip growth in *Arabidopsis* plants expressing the Ca^{2+} sensor YC3.6 targeted to the cytosol were imaged every 3 s. Note the lack of detectable Ca^{2+} oscillations at the apex.

Supplementary Figure 3. Effect of Gd^{3+} treatment on cytosolic Ca^{2+} . Root hairs undergoing tip growth in *Arabidopsis* plants expressing the Ca^{2+} sensor YC3.6 targeted to the cytosol were imaged every 3 s. 1 mM $GdCl_3$ was added and the effect on growth and Ca^{2+} dynamics monitored. Note the reduction in tip Ca^{2+} levels induced by addition of Gd^{3+} . The sudden rapid increase in cytosolic Ca^{2+} at the end of the recording (arrow) was caused by Ca^{2+} entry as the cell ruptured. These effects mimic those seen upon La^{3+} treatment.