Magnetosphere Lab

A Tour of the Magnetosphere with CCMC Models

Go to the CCMC web site
**http://ccmc.gsfc.nasa.gov**

Click "View Model Run Results"

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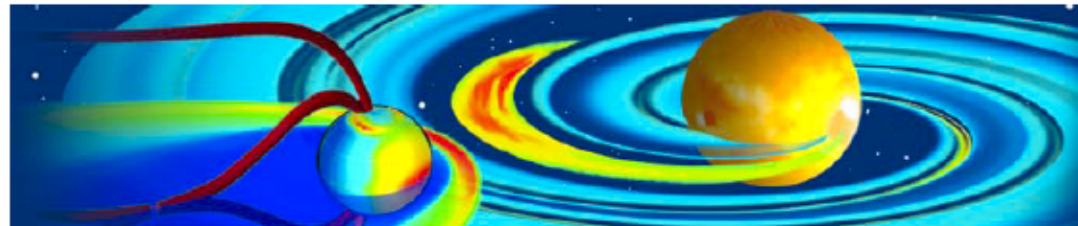
CCMC Mission Statement

The CCMC is a multi-agency partnership to enable, support and perform the research and development for next-generation space science and space weather models.

Space Weather Explorer (SWX) Now Available at CCMC

CCMC now has additional 3D visualization options available for BATSRUS/SWMF and UCLA-GGCM/OpenGGCM runs. The new visualizations, created using Space Weather Explorer (an OpenDX-based application) can all be exported as VRML. New plot modes include 3D flowlines as tubes, slices and surface plots both with and without contour lines (shown in 3D), and combinations of flowlines and slice/surface plots.

Read on

CCMC Services

- We provide, to the scientific community, access to modern space research models

- We test and evaluate models

- We support Space Weather forecasters

- We support space science education

Find out more

The CCMC website has undergone extensive redesign, with some of the pages renamed in the process. If you are unable to locate a previously bookmarked page or have difficulties navigating the redesigned website, please contact the CCMC staff.

Curator: Ms. Anna Chulaki | NASA Official: Dr. Michael Hesse | Privacy, Security Notices

CCMC logo designed by artist Nana Bagdavadze

View Run Results

Runs on Request Results

View the results of your requested run as well as the results of runs submitted by other users. If you use the results from the Runs on Request in a scientific publication or presentation, please acknowledge the CCMC and the originators of the computational model. For more details see the CCMC Publications Policy. **Note**: For tracking purposes for our government sponsors, we ask that you notify the CCMC whenever you use CCMC results in scientific publications or presentations by **emailing CCMC** .
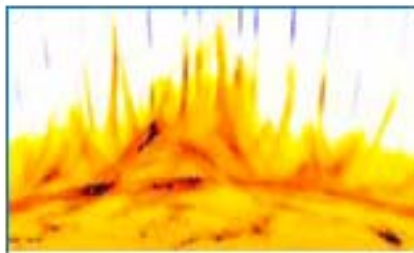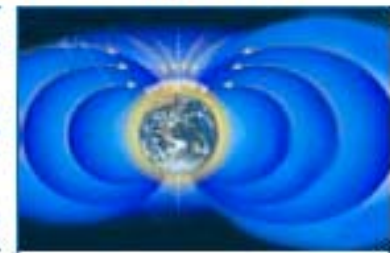

Solar Models Runs Results
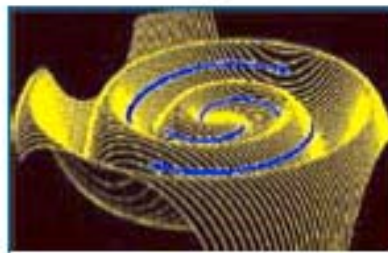
Heliosphere Models Results

Global Magnetosphere Models Results
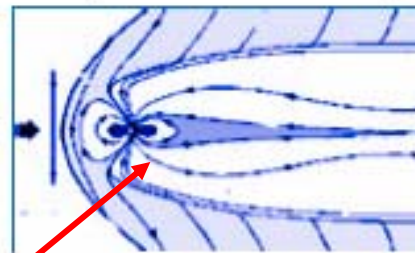
Inner Magnetosphere Models Results

Ionosphere / Thermosphere Models Results

Web interface of Weimer models

AbbyNormal local run

Click "Global Magnetosphere Models Results"

Click "General purpose runs for education and research" then sort by "IMF Clock Angle"

Global Magnetosphere Simulation Results

- ## List all Runs on Request
- ## List simulations with modeled conditions
- ## List simulations of real events
- ## General purpose runs for education and research

Search the database for the string: [   ] (you can search for multiple strings by seperating them using <AND> or <OR>, i.e. 2006<AND>BATSRUS will search for 2006 and BATSRUS)

◉ **In All Columns**

or

◯ **In These Columns** (Key words automatically included, feel free to choose multiple columns):

☑ Run Number   ☐ Surname   ☐ Model   ☐ Event Date   ☐ Run Type
☐ Request Date   ☐ Conductance Model   ☐ Corotation

Do you want to perform an exact search: ◯ Yes   ◉ No   [Find it!]

•Note options and open BATSRUS zero IMF

Sort by: | Model | Vx | IMF Clock Angle | SW Density (N) | IMF Magnitude (|B|) | IMF Bz | IMF By | Conductance Model |

Total Number of Runs in the Database: 772
Number of Educational Runs in this Database: 34

Model	Model Version	V_x	N	|B|	IMF Clock Angle	B_x	B_y	B_z	Conductance Model	Diploe Tilt	Run Number
OpenGGCM	2.1-1	-400.00000	5.00000	5.00000	0.00000	0.00000	0.00000	5.00000	uniform(p=5;h=5)	0.00	CCMC_CCMC_111605_2
BATSRUS	v7.73	-400.00000	5.00000	5.00000	0.00000	0.00000	0.00000	5.00000	uniform(p=5;h=0)	35.00	CCMC_CCMC_080306_5
BATSRUS	v7.73	-400.00000	5.00000	5.00000	0.00000	0.00000	0.00000	5.00000	uniform(p=5;h=0)	0.00	CCMC_CCMC_053106_1
OpenGGCM	2.1-1	-400.00000	5.00000	0.00000	0.00000	0.00000	0.00000	0.00000	uniform (p=5;h=5)	0.00	CCMC_CCMC_053006_2
BATSRUS	v7.73	-400.00000	5.00000	0.00000	0.00000	0.00000	0.00000	0.00000	uniform(p=5;h=0)	0.00	CCMC_CCMC_053006_1
OpenGGCM	2.1-1	-400.00000	5.00000	5.00000	0.00000	0.00000	0.00000	5.00000	uniform (p=5;h=5)	35.00	CCMC_CCMC_080306_6
OpenGGCM	2.1-1	-400.00000	5.00000	20.00000	0.00000	0.00000	0.00000	20.00000	uniform(p=5;h=5)	0.00	CCMC_CCMC_120505_1
OpenGGCM	2.1-1	-400.00000	30.00000	5.00000	0.00000	0.00000	0.00000	5.00000	uniform(p=5;h=5)	0.00	CCMC_CCMC_112305_1
BATSRUS	v7.73	-400.00000	5.00000	5.00000	0.00000	0.00000	0.00000	5.00000	uniform(p=5;h=5)	0.00	CCMC_CCMC_111705_1
BATSRUS with RCM	v7.73	-400.00000	5.00000	5.00000	0.00000	0.00000	0.00000	5.00000	uniform(p=5;h=5)	0.00	CCMC_CCMC_111605_1
BATSRUS	v7.73	-1000.00000	30.00000	5.00000	180.00000	0.00000	0.00000	-5.00000	uniform(p=5;h=0)	0.00	CCMC_CCMC_020906_2
BATSRUS	v7.73	-400.00000	5.00000	20.00000	180.00000	0.00000	0.00000	-20.00000	uniform(p=5;h=0)	0.00	CCMC_CCMC_021606_1
BATSRUS	v7.73	-400.00000	15.00000	20.00000	180.00000	0.00000	0.00000	-20.00000	uniform(p=5;h=0)	0.00	CCMC_CCMC_021606_2
BATSRUS with RCM	v7.73	-400.00000	5.00000	5.00000	180.00000	0.00000	0.00000	-5.00000	uniform(p=5;h=5)	0.00	CCMC_CCMC_111605_5
BATSRUS	v7.73	-400.00000	5.00000	40.00000	180.00000	0.00000	0.00000	-40.00000	uniform(p=5;h=0)	0.00	CCMC_CCMC_060906_3
OpenGGCM	2.1-1	-400.00000	5.00000	40.00000	180.00000	0.00000	0.00000	-40.00000	uniform (p=5;h=5)	0.00	CCMC_CCMC_060906_4

CCMC_CCMC_053006_1

Title/Introduction:

Key Word: educational

3D MHD Model: BATSRUS
Simulation With Modeled Conditions
Inflow Boundary Conditions: Fixed
Start Time: 2000/01/01 00:00
End Time: 2000/01/01 02:30
Dipole Tilt at Start in X-Z Plane: 0.0 deg.
Dipole Tilt in Y-Z GSE Plane: 0.0 deg.
Dipole Update With Time: no
Ionospheric Conductance: uniform(5,0)
No Corotation Velocity is Applied at The Inner Boundary.
Radio Flux 10.7 cm: 150.
Coordinate System for the Output: GSM
Initial Solar Wind (SW) Parameters in GSM Coordinates:

      SW Density: 5. n/cc
      SW Temperature [Kelvin]: 232100. Kelvin
      X Component of SW Velocity: -400. km/sec
      Y Component of SW Velocity: 0. km/sec
      Z Component of SW Velocity: 0. km/sec
      IMF Bx: 0. nT
      IMF By: 0. nT
      IMF Bz: 0. nT
      IMF |B|: 0.00 nT
      IMF Clock Angle: 0.0 deg.

- View Magnetosphere ←——————— **View Magnetosphere and hit "Update Plot"** 6
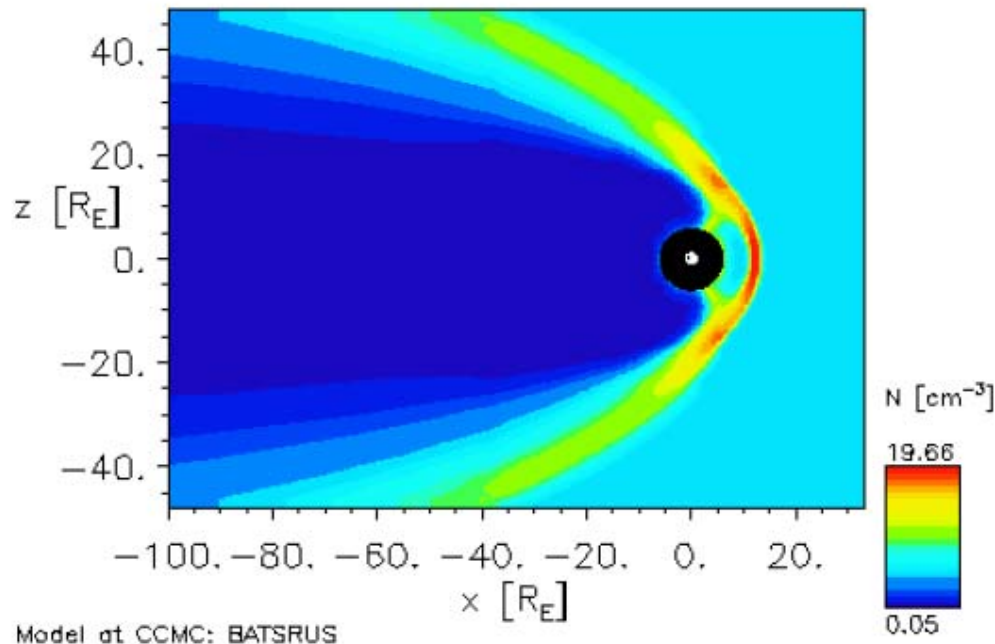- View Ionosphere

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**About Us Space
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Time Simulations**

01/01/2000 Time = 02:30:00 y= 0.00R$_E$

Model at CCMC: BATSRUS

**Figure: Simulation of the Solar Wind flow around the Earth.
EPS image
Model: BATSRUS
Run: CCMC_CCMC_053006_1**

To track usage for our government sponsors, we ask that you notify CCMC staffCCMC staff whenever you use CCMC results in scientific publication or presentation. Thank you.

Update Plot *Update Plot* will update (generate) the plot with the chosen time and plot parameters below.
This will take some time (typically 10-30s) as data is read in and processed.

Plot Options:

☑ **Exclude region around the Earth** up to 6 R_E

⊙ **Choose data time:**
Date: 2000/01/01 Time: 02:3

Image magnification 1
(all images; use >=1.25 for 3D Flowlines)

- or -

○ **Change time** by moving

-1 output steps

☑ **Allow variable plot image size**
(all 2D plots: aspect ratio dx/dy between **0.3** and **4**)

☐ **Show simulation grid** (disabled with 3D-Surface)

☑ **Interpolate data onto equidistant grid**
(available with 3D-Surface and Vector; recommended for plots
with Vector)

**Review the options
available in the
various boxes**

Choose **Plot Mode:**
ColorContour (2D)

Choose **quantity** to be displayed (some **Plot Modes** require up to three choices):
Q 1: N   Q 2: N   Q 3: N

Plot Options for selected Plot Modes:

3D-Surface, 3D-Flowlines:
 View angles:

AX [-90..90]: 30 AZ [-180 ... 180]: 30
Color Contour:
 ☐ **Use Grayscale**
 ☐ **Lock color range:**
  Min.: -1 Max.: 1
 ☐ **Log scale** (use all data>0 in non-negative fields)
Contour: ☐ **show values with contour levels**
Vector: **length of arrows:** 1.0

3D-Flowlines:
 flowline start positions
 Choose **Flowline Setup Mode:**
 predefined in 3D (V,B,other)
 user-defined flowline start positions:

X: 9,9.5,10,10.5,11,11.5

Y: 0,0,0,0,0,0

Z: 0,0,0,0,0,0

☐ **Plot to VRML**

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Choose Plot Area:

All **Plot Modes** except **Line Plot** and **Vertical Plot**:   Select lower left corner of plot area on the left, and the upper right corner on the right.
  Line Plot: Select start point of line on the left, the end point on the right.
  Vertical Plot: Select X and Y position on the left.

Choose Cut Plane:

X_1 [-100]　　X_2 [33] Range: -255 ... 33 R_E　　X=constant ○ [-111]

Y_1 [-48]　　Y_2 [48] Range: -48 ... 48 R_E　　Y=constant ◉ [0]

Z_1 [-48]　　Z_2 [48] Range: -48 ... 48 R_E　　Z=constant ○ [0]

[Reset Form]　*Reset Form* will reset changes to the defaults specified by the previous run of this script.

[Update Plot]　*Update Plot* will update (generate) the plot with the chosen time and plot parameters above.

☐ **List Data** (check to get any of the following outputs):

What:　◉ Plot variables from above

　　○ Include all primary model output parameters (**Warning:** text files may become large).
　　You have to select **vector magnitudes** (e.g., "B","V","J") explicitly for plotting to get them:
　　　computed scalars such as
　　　derived vectors (e.g, "JxB"): select one component or its magnitude to get all components

　　○ Include parameters from this list in addition to those selected for the plot:
　　　[   ] (copy names from **Q1** list above and separate them with commas).

Where:　○ **At positions specified:**　enter positions in X, Y, Z, (within the allowed range) as comma-separated lists.

　　　☐ Use combination of positions in a 3D grid.
　　　X positions: [0,0,0]
　　　Y positions: [5,7.5,10]
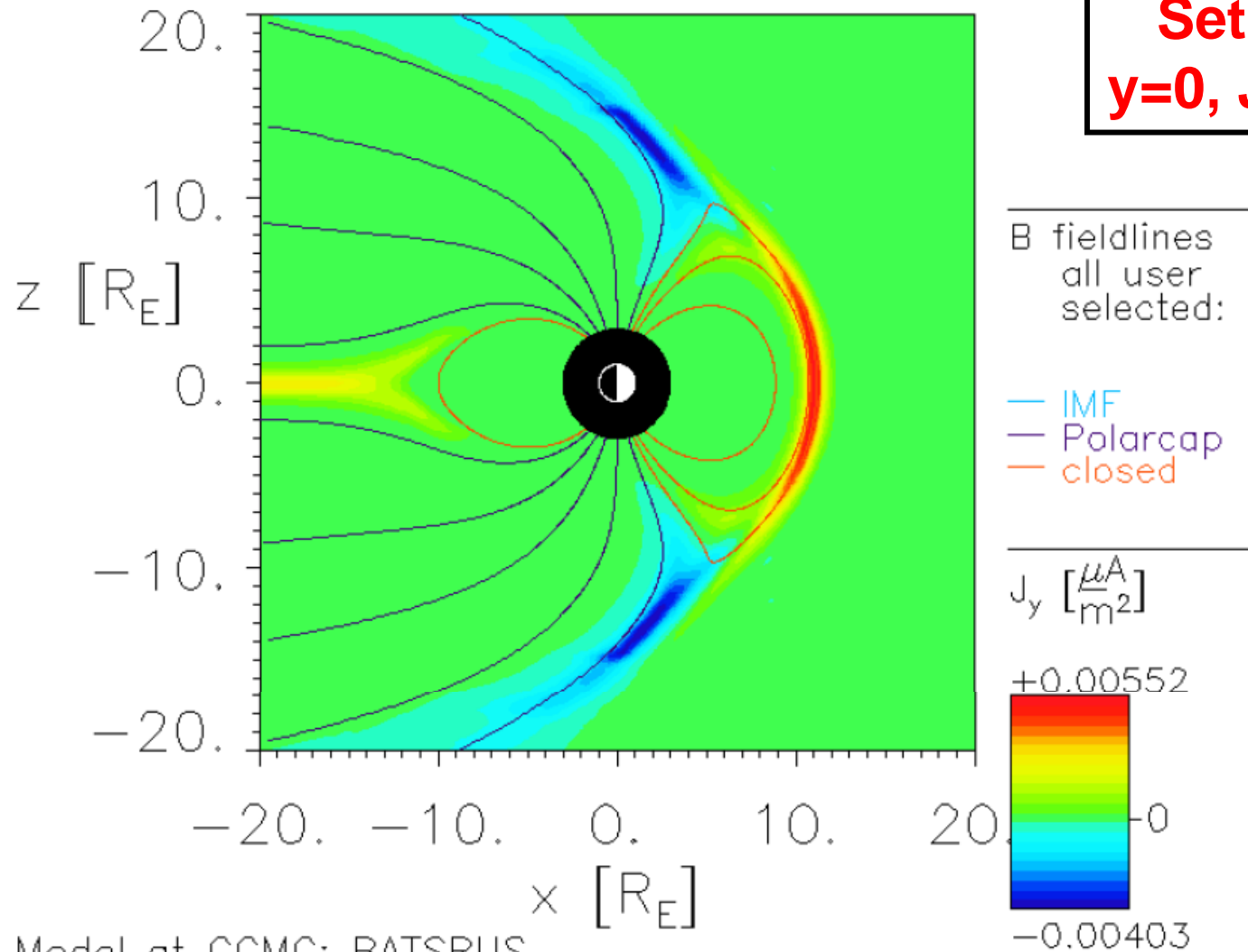　　　Z positions: [0.2,0.3,0.4]

　　◉ **List Data From Plot**:

　　　• **2D plots** (Contour, Vector, ...):
　　　　equidistant 61x61-element grid in cut plane (**Interpolate data onto equidistant grid** selected)

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01/01/2000 Time = 02:30:00 y= 0.00R$_E$

Setup for Z IMF, y=0, Jy, & field lines

B fieldlines
all user
selected:

— IMF
— Polarcap
— closed

$J_y \left[\frac{\mu A}{m^2}\right]$

+0.00552

0

−0.00403

z [R$_E$]

x [R$_E$]

Model at CCMC: BATSRUS

Figure: Simulation of the Solar Wind flow around the Earth.
EPS image
Model: BATSRUS
Run: CCMC_CCMC_053006_1

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Update Plot   *Update Plot* will update (generate) the plot with the chosen time and plot parameters below.
This will take some time (typically 10-30s) as data is read in and processed.

Plot Options:

☑ **Exclude region around the Earth** up to [3] R_E

⦿ **Choose data time:**

Date: 2000/01/01 Time: 02:3

- or -

○ **Change time** by moving

[-1] output steps

Image magnification [2]
(all images; use >=1.25 for 3D Flowlines)

☑ **Allow variable plot image size**
(all 2D plots: aspect ratio dx/dy between **0.3** and **4**)

☐ **Show simulation grid** (disabled with 3D-Surface)

☑ **Interpolate data onto equidistant grid**
(available with 3D-Surface and Vector; recommended for plots
with Vector)

Choose **Plot Mode**:   Choose **quantity** to be displayed (some **Plot Modes** require up to three choices):

Color+Vector+Flowlines   Q 1: [J_y]   Q 2: [N]   Q 3: [B_x]

Plot Options for selected Plot Modes:

3D-Surface, 3D-Flowlines:
View angles:

AX [-90..90]: [30]   AZ [-180 ... 180]: [30]

Color Contour:

☐ **Use Grayscale**

☐ **Lock color range:**

Min.: [-1]   Max.: [1]

☐ **Log scale** (use all data>0 in non-negative fields)

Contour: ☐ **show values with contour levels**

Vector: **length of arrows:** [1.0]

3D-Flowlines:
flowline start positions
Choose **Flowline Setup Mode**:

only user-defined start points

user-defined flowline start positions:

X: [-4,-4,-2,-2,-1,-1,0,0,1,1,1.5,2,4,-10]

Y: [0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0]

Z: [4,-4,4,-4,4,-4,4,-4,4,-4,4,4,4,0]

☐ **Plot to VRML**

Choose Plot Area:

All **Plot Modes** except **Line Plot** and **Vertical Plot**: Select lower left corner
of plot area on the left, and the upper right corner on the right.
Line Plot: Select start point of line on the left, the end point on the right.
Vertical Plot: Select X and Y position on the left.

Choose Cut Plane:

X_1 [-20] X_2 [20] Range: -255 ... 33 R_E X=constant ○ [-111]

Y_1 [-20] Y_2 [20] Range: -48 ... 48 R_E Y=constant ⦿ [0]

Z_1 [-20] Z_2 [20] Range: -48 ... 48 R_E Z=constant ○ [0]

Reset Form   *Reset Form* will reset changes to the defaults specified by the previous run of this script.

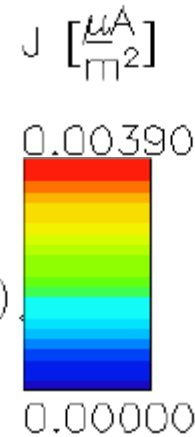Update Plot   *Update Plot* will update (generate) the plot with the chosen time and plot parameters above.

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01/01/2000 Time = 02:30:00 x= 2.00R_E

Setup for Z IMF, X=2, J, and Chapman-Ferraro Current Lines

z [R_E]

y [R_E]

Model at CCMC: BATSRUS

J flowlines
connection
to Earth:
all user
selected:

— disconn.
— one end
— both ends

J [$\frac{\mu A}{m^2}$]

0.00390

0.00000

Figure: Simulation of the Solar Wind flow around the Earth.
EPS image
Model: BATSRUS
Run: CCMC_CCMC_053006_1

Update Plot   *Update Plot* will update (generate) the plot with the chosen time and plot parameters below.
This will take some time (typically 10-30s) as data is read in and processed.

Plot Options:

☑ **Exclude region around the Earth** up to [3] R_E

⊙ **Choose data time:**
    Image magnification [2]
[Date: 2000/01/01 Time: 02:3]   (all images; use >=1.25 for 3D Flowlines)

- or -
○ **Change time** by moving   ☑ **Allow variable plot image size**
          (all 2D plots: aspect ratio dx/dy between 0.3 and 4)
[-1] output steps   ☐ **Show simulation grid** (disabled with 3D-Surface)

☑ **Interpolate data onto equidistant grid**
     (available with 3D-Surface and Vector; recommended for plots
with Vector)

Choose **Plot Mode:**   Choose **quantity** to be displayed (some **Plot Modes** require up to three choices):
[Color+Vector+Flowlines]   Q 1: [J]   Q 2: [N]   Q 3: [J_x]

Plot Options for selected Plot Modes:

3D-Surface, 3D-Flowlines: 3D-Flowlines:
  View angles: **flowline start positions**
                                            Choose **Flowline Setup Mode:**
   AX [-90..90]: [30]   AZ [-180 ... 180]: [30]   [only user-defined start points]
Color Contour: **user-defined flowline start positions:**
  ☐ **Use Grayscale**
  ☐ **Lock color range:**   X: [8.7,9.4,9.8,10.2,10.6,8.7,9.4,9.8,10]
   Min.: [-1]   Max.: [1]   Y: [0,0,0,0,0,0,0,0,0,0,0,0]
  ☐ **Log scale** (use all data>0 in non-negative fields)
Contour: ☐ **show values with contour levels**   Z: [6,5,4,3,2,-6,-5,-4,-3,-2]
Vector: **length of arrows:** [1.0]
                                              ☐ **Plot to VRML**

Choose Plot Area:
  All Plot Modes except **Line Plot** and **Vertical Plot:**   Select lower left corner
of plot area on the left, and the upper right corner on the right.
  Line Plot: Select start point of line on the left, the end point on the right.
  Vertical Plot: Select X and Y position on the left.   **Choose Cut Plane:**

X₁ [-10]   X₂ [20] Range: -255 ... 33 R_E X=constant ⊙ [2]

Y₁ [-20]   Y₂ [20] Range: -48 ... 48 R_E Y=constant ○ [0]

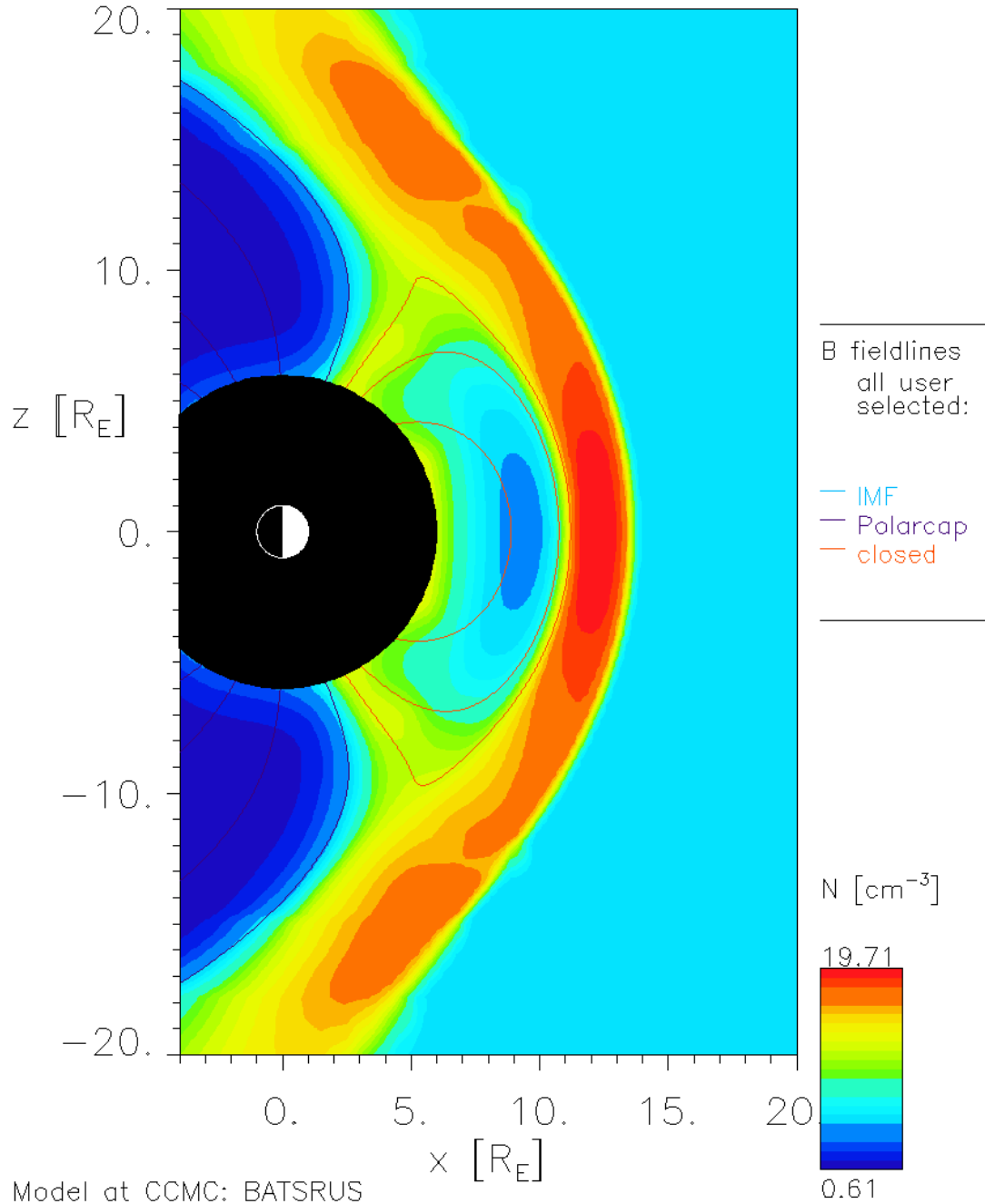Z₁ [-20]   Z₂ [20] Range: -48 ... 48 R_E Z=constant ○ [0]

Reset Form   *Reset Form* will reset changes to the defaults specified by the previous run of this script.
Update Plot   *Update Plot* will update (generate) the plot with the chosen time and plot parameters above.
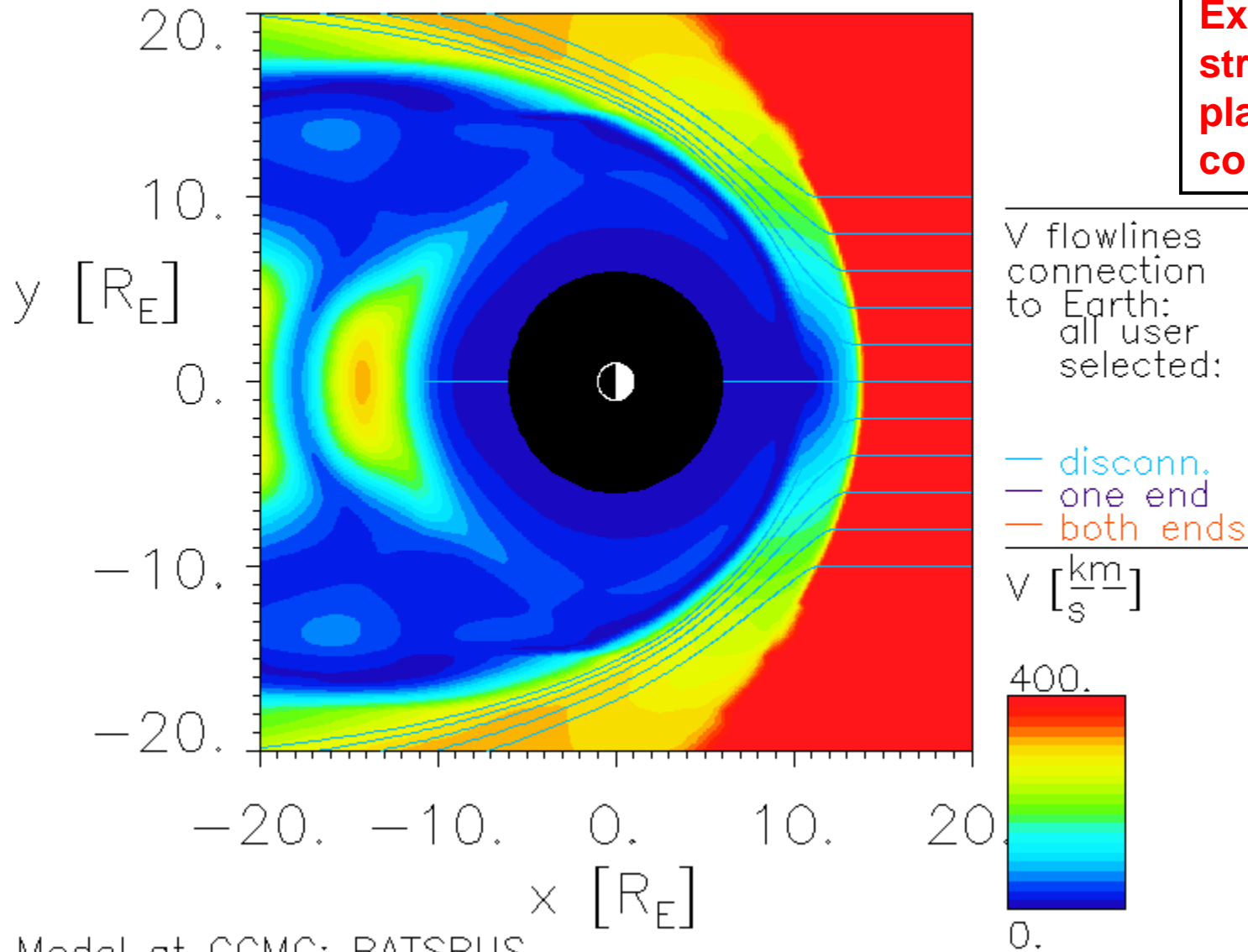
01/01/2000 Time = 02:30:00 y= 0.00R$_E$

Z IMF, y=0, N, B-lines

Obtain images for color-contour quantities N, T, P, and B1 (not B). Use 6 Re blocking radius and x2 magnification.

B fieldlines all user selected:

— IMF
— Polarcap
— closed

N [cm^{-3}]

19.71

0.61

Model at CCMC: BATSRUS

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01/01/2000 Time = 02:30:00 z= 0.00R_E

Z IMF z=0 V Vlines

Exercise: Obtain flow streamlines in z=0 plane with V color contours.

y [R_E]

V flowlines
connection
to Earth:
all user
selected:

— disconn.
— one end
— both ends

V [$\frac{km}{s}$]

400.

0.

x [R_E]

Model at CCMC: BATSRUS

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•Open OpenGGCM zero IMF and "View Magnetosphere"

Sort by:
| Model | Vx | IMF Clock Angle | SW Density (N) | IMF Magnitude (|B|) | IMF Bz | IMF By | Conductance Model |

Total Number of Runs in the Database: 772
Number of Educational Runs in this Database: 34

Model	Model Version	V_X	N	|B|	IMF Clock Angle	B_X	B_y	B_z	Conductance Model	Diploe Tilt	Run Number
OpenGGCM	2.1-1	-400.00000	5.00000	5.00000	0.00000	0.00000	0.00000	5.00000	uniform(p=5;h=5)	0.00	CCMC_CCMC_111605_2
BATSRUS	v7.73	-400.00000	5.00000	5.00000	0.00000	0.00000	0.00000	5.00000	uniform(p=5;h=0)	35.00	CCMC_CCMC_080306_5
BATSRUS	v7.73	-400.00000	5.00000	5.00000	0.00000	0.00000	0.00000	5.00000	uniform(p=5;h=0)	0.00	CCMC_CCMC_053106_1
OpenGGCM	2.1-1	-400.00000	5.00000	0.00000	0.00000	0.00000	0.00000	0.00000	uniform (p=5;h=5)	0.00	CCMC_CCMC_053006_2
BATSRUS	v7.73	-400.00000	5.00000	0.00000	0.00000	0.00000	0.00000	0.00000	uniform(p=5;h=0)	0.00	CCMC_CCMC_053006_1
OpenGGCM	2.1-1	-400.00000	5.00000	5.00000	0.00000	0.00000	0.00000	5.00000	uniform (p=5;h=5)	35.00	CCMC_CCMC_080306_6
OpenGGCM	2.1-1	-400.00000	5.00000	20.00000	0.00000	0.00000	0.00000	20.00000	uniform(p=5;h=5)	0.00	CCMC_CCMC_120505_1
OpenGGCM	2.1-1	-400.00000	30.00000	5.00000	0.00000	0.00000	0.00000	5.00000	uniform(p=5;h=5)	0.00	CCMC_CCMC_112305_1
BATSRUS	v7.73	-400.00000	5.00000	5.00000	0.00000	0.00000	0.00000	5.00000	uniform(p=5;h=5)	0.00	CCMC_CCMC_111705_1
BATSRUS with RCM	v7.73	-400.00000	5.00000	5.00000	0.00000	0.00000	0.00000	5.00000	uniform(p=5;h=5)	0.00	CCMC_CCMC_111605_1
BATSRUS	v7.73	-1000.00000	30.00000	5.00000	180.00000	0.00000	0.00000	-5.00000	uniform(p=5;h=0)	0.00	CCMC_CCMC_020906_2
BATSRUS	v7.73	-400.00000	5.00000	20.00000	180.00000	0.00000	0.00000	-20.00000	uniform(p=5;h=0)	0.00	CCMC_CCMC_021606_1
BATSRUS	v7.73	-400.00000	15.00000	20.00000	180.00000	0.00000	0.00000	-20.00000	uniform(p=5;h=0)	0.00	CCMC_CCMC_021606_2
BATSRUS with RCM	v7.73	-400.00000	5.00000	5.00000	180.00000	0.00000	0.00000	-5.00000	uniform(p=5;h=5)	0.00	CCMC_CCMC_111605_5
BATSRUS	v7.73	-400.00000	5.00000	40.00000	180.00000	0.00000	0.00000	-40.00000	uniform(p=5;h=0)	0.00	CCMC_CCMC_060906_3
OpenGGCM	2.1-1	-400.00000	5.00000	40.00000	180.00000	0.00000	0.00000	-40.00000	uniform (p=5;h=5)	0.00	CCMC_CCMC_060906_4

Investigate variation of quantities along the stagnation streamline

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[Update Plot] *Update Plot* will update (generate) the plot with the chosen time and plot parameters below.
This will take some time (typically 10-30s) as data is read in and processed.

Plot Options:

☑ **Exclude region around the Earth** up to [6] R_E

◉ **Choose data time:**

[Date: 2000/01/01 Time: 02::]

Image magnification [2]
(all images; use >=1.25 for 3D Flowlines)

- or -

○ **Change time** by moving

[-1] output steps

☑ **Allow variable plot image size**
(all 2D plots: aspect ratio dx/dy between 0.3 and 4)

☐ **Show simulation grid** (disabled with 3D-Surface)

☑ **Interpolate data onto equidistant grid**
(available with 3D-Surface and Vector; recommended for plots
with Vector)

Choose **Plot Mode:**   Choose **quantity** to be displayed (some **Plot Modes** require up to three choices):

[Line (1D)]   Q 1: [J_y] Q 2: [N] Q 3: [V]

Plot Options for selected Plot Modes:

3D-Surface, 3D-Flowlines:
 View angles:

  AX [-90..90]: [30]   AZ [-180 ... 180]: [30]
Color Contour:
 ☐ **Use Grayscale**
 ☐ **Lock color range:**
  Min.: [-1]   Max.: [1]
 ☐ **Log scale** (use all data>0 in non-negative fields)
Contour: ☐ **show values with contour levels**
Vector: length of arrows: [1.0]

3D-Flowlines:
 flowline start positions
 Choose **Flowline Setup Mode:**
 [predefined in 3D (V,B,other)]
 user-defined flowline start positions:

 X: [9,9.5,10,10.5,11,11.5]

 Y: [0,0,0,0,0,0]

 Z: [0,0,0,0,0,0]

 ☐ **Plot to VRML**

Choose Plot Area:
 All **Plot Modes** except **Line Plot** and **Vertical Plot**: Select lower left corner
of plot area on the left, and the upper right corner on the right.
 Line Plot: Select start point of line on the left, the end point on the right.
 Vertical Plot: Select X and Y position on the left.

Choose Cut Plane:

X_1 [8] X_2 [16] Range: -350.01 ... 24.01 R_E X=constant ○ [-163]

Y_1 [0] Y_2 [0] Range: -48.01 ... 48.01 R_E Y=constant ◉ [0]

Z_1 [0] Z_2 [0] Range: -48.01 ... 48.01 R_E Z=constant ○ [0]

[Reset Form] *Reset Form* will reset changes to the defaults specified by the previous run of this script.

[Update Plot] *Update Plot* will update (generate) the plot with the chosen time and plot parameters above.
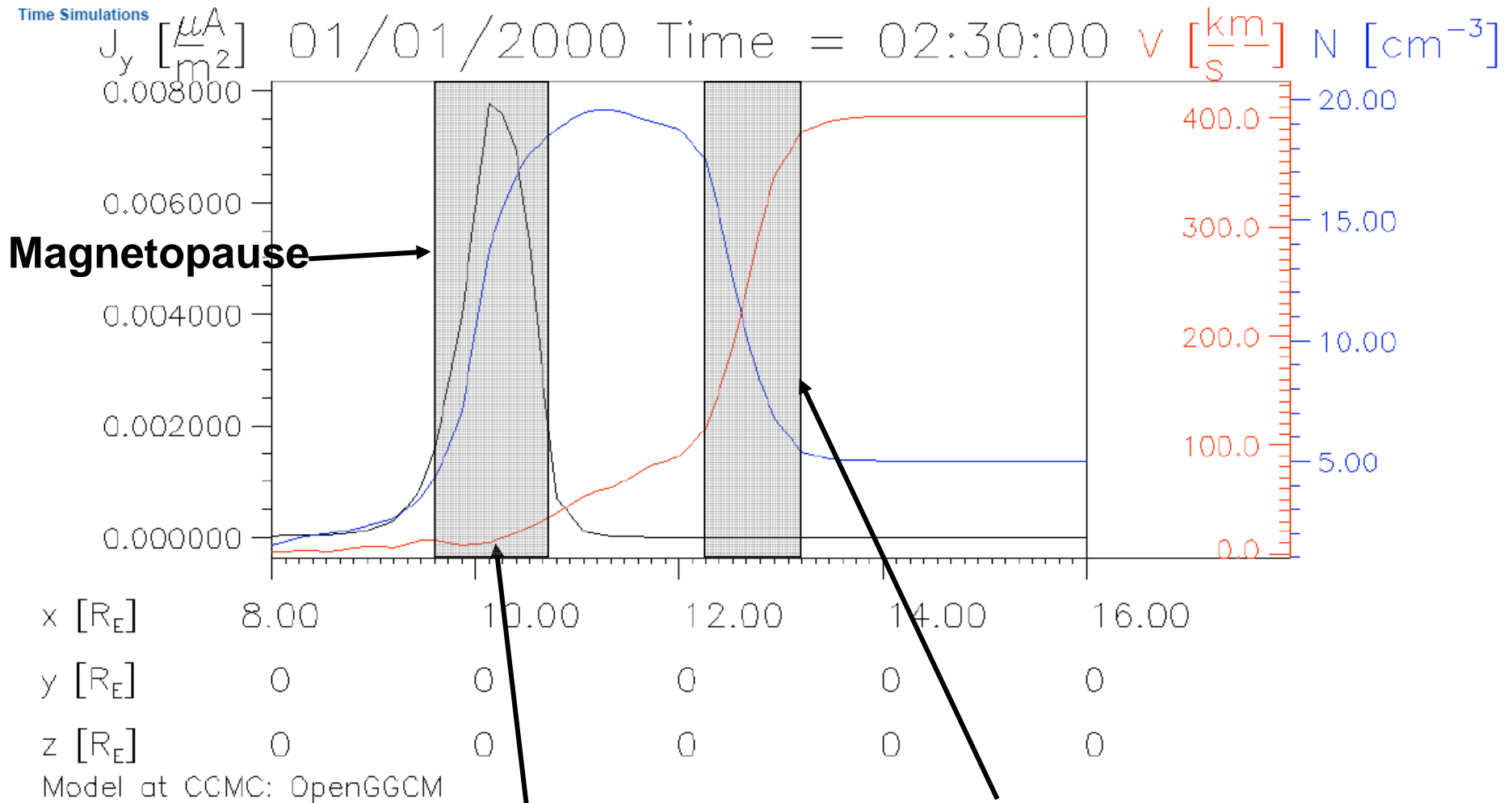
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Figure: Simulation of the Solar Wind flow around the Earth.
EPS image
Model: OpenGGCM
Run: CCMC_CCMC_053006_2

1. Make similar plots of (N, T, P) and (P, P$_{ram}$)

2. Find ratio of P$_{stagnation}$ to P$_{ram}$

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North IMF Case

- **Go to BATSRUS N IMF (CCMC_CCMC_053106_1)**
- **Obtain y=0, Jy color contour, magnetic field line image (like slide 13). You will want the following start positions for the field lines.**

3D-Flowlines:
flowline start positions
Choose **Flowline Setup Mode**:

only user-defined start points

user-defined flowline start positions:

X: -4,-4,-2,-2,-1,-1,0,0,1,1,1.5,2,4,11.1

Y: 0,0,0,0,0,0,0,0,0,0,0,0,0,0

Z: 4,-4,4,-4,4,-4,4,-4,4,-4,4,4,4,0

01/01/2000 Time = 02:30:00 y= 0.00R_E

N IMF y=0 Jy Blines

Model at CCMC: BATSRUS

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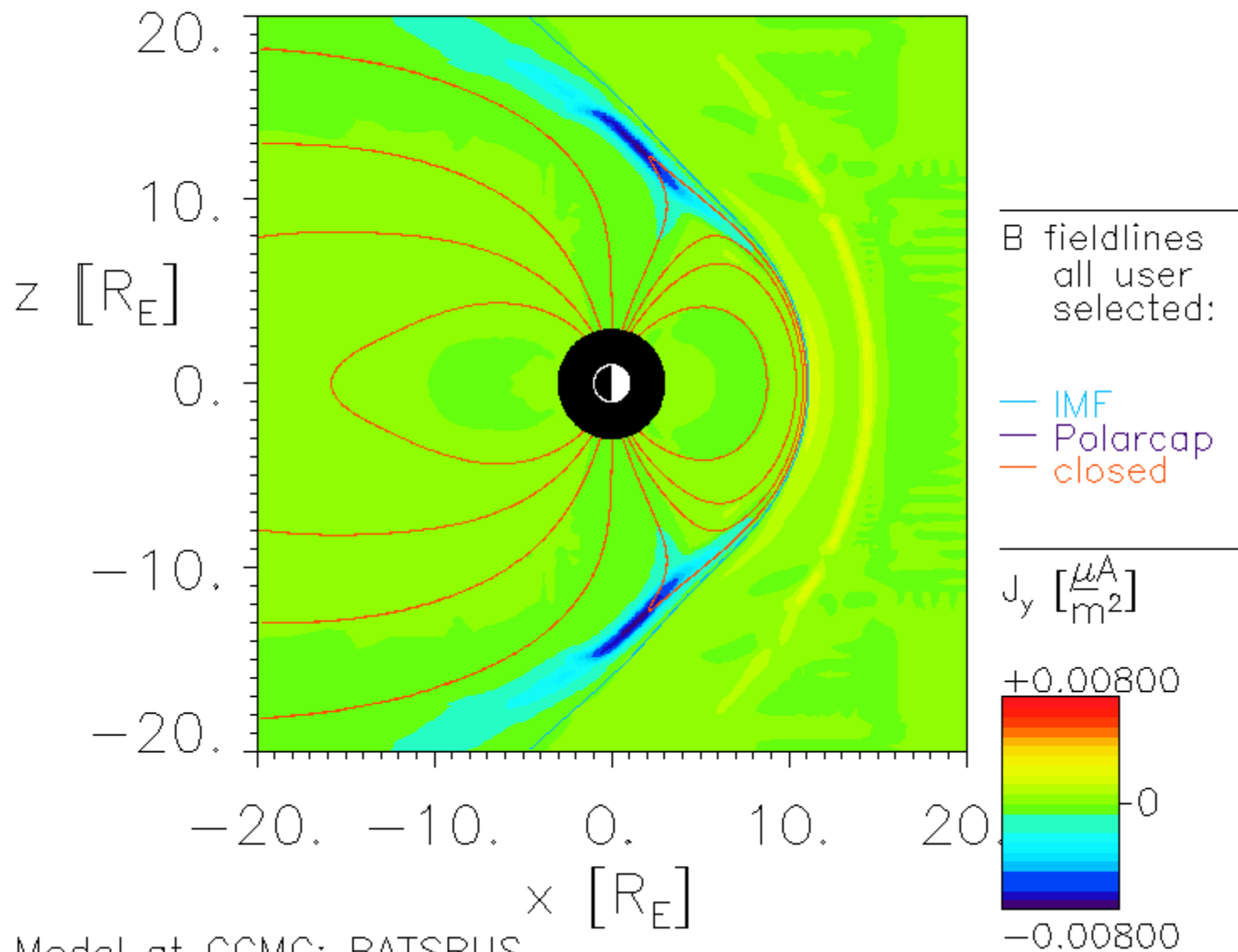
Exercise for north IMF case

- **Find gradient along the x-axis of the z-component of the perturbation field (B1) at earth (x=0). You will have to interpolate across the gap from x=-3.5 to x=3.5. From this calculate the force that the solar wind exerts on the Earth (gradient times dipole moment, 8×10^{22} A-m^2).**
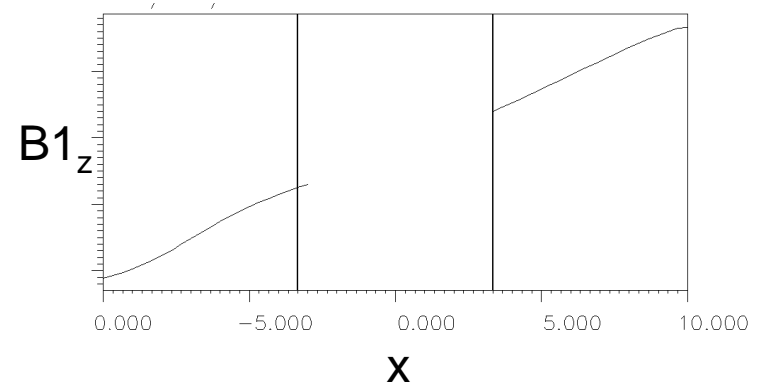
South IMF Case

- **Go to BATSRUS S IMF (CCMC_CCMC_011006_1)**
- **Obtain y=0, Jy color contour, magnetic field line image (like slide 13). You will want the following start positions for the field lines.**

3D-Flowlines:
flowline start positions
Choose Flowline Setup Mode:

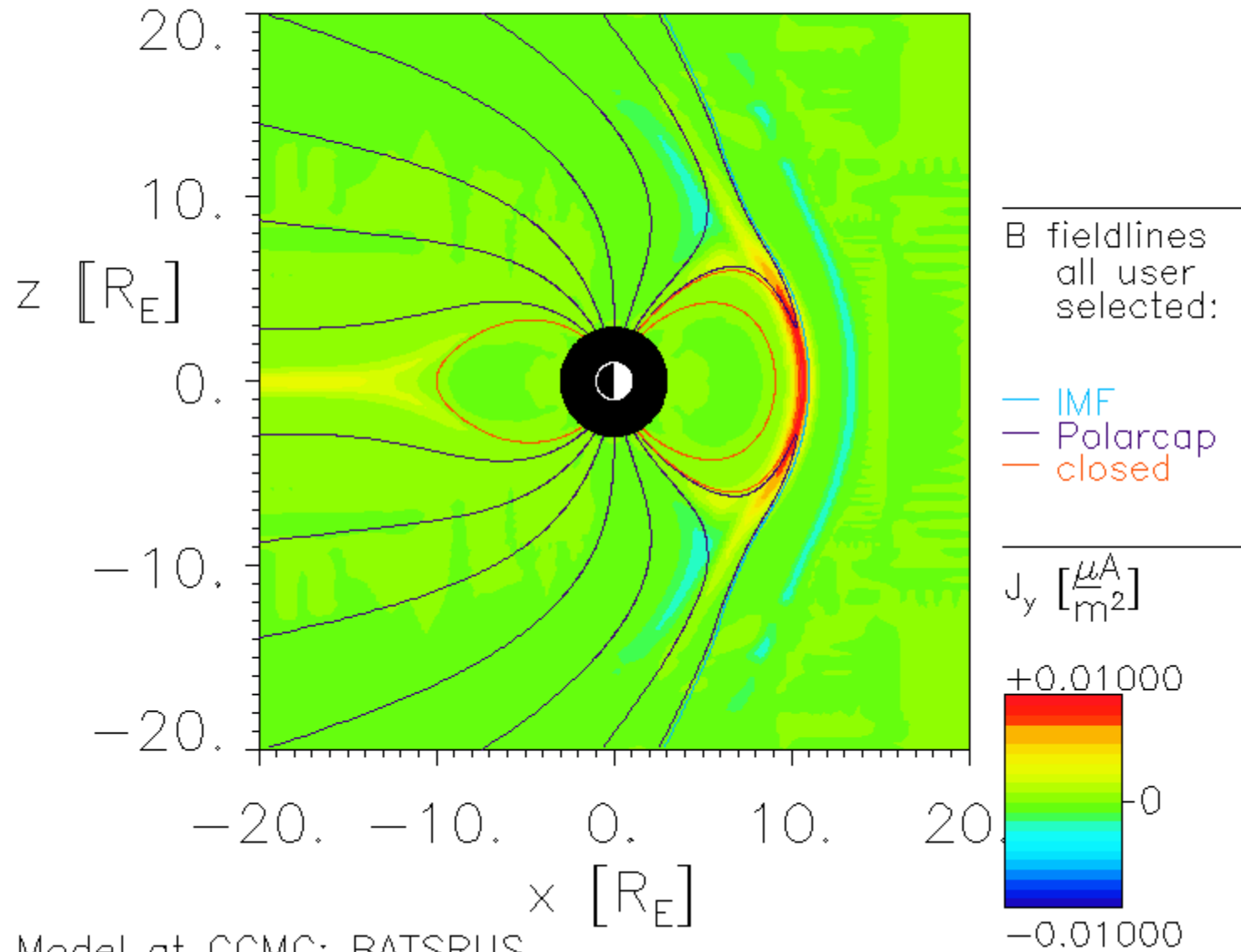only user-defined start points

user-defined flowline start positions:

X: -4,-4,-2,-2,-1,-1,0,0,1,1,2,2,4,2.52,2

Y: 0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0

Z: 4,-4,4,-4,4,-4,4,-4,4,-4,4,-4,4,4,-4,4
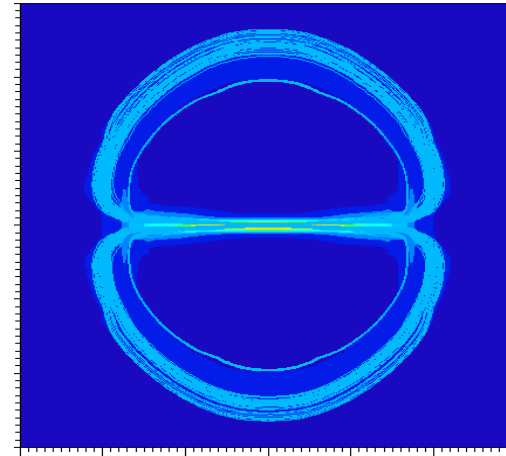
01/01/2000 Time = 02:00:00 y= 0.00R_E
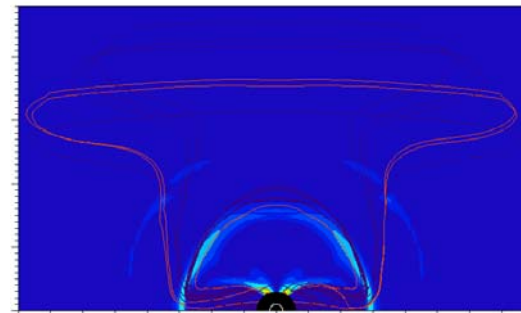
S IMF y=0 Jy Blines

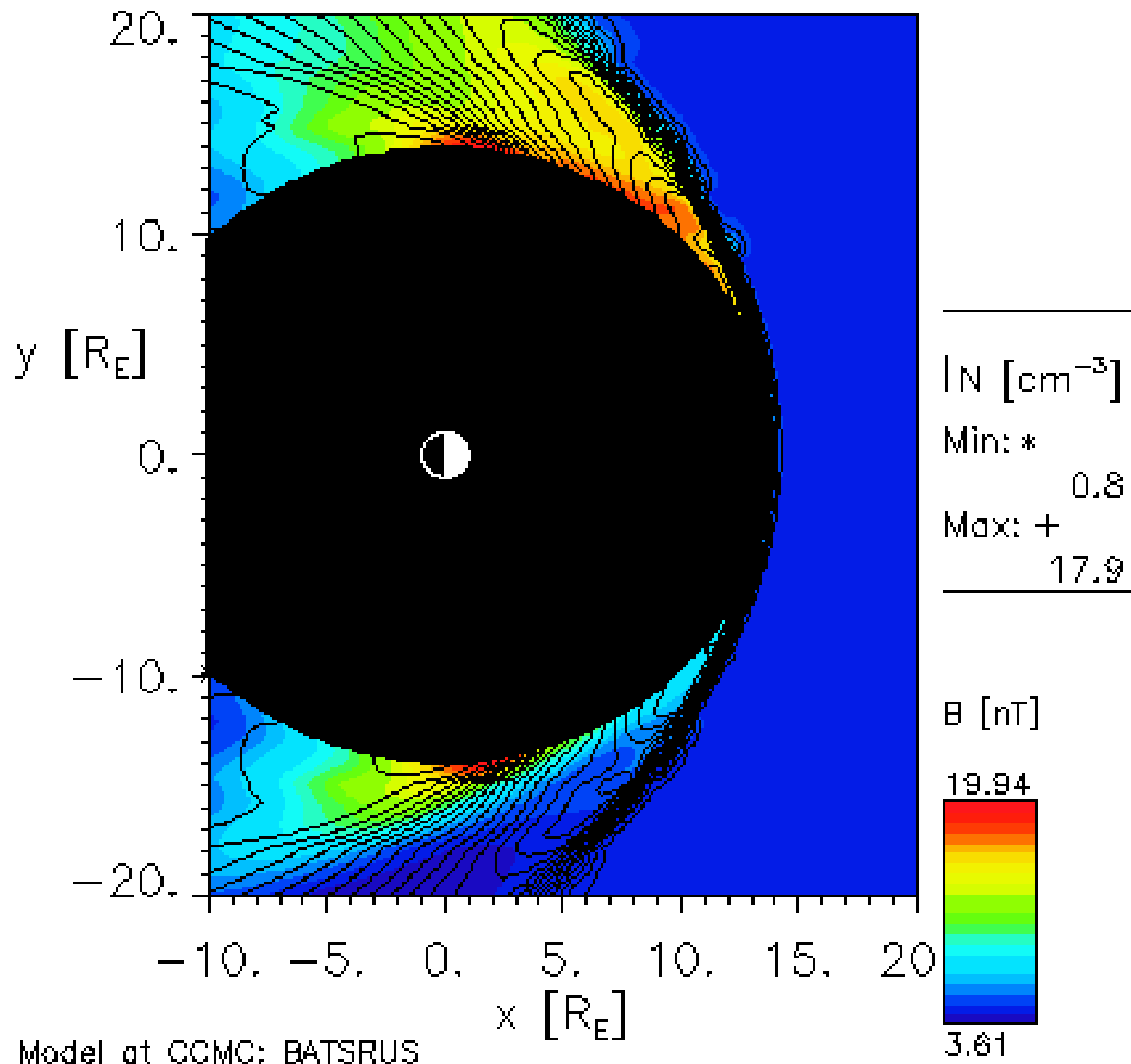Model at CCMC: BATSRUS

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Exercises for south IMF case

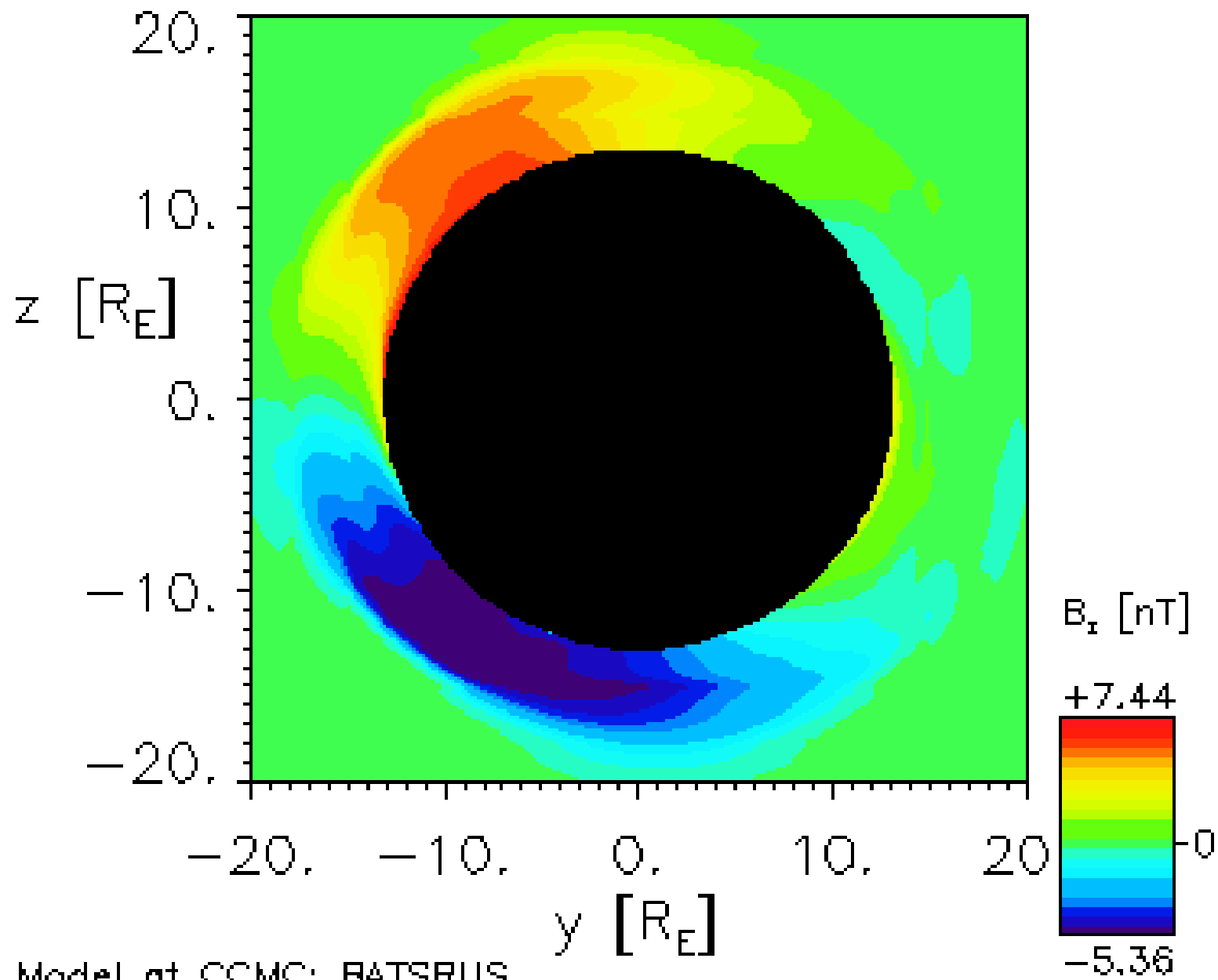1. **Obtain tail current flow lines with J color contours. (Project onto x=-20 plane.)**

2. **Obtain Region 1 current flow lines with J color contours. (Project onto x=0 plane)**

01/01/2000 Time = 02:30:00 z= 0.00R_E

Model at CCMC: BATSRUS

N [cm⁻³]
Min: *
   0.8
Max: +
   17.9

B [nT]
19.94

3.61

25

01/01/2000 Time = 02:30:00 x= 5.00R$_E$

z [R$_E$]

y [R$_E$]

B$_x$ [nT]

+7.44

0

−5.36

Model at CCMC: BATSRUS

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Code	V_{SW} (km/s)	N (cm^{-3})	(B_x,B_y,B_z) (nT)	Max Vy (km/s)	Max Vy/V_{SW}
BATSRUS	400	5	(0,0,0)		
BATSRUS	400	5	(0,0,5)		
BATSRUS	400	5	(0,5,0)		
BATSRUS	400	5	(0,0,-5)		
BATSRUS	400	5	(3.54,-3.54,0)		
BATSRUS	700	5	(0,0,-5)		
BATSRUS	1000	5	(0,0,-5)		
BATSRUS	400	30	(0,0,-5)		
OpenGGCM	400	5	(0,0,-5)		
OpenGGCM	400	5	(0,0,5)		
OpenGGCM	400	30	(0,0,5)		
Average					