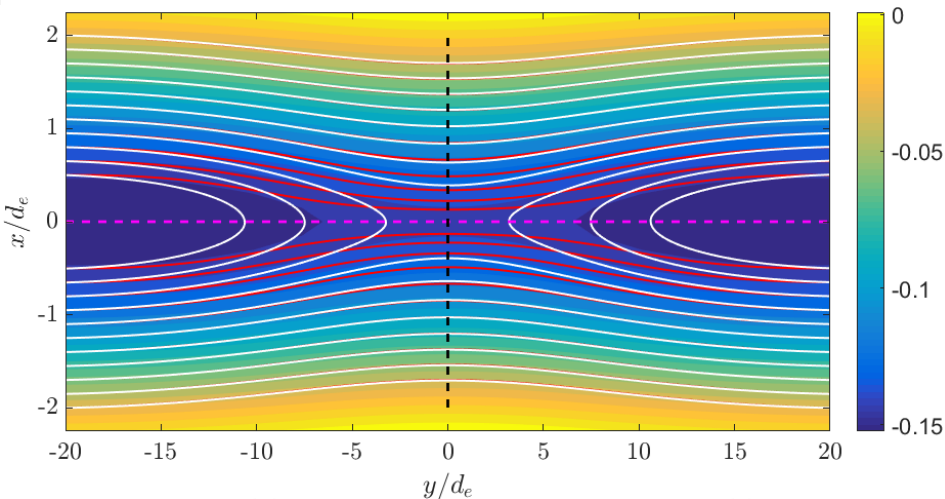# Stochastic ion heating is intrinsic to collisionless reconnection

Y. D. Yoon and P. M. Bellan (submitted)

- Single-particle phenomenon
- Strong (time-dependent) perpendicular electric field destabilizes ion orbital motion => chaotic ion motion
- Involves breakdown of the guiding center approximation
- Criterion is

$$\frac{m_i}{q_i B^2} \left| \nabla_\perp^2 \phi \right| > 1$$



$$q_e \mathbf{E} = m_e \frac{D\mathbf{u}_e}{Dt} - q_e \mathbf{u}_e \times \mathbf{B} + \frac{\nabla p_e}{n_e}$$

$$q_e \mathbf{E} = m_e \frac{\partial \mathbf{u}_e}{\partial t} - \mathbf{u}_e \times \mathbf{Q}_e + \nabla \left( \frac{m_e u_e^2}{2} \right) + \frac{\nabla p_e}{n_e}$$
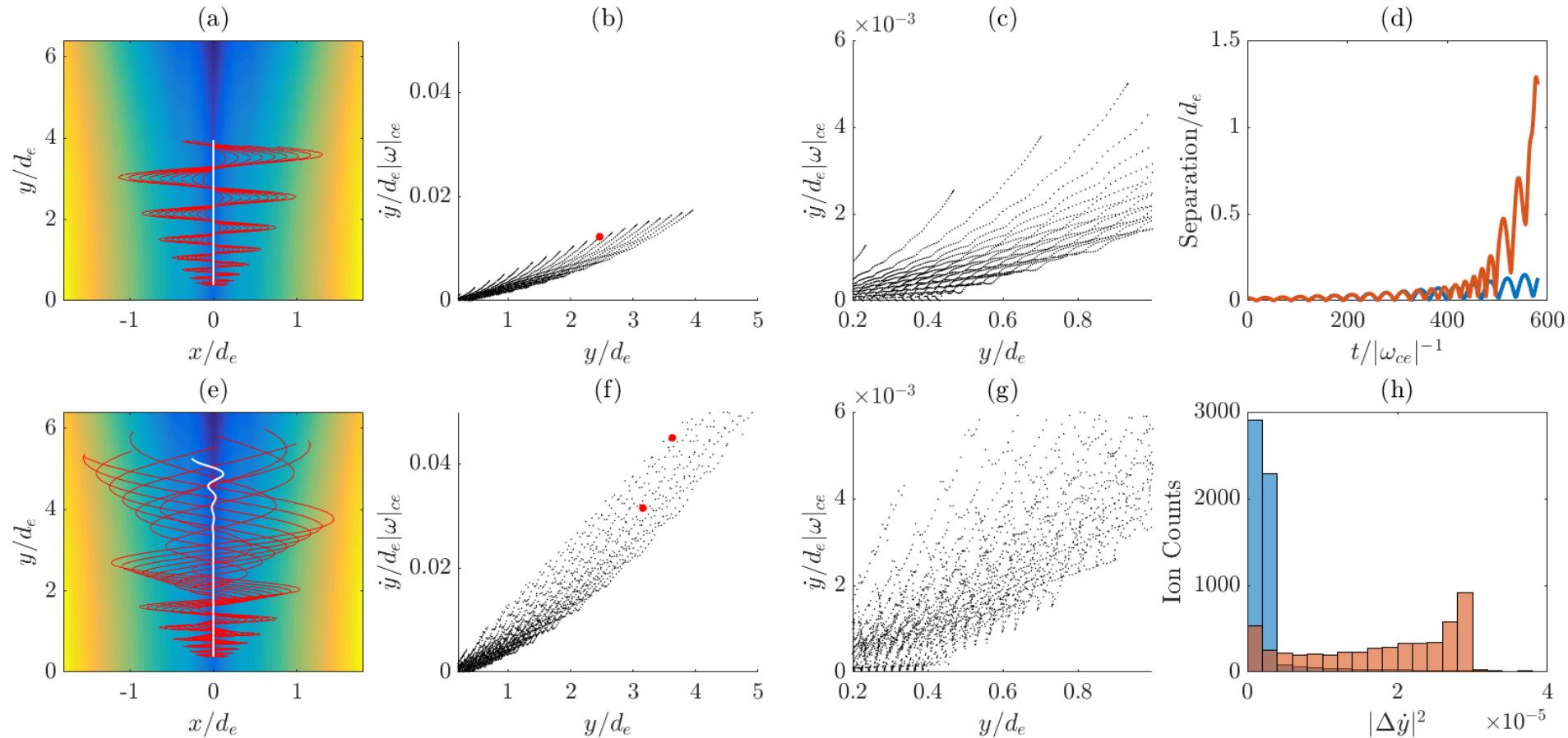
- Inflow Criterion:     $L_x < d_i$

- Outflow Criterion:     $m_i / m_e > 1$

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# Stochastic ion heating is intrinsic to collisionless reconnection

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For more info, see poster P19

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