



## FYS 3610

Exercise Week 37 (Everything relevant for  
midterm/exam)

### Discussion questions

Draw a scheme of the Earth's magnetosphere and label the different regions (magnetopause, polar cap, cusp, magnetotail, tail lobes, magnetosheath).

How can you estimate a “typical” distance of the magnetopause from the Earth at the subsolar point?

**Exercise** (adapted from Exercise 5.5, from Prölss, 2004, ISBN 3-540-21426-7, p.274)

Consider a proton with an energy of 50 keV moving along a dipole field line with shell parameter  $L=3$ , and an equatorial pitch angle  $\alpha = 15^\circ$ .

- 1) Calculate the gyro radius of the proton at the (magnetic) equator and at its mirror point.
- 2) Determine the height (above the surface of the Earth) of the mirror point and the period of a bounce.





Help: Using the dipole approximation, the magnetic field intensity along a given field line is given by

$$B_{fl} = \frac{B_{00}}{L^3} \frac{\sqrt{1 + 3 \sin^2 \phi}}{\cos^6 \phi}$$

Where  $B_{00} \approx 30 \mu T$  is the magnetic field intensity on the ground, and  $\phi$  the magnetic latitude. Use the graph below to estimate  $\phi$

