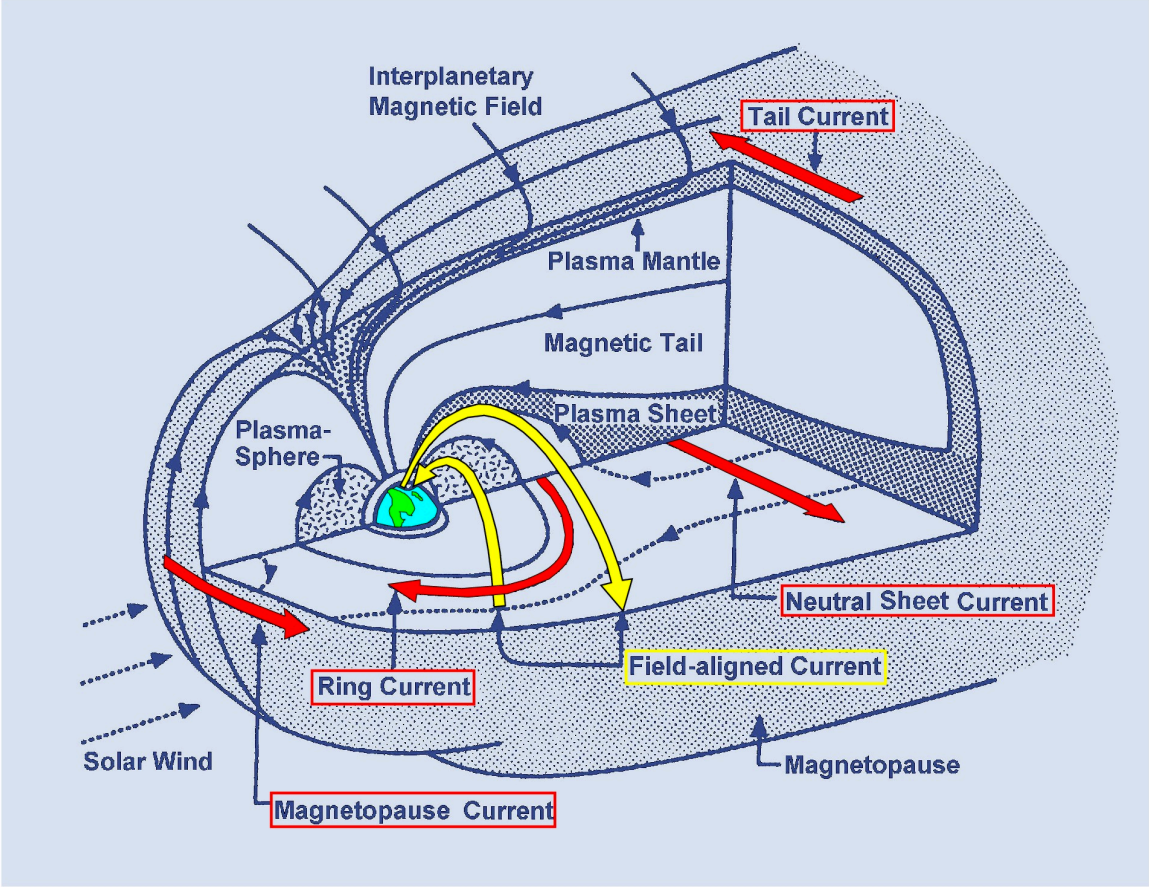

Fig. 1

Runs with artificial conditions

Internet: http://ccmc.gsfc.nasa.gov/support/ILWS/results_mag_model.php
Local network: http://10.0.1.5/support/ILWS/results_mag_model.php

The quiet time magnetosphere?

Objective: Features of the quiet time magnetosphere (southward interplanetary magnetic field). Runs to be used are:

SSW16_CCMC_011216_2
or
HSS2011_SWMF_051111_2 (demo run for practice in preparation to the School)

Follow along the "magnetosphere visualization tutorial". Then, using the cartoon picture (Fig. 1) as a reference use the visualization tools to explore the basic features of the magnetosphere.

What is the effect of ring current on the global magnetosphere?

Objective: Students will learn about how the ring current influences the global magnetosphere and ionosphere using CCMC runs without and with ring current. Runs to be used are:

Matthew_Lund_050315_1 (with ring current = with RCM)
SSW16_CCMC_011216_2 (without ring current = without RCM)

Lets make plots to demonstrate the effects of the ring current on the magnetosphere by comparing runs with and without ring current. Examples include:
1) Making plots in the x-y plane for each run compare the inner magnetospheric pressure.
2) For the run with ring current where does the pressure peak and why?
3) Locate the magnetopause and find the shape in the x-y plane, x-z plane, and 1D plotting. Does the ring current have an impact?
4) What effects do you see in coupling to the magnetosphere? Make plots of the current going into the ionosphere and the polar cap potential. Are the region 2 currents (the more equatorial ones) enhanced with ring current? Can make a plot or plots illustrating what drives this enhancement in the magnetosphere? Anything else you notice?

What happens during geomagnetic storms?

Objective: Use an idealized run with enhanced ram pressure and magnetic field to illustrate key features driving activity during a magnetic storm. Runs to be used:

Option 1 (with RCM):
Control case (nominal solar wind): Matthew_Lund_050315_1
Idealized "storm" case with RCM: SSW16_CCMC_011216_3

Option 2 (without RCM):
Control case (nominal solar wind): SSW16_CCMC_011216_2
Idealized "storm" case without RCM: SSW16_CCMC_011216_4

Increased solar wind magnetic field B and and density N are common features during a geomagnetic storm. The cases let us explore the effects of these features without the complicated dynamics of above are simplified. Do the following for one for the run pairs (Option 1 or Option 2):
1) Find the magnetopause location. Why does it move inward?
2) In the X-Y plane plot the velocity and flow vectors. In the ionosphere plot the polar cap potential. Why does the convection increase?
3) Plot magnetic field lines in the x-z plane and find reconnection site in the tail. How does this change under storm conditions?

Objective: Analyze magnetosphere dynamics response to storm-type changes in solar wind conditions. Use an idealized run HSS2012_SWMF_052212_1 (without RCM and time-dependent solar wind) with north-south turning of the interplanetary magnetic field (IMF) and increase in solar wind ram pressure (density, velocity) and magnetic field strength (see Fig. 2).

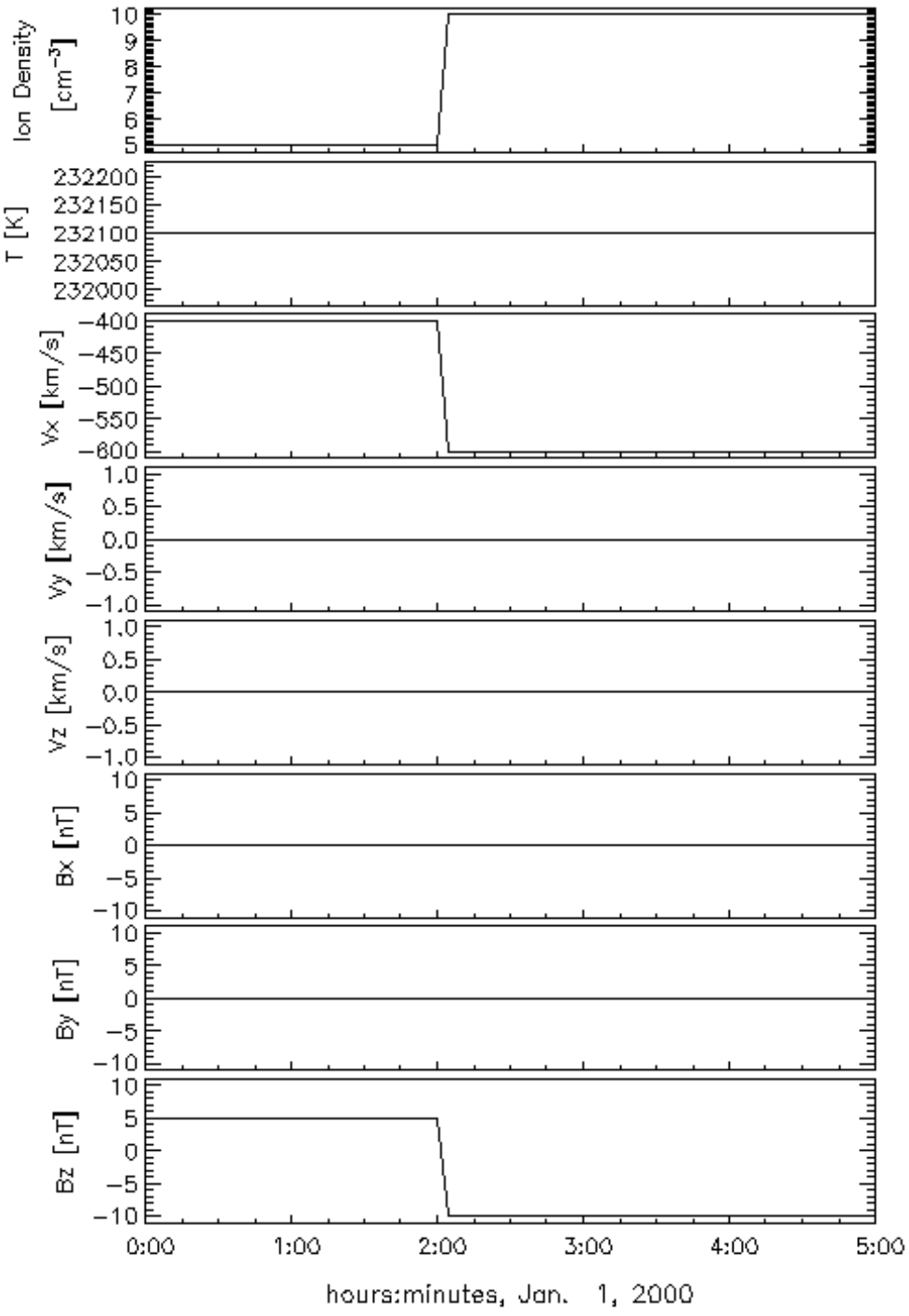

Fig. 2

Run to be used: HSS2012_SWMF_052212_1

Compare states of the magnetosphere
- magnetic field configuration and locations of magnetic reconnection
- density N, velocity Vx, ram pressure P_ram, current Jy

and high latitude ionosphere
- current going into the ionosphere
- polar cap potential
- polar cap boundary (the boundary between open and closed field lines)

before (at 2:00) and after (e.g., 2:14, 2:46, 2:56, 4:00) the storm-type changes in the solar wind.

View pre-computed timeseries to analyze temporal evolution of
- cross polar cap potential (CPCPnorth),
- Northern hemisphere polar cap flux (PC_flux) and area (PC_area)
- Magnetopause standoff (mpnose)
- Energy deposition into ionosphere (go to "Ionospheric dissipation", plot Joule heating - JrPHI)

Real events simulations

Internet: http://ccmc.gsfc.nasa.gov/support/ILWS/results_mag_event.php
Local network: http://10.0.1.5/support/ILWS/results_mag_event.php

Look at an actual event

Objective: look at simulations of real events using Halloween and GALAXI 15 storms as examples:

SWPC_SWMF_030311_1a
SWPC_SWMF_022512_7

Divide into groups to analyze aspects of the storms:
1) Plot input conditions. What might the most geoeffective times might be?
2) Visualize the magnetosphere at these times. What can you tell about how the flow changes? How does the magnetopause location change? The current systems?
3) Plot comparison at particular satellites and ground magnetometers.