

Fig. S1. Multiscale analysis of a full-moon-shaped keratocyte. (A) Time sequence of phase contrast images showing the cell peripheral movement of a full-moon-shaped keratocyte. Bar, 10 μm . Numbers in upper right corner indicate time in seconds. (B) Multiscale nested structure of spatiotemporal pattern of the cell protrusion rate. For a time series of live cell images of a full-moon keratocyte, the protrusion rates are calculated at different time intervals Δt : (A) $\Delta t = 13.58$ s, (B) $\Delta t = 2.72$ s, and they are mapped against space θ and time t . The ordinate time scale of (B) is enlarged five times relative to that of (A). The scale at the bottom of each map is the approximated arc length corresponding to the angle θ indicated by the abscissa. (C) The relationships between $v'_{\Delta t}$ ($\Delta t = 2.72$ s) and $\kappa_{\Delta s}$ ($\Delta s = 12.5$ pixels) in Pp (top right), Pm (top left), Mp (bottom right) and Mm (bottom left) domains. The percentage of the domains showing a negative correlation between $v'_{\Delta t}$ and $\kappa_{\Delta s}$ was plotted against v_i^{\max} , which is a measure of the magnitude of the relative protruding activity for Pp and Mp domains. The percentage of the domains showing a negative correlation between $v'_{\Delta t}$ and $\kappa_{\Delta s}$ was plotted against v_j^{\min} , which is a measure of the magnitude of the relative retracting activity for Pm and Mm domains. The dotted lines indicate 50%.

Fig. S2. Multiscale analysis of a full-moon keratocyte cultured at 10°C. (A) Time sequence of phase contrast images showing the cell peripheral movement of a full-moon keratocyte. Bar, 10 μm . Numbers in the upper right corner indicate time in seconds. (B) Multiscale nested structure of spatiotemporal pattern of the cell protrusion rate. For a time series of live cell images of a full-moon

keratocyte, the protrusion rates are calculated at different time intervals Δt : (A) $\Delta t = 13.58$ s, (B) $\Delta t = 2.72$ s, and they are mapped against space θ and time t . The ordinate time scale of (B) is enlarged five times relative to that of (A). The scale at the bottom of each map is the approximated arc length corresponding to the angle θ indicated by the abscissa. (C) The relationships between $v'_{\Delta t}$ ($\Delta t = 2.72$ s) and $\kappa_{\Delta s}$ ($\Delta s = 12.5$ pixels) in Pp (top right), Pm (top left), Mp (bottom right) and Mm (bottom left) domains. The percentage of the domains showing a negative correlation between $v'_{\Delta t}$ and $\kappa_{\Delta s}$ was plotted against v_i^{\max} , which is a measure of the magnitude of the relative protruding activity for Pp and Mp domains. The percentage of the domains representing a negative correlation between $v'_{\Delta t}$ and $\kappa_{\Delta s}$ was plotted against v_j^{\min} , which is a measure of the magnitude of the relative retracting activity for Pm and Mm domains. The dotted lines indicate 50%.

Movie S1 Typical time sequence of phase contrast images showing the hierarchical cell peripheral movement of a full-moon keratocyte. Frames were collected at 2.27-s intervals and are displayed at 20 frames/s. Bar, 10 μm .