

# On-Line Visualization

Quiet Ionosphere/Thermosphere

# Heliophysics Laboratory Primer

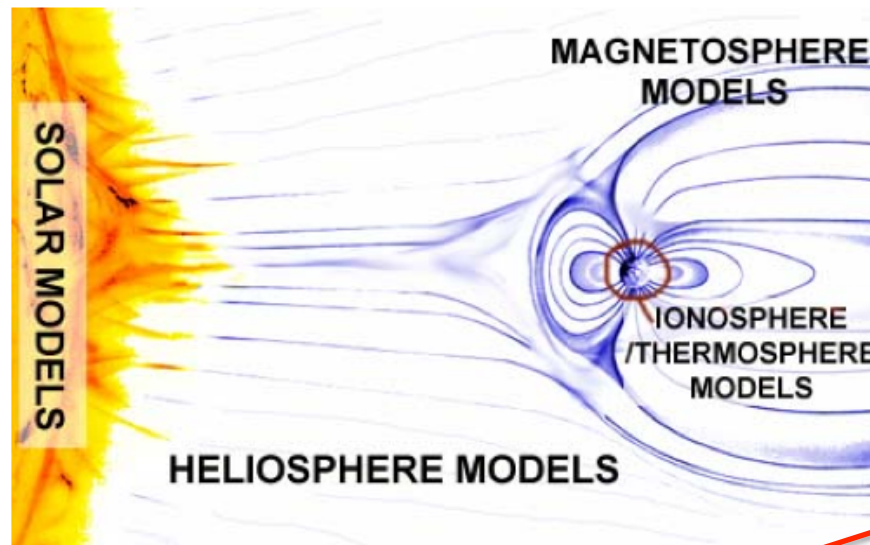
## Quiet Ionosphere/Thermosphere

### Heliophysics Laboratory Primer

This primer has been created to help you to:

1. use the CCMC tools designed to interrogate Heliophysics models at CCMC, and
2. obtain a top level view of the connectivity and naming of regions and parameters that comprize the heliophysics system.

The highest level picture of the Heliophysics system shows three components - the Sun, the solar wind, and the magnetosphere while buried inside the magnetosphere is the ionosphere and thermosphere. Click for the specific primer:



[Click here](#)

- [Heliosphere](#)
- [Magnetosphere](#)
- [Ionosphere/Thermosphere](#)

# On-Line Visualization Quiet Ionosphere/Thermosphere

[Click here](#)



## **Ionosphere/Thermosphere**

### **Quiet Ionosphere/Thermosphere (Equinox)**

- Input Parameters:  $|B|=0.42$ ,  $B_x=B_y=0$ ,  $B_z=-0.42$  nT,  $|V|=470$  km/s,  $N=5$   $\text{cm}^{-3}$ ,  $\text{HP\_index}=5$ ,  $\text{HP} = 50$  GW,  $F_{10.7} = 150$
- [CTIPE\\_Equinox\\_quiet \(low altitude: 80 - 500 km\)](#)
- Ionosphere/Thermosphere Tutorial

*Physical Variables written by CTIPE simulations (PDF file)*

# Select time step

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.**

## Choose data time:

Date: 2010/03/30 Time: 12:00:00

Date: 2010/03/30 Time: 09:00:00

Date: 2010/03/30 Time: 09:15:00

Date: 2010/03/30 Time: 09:30:00

Date: 2010/03/30 Time: 09:45:00

Date: 2010/03/30 Time: 10:00:00

Date: 2010/03/30 Time: 10:15:00

Date: 2010/03/30 Time: 10:30:00

Date: 2010/03/30 Time: 10:45:00

Date: 2010/03/30 Time: 11:00:00

Date: 2010/03/30 Time: 11:15:00

Date: 2010/03/30 Time: 11:30:00

Date: 2010/03/30 Time: 11:45:00

**Date: 2010/03/30 Time: 12:00:00**

Date: 2010/03/30 Time: 12:15:00

Date: 2010/03/30 Time: 12:30:00

Date: 2010/03/30 Time: 12:45:00

Date: 2010/03/30 Time: 13:00:00

Date: 2010/03/30 Time: 13:15:00

Date: 2010/03/30 Time: 13:30:00

Date: 2010/03/30 Time: 13:45:00

Choose time step from the pull-down menu

Click **“Update Plot”** to make a first plot with default selections

OR

**Scroll down** to modify default selections such as “Physical Variables”, “Plot Mode”, “Plot Area”, “Plot Options”, etc.

# Select **Plot Mode** and **Physical Variables** to be Displayed from Pull-Down Menus

Click here for Plot Modes description

Click here for the complete list of **physical variables** written by ionosphere model CTIPe

Choose **Plot Mode**:

- ColorContour (2D)
- 3D-Surface/EarthView
- Line (1D)
- Vertical Line (1D)
- Contour (2D)
- Vector (2D)
- ColorContour (2D)**
- Color+Vector
- Contour+Vector
- Color+Contour
- Color+Vector+Contour

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

Q 1: T\_n Q 2: Vn\_lat Q 3: N\_e

selected view:

- rho
- H
- T
- Rmt
- Vn\_lat
- Vn\_lon
- Vn\_IP
- T\_n**
- N\_e
- Psolar
- Pjoule
- Prad
- N\_O
- N\_O2
- N\_N2
- N\_NO
- N\_NO+
- N\_N2+

**Color Contour:**

Color table: Rainbow

Reverse Colortable

Number of levels: 32

**Lock color range:**

Min.: -1 Max.: 1

## Plot Mode Example:

**ColorContour** – Contour plot in 2D slice (2D Plot Area) using color-filled levels. Physical Variable (e.g., T\_n – neutral gas temperature) is selected in Q1 pull-down menu

Scroll down to choose “Plot Area”

# Choose Plot Area

## **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 lon and lat position on the left.

lon<sub>1</sub>       lon<sub>2</sub>  Range: 0 ... 360 deg

lat<sub>1</sub>       lat<sub>2</sub>  Range: -90 ... 90 deg

**CTIP** data: the vertical coordinate can either be IP or H for determining plot range or cut plane.

Note that the full range in H will not be reached at all times. Limits or selections of H may be modified within the plot.

IP<sub>1</sub>       IP<sub>2</sub>  Range: 1 ... 15 []

H<sub>1</sub>       H<sub>2</sub>  Range: 80 ... 1000 km

Render polar plot with maximum colatitude:

## **Choose Cut Plane:**

lon=constant

lat=constant

IP=constant

H=constant

IP=8 cut plane  
Is selected for  
2D Plot

## **H (height)** in [km] corresponding to pressure level number **IP**

The height of a pressure level varies spatially and with time. Heights covered start at about 80 km (**IP=0**) and reach a few hundred km above ground (the maximum found for **IP=14**, the top layer, is typically between 450 km and 1000 km).

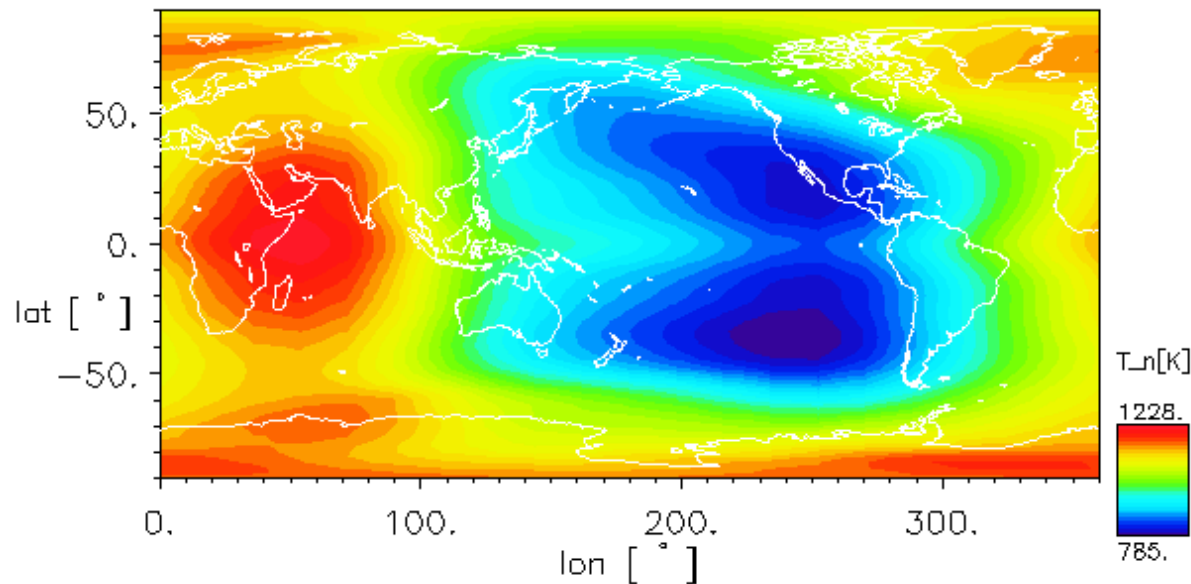
The height can be used as an alternative 3rd coordinate for plotting.

# Example: ColorContour Plot Mode

## Neutral Gas Temperature for IP=12

Select Time Step: e.g., Date: 2010/03/21 Time: 12:00:00  
Choose Plot Mode: **ColorContour(2D)**  
Choose Physical Variable for Color (Q1 menu): e.g., **T\_n**  
Choose Plot Area: e.g., **IP=constant=12**  
Click “Update Plot”

03/21/2010 Time = 12:00:00 UT IP= 12.0



# Example: Color+Vector Plot Mode

## Neutral Gas Temperature and Velocity Vectors

Select Time Step: Date: 2010/03/21 Time: 12:00:00

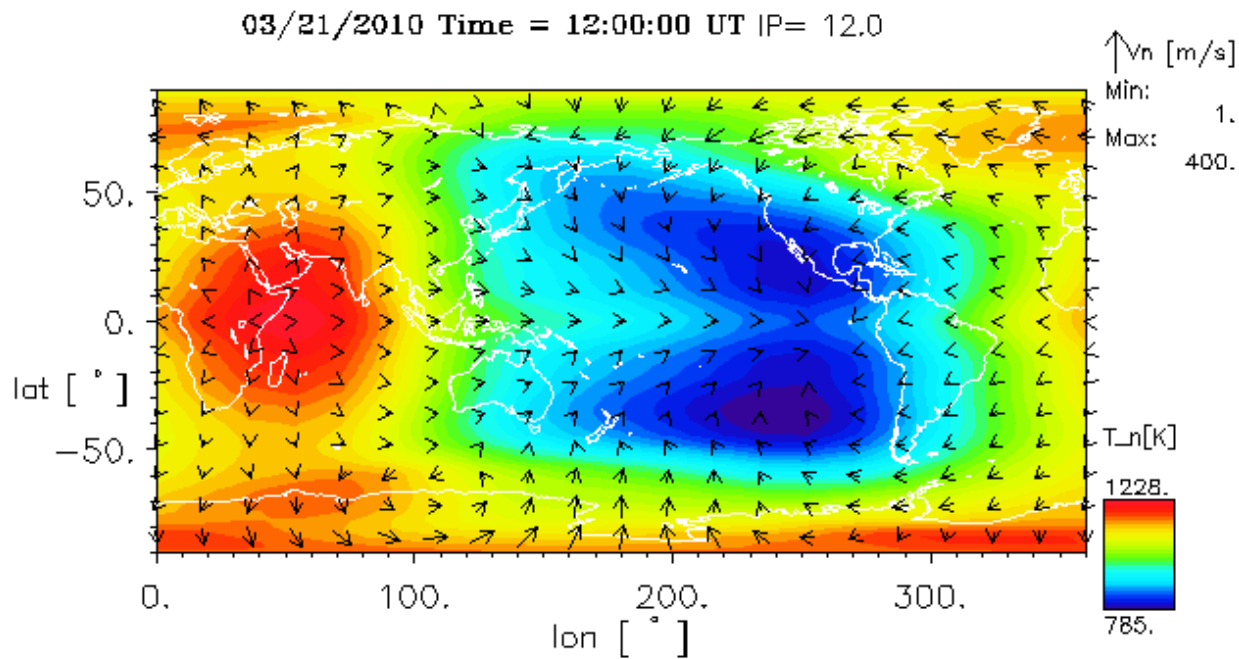
Choose Plot Mode: **Color+Vector**

Choose Physical Variable for Color (Q1 menu): **T<sub>n</sub>**

Choose Physical Variable for Vector (Q2 menu): **any component of the neutral gas velocity (V<sub>n\_lat</sub>, V<sub>n\_lon</sub>, or V<sub>n\_IP</sub>)**

Choose Plot Area: **IP=constant=12**

Click **“Update Plot”**



Model at CCMC: CTIP



# Example: Color+Vector Plot Mode

## Lock Color Range. Normalize Arrow Length

Check box

**Lock color range:**

Min.:  Max.:

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

Select color range

Check box

Vector:

length of arrows:

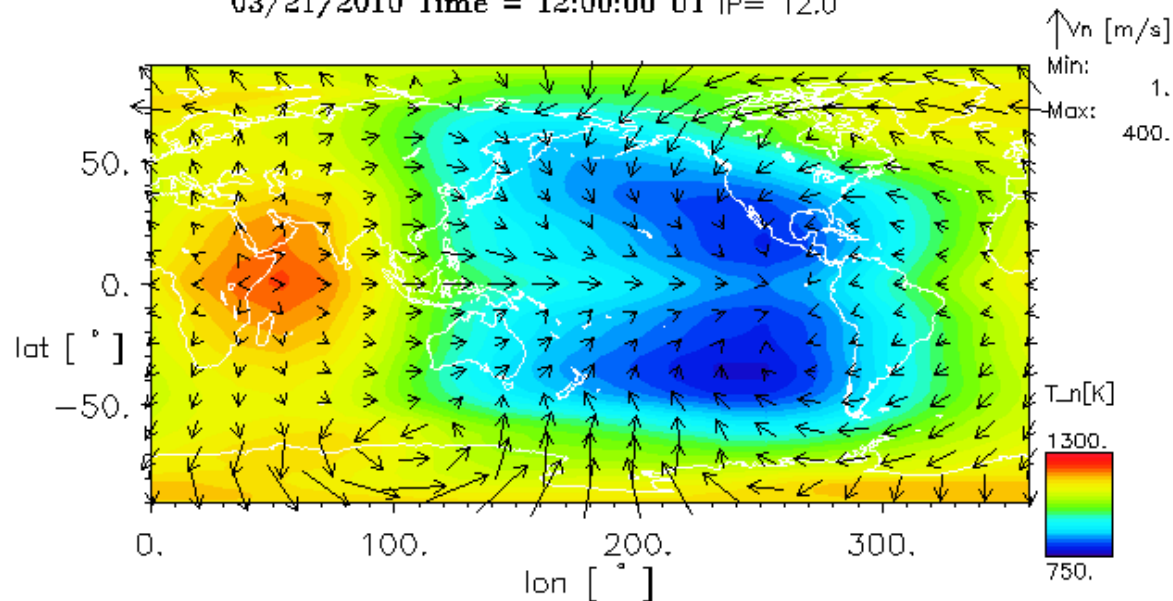
**Normalize arrow length**

Unit arrow length at:

**Log scale** (scale arrows logarithmically)

Select unit arrow length

03/21/2010 Time = 12:00:00 UT IP= 12.0



Model at CCMC: CTIP

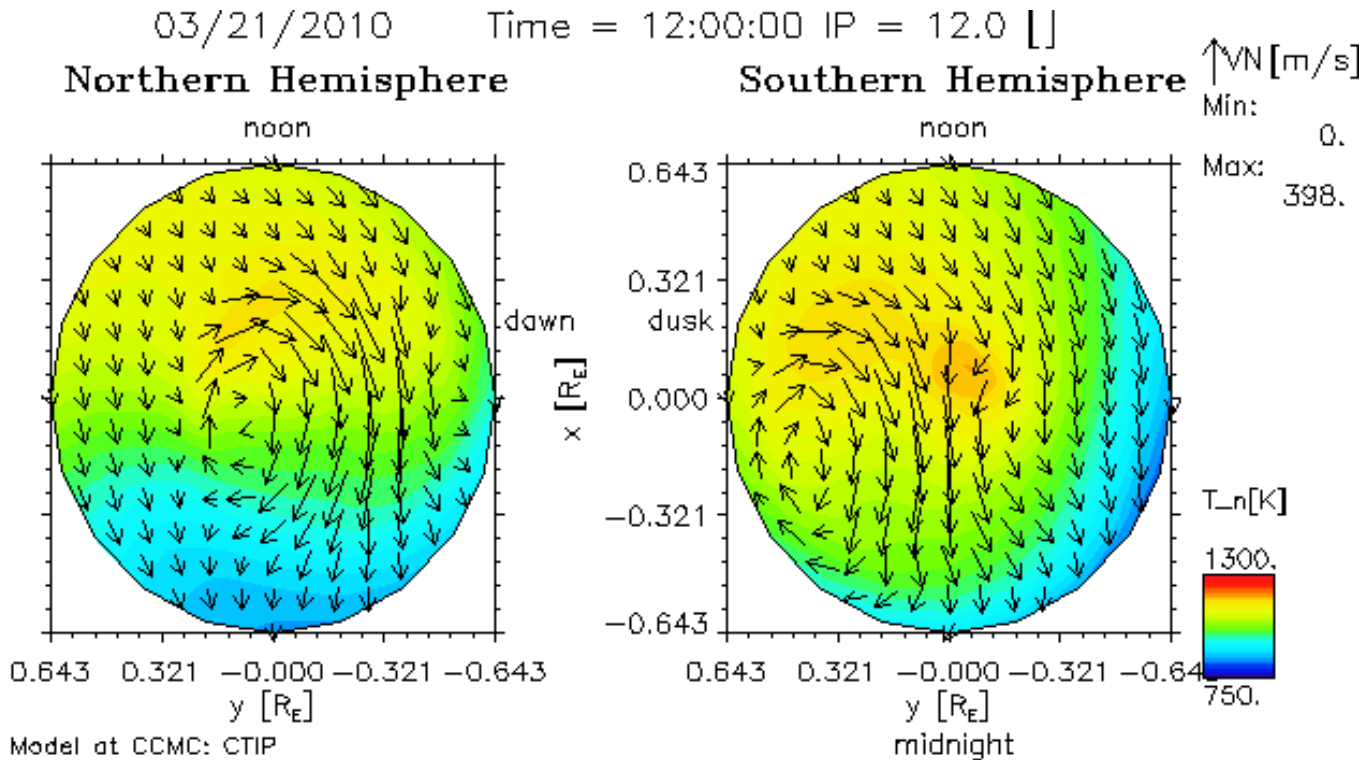
# Example: Color+Vector Plot Mode Polar Plot

IP<sub>1</sub>       IP<sub>2</sub>  Range: 1 ... 15 []      IP=constant    
 H<sub>1</sub>       H<sub>2</sub>  Range: 80 ... 1000 km      H=constant

Render polar plot with maximum colatitude:

Check box

Select maximum colatitude  
(pole: 0; equator: 90)



# Request a Movie with Selected Plot Settings

Select radio button

- **Create GIF movie with current plot settings** (not for SWX plot modes)  
**Note:** This is a queue submission system requiring the following three additional inputs:

- **Start Time:**

Date: 2010/03/24 Time: 12:00:00

- **End Time:**

Date: 2010/03/22 Time: 12:00:00

- **Email address** for notification (replace the example email address with yours):

Maria.M.Kuznetsova@nasa.gov

Your E-mail

**Note:** The movie will be *requested* but **NOT be shown** in this interface. You will get an email with a download URL when the request has been completed (this will take at least a few minutes). Only one request can be pending at a time for each client IP or email address.

# Example: Vertical Line (1D)

Select Time Step: e.g., Date: 2010/03/21 Time: 18:00:00

Choose Plot Mode: **Vertical Line (1D)**

Choose 1<sup>st</sup> Physical Variable (Q1 menu): **rho**

Choose 2<sup>nd</sup> Physical Variable (Q2 menu): **Vn\_lat**

Choose 3<sup>rd</sup> Physical Variable (Q3 menu): **Vn\_lon**

**Vertical Plot:** Select lon and lat position on the left.

Set longitude  
and latitude

lon<sub>1</sub>

lon<sub>2</sub>  Range: 0 ... 360 deg

lat<sub>1</sub>

lat<sub>2</sub>  Range: -90 ... 90 deg

**CTIP** data: the vertical coordinate can either be IP or H for determining plot range or cut plane.

Note that the full range in H will not be reached at all times. Limits or selections of H may be modified within the plot.

Select vertical  
coordinate: H

IP<sub>1</sub>

IP<sub>2</sub>  Range: 1 ... 15 []

IP=constant

H<sub>1</sub>

H<sub>2</sub>  Range: 80 ... 1000 km

H=constant

Click "Update Plot"

# Example: Vertical Line (1D) (results)

Select Time Step: e.g., Date: 2010/03/21 Time: 18:00:00

Choose Plot Mode: **Vertical Line (1D)**

Choose 1<sup>st</sup> Physical Variable (Q1 me

Choose 2<sup>nd</sup> Physical Variable (Q2 me

Choose 3<sup>rd</sup> Physical Variable (Q3 me

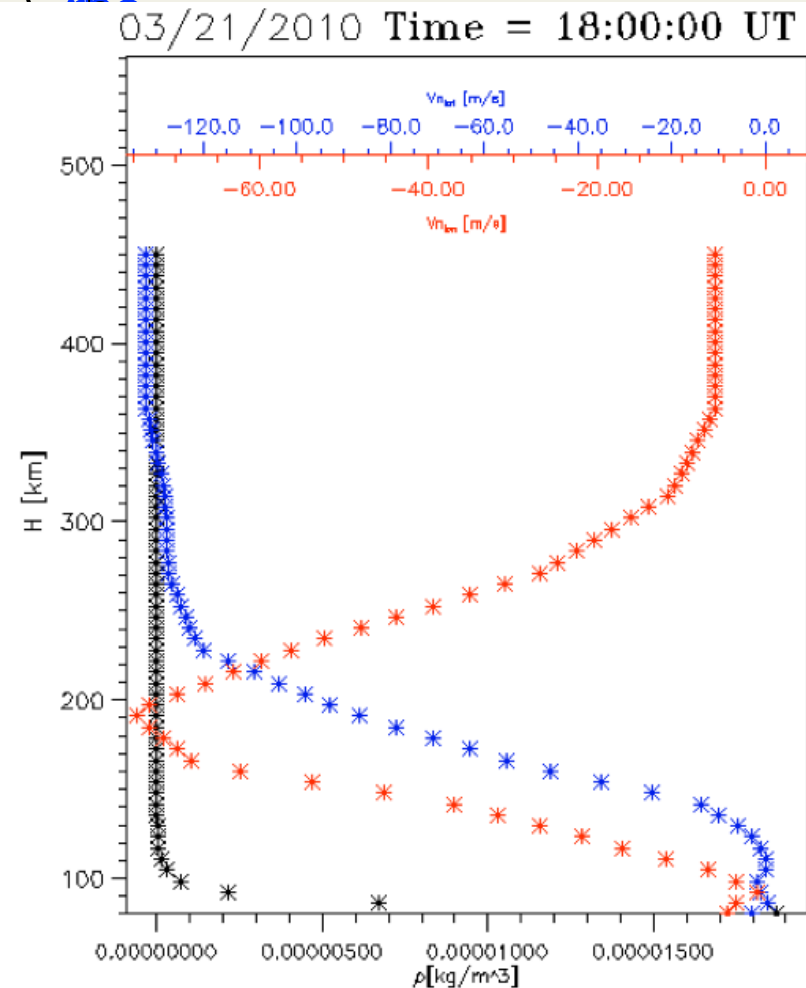
**Vertical Plot: Select**

Set longitude  
and latitude

lon<sub>1</sub>

lat<sub>1</sub>

Click "Update Plot"



lon [°] = 90.0000 lat [°] = 60.0000  
Model at CCMC: CTIP

# List Data From the Plot in ASCII

Check box

**List Data** (check to get any of the following outputs which apply to movie requests as well):

**What:**  Plot variables from above

Include all primary model output parameters (**Warning:** text files may become large).

Select radio button

Click "Update Plot"

Scroll down to the bottom of the page

[ASCII data output \(4.79 kB\)](#)

Click here to download data

Runs-on-Request: [Contact CCMC Staff](#)

Visualization: [Dr. Lutz Rastätter](#)

```
# Data format string: '(6E12.4)'  
# Data printout from CCMC-simulation: version 1.1  
# Data type: CTIP ionosphere/thermosphere  
# Run name: CTIPe_Equinox_quiet_030510 Missing data: NaN  
# Date, time: 2010 3 21 18:00:00  
# Output data: point locations with 61 elements  
# lon lat H rho Vn_lat Vn_lon  
# [deg] [deg] km [kg/m^3] [m/s] [m/s]  
9.0000E+01 6.0000E+01 8.0000E+01 1.8739E-05 -2.7295E+00 -4.5252E+00  
9.0000E+01 6.0000E+01 8.6167E+01 6.6990E-06 3.0762E-01 -3.4701E+00  
9.0000E+01 6.0000E+01 9.2333E+01 2.1612E-06 -1.1042E+00 -1.1246E+00  
9.0000E+01 6.0000E+01 9.8500E+01 7.2422E-07 -1.6075E+00 -3.6367E+00  
9.0000E+01 6.0000E+01 1.0467E+02 2.8674E-07 1.5463E-01 -6.8714E+00
```

# Example: Vertical Line (1D) (optional) Log Scale. Lock Range.

Select Time Step: e.g., Date: 2010/3/30 Time: 03:00:00  
Choose Plot Mode: **Vertical Line (1D)**  
Select Vertical Coordinate: **H**  
Set Longitude: **284**; Set Latitude: **55**  
Choose 1<sup>st</sup> Physical Variable (Q1 menu): **Ne**  
Choose 2<sup>nd</sup> Physical Variable (Q2 menu): **N\_O+**  
Choose 3<sup>rd</sup> Physical Variable (Q3 menu): **N\_O2+**

## Color Contour, (Vertical) Line:

Color table:

Reverse Colortable

Number of levels:

Check box to lock range

**Lock color range:**

Min.:  Max.:

Select range

Check box to set  
logarithmic scale

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

Click "Update Plot"

# Example: Vertical Line (1D) (optional) Log Scale. Lock Range.

Select Time Step: e.g., Date:  
Choose Plot Mode: **Vertical L**  
Select Vertical Coordinate: **H**  
Set Longitude: **284**; Set Latitude:  
Choose 1<sup>st</sup> Physical Variable  
Choose 2<sup>nd</sup> Physical Variable  
Choose 3<sup>rd</sup> Physical Variable

Color  
Color  
 Re  
Num  
Check box to lock range →  **L**  
Mi  
Check box to set logarithmic scale →  **L**

Click "Update Plot"

