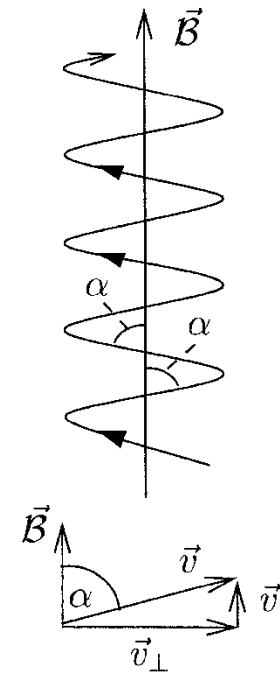
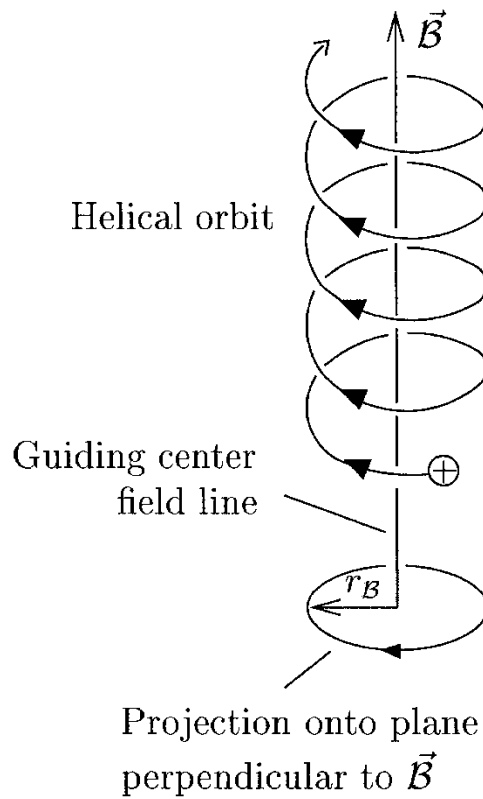


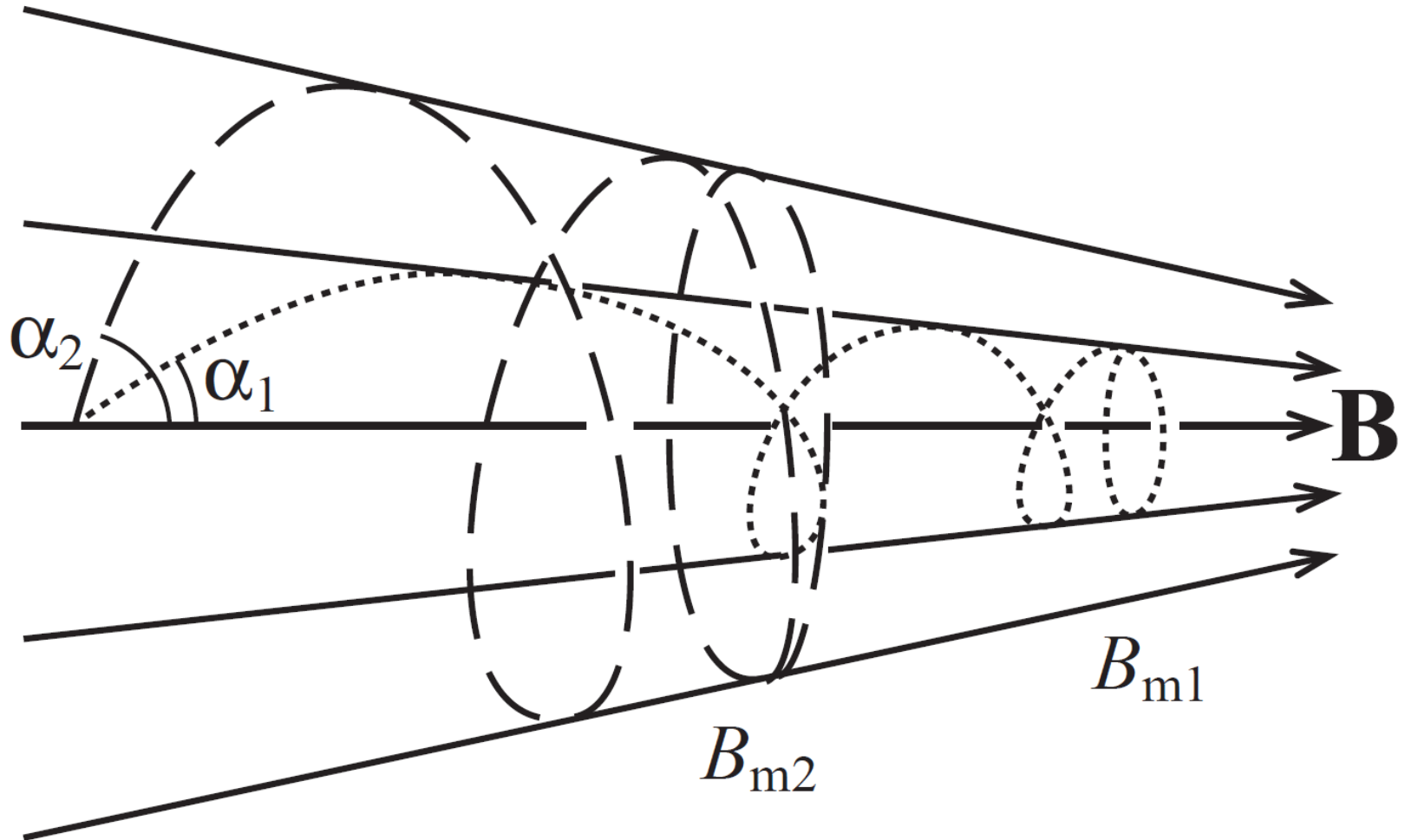
Gyration

$$v_{\parallel} \neq 0$$

Projection onto plane
parallel to \vec{B}



Magnetic mirror/loss cone



Single particle drifts

E × *B* Drift:
$$\mathbf{v}_E = \frac{\mathbf{E} \times \mathbf{B}}{B^2}$$

Polarization Drift:
$$\mathbf{v}_P = \frac{1}{\omega_g B} \frac{d\mathbf{E}_\perp}{dt}$$

Gradient Drift:
$$\mathbf{v}_\nabla = \frac{mv_\perp^2}{2qB^3} (\mathbf{B} \times \nabla B)$$

Curvature Drift:
$$\mathbf{v}_R = \frac{mv_\parallel^2}{qR_c^2 B^2} (\mathbf{R}_c \times \mathbf{B})$$

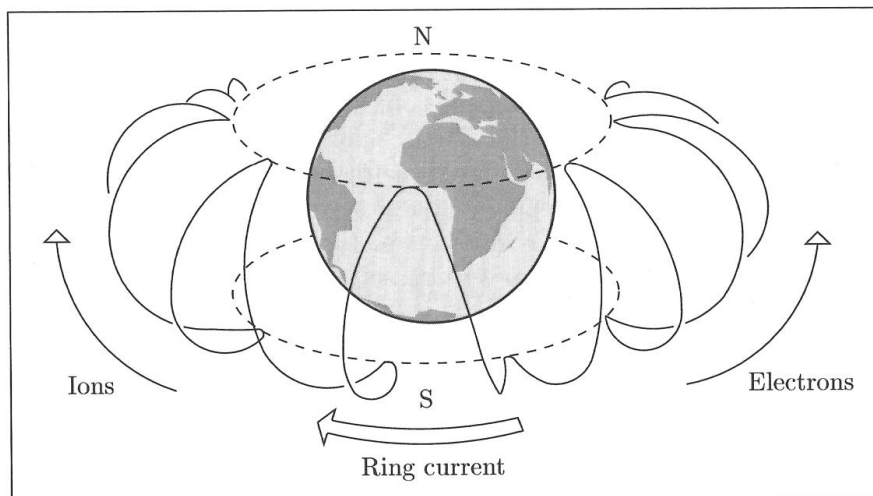
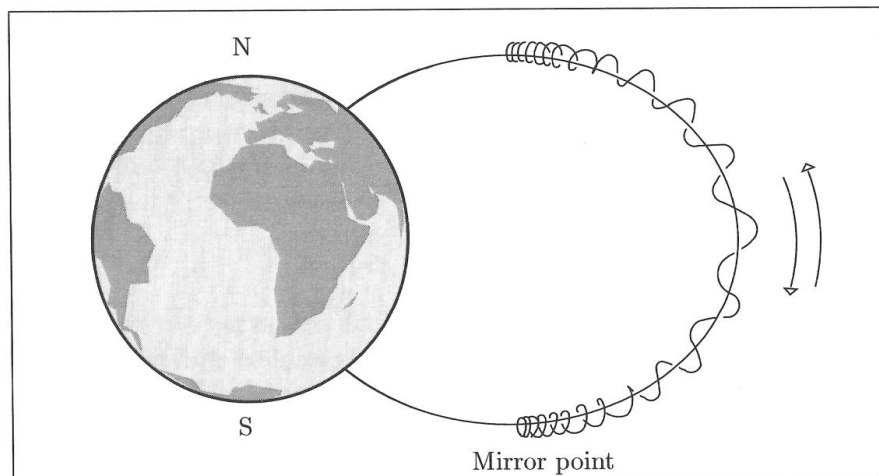
$$\mathbf{j}_P = \frac{n_e(m_i + m_e)}{B^2} \frac{d\mathbf{E}_\perp}{dt}$$

$$\mathbf{j}_\nabla = \frac{n_e(\mu_i + \mu_e)}{B^2} (\mathbf{B} \times \nabla B)$$

$$\mathbf{j}_R = \frac{2n_e(W_{i\parallel} + W_{e\parallel})}{R_c^2 B^2} (\mathbf{R}_c \times \mathbf{B})$$

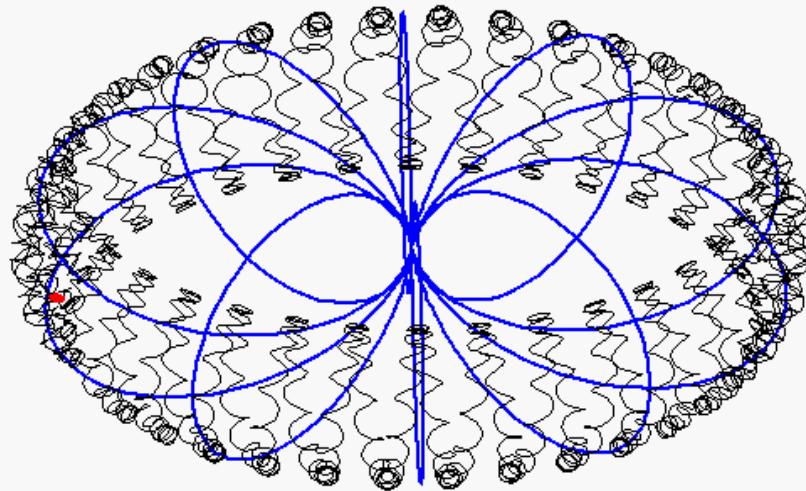


Bounce and drift motion



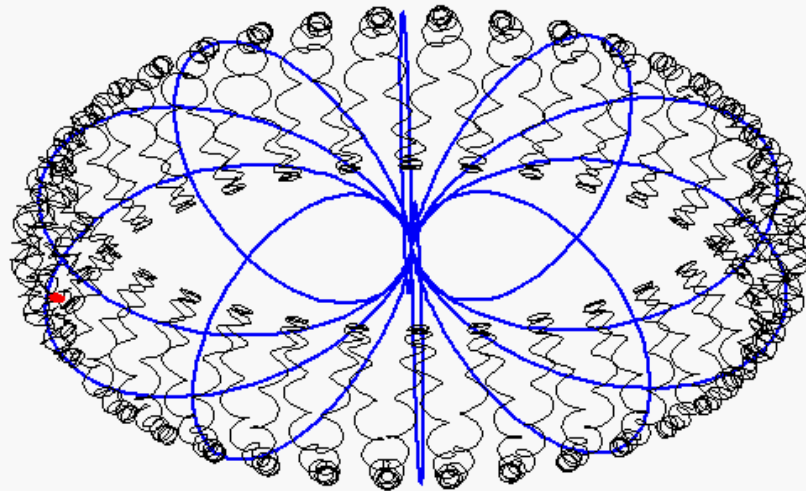
Single particle motion in dipole field

$$\begin{aligned} m &= 16\text{amu}, q = 1e \\ T_{\parallel} &= 14\text{MeV}, T_{\perp} = 31\text{MeV}, \alpha_0 = 56^\circ \\ t &= 0.00\text{s} \end{aligned}$$

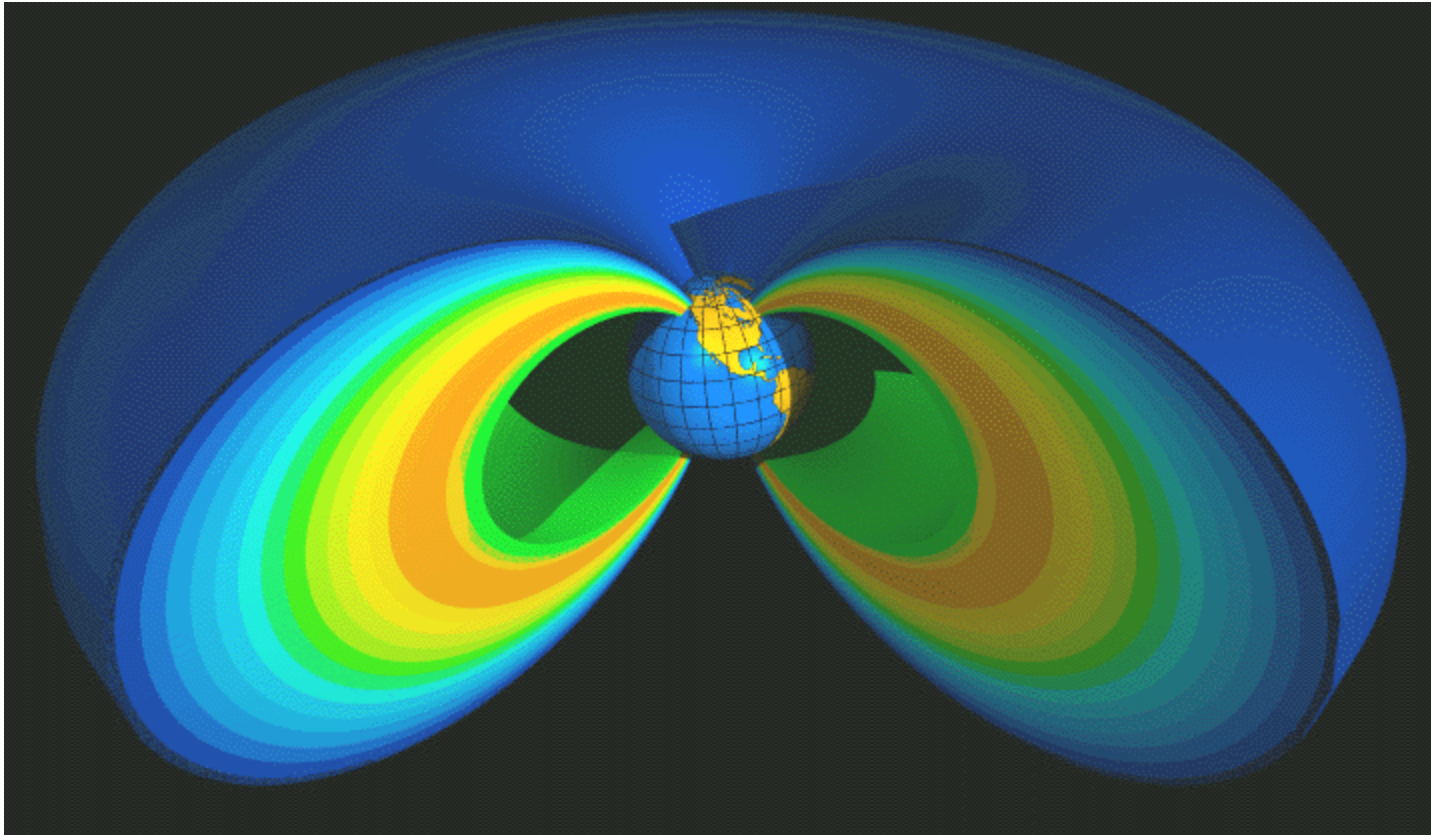


Single particle motion in dipole field

$$\begin{aligned} m &= 16\text{amu}, q = 1e \\ T_{\parallel} &= 14\text{MeV}, T_{\perp} = 31\text{MeV}, \alpha_0 = 56^\circ \\ t &= 0.00\text{s} \end{aligned}$$

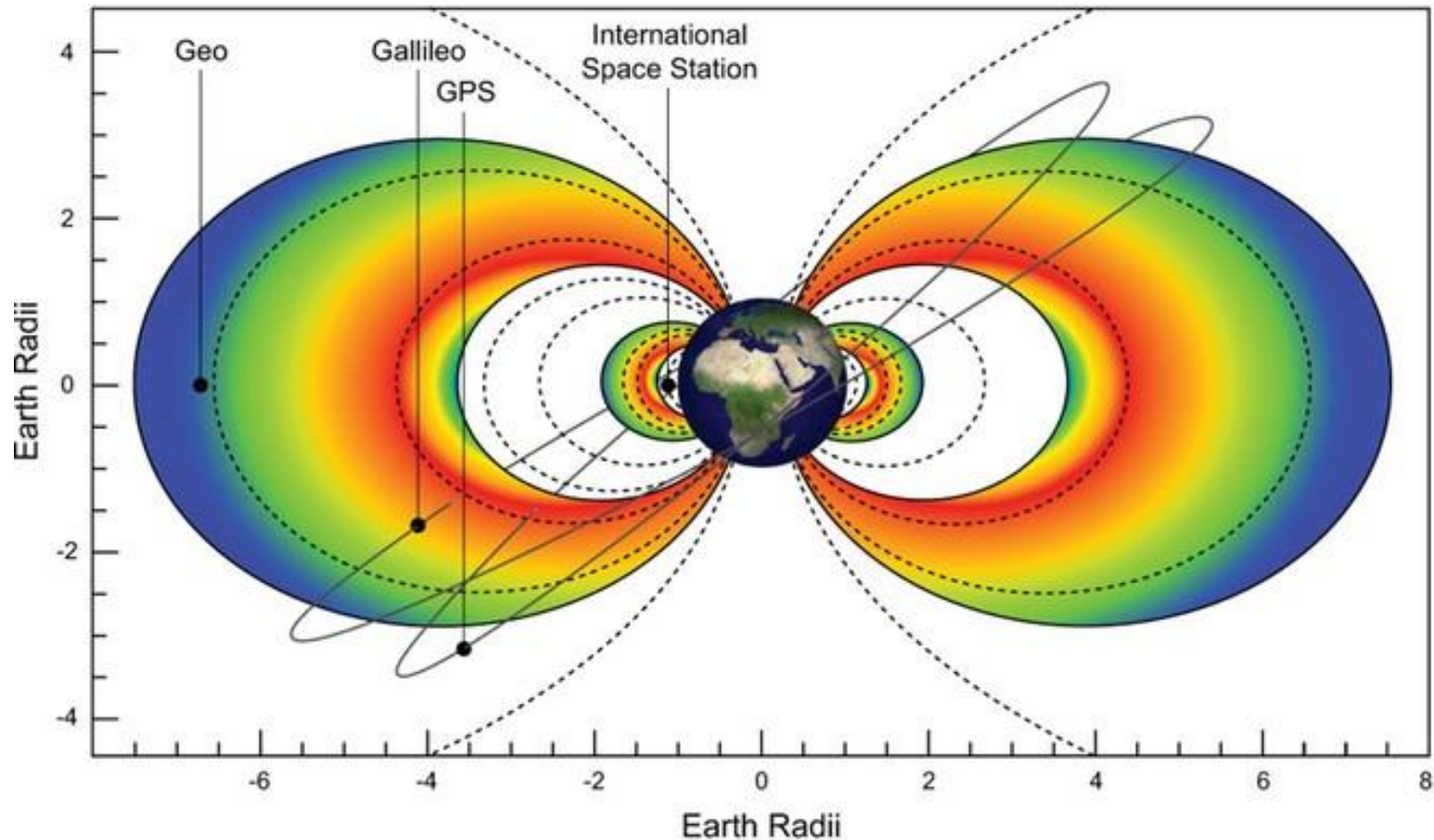


Radiation belts



Space weather relevance

The Earth's Electron Radiation Belts



Ring current

