Geomagnetism 2015
Exercise 6/6
Return to reko.hynonen@fmi.fi by: Sun 29.11.2015 10:00
Exercise session: Mon 30.11.2015 14-16, Physicum room D115

1. Use

http://space.fmi.fi/image/beta/?page=user_defined

to plot the X component magnetogram for 6 November 2001. We are interested in the readings around 05 UT. Next, find a suitable baseline for the event: a day as close to the event as possible (say, within +/- 10 days) when the magnetic field disturbances at all stations around the same UT as the event were much smaller than during the event.

2. Download IMAGE magnetometer data (all available stations) for both 6 November 2001 and your selected baseline day using http://www.space.fmi.fi/image/data.html (simple column format is recommended). Calculate the disturbance magnetic field (*X,Y,Z*) for each station on 6 November 2001 at 05:06:00 UT by subtracting the baseline value from the event: $\Delta X = X_{event}-X_{baseline}$, $\Delta Y = Y_{event}-Y_{baseline}$, $\Delta Z = Z_{event}-Z_{baseline}$. Plot the horizontal disturbance magnetic field vectors on a map. Rotate the vectors to show approximately the ionospheric (equivalent) current density.

3. The file

CHAMP_BresXYZ_20011106.dat

contains the disturbance magnetic measured by the low-orbit CHAMP satellite on 6 November 2001. The main field has already been subtracted from the data. CHAMP crossed IMAGE approximately between 05:04:00 and 05:08:00 UT. You can assume that 1) B_res_y in the file was caused by vertical field-aligned currents and the horizontal ionospheric currents that closed them at 100 km altitude and that 2) B_res_x and B_res_z were caused by horizontal ionospheric equivalent currents at 100 km altitude. These assumptions are strictly true when the current system is independent of longitude. You can further assume that 3) the currents remained stationary during the four minutes it took for CHAMP to cross IMAGE.

Plot the disturbance magnetic field as a function of latitude for the crossing. What was the direction of the equivalent current? Was it consistent with IMAGE?