FYS 3610
Exercises week 42

Excercise 1:

Draw and explain the principles of the Solar Wind Dynamo.

Excercise 2:

a) Where do we expect reconnection to occur in the Sun-Earth system?

b) Assume IMF B_Z purely southward, IMF B_X = IMF B_Y = 0. Sketch reconnection geometry for the dayside magnetosphere.

c) Assume IMF B_Z purely northward, IMF B_X = IMF B_Y = 0. Sketch reconnection geometry for the dayside magnetosphere.

d) Which of the situations in c) and d) yields an open magnetosphere?

e) Which of the situations in c) and d) may erode the magnetospheric dayside flux and increase tail flux? Explain.

f) What is the effect of IMF B_Y for dayside magnetopause reconnection? Make a sketch.

g) In an environment where ideal MHD is valid, explain how can we mix plasma populations originally located on IMF and geomagnetic field lines respectively?

h) Make a drawing of the Dungey cycle and use it to explain plasma convection in the open magnetosphere.

Excercise 3:

a) Discuss the usage of the Reynolds number as an indicator of whether the frozen- in flux concept is valid or not. Why does the frozen-in-flux concept (ideal MHD) break down locally near a reconnection site.

b) Sketch a Sweet-Parker reconnection geometry indicating plasma and magnetic field in and outflow as well as the direction of the electric field and the current sheet.

c) Point out what are the major differences between the Sweet-Parker and Petschek model of magnetic reconnection. What allows Petschek reconnection to proceed at such a high rate compared to a Sweet-Parker diffusion region?