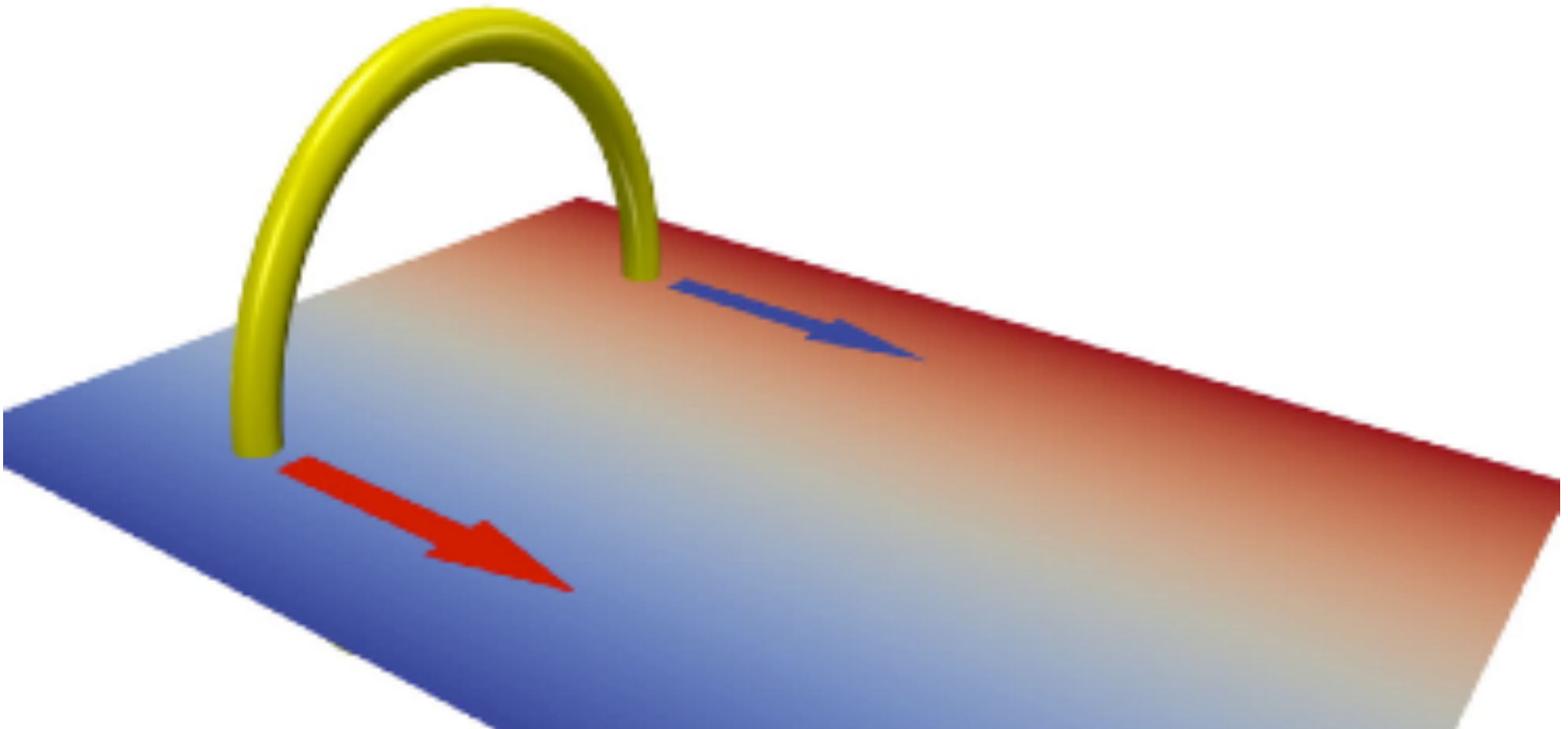
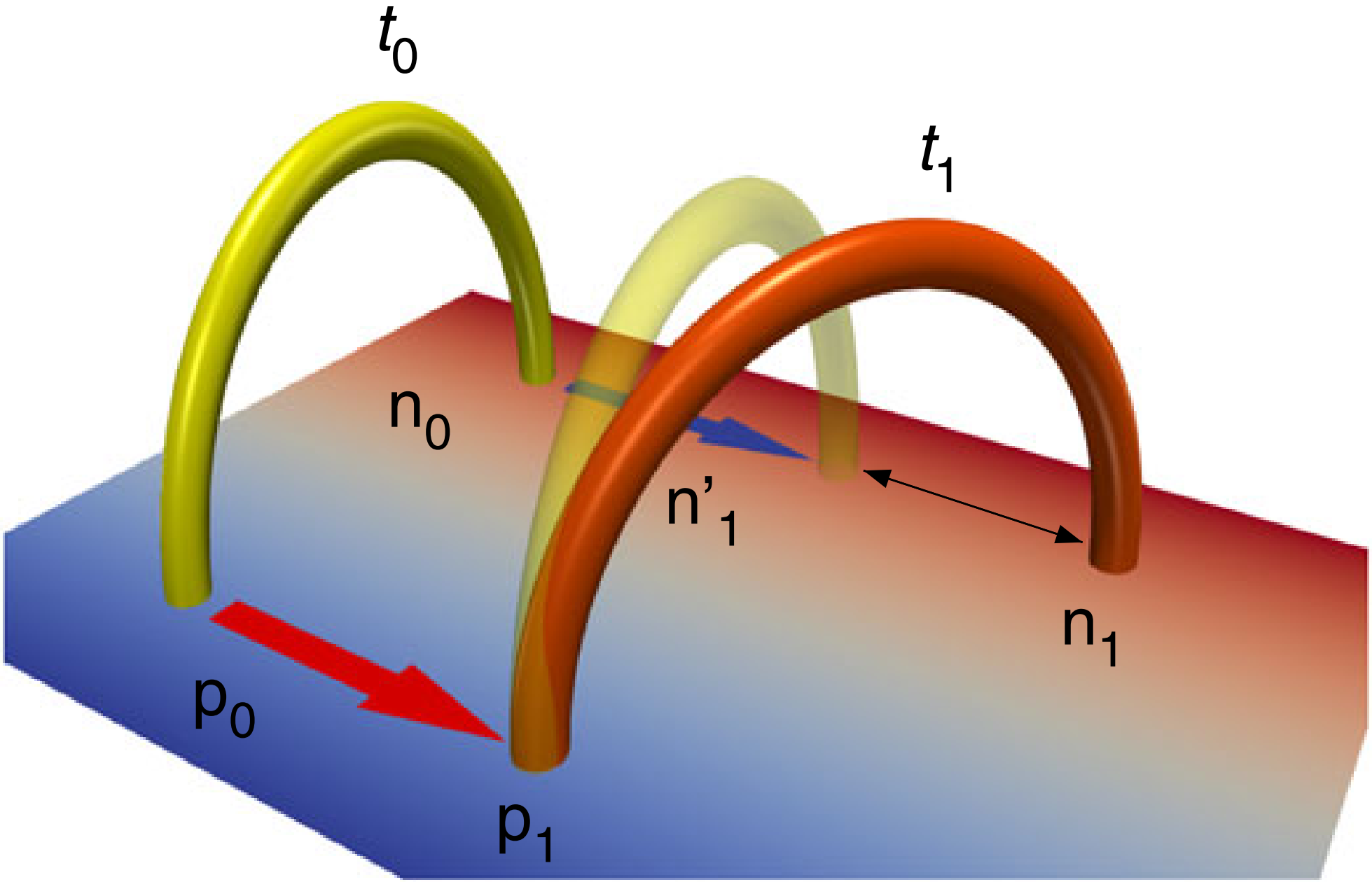
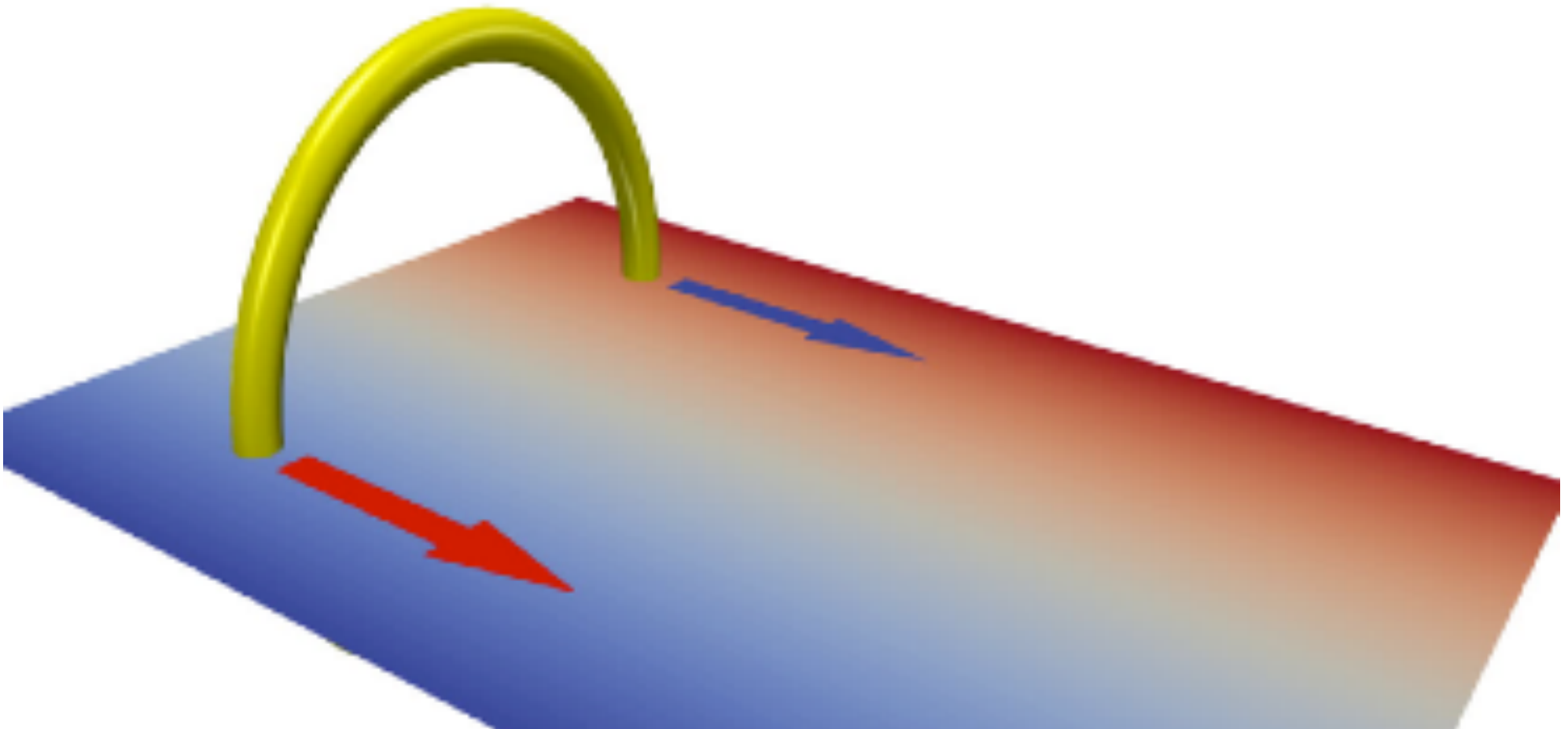
Measuring the non-ideal motion

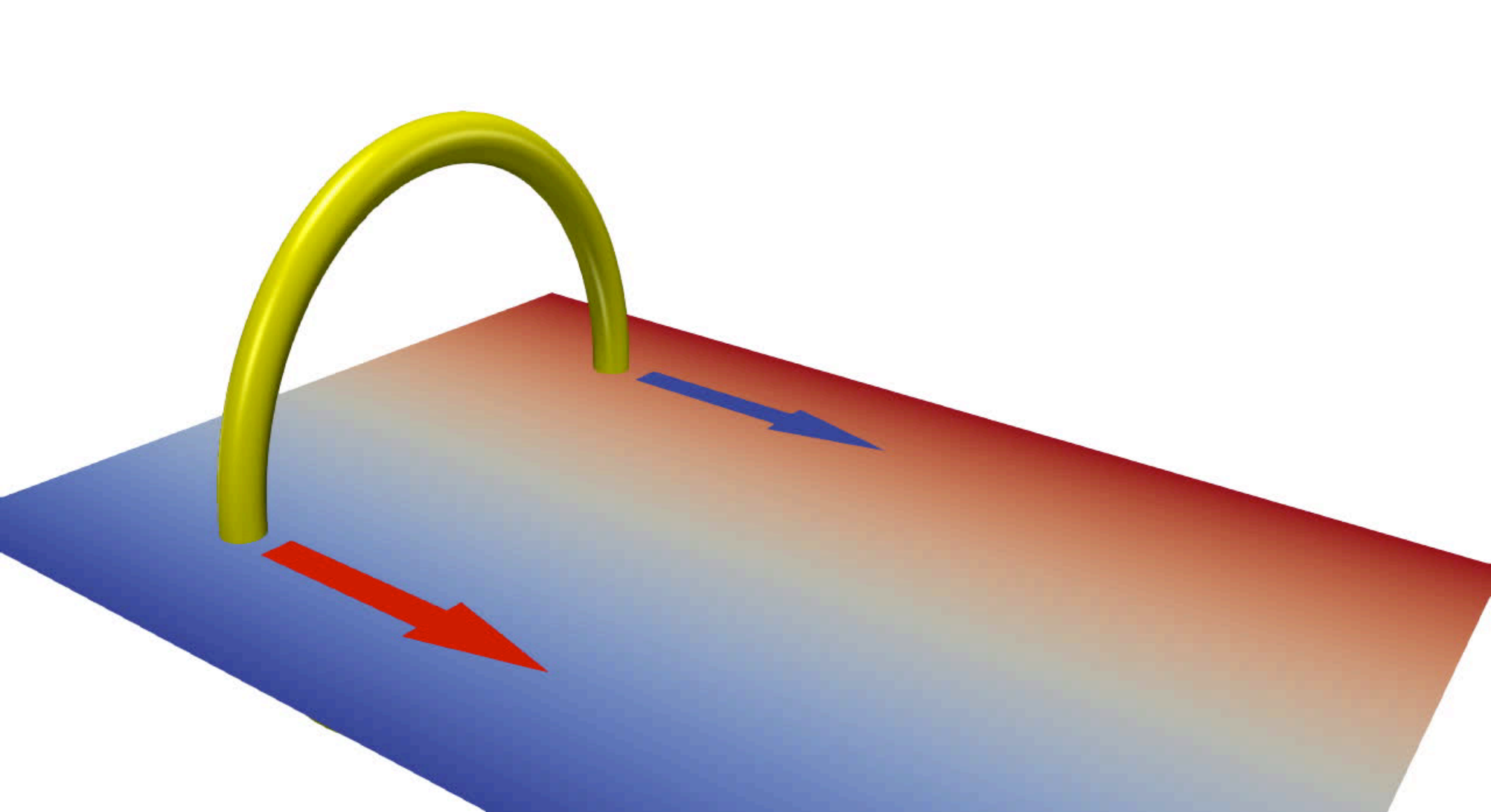



t_0
t_1
n_0
n'_1
n_1
p_0
p_1

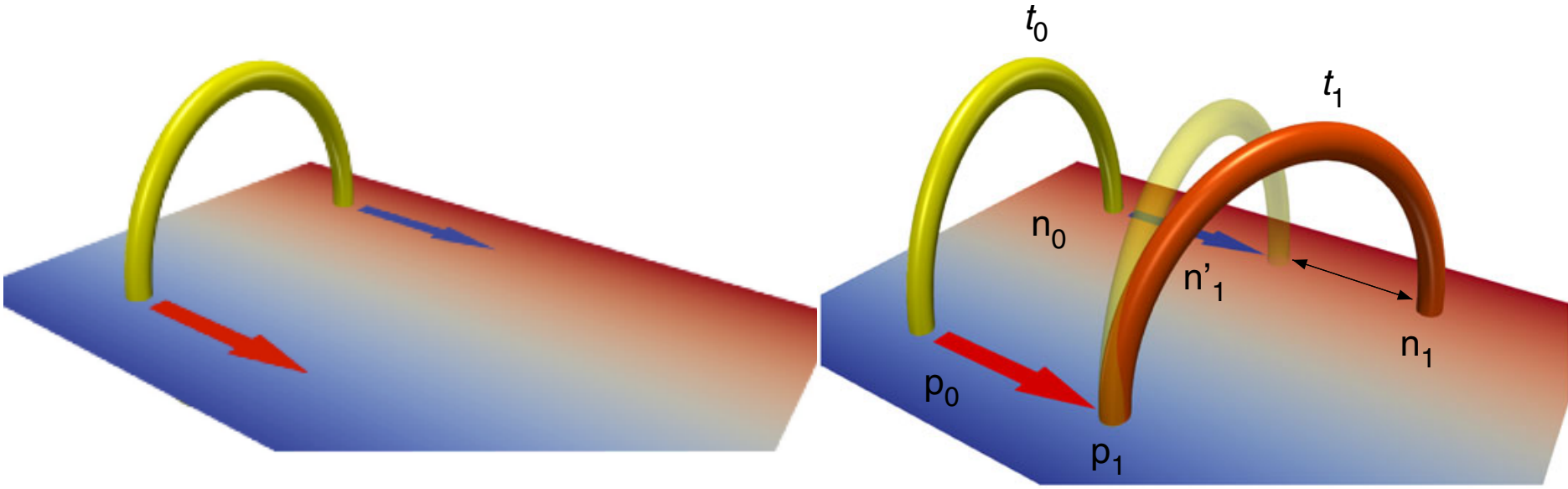

$\mathbf{x}_{n0}$
$\mathbf{B}_0$
$\mathbf{x}_{p0}$
$\mathbf{V}$
$\mathbf{x}_{p1}$
$\mathbf{B}_1$
$\mathbf{x}_{n1}$

$$V_s(\mathbf{x}_{n1}) = \lim_{\delta t \to \infty} \frac{\left|\mathbf{x}_{n1} - \mathbf{x}_{n'1}\right|}{\delta t}$$





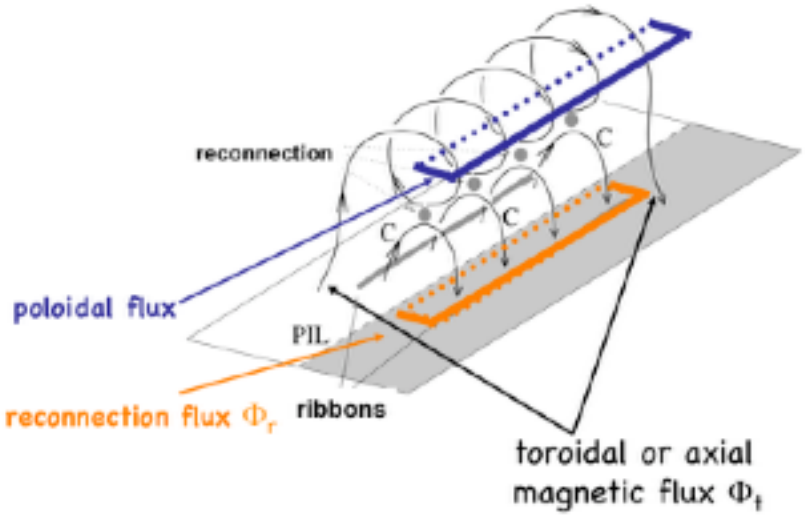
Measuring the non-ideal motion



$$\mathbf{x}_{n0} \xrightarrow{\mathbf{B}_0} \mathbf{x}_{p0} \xrightarrow{\mathbf{V}} \mathbf{x}_{p1} \xrightarrow{\mathbf{B}_1} \mathbf{x}_{n1}$$

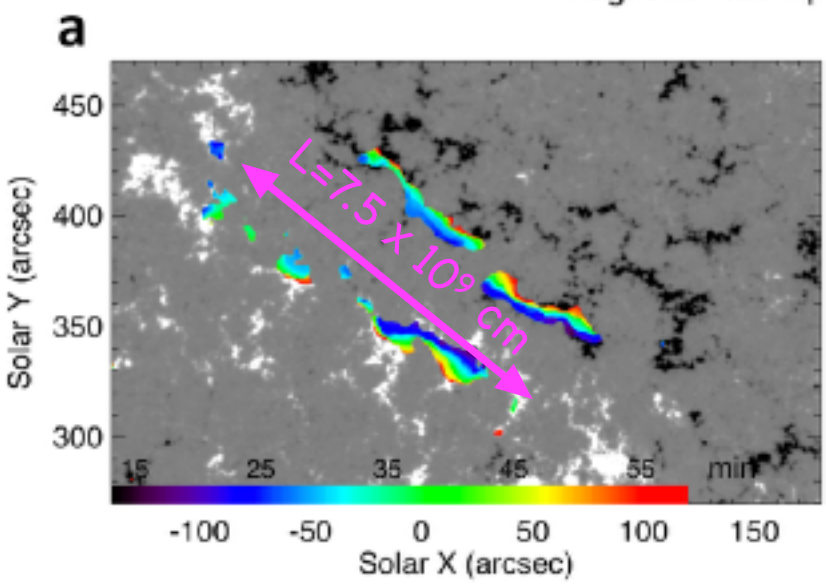
$$V_s(\mathbf{x}_{n1}) = \lim_{\delta t \to \infty} \frac{|\mathbf{x}_{n1} - \mathbf{x}_{n'1}|}{\delta t}$$

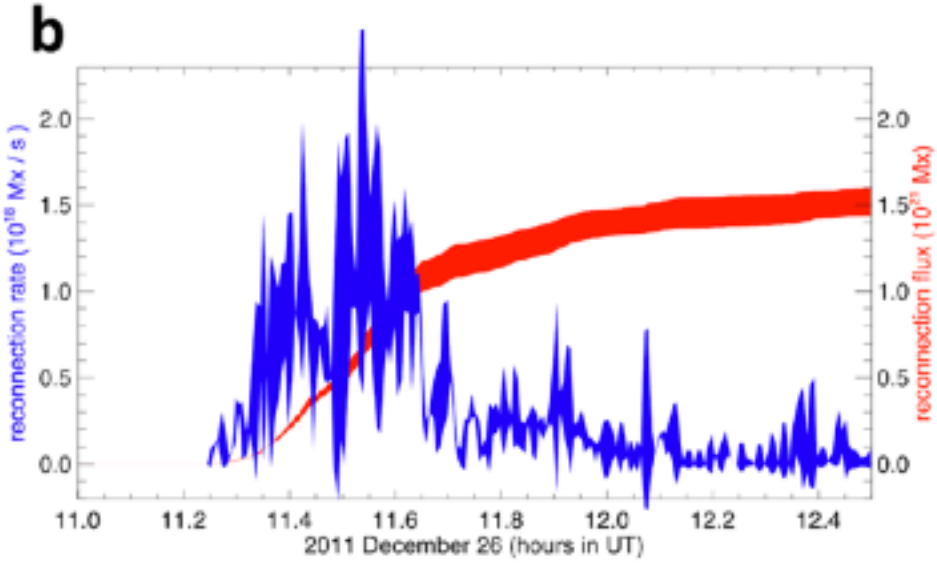
Energy dissipation in Reconnection



$$\dot{\Phi} = -\oint \mathbf{E} \cdot \mathrm{dl}$$

$$P = I\dot{\Phi}$$





$$W = \int I \mathrm{d}\phi \sim \frac{1}{2} I_0 \delta\phi \sim \frac{(\delta\phi)^2}{8\pi L} = \frac{(1.5\times10^{21})^2}{8\pi\cdot 7.5\times10^{9}} = 1.2\times10^{31}\ \mathrm{erg}$$

Qiu 2002–2010