PROJECT IN FYS-3610 SPACE PHYSICS, AUTUMN 2012

Room KV301 Group work and for Space Weather Data processing.

Objective:

- Study ionospheric and auroral dynamics in response to changes in solar wind conditions. Reconnection is the dominant mechanism, giving rise auroral activity and flow channels, and change in the polar cap size.

Data sources:

- **ACE data** are available at
  http://cdaweb.gsfc.nasa.gov/cdaweb/istp_public/
  Choose the satellite ACE, then Level2 data with best resolution from the MAG and SWEPAM instruments, and then the time period you desire.

- **Magnetometer data** are available at http://www.ava.fmi.fi/image/
  Goto Data 🕓 a) jpg plots (daily files of the X component stored on hard disk) 🕓 Form-for user defined events (jpg and PostScript magnetograms) and you can choose stations, time period and scaling (in nT) for the x, y and z components. Alternativeley you can retrieve data from Tromsø Geophysical Observatory www.tgo.uit.no

- **SuperDARN data**: http://superdarn.jhuapl.edu/
  Go to data archives, convection map (north). You need to register in order to get data.

- **All-Sky Camera keogram data** : http://folk.uio.no/espentr/all-sky

Requirements of the report:

- Front page with title and author(s), list of content, introduction. The main part should be subdivided in sections, numbered figures with captions, numbered equations, list of references, and the pages should be numbered. A brief description of the instruments used is required.
- The report can be written in Norwegian or English.
- Between 2000-3000 words.
- Team work (two and two, and maybe one group three).
- You will receive comments and be examined from your report during the oral examination. The we will also ask what is your main contribution.

Time line:

- **Start ASAP.**
- Submission deadline is 19 November 16:00. The report has to submitted electronically (pdf or word format) to jmoen@fys.uio.no

Recommendation:

- In team work please ensure that tasks are distributed and that you make a fair contribution!
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Suggested approach:

- Familiarize with the ACE data and create plots of key parameters.
- Develop a routine to measure time delay from ACE to the Earth magnetopause.
- Inspect the quick look data base of Keograms (auroral intensity along the north-south magnetic meridian versus time.(http://folk.uio.no/espentr/all-sky. Note that not all auroral data are good data due to poor weather conditions more than half of the time)
- Select a data set: Identify some examples where the auroral band of activity migrates equatorward in the 06-12 UT time interval (09-15 MLT). Compare the north-south dynamics with the corresponding IMF conditions. The goal is to see auroral signatures of magnetopause reconnection events.
- Widen the scope by adding flow dynamics by the SuperDARN Radar and possibly signatures in ground magnetometer data.

Supporting literature:

Sandholt, P.E., C.J. Farrugia, J. Moen, Ø. Noraberg, B. Lybekk, T. Sten, and T.L. Hansen, A classification of dayside auroral forms and activities as a function of IMF orientation, *J. Geophys. Res.,103*, 23,325-23,345, 1998.

Ruohoniemi, J. M., R. A. Greenwald, Dependencies of high-latitude plasma convection: Consideration of interplanetary magnetic field, seasonal and universal time factors in statistical patterns, *J. Geophys. Res.*, *110*, A09204, doi:10.1029/2004JA010815, 2005.

Newell, P. T., J. M. Ruohoniemi, and C.–I. Meng, Maps of precipitation by source region, binned by IMF, with inertial convection streamlines, J. Geophys. Res., 109, A10206, doi:10.1029/2004JA010499, 2004.

Kievelson and Russel, Introduction to Space Physics (Chapter 9.5): Reconnection at the magnetopause. (Book available in the Library)