



$$\begin{cases} \partial_t f = \sigma_x \Delta_x f - \text{Pe} \nabla_x \cdot (v(\theta) f) + \sigma_\theta \partial_\theta^2 f - \chi \partial_\theta (n(\theta) \cdot (\nabla K * \rho + \tau \nabla^2 K * \rho v(\theta)) f) \\ f(t=0) = f_0 \end{cases}$$

• What happens as  $t \rightarrow \infty$ ?

• Part 2 (Rakotomalala & dM, in review, 2026):

What about existence of spots and lanes?

o Bifurcation theory (e.g. Kielhöfer, 2004): Lyapunov-Schmidt method

O

P

D

E



O

D

E



**Dynaramics**

# Dynamics

$$\begin{cases} \partial_t f &= \sigma_x \Delta_x f - \text{Pe} \nabla_x \cdot (v(\theta) f) + \sigma_\theta \partial_\theta^2 f - \chi \partial_\theta (n(\theta) \cdot (\nabla K * \rho + \tau \nabla^2 K * \rho v(\theta))) f \\ f(t=0) &= f_0 \end{cases}$$

- What happens as  $t \rightarrow \infty$ ?
- Part 2 (Rakotomalala & dW, in review, 2026):
  - What about existence of spots and lanes?
  - Bifurcation theory (e.g. Kielhöfer, 2004): Lyapunov-Schmidt method
  - PDE  $\implies$  ODE



# Dynamics

$$\begin{cases} \partial_t f &= \sigma_x \Delta_x f - \text{Pe} \nabla_x \cdot (v(\theta) f) + \sigma_\theta \partial_\theta^2 f - \chi \partial_\theta (n(\theta) \cdot (\nabla K^* \rho + \tau \nabla^2 K^* \rho v(\theta))) f \\ f(t=0) &= f_0 \end{cases}$$

- What happens as  $t \rightarrow \infty$ ?
- Part 2 (Rakotomalala & dW, in review, 2026):