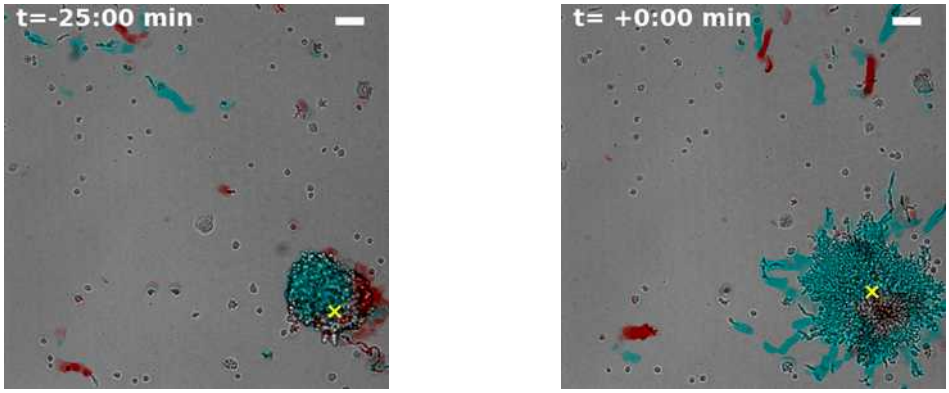
Dense optical flow for inward/outward cell motion

Cells were observed here to gather into a large aggregate and then explode into outward ballistic cell motion. My goal is to test whether this explosion can be explained by a chemorepellant or explained by an agent such as PDE that depletes the chemoattractant near the cluster.

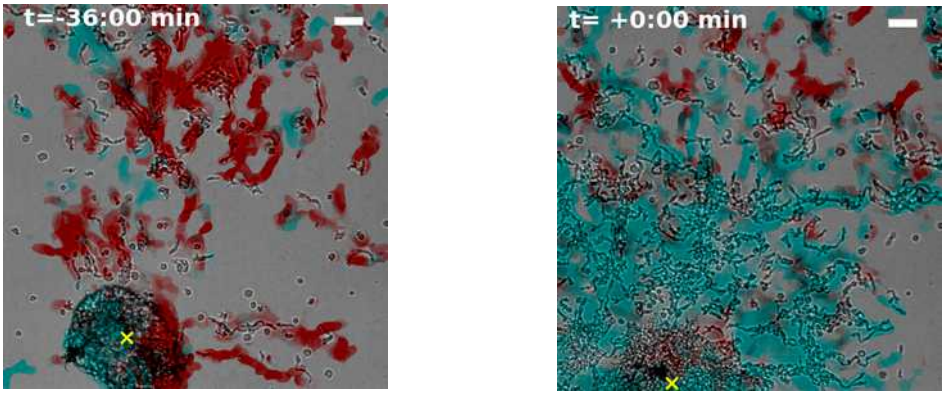
The inward (red) and outward (blue) component of cell motion was measured with dense optical flow for DIC channel. The resulting inward/outward flow was temporally averaged for 10 minutes and spatially averaged 120~ 240 microns distance from the apparent centroid of the cell aggregate.

The apparent centroid of the cell aggregate (yellow) was calculated from spline interpolation of manual pixel measurements.

Dense optical flow for trial '120519_pos7'

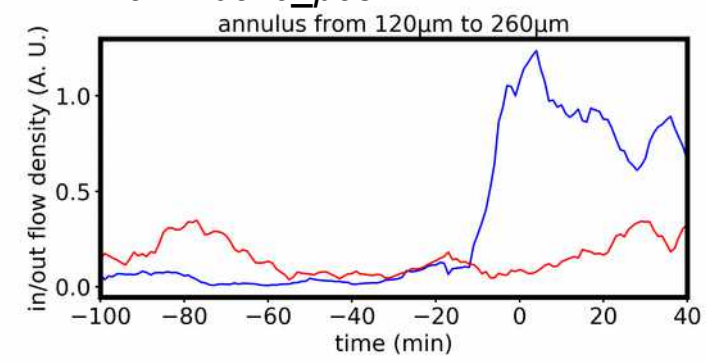


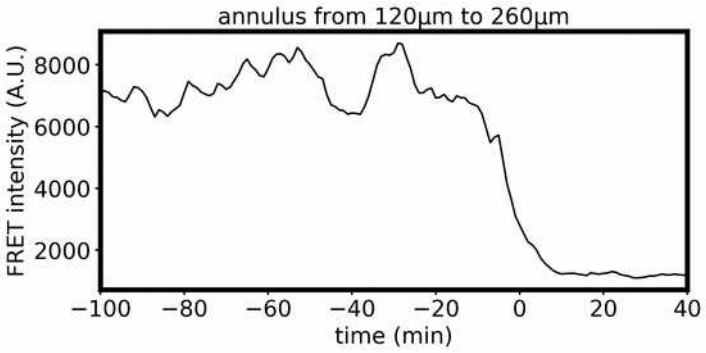
Dense optical flow for trial '120519_pos4'

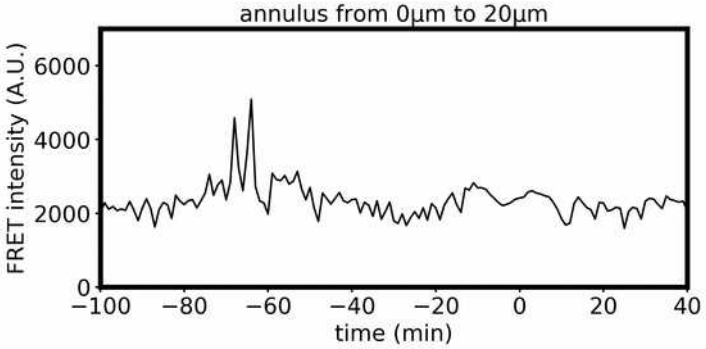


Comparing dense optical flow and FRET time series

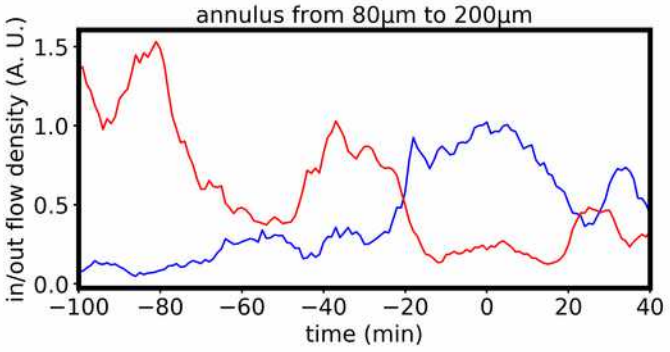
For 120519_pos7

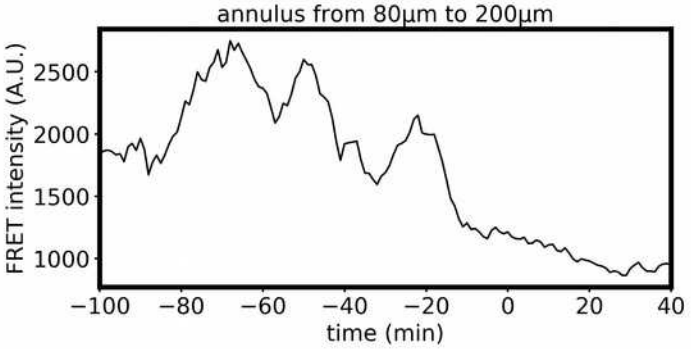


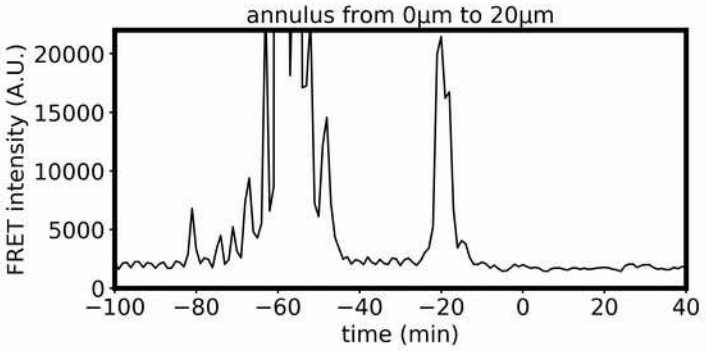




For 120519_pos4







FRET intensities decrease as intercellular cAMP concentrations increase here.

The concentration of cAMP is relatively stable and is at a high concentration inside the cell aggregate at the peak of the “bust” (t=0).

The concentration of cAMP increases dramatically in dispersing cells when the cell aggregate “busts”.

Values plotted are normalized with respect to the area of the annulus belonging to cells.

For 120519_pos7, the outward “bust” speed was ~4μm/min.
For 120519_pos4, the outward “bust” speed was ~16μm/min.

Tyree – Rappel Group - 12.17.19