# Magnetic Reconnection

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The previous chapters have been devoted to the dynamics of ideal plasmas, neglecting all effects connected with their finite resistivity. Rewrite the induction equation describing the temporal variation of $\boldsymbol{B}$,

$$\frac{\partial \boldsymbol{B}}{\partial t} = \nabla \times (\boldsymbol{U} \times \boldsymbol{B}) + \eta \nabla^2 \boldsymbol{B} \ . \tag{1}$$

The two terms on the rhs vary over different timescales which can be defined as $\tau_f = \mathcal{L}/\mathcal{U}$ (the fluid or convective scale) and $\tau_d = \mathcal{L}^2/\eta$ (the diffusive or resistive scale), where $\mathcal{U}$ is a typical value of the fluid velocity, $\mathcal{L}$ is the spatial scale of variation of the magnetic field and $\eta = (c^2/4\pi\sigma)$ is the plasma magnetic diffusivity. The relative importance of the two terms is measured by the value of the magnetic Reynolds number, $\mathcal{R}_m = \tau_d/\tau_f = (\mathcal{U}\mathcal{L})/\eta$.