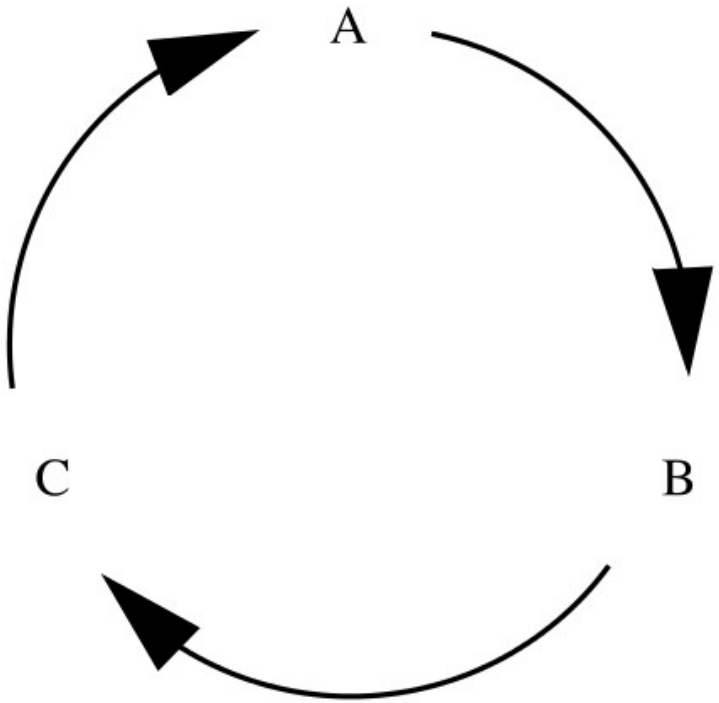
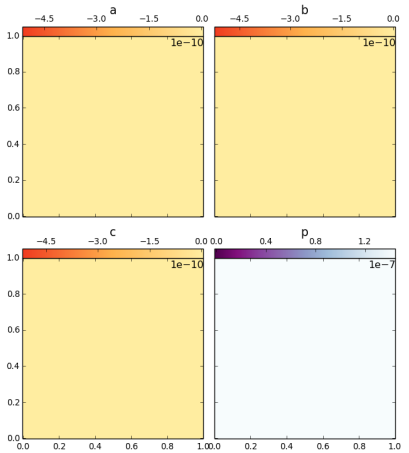
Dog eat dog

Modeling cyclic predation with Dedalus



PDE



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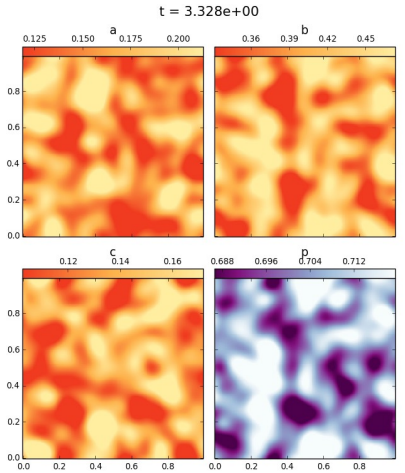


Baylee Bordwell – ASTR 5540 – Fall 2014

The Model: Langevin Equation

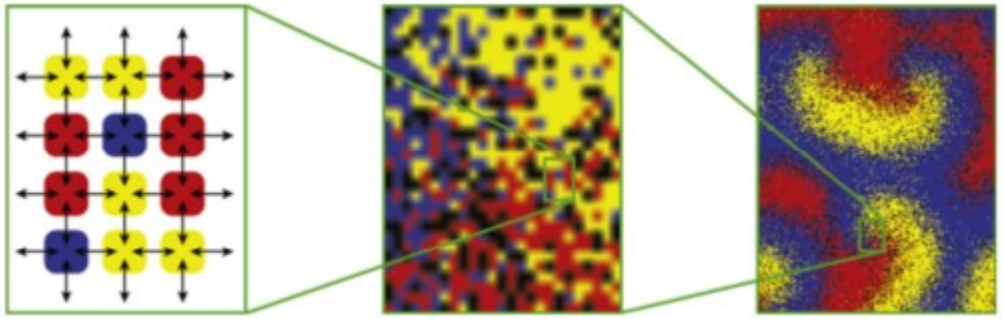
$$m\frac{d^2\mathbf{x}}{dt^2} = -\lambda\frac{d\mathbf{x}}{dt} + \eta(t)$$

Diffusion "Migration"

Noise

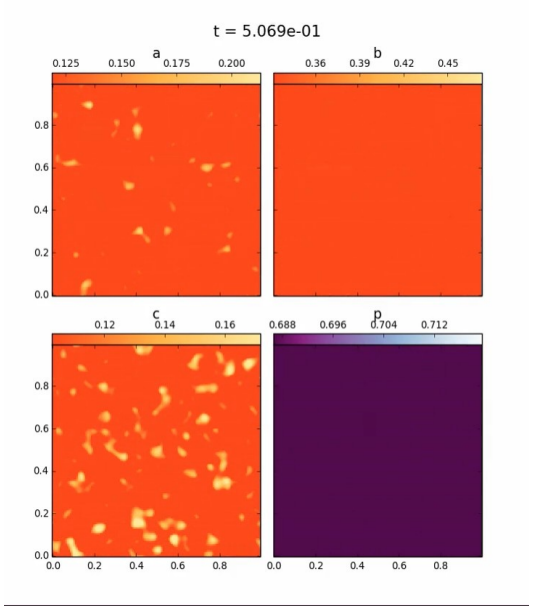
$$\partial_t a(\vec{r},t) = D\nabla^2 a(\vec{r},t) + a(\vec{r},t)[\mu(1-\rho(\vec{r},t)) - \sigma c(\vec{r},t)] + \frac{1}{\sqrt{N}}\sqrt{a(\vec{r},t)[\mu(1-\rho(\vec{r},t)) + \sigma c(\vec{r},t)]}\xi_A$$

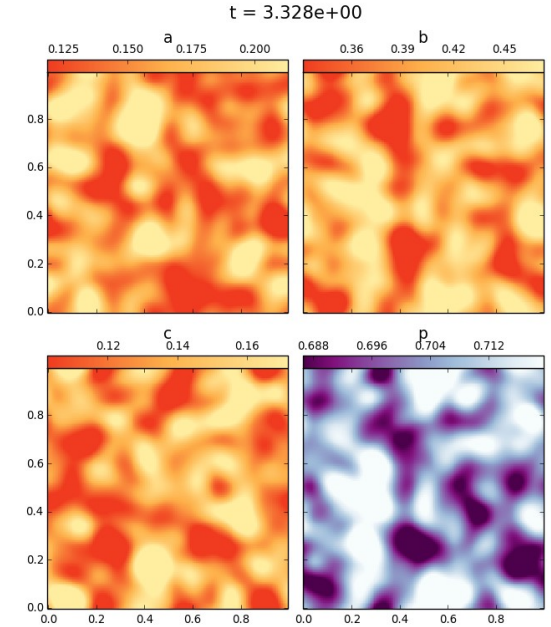
Birth **Death**



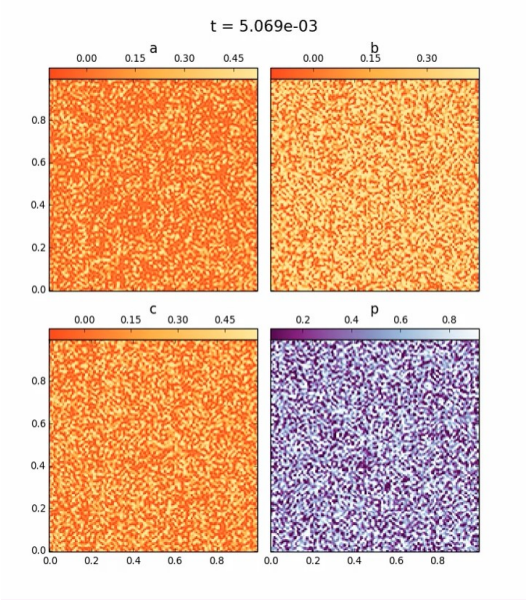
E. Frey / Physica A 389 (2010) 4265–4298

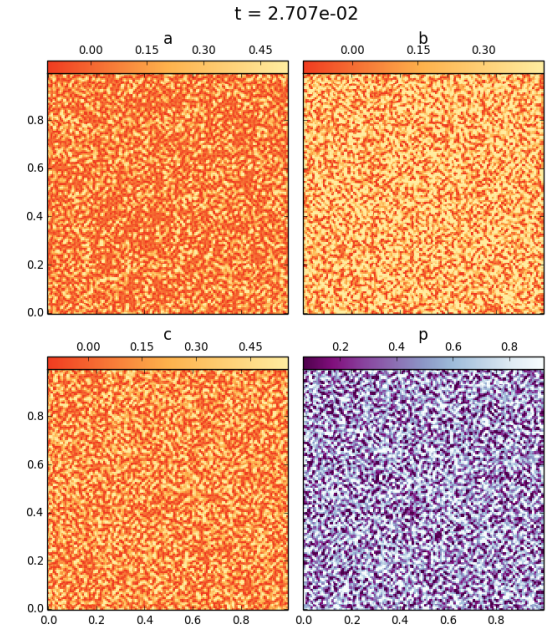
Dispersed Populations





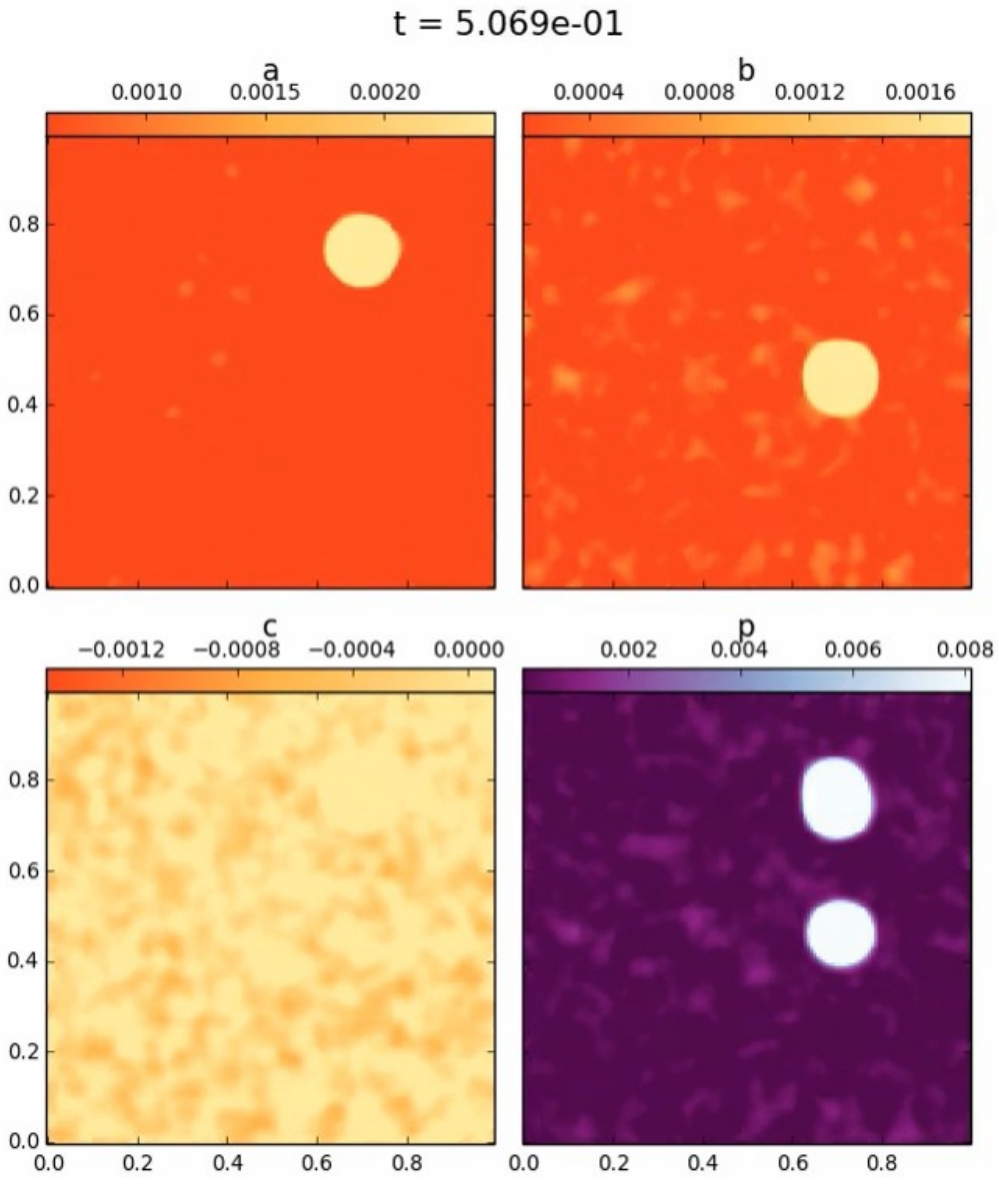
Quickly migrating population





Slowly migrating population

Localized Populations



Quickly migrating population