

3DVIEW Tutorial Version 2.0







Revision History

Versio	Date	Released by	Detail
n			
1.0	July 17 th 2015	Michel Gangloff	Initial version
1.11	October 7 th 2016	Michel Gangloff	CDPP and Europlanet H2020 version
			Addition of a use case related to VESPA
1.11.2	May 4 th 2017	Laurent Beigbeder	Load map part completed and APIS map
			projection added for H2020 in §2.20
2.0	January 2 nd 2018	Michel Gangloff	Addition of a use case related to the
			Conjunction Search Tool §2.28

Note: Any notes here.

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1 INTRODUCTION

3DView offers 3D visualization of position and orientation of spacecraft and planetary ephemerides. This document contains several examples demonstrating some capabilities of 3DView developed during the IMPEx and Europlanet H2020 projects.

For a detailed description of the functions provided by 3DView, please read the User guide available at <u>http://3dview.cdpp.eu</u>

2 EXAMPLES

2.1 How to start 3DView

• Enter <u>http://3dview.cdpp.eu</u> in a browser



Click on Launch 3DView, save the file as launch3dview.jnlp and run the application

• In the desktop bar, select "File/New to open a new 3D scene

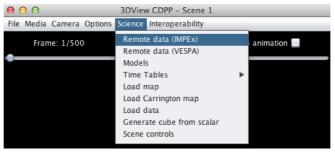


2.2 Compare simulations and observations along Cluster trajectory

 In the selection dialog box, select the following time interval Start time: 2008-10-02T04:00:00 Stop time: 2008-10-03T04:00:00 and the spacecraft: CLUSTER1

ene eriod	Start time 2008	8/10/02 04:00:00	Coordinate sys	tem GSE	Cer	ter Earth	•
\rightarrow	Stop time 2008	8/10/03 04:00:00		Step 173	seconds St	ars No star	•
	Spacecraft N	atural bodies Search	n in Region				
	Available space	craft					
	Spacecraft	Range			File list	Time shift(Days)	Select
	ACE		01:00:00 - 2015-1		C Details	Specific	
	AMPTE/IRM		00:12:00 - 1986-0		Details	Specific	
	Cassini	2003-08-31T	23:58:55 - 2017-0	9-28T23:58:52	Details	Specific	
acecraft	CHAMP	2000-11-09T	00:10:00 - 2010-1	0-10T00:00:00	Details	Specific	
	Chandra-1		07:31:04 - 2016-0		Details	Specific	
	CLUSTER1	2000-08-22T	00:18:30 - 2019-1	2-31T23:44:30	Details	Specific	Image: A state of the state
	CLUSTER2	2000-08-22T	00:18:30 - 2019-1	2-31T23:44:30	Details	C Specific	
	CLUSTER3	2000-08-22T	00:18:30 - 2019-1	2-31T23:44:30	Details	Specific	
	CLUSTER4	2000-08-22T	00:18:30 - 2019-1	2-31T23:44:30	Details	Specific	
	COROT	2006-12-27T	15:12:32 - 2010-0	6-15T23:59:28	Details	Specific	
	DEMETER	2004-07-08T	00:10:00 - 2009-1	1-24T00:00:00	Details	Specific	
	Doublestar1	2004-01-03T	07:16:00 - 2007-1	0-10T12:34:00	Details	Specific	
	Doublestar2	2004-09-17T	00:04:00 - 2009-1	2-31T23:54:00	Details	Specific	
	DSCOVR	2015-02-12T	01:00:00 - 2017-0	1-03T00:00:00	Details	Specific	
	FAST	1996-08-221	00.20.00 - 2015-0	3-15700-00-00	(Details	Snerific	
	Selected data fi	iles					
	SC	File name	Type	Range		Choic	e
	CLUSTER1	cluster1.bsp	ORBIT	2000/08/2	2 00:18:30-2019	/12/31 23 (hange

• Select Remote data (IMPEx) in the Science menu



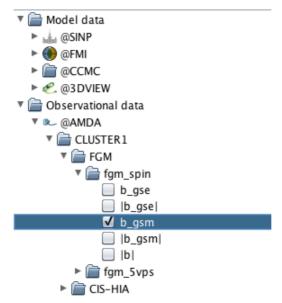
• Select the following simulation data

V 📄 @CCMC	Console
V 😔 Earth	New selected param: #
Vincent_Genot_012610_1	Sim Run/numoutput: sp
▼ ⇒ Time series	Sin Kunynunoucput. Sp
CLUSTER1	
🔻 🗁 NumberDensity	
🔻 📄 Density	
rho	
rho	
nho nho	
► 📄 FlowVelocity	
The Magnetic	
MagneticField	
Bx,By,Bz	
✓ #Ve Parameter: MagneticField	
Bx Resource name: CCMC/BATSRUS along CLUST	FR-1 trajectory in GSM
By Type: Vector	reit i trujectory in Obin
Bz Frame: GSM	
Bx Formula: null	
Unite: nT	
4 Vt StartDate: 2008-10-02T04:00:00.000	
By Bz	
Bx,By,Bz	
#Vector Bx,By,Bz	
Ry	

• Click on **Add selected data to 3Dscene**; a control window is opened and the magnetic field vector is displayed along the trajectory of the S/C

000	3DView CDPP – Scene 1
File Media Camera Options Science Interoperability	ý
Frame: 479/500	Go Step 25 frame/s Loop animation
Vector CLUSTER1 #Vector Bx	
Arrows length:	
$\begin{array}{c ccccccccccccccccccccccccccccccccccc$	30 24.06 20.62
	CLUSTER1
2 Y	The second second
Time: 2008/10/03 02:58:14 Distances (Re = Ea	rth radius = 6371.010km)
Frame = CSE Center = Earth Start = 2008/10/02 04:00:00 Stop = 2008/10/03 04:00:00	

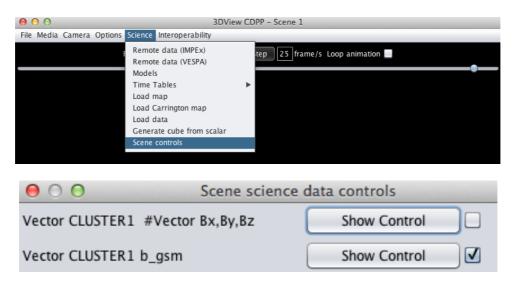
• Now, select from AMDA the observed magnetic field vector along the trajectory of CLUSTER1



• Click on Add selected data to the 3Dscene

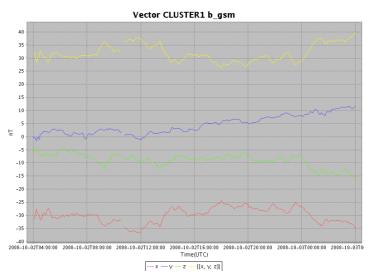
000	3DView CDPP – Scene 1
File Media Camera Options Science Interoperability	y
Frame: 479/500	Go Step 25 frame/s Loop animation
⊖ ○ Vector CLUSTER1 b gsm	
49 0 25 50 75	
49 0 25 50 75 Arrows width:	-36.02
	30 32.69
Sample density:	29.36
10 1 6 11	
Color min 26.0377 Color max 39.345	58 nT 26.04
Animated : 🗹 Display : 🗹 Log mode : 🗌	2 DPlot
	CLUSTER1
4	
<u>x_</u>	Trender Land
Time: 2008/10/03 02:58:14 Distances (Re = Ear	rth radius = 6371.010km)
Frame = GSE Center = Earth Start = 2008/10/02 04:00:00 Stop = 2008/10/03 04:00:00	

• Now, it is possible to select which vector is displayed on the scene with the **Science/Scene controls** menu

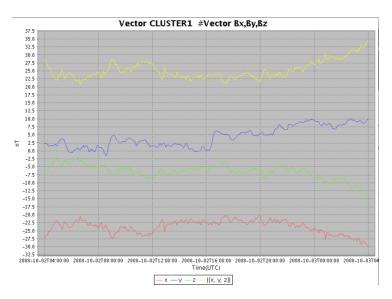


We will use the 2DPlot capability to compare simulations and observations in 2D.

• In the control box of *b_gsm*, click on **2DPlot**



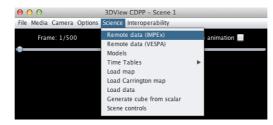
• In the control box of *#Vector Bx,By,Bz* click on **2DPlot**



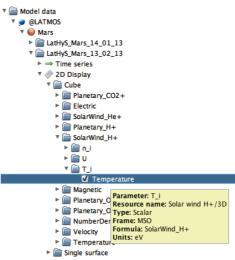
2.3 Select and display a parameter from a 3D Cube from LATMOS

In this use case, we select a standard parameter from a Cube provided by LATMOS and add it to the 3D scene. A Cut on every axis, with its control box is displayed in the 3D scene.

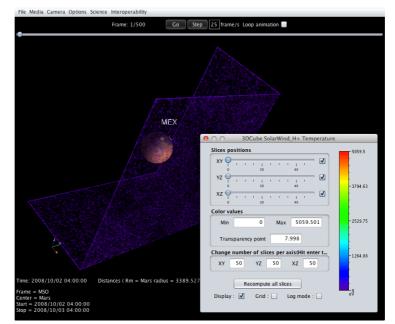
- With the "Manage Scene" window, create a scene with:
 - Start: 2008/10/02 04:00:00
 - End: 2008/10/03 04:00:00
 - \circ $\;$ Spacecraft: MEX, Coordinate System: MSO $\;$
- Select the Science/Remote data (IMPEx) menu:



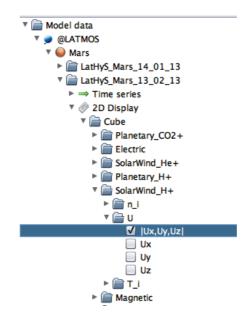
• This opens the hierarchy of IMPEx data. Select the following parameter, in a Cube from LATMOS:



• Then click on *add to the 3D scene.* The following figure is displayed with its control box.



• Now select the module of a parameter of type "vector":

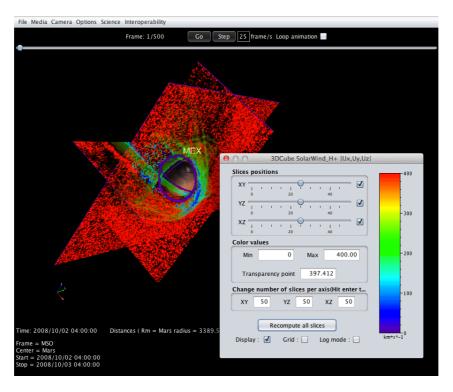


• Then click on *add to the 3D scene.* The following figure is displayed with its control box.

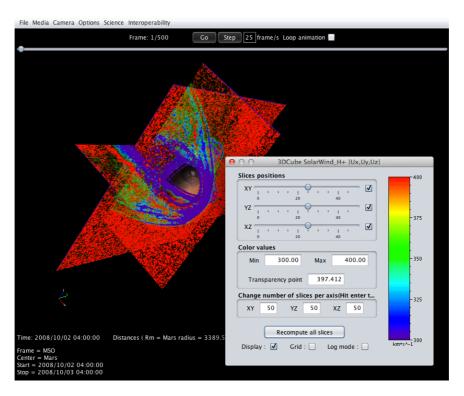
File Media Camera Options Science Interoperability	
Frame: 1/500 Go Step 25 frame/s Loop animation	
MEX 3DCube SolarWind H+ Ux,Uy,Uz	
$ \begin{array}{c} $	-1525.82
Color values Min 0 Max 2034.422 Transparency point 397.412	-1017.21
Change number of slices per axis(Hit enter t XY 50 YZ 50 XZ 50	-508.61
Time: 2008/10/02 04:00:00 Distances (Rm = Mars radius = 3389.5 Frame = MSO Center = Mars Start = 2008/10/02 04:00:00 Stop = 2008/10/03 04:00:00	0 km*s^_1

- Use the cursors to change the position of cuts displayed on each axis (slices positions), directly on the 3D scene.
- Set Max = 400 and click on « Recompute all slices ». The cube values that are greater than Max are displayed in red, and the colour bar is updated.

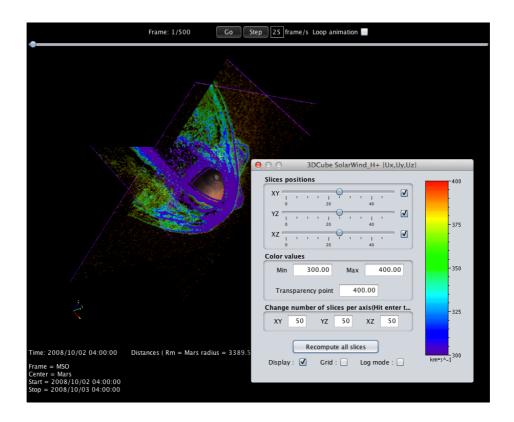
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• Set Min = 300 and click on « Recompute all slices ». The cube values that are lower than Min are now transparent.



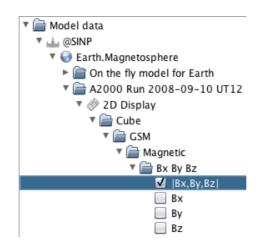
• Set Transparency point = 400 and click on « Recompute all slices ». Values that are close to Mean are transparent. For example, this value corresponding to Max, are values in red are now transparent.



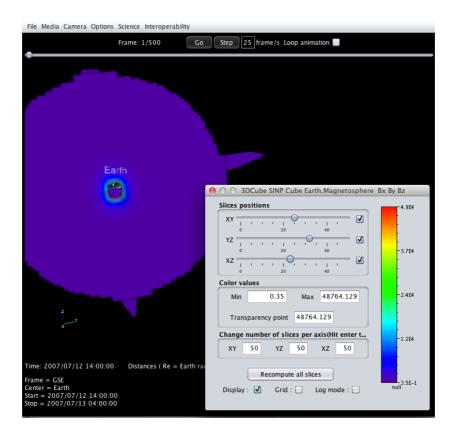
2.4 Select and display a parameter from a 3D Cube from SINP

In this use case, we select a standard parameter from a Cube provided by SINP and add it to the 3D scene. A Cut on every axis, with a control box is displayed in the 3D scene.

• Select the Science/Remote data (IMPEx) menu, to open the hierarchy of IMPEx data. Select the following parameter, in a Cube from SINP:

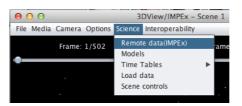


• Then click on *add to the 3D scene.* The following figure is displayed with its control box.

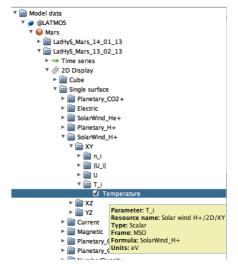


2.5 Select and display a 2D Cut

- With the "Manage Scene" window, create a scene with:
 - Start: 2008/10/02 04:00:00
 - End: 2008/10/03 04:00:00
 - Spacecraft: MEX, Coordinate System: MSO
- Select the Science/Remote data (IMPEx) menu:



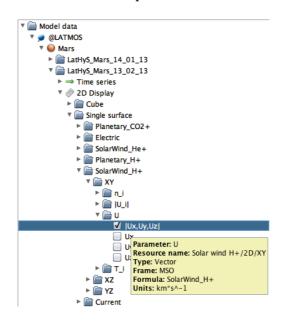
• Select the following parameter, a 2D Cut from LATMOS:



• Then click on *add to the 3D scene.* The Cut and a control box are displayed in the 3D scene.

Cut2D 3DVIEW comp on LATMOS 3D	View surface			
Slices Color values Min 0 Max 111.6	-83.68			
Transparency point 26.5 Recompute colors	ev			
Display : 🗹 🛛 Log mode : 🗌				
ime: 2007-07-12T14:00:00 Distances (Rm =	Mars radius = 3389.5	527km)		
rame = MME enter = Mars tart = 2007/07/12 14:00:00 top = 2007/07/13 04:00:00				

• Now select the module of a "vector" parameter:

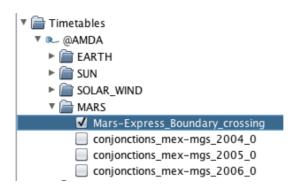


• Then click on *add to the 3D scene*. The Cut and a control box are displayed in the 3D scene.

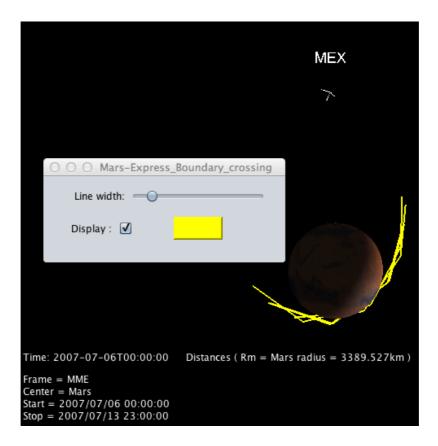
O O Cut2D 3DVIEW comp on LATMOS 3D	OView surface
Transparencies	404.02
Slices O	364.12
Color values Min 244.4 Max 404	-324.23
Transparency point 386.5	-284.34
Recompute colors	244.45 km*s^-1
Display : 🗹 🛛 Log mode : 🗌	
ime: 2007-07-12T14:00:00 Distances (Rm = Mars	radius = 3389.527km)
rame = MME enter = Mars tart = 2007/07/12 14:00:00 top = 2007/07/13 04:00:00	

2.6 Select and display a Time Table

- Create a scene with MEX from 2007-07-06T00:00:00 to 2007-07-13T23:00:00.
- Select the Science/Remote data (IMPEx) menu to open the hierarchy of IMPEx data.
- Select the following time table and add it to the 3D scene



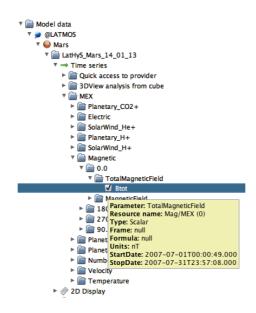
• The trajectory is highlighted from the position of MEX, and a control box is displayed



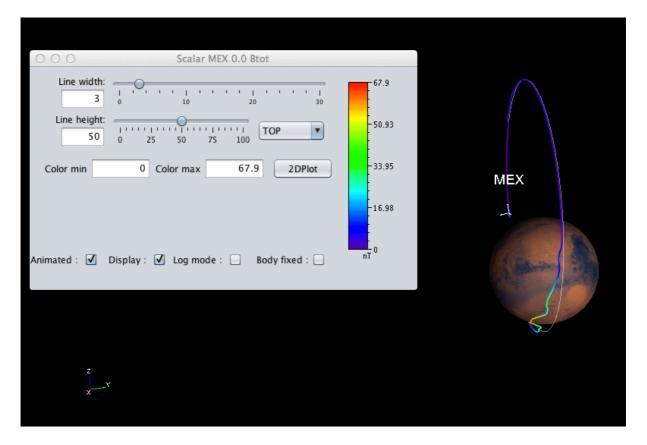
- Click on the color associated with the zone to change it. The cursor may be used to change the depth of the highlighted zone
- The list of Time Tables displayed in the 3D scene can be displayed via the **Science/Scene controls** menu

2.7 Select and Display Time Series

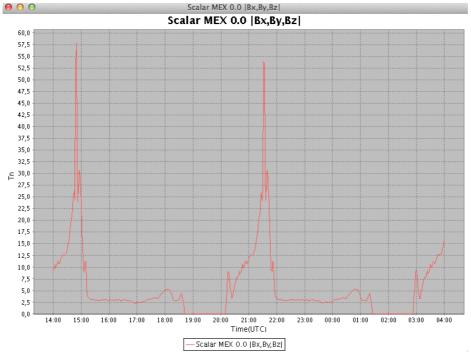
- Create a scene with MEX from 2007-07-12T14:00:00 to 2007-07-13T04:00:00 and move the cursor to the middle
- In the Science/Remote data (IMPEx) menu, select a scalar parameter



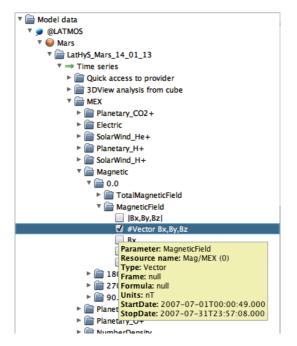
• Add it to the 3D scene. The parameter is displayed as a curve above the trajectory of the S/C



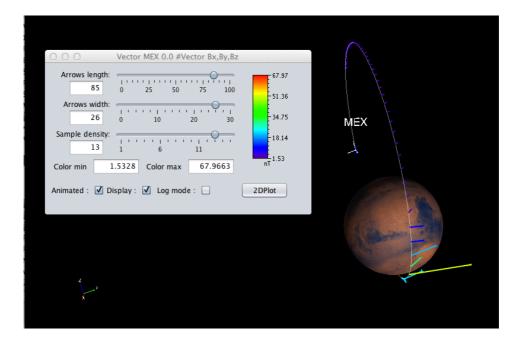
• Click on **2DPlot**. A window is opened, with the scalar parameter displayed as one curve.



• Now, select a vector, and add it to the 3D scene

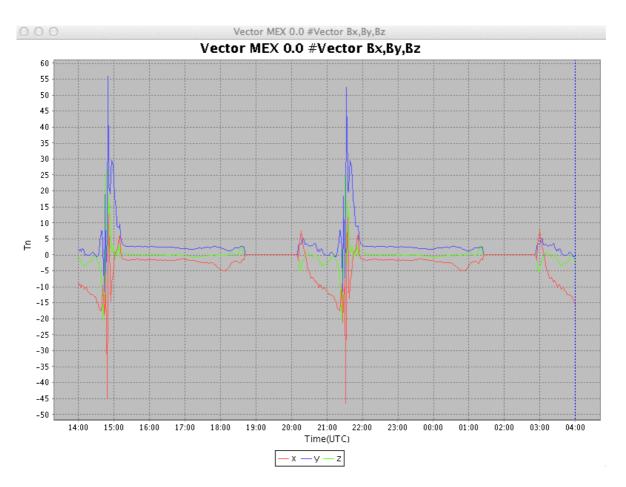


• The vector time series is displayed along the S/C trajectory

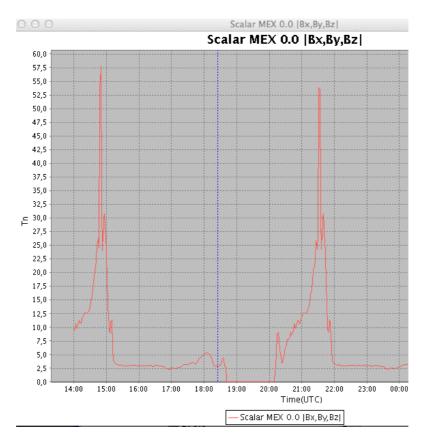


• Click on **2DPlot**. A Window containing the plot of 3 parameters x/y/z displayed as 3 curves of different colors is displayed

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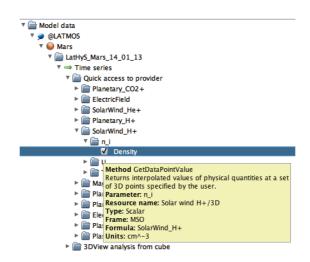
• During animation ("Go" in the 3D scene), a vertical cursor follows, in the 2D plot, the cursor of the 3D scene



2.8 Interpolation of a physical quantity at a set of 3D points

In this example, the interpolation of a physical quantity (scalar or vector) is done with the getDataPointValue method of LATMOS at a set of 3D points defined by the user.

- With the **File/Manage scene** menu, create a scene with MEX from 2007-07-12T14:00:00 to 2007-07-13T04:00:00 and move the cursor to the middle
- In the Science/Remote data (IMPEx) menu, select



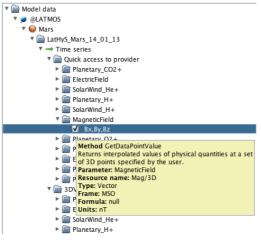
• In the panel on the right part, there is a tab containing the "Clock Angle" and the spacecraft for which we want data. When you unselect the parameter, the tab disappears

Console Density	
Resource name	Solar wind H+/3D
Parameter	n_i
Plot on trajectory of sc	ene body MEX
Clock angle 0	
Add se	elected data to 3Dscene

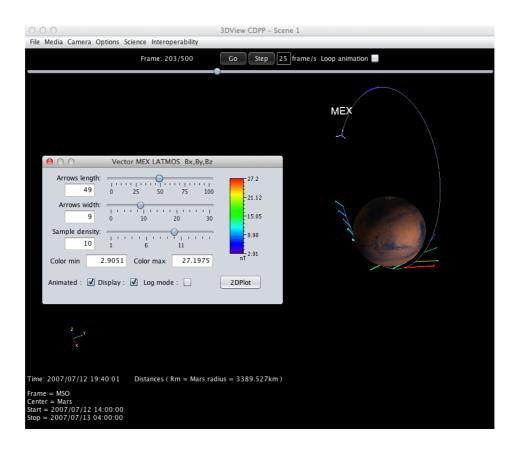
• Click on **Add selected data to 3D scene**. When you unselect **Animated**, a curve is displayed above the spacecraft's trajectory, with the associated control box

0 0 0	3DView CDPP – Scene 1
File Media Camera Options Science Interoperability	
Frame: 203/500	Go Step 25 frame/s Loop animation
Scalar MEX LATMOS Density Line width: 3 1 50 25 50 25 50 75 11.383 2D Color min 0 Color max 11.383 2D Animated : Display : Y	30 • 8.54 • 5.69 • 2.85 • 0
Time: 2007/07/12 19:40:01 Distances (Rm = Mars radii Frame = MSO	ius = 3389.527km)
Center = Mars Start = 2007/07/12 14:00:00 Stop = 2007/07/13 04:00:00	

• Now, in the Science/Remote data (IMPEx) menu, select a vector



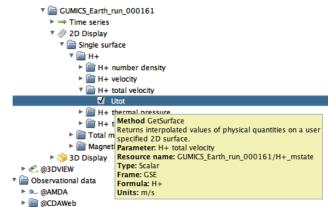
- In the panel on the right part, there is a tab containing the "Clock Angle" and the spacecraft for which we want data.
- Click on **Add selected data to 3D scene**. When you unselect **Animated**, a set of vectors is displayed above the spacecraft's trajectory, with the associated control box



2.9 Interpolation of a physical quantity on a 2D surface

In this example, the interpolation of a physical quantity (scalar or vector) is done with the *getSurface* method of FMI on a 2D surface defined by the user.

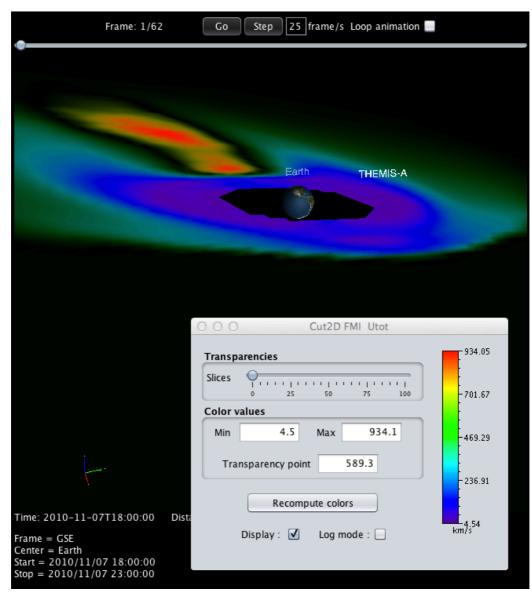
- With the **File/Manage scene** menu, create a scene in GSE coordinates with Themis A from 2010-11-07T18:00:00 to 2010-11-07T23:00:00 and move the cursor to the middle.
- In the **Science/Remote data (IMPEx)** menu, select *Model data/@FMI/Earth,* then



• In the panel on the right part, there is a tab containing the interpolation method, the plane name, and the grid step. When you unselect the parameter, the tab disappears

Console Utot	
Resource name	GUMICS_Earth_run_000161/H+_mstate
Parameter	H+ total velocity
Interpolation Method	NEAREST_GRID_POINT
Plane	XY V
Grid step	5000 km
Add	selected data to 3Dscene

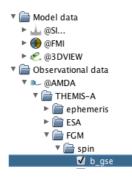
- Select 5000 for the step, plane XY and NEAREST_GRID_POINT as interpolation method. Please note that a too small step may infer a calculate time greater than 30 seconds and generate a time out error from the FMI server. Click on Add selected data to 3D scene
- A 2D Cut is displayed with its control box



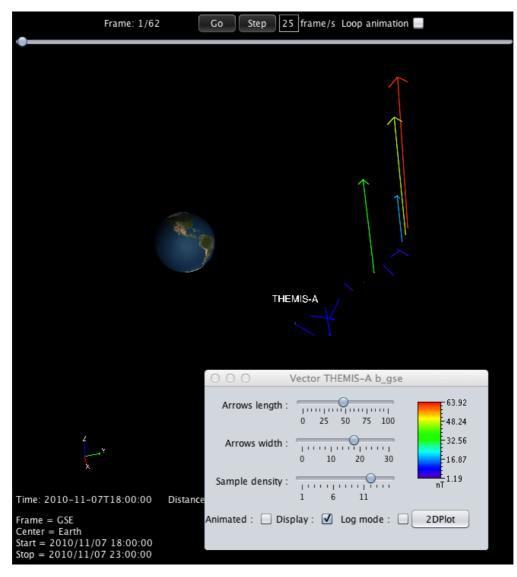
2.10 Get and Display a parameter from AMDA

In this example, the interpolation of a physical quantity (vector) along the trajectory of a spacecraft is done. The physical quantity is uploaded with the *getParameter* method of AMDA.

- With the **File/Manage scene** menu, create a scene in GSE coordinates with Themis A from 2010-11-07T18:00:00 to 2010-11-07T23:00:00 and move the cursor to the middle.
- In the Science/Remote data (IMPEx) menu, select



• Click on Add selected data to 3D scene

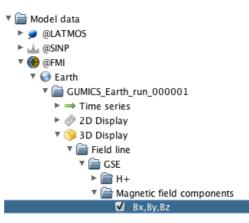


• When you unselect **Animated** the physical quantity is displayed in the form of a set of arrows along the trajectory of the spacecraft, with its associated control box.

2.11 Display Magnetic Field Lines from a GUMICS run of FMI

In this example, the magnetic field lines are calculated with the *getFieldLine* method of FMI.

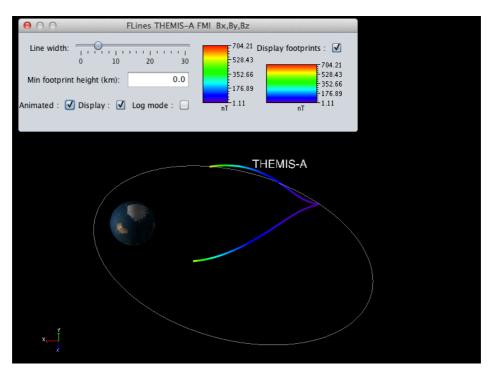
- With the **File/Manage scene** menu, create a scene in GSE coordinates with Themis A from 2010-03-27T00:00:00 to 2010-03-28T00:00:00 and a step of 500 seconds.
- In the **Science/Remote data (IMPEx)** menu, select the components of a magnetic field



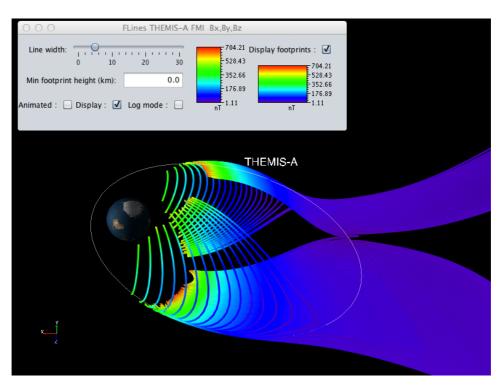
• A window called **Bx,By,Bz** is displayed in the right panel.

Console Bx,By,Bz		
Resource name GUMICS_Earth_run_000001/Mag		
Parameter Magnetic field comp		
Get start points from body trajectory THEMIS-A		
○ Generate start points		
Nb longitudes 6 Vb latitudes 6 Radius 3		
Step size 0.4 radius Max steps 200 radius		
*Selecting 'spacecraft' in a scene with more than 200 time steps can lead to an error during field line computation		
Add selected data to 3Dscene		

• Select the **Get start points from body trajectory** option with THEMIS-A as spacecraft and click on **Add selected data to 3Dscene.** A single line, corresponding to THEMIS-A is displayed.



• Unselect **Animated** option to display the set of field lines



2.12 Display an Energy spectrum of LATMOS

In this example, the energy spectrum of given particle populations at given points in 3D is displayed, using the *getDataPointSpectra* method of LATMOS.

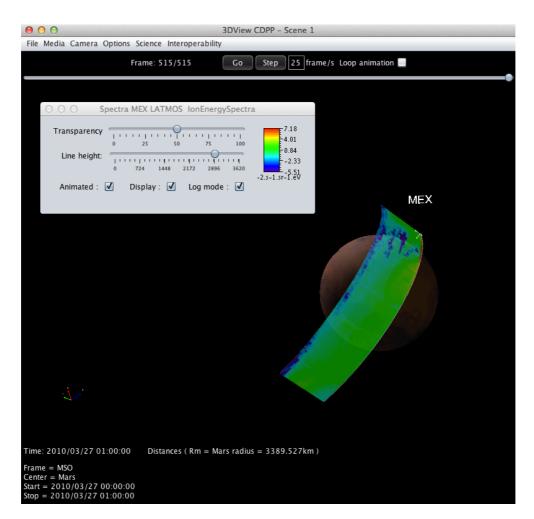
• With the **File/Manage scene** menu, create a scene in MSO coordinates with MEX from 2010-03-27T00:00:00 to 2010-03-28T01:00:00 and a step of 7 seconds.

- 🔻 🚞 Model data 🔻 🗩 @LATMOS 🔻 🥥 Mars LatHyS_Mars_14_01_13 LatHyS_Mars_13_02_13 ▶ 📄 LatHyS_Mars_18_01_13 LatHyS_Mars_23_01_13 LatHyS_Mars_27_01_13 ▶ 📄 LatHyS_Mars_03_01_14 LatHyS_Mars_09_01_14 LatHyS_Mars_14_03_14 ► ⇒ Time series 🔻 🖉 2D Display Single surface Cube 🔻 🚞 Single surface spectra 🔻 📄 EnergyFlux 🔻 📄 IonEnergySpectra IonEnergySpectra Source of the second seco LatHyS_Mars_
 Parameter: IonEnergySpectra 🕨 🌒 @FMI Resource name: lon_spectra Type: Scalar @3DVIEW Frame: MSO Formula: null 🔻 🚞 Observational data ▶ 🥾 @AMDA Units: m-2.s-1.sr-1.eV-1 🔻 🚞 Timetables
- In the Science/Remote data (IMPEx) menu, select a spectrum

• When **IonEnergyspectra** is selected, a dialog box is displayed in the right panel.

	Console EnergySpectra
	Resource name Ion_spectra
	Parameter IonEnergySpectra
)	Plot on trajectory of scene body MEX
	Clock angle 0
	Add selected data to 3Dscene

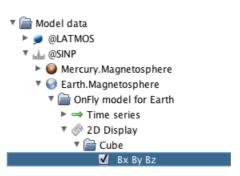
• Select MEX, and click on **Add selected data to 3Dscene**, to display the spectrum, with the control box. Since there are a lot of calculations, this may take a long time (between one and two minutes).



2.13 Display the magnetic field calculated in a 3D Cube

In this example, we use the *calculateCube* method of SINP. This method returns the magnetic field calculated by the *Paraboloid Model*, in grid points of a cube with chosen boundaries inside the planetary magnetosphere at a given time and sampling.

- With the **File/Manage scene** menu, create a scene in GSM coordinates with the Earth as central body.
- In the Science/Remote data (IMPEx) menu, select a Cube



• The following dialog box is displayed in the right panel

Console Bx	By Bz				
Resource name	On	Fly mod	el for Eart	h	
Parameter	Вx	By Bz			
Parameters					
SWDensity	4	cm^-3	plot	plo	ot IMF
SWSpeed	300	km/s	plot	IMF Bx	-1 nT
DST	-30	nT	plot	IMF By	4 nT
AL	-150	nT	plot	IMF Bz	1 nT
Use dynamic va	lues 🗌				
	Add s	elected	data to 3	Dscene	

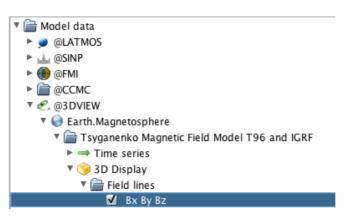
• Click on Add selected data to 3Dscene.

⊖ ○ 3DCube SINP Cube Earth.Magnetosphere Bx By Bz	and the second se
Slices positions	19.
xy V yz V xz V	37.
Color values	Ear
Min 0.337 Max 45249.984	
Transparency point 45249.984	
Change number of slices per axis(Hit enter t XY 50 YZ 50 XZ 50	2.
Recompute all slices	
Time: 2010-03-27T00:00:00 Distances (Re = Earth radius = 63	71.010km)
Frame = GSM Center = Earth Start = 2010/03/27 00:00:00 Stop = 2010/03/27 07:00:00	

2.14 Display magnetic field lines calculated with Tsyganenko T96

In this example, we use the **Tsyganenko Magnetic Field Model T96** implemented on the 3DView server.

- With the **File/Manage scene** menu, create a scene in GSM coordinates with Themis-A from 2010-03-26T00:00:00 to 2010-03-27T00:00:00 with a step of 300 seconds.
- In the Science/Remote data (IMPEx) menu, select



• The following dialog box is displayed in the right panel

Console Bx	By Bz						
Resource name	Resource name Tsyganenko Magnetic Field Model T96 and IG						
Parameter Bx By Bz							
Get start po	Get start points from body trajectory THEMIS-A						
🔘 Generate st	art points						
Nb longitudes	Nb longitudes 6 V Nb latitudes 6 V Radius 1.05						
U	Step size Idaptative						
Parameters							
SW pressure 3 nPa plot plot IMF							
SW VGSEx	400 km/s plot						
DST	DST -10 nT plot IMF By 2 nT						
	IMF Bz -3 nT						
Use dynamic va	Use dynamic values 🗌						
*Selecting 'spacecraf during field line com	t' in a scene with more than 200 time steps can lead to an error putation						
	Add selected data to 3Dscene						

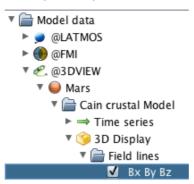
• Select the option named **Get start points from body trajectory** with THEMIS-A and click on **Add selected data to 3Dscene**

00	3DView CDPP - Scene 1
File Media Camera Options Science Interoperabilit	γ
Frame: 1/500	Go Step 25 frame/s Loop animation
•	
	THEMIS-A
	ines THEMIS-A 3DView Bx By Bz
Line width:	6.6E4 Display footprints : 🗹
0 10	20 30 4.9E4 6.6E4
Min footprint height (km):	0.0 3.3E4 4.9E4 3.3E4 3.3E4 3.3E4
x Animated : 🗹 Display : 🗹	E 1.664
Time: 2010/03/26 00:00:00 Distances (Re = Ea	rth radius = 6371.010km)
Frame = GSE	
Center = Earth Start = 2010/03/26 00:00:00	
Stop = 2010/03/27 00:00:00	

2.15 Display magnetic field lines calculated with Cain Crustal Model

In this example, we use the **Cain Crustal Model**, implemented on the 3DView server.

- With the **File/Manage scene** menu, create a scene in MSO coordinates with MEX from 2010-03-26T00:00:00 to 2010-03-26T08:00:00.
- In the **Science/Remote data (IMPEx)** menu, select



• The following dialog box is displayed in the right panel

Console Bx By Bz
Resource name Cain crustal Model
Parameter Bx By Bz
Get start points from body trajectory MEX
⊖ Generate start points
Nb longitudes 6 V Nb latitudes 6 V Radius 1.05
Step size idaptative Line length 1.25 R

• Select the option named **Get start points from body trajectory** with MEX and click on **Add selected data to 3Dscene**.

00	3DView CDPP – Scene 1	1
File Media Camera Options Science Interopera	bility	
Frame: 1/50	Go Step 25 fra	me/s Loop animation
FLines MEX 3DView Bx	By Bz	
Line width: 0 10 20		
Min footprint height (km): 0.0	-4.54	
		r and a second sec
	MEX	
	, in the second s	
z ,, v		
Time: 2010/03/26 00:00:00 Distances (Rm	= Mars radius = 3389.527km)	
Frame = MSO Center = Mars Start = 2010/03/26 00:00:00		

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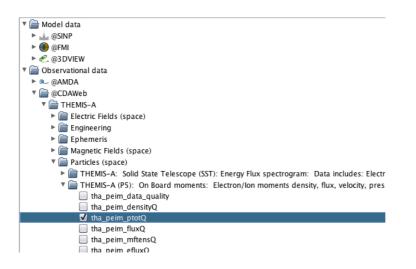
000				3DView CD	PP - Scene 1	
File Media Ca	amera	Options Scie	ence Interoperability			
			Frame: 1/506	Go Ste	p 25 frame/s	Loop animation
	width:	0 1(s 3DView Bx By Bz 20 30 20 30 20 30 30 30 √ Log mode : _	3139.97 2354.98 -1569.99 784.99 nT		
z yy				MEX		
Time: 2010/03 Frame = MSO Center = Mars Start = 2010/0 Stop = 2010/0	03/26	00:00:00	Distances (Rm = Ma	rs radius = 3389.5	27km)	

• Select the option named **Generate start points** and click on **Add selected data to 3Dscene**.

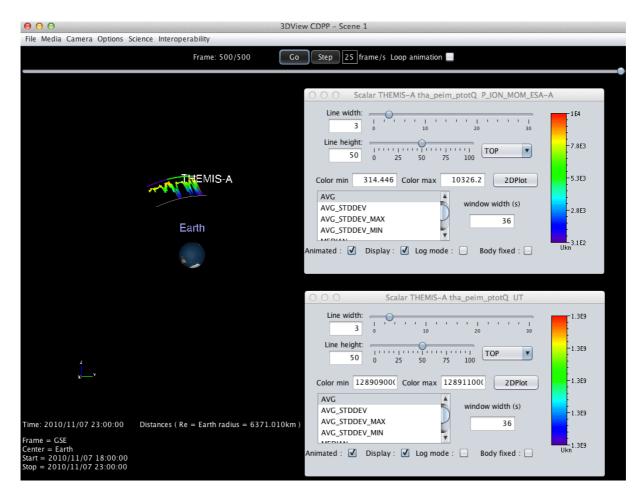
2.16 Display observational data from CDAWeb

In this example, we show how to display observational data from the CDAWeb.

- With the **File/Manage scene** menu, create a scene in GSE coordinates with THEMIS-A from 2010-11-07T18:00:00 to 2010-11-07T23:00:00.
- In the Science/Remote data (IMPEx) menu, select

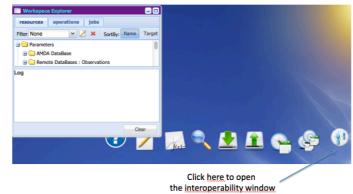


• Then click on **Add selected data to 3D scene**. Two physical quantities are displayed with their control box.



2.17 Display observational data from AMDA using SAMP

- With the **File/Manage scene** menu, create a scene in GSE coordinates with THEMIS-A from 2010-03-27T00:00:00 to 2010-03-27T07:00:00.
- In a browser, enter <u>http://amda.cdpp.eu</u> to start AMDA
- Follow these steps to start a SAMP Hub and open a SAMP connexion

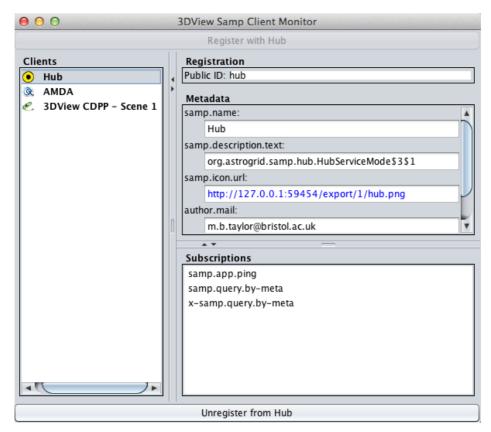


o Step 1

o Step 2

-	Open the SAM	1P window	
	Interoperability		
	SAMP Remote Data Base		
	VEXGRAZ CDAWEB THEMIS MAPSK	(P	
	Source	destination	
o Step 3			
	ft Interoperability		1
	SAMP Remote Data Base		
	SAMP connection : 💕		
	Open th	he SAMP connection	
o Step 4			
	Click here	e to <u>start</u> a SAMP HL	В
Failure			×
You You	not connect to a SAMP hub. I can use Java WebStart to start a use internal hub included in tools	s like <u>TOPCAT</u> or <u>Aladin</u>	here: <u>start hub</u>

• Back in **3DView**, select **Interoperability/SAMP**, and then click on **Register Hub**. AMDA and 3DView are displayed in the list of connected clients.



- Back in AMDA
 - Open the plot Manager, drag and drop Themis-A/FGM/low/B_gse from the Workspace Explorer
 - o Select the period 2010-03-27T01:00:00 2010-03-27T05:00:00
 - Select **VOTable** as file format and click on **Download**
 - In the **Download** window, click on **Send via SAMP to 3DView**
- A **Download** pop-up window is displayed by 3DView. You have to select the spacecraft on which trajectory the exchanged data will be displayed.

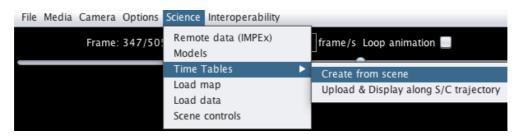
⊖ ○ ○ No spacecraft found for data.
Select a spacecraft to add data.
THEMIS-A
OK Cancel

• Data are displayed in the 3D scene, with the associated control box.

00	3DView CDPP	- Scene 1	
File Media Camera Options Science Interoperab	ility		
Frame: 57/50	4 Go Step	25 frame/s Loop animation	
•			
OOO Vector THEMIS-A b_gs	e		
Arrows length: 49 0 25 50 75	100		
Arrows width:	-22.84	Earth	
9 0 10 20			
Sample density:	9.86		Mary 1997
10 1 6 11	304 nT 3.38		LTHEM S.A
Color min 3.3757 Color max 29.33	104 nT		
Animated : 🗌 Display : 🗹 Log mode : 🗌	2 DPlot		
7			
x			
Time: 2010/03/27 00:46:40 Distances (Re =	Earth radius = 6371.010	0km)	
Frame = GSE Center = Earth Start = 2010/03/27 00:00:00 Stop = 2010/03/27 07:00:00			

2.18 Create a Time Table from the animation bar

- With the **File/Manage scene** menu, create a scene in GSE coordinates with THEMIS-A from 2010-03-27T00:00:00 to 2010-03-27T07:00:00.
- Then select the following menu



• In the animation bar, select the time with the animation button and create an interval with the *Start* and *Stop* buttons.

Frame: 60/505	Go	tep 25 fran	ne/s Loop animation 📃
<u> </u>			
00	Time table	e generation	
Start 2010-03-27T00 Stop 2010-03-27T00			Add time range
Start		Stop	
	Generate Time	Table Car	ncel

• Click on Add time range to append the selected time interval to the list.

0 0 0 Time table	generation
	generation
Start 2010-03-27T00:30:50 Stop 2010-03-27T00:49:10	Add time range
Start	Stop
2010-03-27T00:30:50	2010-03-27T00:49:10
Generate TimeT	Table Cancel

• Repeat this operation for several time intervals, and then click on **Generate Time Table**. The Time Table will be saved in a file with the *xml* extension.

2.19 Access to private Time Tables from AMDA

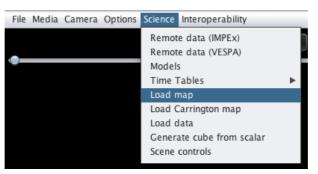
- With the **File/Manage scene** menu, create a scene in GSE coordinates with THEMIS-A from 2010-03-27T00:00:00 to 2010-03-27T07:00:00.
- Select **Interoperability/AMDA login.** Enter your AMDA user ID, with your password. Select the **Store in a local file** option to save the ID and password. This way, they are saved for further 3DView sessions. Then click on **Apply**.

000		Amda login		
Amda Login Password	gangloff *****		√ Sto	re in a local file
		Apply Close		
	000	Amda login test		
	i	Login successfull		
			ОК	

• The **Science/Remote data (IMPEx)** menu now displays the list of user owned Time Tables in the *Timetables/Private* directory.

2.20 Add a Map on or above a Central Body

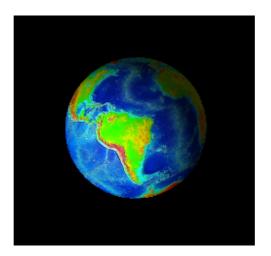
- 2.20.1 Add a predefined map
 - With the **File/Manage scene** menu, create a scene with the EARTH as central body, in 2014.
 - Then select



• The following window is displayed. Select **Choose an map from those available on server** and *Height*

00	Add projection map
Body: Ea	arth 💌
Choose a	map from those available on server
Height	Height map
🔘 Load a ma	ap file (Equirectangular projection)
Local 💿	Browse
Altitude:	0.0 km
	Add Cancel

• The *Height* map is displayed on the Earth



2.20.2 Add a map from APIS

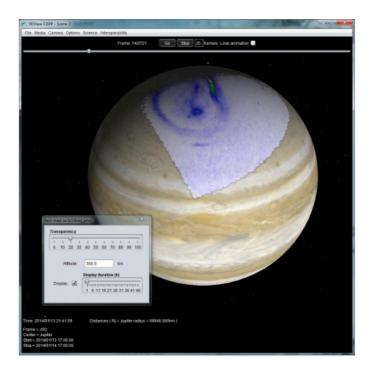
The APIS auroral image database (http://apis.obspm.fr/) available through EPN-TAP can be used to add specific maps on planets such as Jupiter or Saturn.

• To be able to find available data on APIS, choose a scene 2014/01/13 19:00:00 to 2014/01/14 01:00:00 with Jupiter center.

• Open the Science/load map menu and select Auroral images from APIS.

Add projection map	
Body: Jupiter	Auroral images from APIS
Choose a map from those available on server	oclz14e4q_proc 2014/01/13 21:03
Auroral images from APIS Found 4 APIS maps Show map	ocl214eaq_proc 2014/01/13 21:33
Load a map file (Equirectangular projection) URL ()	oc1z08edq_proc 2014/01/13 22:39
Local Brow	se oc1z08ejq_proc 2014/01/13 23:09
Altitude: 300 km	
Add Can	cel

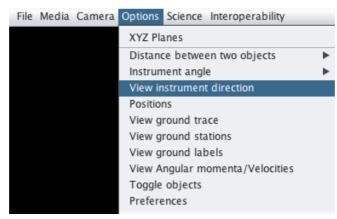
• Clicking the add button loads the maps in the scene and show them according to their timestamp. The image list on the right in Figure 7 allows the user to set scene time by clicking on the desired one.



With some graphic cards, at low altitudes, the aurora can be interlaced with planet surface.

2.21 Display a cone view a target in a pop-up window

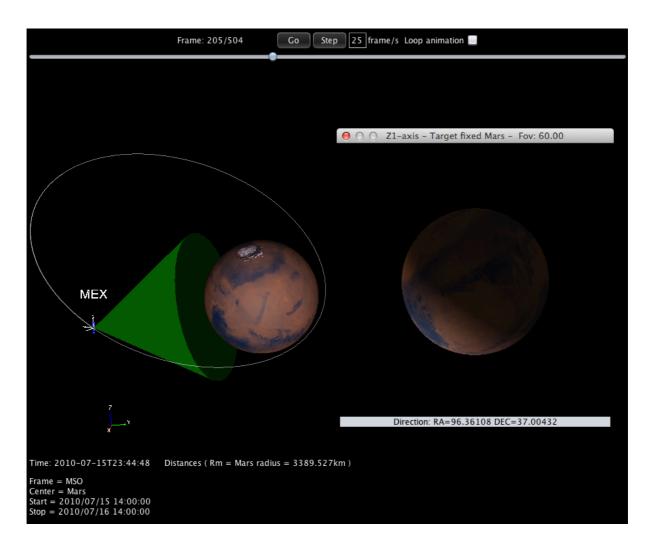
- With the **File/Manage scene** menu, create a scene with MEX and MSO as coordinate system from 2010-07-15T14:00:00 to 2010-07-16T14:00:00
- Then select



• Select **Pointing a target** option with *Mars*, **New View** in *View Simulation window*, and an angle of 60.0 degrees.

$\Theta \cap \Theta$	Instrument View
Spacecraft: MI Direction type	EX V Z1-axis V
Fixed on attitu	ude
	Cone/line length
X 0.0	
Y 0.0	○ Fixed
Y 0.0	Adapted on: Mars
Z 1.0	
• Pointing a tar	get Mars
Representation ty	pe
O Draw a line	
	Cone/line color:
Oraw a cond	
 Set view 	Angle (degrees): 60.0
View simulation w	indow
☑ New View	View name: Z1-axis
	OK Cancel

• A Cone is displayed in the main window, and a new window containing a view of Mars (60°) from MEX.



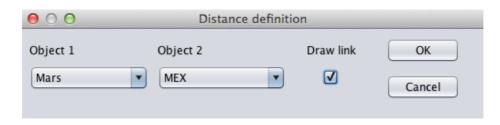
• Now, if you select *set view* and an angle of 60.0° in the *Instrument view* window, a view of Mars (60°) from MEX in displayed in the main window.

2.22 Display the distance between two bodies

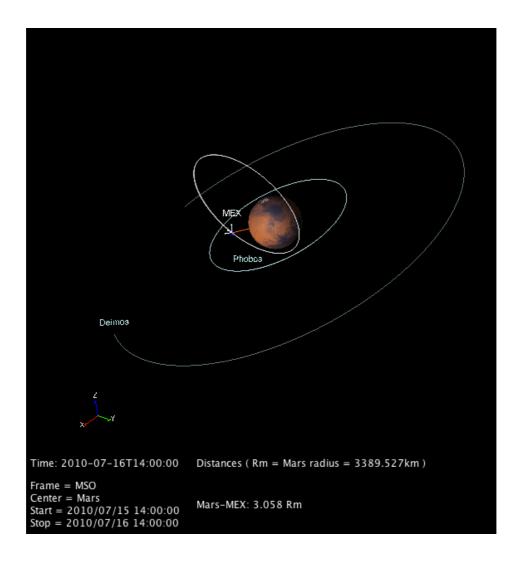
- With the **File/Manage scene** menu, create a scene with MEX and MSO as coordinate system from 2010-07-15T14:00:00 to 2010-07-16T14:00:00. Select *Phobos* and *Deimos* as Natural bodies.
- Then select

File Media Camera	Options Science Interoperability		-
Frame: 5	XYZ Planes		ie/s Loop anii
	Distance between two objects	►	Set
	Instrument angle	•	Display
	View instrument direction		
	Positions		
	View ground trace		
	View ground stations		
	View ground labels		
	View Angular momenta/Velocities		
	Toggle objects		
	Preferences		

• This opens a pop-up window. Select Mars as Object#1, MEX as Object#2, and select *Draw link*



• A link between Mars and MEX is displayed as well as the distance.



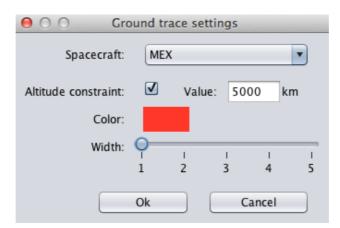
2.23 Display a ground trace

- With the **File/Manage scene** menu, create a scene with MEX and MSO as coordinate system from 2010-07-15T14:00:00 to 2010-07-16T14:00:00. Select *Phobos* and *Deimos* as Natural bodies.
- Then select

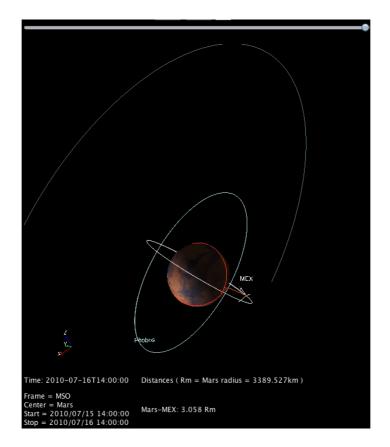
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File Media	Camera	Options	Science	Interoperability	
	Frame: 5	XYZ Pla	anes		
		Distan	ce betwee	en two objects	►
		Instrun	nent angl	e	►
		View ir	strument	t direction	
		Positio	ns		
		View g	round tra	ice	
		View g	round sta	ations	
		View g	round lab	oels	
		View A	ngular m	omenta/Velocities	
		Toggle	objects		
		Prefere	ences		

• Select an altitude constraint of 5000 km

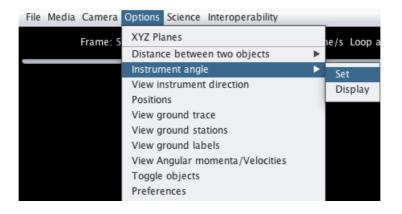


• The ground trace is displayed with the chosen colour.



2.24 Display the angle between an instrument and a body

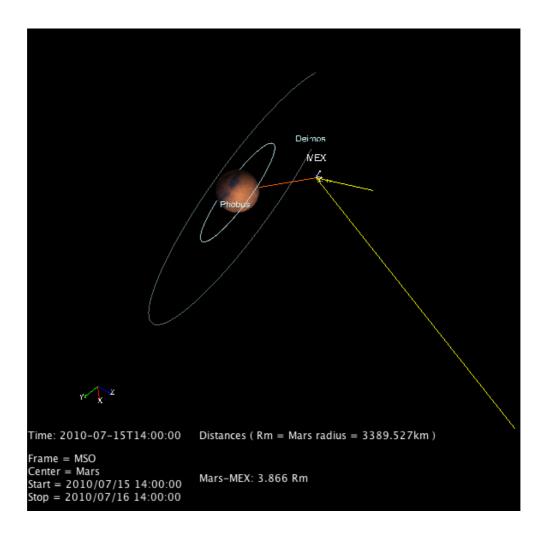
- With the **File/Manage scene** menu, create a scene with MEX and MSO as coordinate system from 2010-07-15T14:00:00 to 2010-07-16T14:00:00. Select *Phobos* and *Deimos* as Natural bodies.
- Then select



• Select X=1 Y=0 Z=0 *Sun* as second direction and yellow as colour

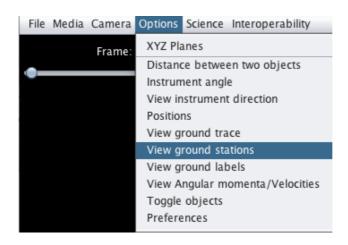
0	00	Angle d	efinition
	Obj	ect: MEX	•
	1st direct	tion	2nd direction
	X Y Z	1 0 0	Sun
		Line length: Line color: OK	Cancel

• The angle between MEX and the Sun is displayed in yellow



2.25 Display ground stations

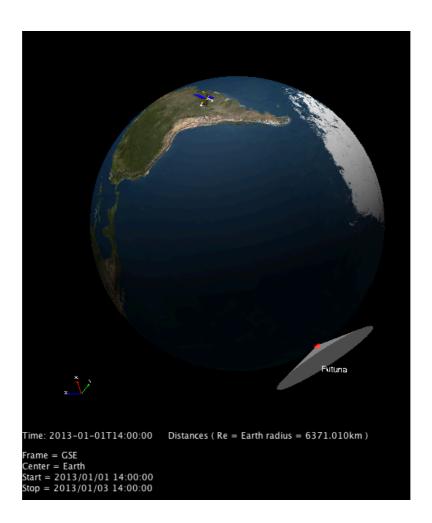
- With the **File/Manage scene** menu, create a scene with SVOM and the EARTH as central body from 2013-01-01T14:00:00 to 2013-01-03T14:00:00.
- Then select



• Select *Futuna* as ground station and *Display*

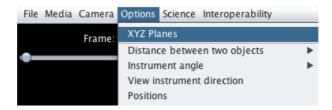
0	○ ○ Ground sta	tions setting
G	For a stations: Future	•
	 Display all Display 	Generate AOS & LOS
	Properties	
	Name: Fut	una
	Visibility angle:	50 Degrees
	Cone length:	
	Longitude: 17	8.1 Degrees
	Latitude: -1	4.4 Degrees
	Color:	
	Update pr	operties
	Clo	se

• A cone associated with the Futuna ground station is displayed.



2.26 Display XYZ planes

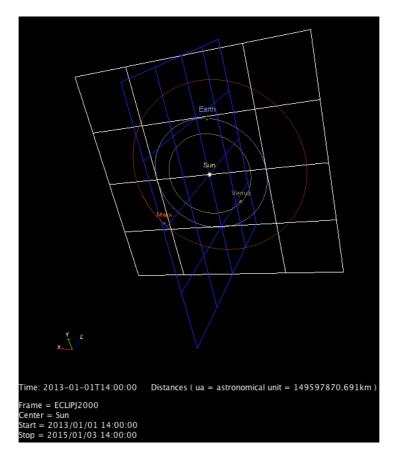
- With the **File/Manage scene** menu, create a scene with the Sun as central body and ECLIPJ2000 as coordinate system from 2013-01-01T14:00:00 to 2015-01-03T14:00:00. Add Venus, the Earth and Mars as Natural bodies.
- Then select



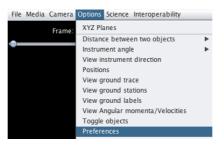
• Then select XY with white colour and YZ.



• Both planes are displayed as grids (units=AU). The white grid is aligned on the orbit of the planets



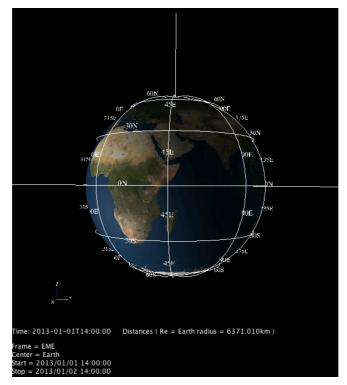
• With the **File/Manage scene** menu, create a scene with the Earth as central body and EME as coordinate system from 2013-01-01T14:00:00 to 2013-01-02T14:00:00, then select



• Select *Display axes* (in Center Body) and set **Long & Lat** to *Precise*

● ○ ○ Preferences
Scene
Display axes: 🗌 Ticks number 🥧
Ambiant light:
Trajectories
Display: Progressive Thickness: O
Bodies
Body names: Spacecraft sizes: proproprogram Reset Natural bodies sizes: proproprogram Reset Center body
Body shape: Planet
Model
Shadow cone:
Display axes: 🗹 Body size: 0 25 50 75 100
Long & Lat: Precise 🔻
Close

• Axes, longitudes and latitudes are displayed above the Earth



2.27 Search and display data around a Titan fly-by with VESPA

For this use case, we use 3DView and another tool called TopCat¹ to display data searched by 3DView among VESPA services.

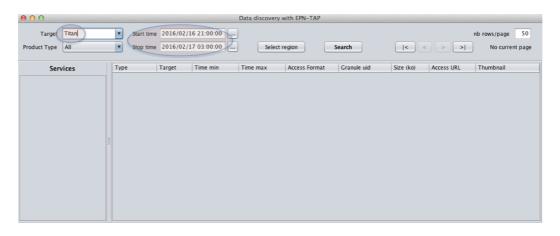
We want to search for data provided by VESPA around a Titan flyby by the CASSINI spacecraft described below (source PDS):

Titan Flyby T-117: Measuring Titan's Atmosphere		Titan Flyby at a Glance
This is Cassini's 118th flyby of Titan and the third of eleven olanned for 2016. This encounter will increase the inclination of Cassini's orbit from 16 degrees to 20.6 degrees. The highest priority science is a grazing atmospheric occultation beserved by Radio Science Subsystem (RSS), which will orofile the thermal structure of the atmosphere, with ingress and egrees latitudes of ~75 and ~30N degrees. The occultation is followed by a short-duration high northerm- atitude egrees-only bistatic scattering with ground track likely crossing small lakes, covering the region from about (80N, 190W) to about (70N, 240W) degrees, and capturing near-grazing scattering angle decreasing from about 80 to 75 tegrees. On approach, the Composite Infrared Spectrometer (CIRS) will view the sub-Satum hemisphere of Titan, the Visible and nfrared Mapping Spectrometer (VIMS) will do two mapping ubservations and the Imaging Science Subsystem (SS) will search for clouds across Titan's Fensal-Aztlan region.	This natural color image shows Titan's upper atmosphere an active place where methane molecules are being broken apart by solar ultraviolet light and the byproducts combine to form compounds like ethane and acetylene. + More Titan Information	Date Feb. 16, 2016 Altitude 633 miles (1,018 km) Spead (rel. to Titan) 20,132 mph (5.9 km/sec) Details + Fixby FAQ + Titan Image Gallery + Browse or Search the Latest Raw Images + Saturn's Moons
Sources: Cassini Science Team. NASA Jet Propulsion Laboratory Cassini Satum Tour Dates Cassini Imaging Central Laboratory for Observations (C Jan 22 - Feb 7 2016		

• With the **File/Manage scene** menu, create a scene with Titan as central body, CASSINI as spacecraft and TIIS as coordinate system from 2016-02-16T21:00:00 to 2016-02-17T03:00:00. Then select the VESPA option

File Media Camera Options	Science Interoperability
	Remote data (IMPEx)
	Remote data (VESPA)
	Models
	Time Tables 🕨 🕨
·	Load map
	Load Carrington map
,	Load data
	Generate cube from scalar
	Scene controls

This opens the VESPA pop-up window, with *Target, StartTime* and *StopTime* selected from the scene.

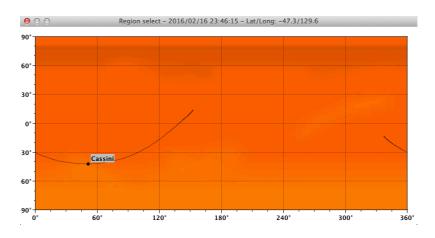


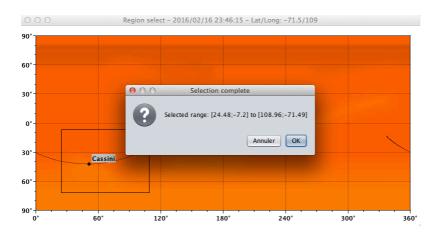
¹ http://www.star.bris.ac.uk/~mbt/topcat/

Then launch the animation and stop it at about 23:16, and click on the *Select Region* button to add a new search keyword.

00	Data discovery with EPN-TAP	
Target Titan	Start time 2016/02/16 21:00:00	nb rows/page 50
Product Type All	Stop time 2016/02/17 03:00:00 Select region Search	I > No current page
	Size (ko) Access URL Thumbnail	

The following pop-up window is opened





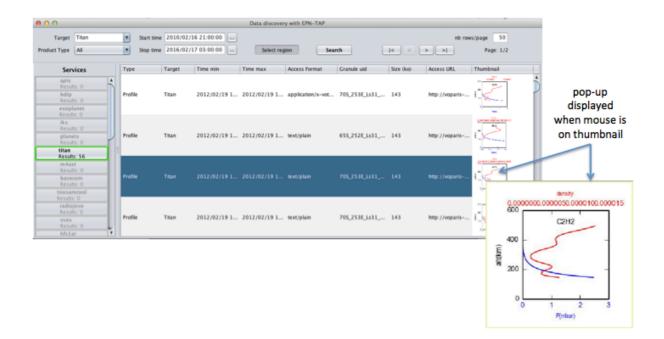
Then select a region

To increase the number of possible responses, change the *Start Date* to 2010-02-16T21:00:00 and click on Search

The list of services is displayed in the left part of the window. The name of each service is displayed with the corresponding number of results.

00			 	Data discove	ry with EPN-TAP			
					gion Se	arch	nb r	ows/page 50 No current page
Product Type All Sop time 2016/02/17 03 00 00 Select region Search (< > > No current page Services Type Target Time min Time max Access Format Granule uid Size (ko) Access URL Thumbnail Polity Regulars 0 Regulars 0								
Resul bdip Resul exopi Resul iks Resul Resul Resul base Resul trosat	ts: 0 ts: 0							

Click on *titan* to display the results of this database.



Launch TopCat. This will automatically start the SAMP HUB hosted by TopCat. Right click on a raw displays several options depending on the data format. Select *send via SAMP to topcat.* This option is available for data of mime type equal to

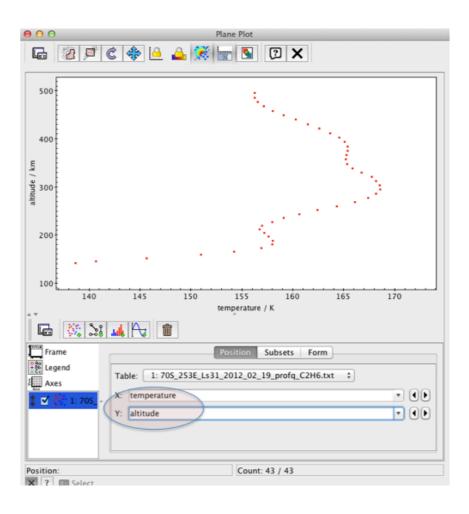
Select *send via SAMP to topcat.* This option is available for data of mime type equal to application/x-votable+xml only.

00					Data discover	y with EPN-TAP				
	Titan All			/16 21:00:00	Select reg	jion Sea	rch	< <	nb rov	rs/page 50 Page: 1/2
Serv	rices	Туре	Target	Time min	Time max	Access Format	Granule uid	Size (ko)	Access URL	Thumbnail
apis Result bdip Result exopla Result	s: 0	Profile	Titan	2012/02/19 1	2012/02/19 1	application/x-vot	Op ser	en in 3DScene nd via SAMP to wnload file	//voparis	
iks Result plane Result titan	is: 0 ts is: 0	Profile	Titan	2012/02/19 1	2012/02/19 1	text/plain	655_252E_Ls31		http://voparis	
Results m4as Result basec Result tnosare	t ss: 0 om ss: 0 ecool	Profile	Titan	2012/02/19 1	2012/02/19 1	text/plain	705_253E_Ls31	. 143	http://voparis	
Results: radioj Result vvex Result hfc1a	ove s: 0	Profile	Titan	2012/02/19 1	2012/02/19 1	text/plain	705_253E_Ls31	. 143	http://voparis	

The table is loaded by TopCat, and visible in the Table List after a few seconds.

The Table sent	to display the contents of the table TOPCAT
Table List 1: 705_253E_Ls31_2012_02_1	Current Table Properties Label: 70S_253E_Ls31_2012_02_19_profq_C2H6.txt Location: 3DView:http://voparis-srv-paris.obspm.fr/titan/to_vot_titan.py?fileurl Name: http://voparis-srv-paris.obspm.fr/titan/to_vot_titan.py?fileurl=http:/ Rows: 43 Columns: 6 Sort Order: Row Subset: All Row Subset: All Row Subset: All SAMP
191 / 911 M	Messages: Clients: 💿 🎂 🗖 🛛 🚿

Select *temperature* on X-axis and *altitude* on Y-axis.



2.28 EISCAT Svalbard radar – Swarm conjunction in the night side

This use case is related to the Conjunction Search Tool. Its goal is i) to find favourable conjunctions between the ESR and Swarm around magnetic midnight, ii) to exploit one of the conjunctions found.

Note: this use case requires, at a later stage, the upload of a Swarm data file in 3D View. The Conjunction Search Tool is accessed through the File Menu of the desktop bar.

	3DView CDPP desktop bar
File Windows Help	
New scene	
Conjunction Search Tool	
Open all	
Save all	
Exit	

Step 1: instruments and time interval selection

Instruments: ESR (Ground -> IS Radars -> EISCAT) and Swarm A (Space -> Polar -> LEO - > Swarm) Hemisphere: HN

Time interval: 2014/01/01 00:00:00 - 2014/01/15 00:00:00 (only 2 weeks for a faster run)

🖉 Conj	unction Search Tool	-		×
Conju	nction search Result			
ick the	facilities to conjugate			
✓ ✓	SwarmA SwarmA SwarmA	Same o Opposi		
ck the	time period			
Stop	t time 2014/01/01 00:00:00 Freeze time 2014/01/15 00:00:00 Duration: 14 da region Vizualisation interface type-2DView	ay 🔻)	
ck the	Max distance from	•		

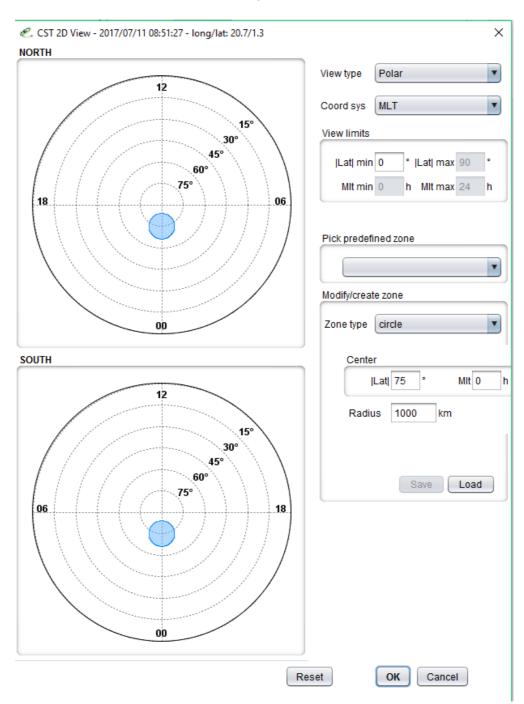


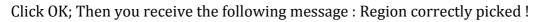
time

interval (Start time and stop time) will automatically adjust to the common operation time of the selected instruments. To avoid this, the "Freeze" box can be ticked.

Step 2: conjunction region

Click the <u>Visualization interface type-2DView</u> button. In polar view and MLT coordinate system, we set the region of conjunction as a circle centred on the ESR latitude (\sim 75 MLAT) and at 0 MLT. Radius of the circle: 1000 km (for the time being, it is recommended not to choose too small radii).





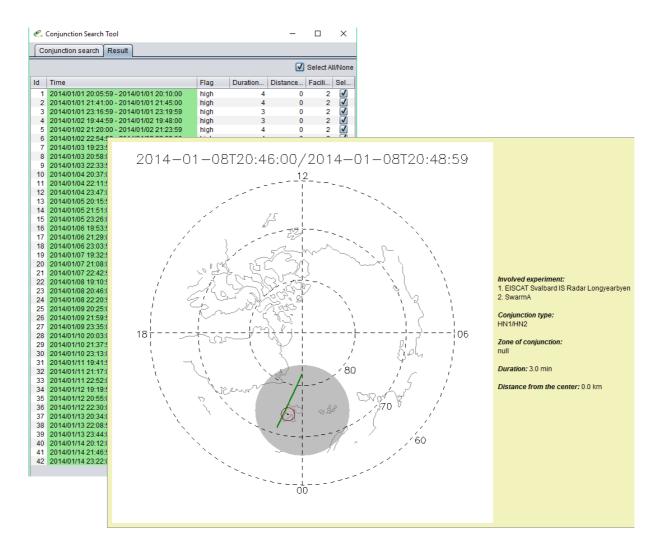
Step 3: run and results

Here we launch the run without specifying any quality criteria (not yet quite implemented). Click the **Search** button. After a while (typically 20s), the CST returns 42 conjunctions in the *Results* tab.

_	Conjunction Search Tool			-		×
Co	njunction search Result					
				V	Select Al	l/Non
Id	Time	Flag	Duration	Distance	Facili	Sel
1	2014/01/01 20:05:59 - 2014/01/01 20:10:00	high	4	0	2	\checkmark
2	2014/01/01 21:41:00 - 2014/01/01 21:45:00	high	4	0	2	\checkmark
3	2014/01/01 23:16:59 - 2014/01/01 23:19:59	high	3	0	2	\checkmark
4	2014/01/02 19:44:59 - 2014/01/02 19:48:00	high	3	0	2	$\overline{\checkmark}$
5	2014/01/02 21:20:00 - 2014/01/02 21:23:59	high	4	0	2	\checkmark
6	2014/01/02 22:54:59 - 2014/01/02 22:59:00	high	4	0	2	$\overline{\checkmark}$
- 7	2014/01/03 19:23:59 - 2014/01/03 19:27:00	high	3	0	2	$\overline{\checkmark}$
8	2014/01/03 20:58:00 - 2014/01/03 21:01:59	high	4	0	2	$\overline{\mathbf{v}}$
9	2014/01/03 22:33:59 - 2014/01/03 22:37:00	high	3	0	2	\checkmark
10	2014/01/04 20:37:00 - 2014/01/04 20:40:59	high	4	0	2	$\overline{\checkmark}$
11	2014/01/04 22:11:59 - 2014/01/04 22:16:00	high	4	0	2	\checkmark
12	2014/01/04 23:47:00 - 2014/01/04 23:50:59	high	4	0	2	$\overline{\mathbf{V}}$
13	2014/01/05 20:15:59 - 2014/01/05 20:18:59	high	3	0	2	\checkmark
14	2014/01/05 21:51:00 - 2014/01/05 21:54:00	high	3	0	2	$\overline{\mathbf{v}}$
15	2014/01/05 23:26:00 - 2014/01/05 23:28:59	high	3	0	2	\checkmark
16	2014/01/06 19:53:59 - 2014/01/06 19:56:59	high	3	0	2	$\overline{\mathbf{V}}$
17	2014/01/06 21:29:00 - 2014/01/06 21:33:00	high	4	0	2	$\overline{\checkmark}$
18	2014/01/06 23:03:59 - 2014/01/06 23:07:59	high	4	0	2	$\overline{\mathbf{v}}$
19	2014/01/07 19:32:59 - 2014/01/07 19:36:00	high	3	0	2	\checkmark
20	2014/01/07 21:08:00 - 2014/01/07 21:11:00	high	3	0	2	$\overline{\mathbf{v}}$
21	2014/01/07 22:42:59 - 2014/01/07 22:45:59	high	3	0	2	\checkmark
22	2014/01/08 19:10:59 - 2014/01/08 19:14:00	high	3	0	2	\checkmark
23	2014/01/08 20:46:00 - 2014/01/08 20:48:59	high	3	0	2	$\overline{\checkmark}$
24	2014/01/08 22:20:59 - 2014/01/08 22:25:00	high	4	0	2	\checkmark
25	2014/01/09 20:25:00 - 2014/01/09 20:27:59	high	3	0	2	$\overline{\checkmark}$
26	2014/01/09 21:59:59 - 2014/01/09 22:03:00	high	3	0	2	\checkmark
27	2014/01/09 23:35:00 - 2014/01/09 23:37:59	high	3	0	2	$\overline{\checkmark}$
28	2014/01/10 20:03:00 - 2014/01/10 20:05:59	high	3	0	2	$\overline{\checkmark}$
29	2014/01/10 21:37:59 - 2014/01/10 21:42:00	high	4	0	2	\checkmark
30	2014/01/10 23:13:00 - 2014/01/10 23:16:59	high	4	0	2	\checkmark
31	2014/01/11 19:41:59 - 2014/01/11 19:44:59	high	3	0	2	\checkmark
32	2014/01/11 21:17:00 - 2014/01/11 21:20:00	high	3	0	2	$\overline{\checkmark}$
33	2014/01/11 22:52:00 - 2014/01/11 22:54:59	high	3	0	2	\checkmark
34	2014/01/12 19:19:59 - 2014/01/12 19:22:59	high	3	0	2	$\overline{\mathbf{v}}$
35	2014/01/12 20:55:00 - 2014/01/12 20:58:00	high	3	0	2	\checkmark
36	2014/01/12 22:30:00 - 2014/01/12 22:33:59	high	4	0	2	1
37	2014/01/13 20:34:00 - 2014/01/13 20:37:00	high	3	0	2	✓ ✓
38	2014/01/13 22:08:59 - 2014/01/13 22:11:59	high	3	0	2	\checkmark
39	2014/01/13 23:44:00 - 2014/01/13 23:47:00	high	3	0	2	\checkmark
40	2014/01/14 20:12:00 - 2014/01/14 20:15:00	high	3	0	2	V
41	2014/01/14 21:46:59 - 2014/01/14 21:49:59	high	3	0	2	\checkmark
42	2014/01/14 23:22:00 - 2014/01/14 23:25:00	high	3	0	2	V
	Save Load Export TimeTa	ble	Send TimeTab	le to AMDA		
			20110 Million di			

Let us choose the conjunction on January 8, between 20:46 à 20:49 (conjunction #23). By passing the mouse over the corresponding line, a picture of the conjunction appears.

3DView 2.0 Tutorial



Step 4: visualisation of the conjunction

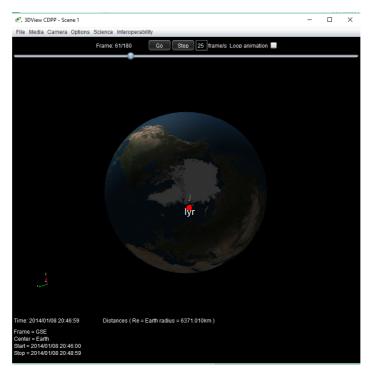
One can then send all the necessary information (time intervals and instruments involved in the conjunction) to 3D View by right clicking on the conjunction #23 and choosing *Plot to new scene.* The option *Plot to current scene* uses an already existing 3DView scene.

Co	njunction search Result						
					🗹 Sel	ect All/N	one
d	Time	Flag	Durati	Distanc	Facilit	Select	
1	2014/01/01 20:06:59 - 2014/01/01 20:10:00	high	3	0	2	\checkmark	4
2	2014/01/01 21:42:00 - 2014/01/01 21:45:00	high	3	0	2	\checkmark	1
3	2014/01/01 23:16:59 - 2014/01/01 23:19:59	high	3	0	2	\checkmark	
4	2014/01/02 19:44:59 - 2014/01/02 19:49:00	high	4	0	2	\checkmark	
5	2014/01/02 21:20:00 - 2014/01/02 21:23:59	high	4	0	2	\checkmark	
6	2014/01/02 22:54:59 - 2014/01/02 22:59:00	high	4	0	2	\checkmark	
7	2014/01/03 19:23:59 - 2014/01/03 19:27:00	high	3	0	2	\checkmark	
8	2014/01/03 20:59:00 - 2014/01/03 21:01:59	high	3	0	2	\checkmark	
9	2014/01/03 22:33:59 - 2014/01/03 22:37:00	high	3	0	2	\checkmark	
10	2014/01/04 20:37:00 - 2014/01/04 20:39:59	high	3	0	2	\checkmark	
11	2014/01/04 22:11:59 - 2014/01/04 22:16:00	high	4	0	2	\checkmark	
12	2014/01/04 23:48:00 - 2014/01/04 23:50:59	high	3	0	2	\checkmark	
13	2014/01/05 20:15:59 - 2014/01/05 20:18:59	high	3	0	2	\checkmark	
14	2014/01/05 21:51:00 - 2014/01/05 21:54:00	high	3	0	2	\checkmark	
15	2014/01/05 23:26:00 - 2014/01/05 23:28:59	high	3	0	2	\checkmark	
16	2014/01/06 19:53:59 - 2014/01/06 19:56:59	high	3	0	2	\checkmark	
17	2014/01/06 21:29:00 - 2014/01/06 21:32:00	high	3	0	2	✓ ✓ ✓	
18	2014/01/06 23:04:59 - 2014/01/06 23:07:59	high	3	0	2	\checkmark	1
19	2014/01/07 19:32:59 - 2014/01/07 19:36:00	high	3	0	2	√	
20	2014/01/07 21:08:00 - 2014/01/07 21:11:00	high	3	0	2	\checkmark	
21	2014/01/07 22:42:59 - 2014/01/07 22:45:59	high	3	0	2	√	
22	2014/01/08 19:10:59 - 2014/01/08 19:14:00	high	3	0	2	\checkmark	
23	201	hiah	3	0	2	\checkmark	1
24	201 Plot to Current s	cene	3	0	2	\checkmark	1
25	201 Download ephemeris New sce		3	0	2	< </td <td>1</td>	1
26	2014010921.38.38-201401092	ie -	3	0	2	\checkmark	ų,
27	2014/01/09 23:35:00 - 2014/01/09 23:37:59	high	3	0	2	\checkmark	I

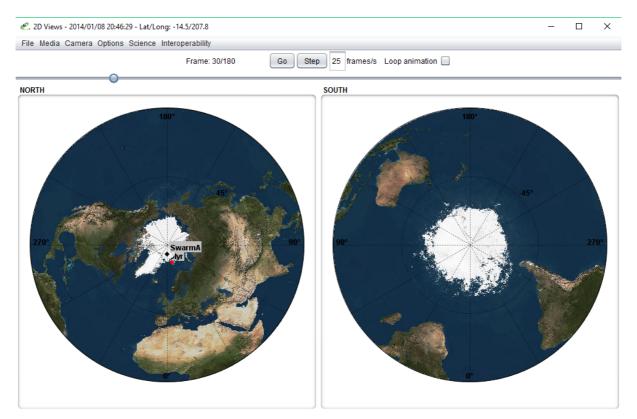
The *Manage scene* of 3D View then opens. The time interval corresponding to the conjunction #23 is prefilled; Swarm A in the *Spacecraft and* ESR in *Ground based facilities* are selected.

tart time 2014	4/01/08 20:46:00	Coordinate	system	GSE			 Center 	Earth		
top time 2014	4/01/08 20:48:59		Step		1	secon	ds Stars	No star		
Spacecraft G	round based facilities N	atural bodies	Small b	odie	5					
vailable space	craft									
Spacecraft	Range			F	ile list	Ti	me shift(Day	Selec	t	
ACE	1997-08-27T00:00:0	0 - 2016-10-09	T00-12-0	0	Details		Specific			
Akebono	2012-08-30T09:36:0				Details	===	Specific	í		
Alouette1	1965-01-01T00:20:0			-	Details	50	Specific	í.	H	
Alouette2	1966-01-27T00:10:0			-	Details		Specific	í.	П	
AMPTE-CCE	1984-08-16T16:15:0				Details	50	Specific)	ň	-1
AMPTE/IRM	1984-09-12T00:12:0	0 - 1986-08-30	T08:00:0	0 0	Details		Specific	5		- 11
ARASE	No data			C	Details	50	Specific	5		-1
Cassini	2003-08-31T23:58:5	5 - 2017-09-21	T23:58:5	2 (Details		Specific)		
Cassiope	2013-10-07T00:15:0	0 - 2017-03-28	T00:00:0	0 0	Details		Specific)	$\overline{\Box}$	
CHAMP	2000-11-09T00:10:0	0 - 2010-10-10	T00:00:0	0 0	Details		Specific)		
Chandra-1	1999-08-07T07:31:0	4 - 2016-06-13	T00:00:0	0 0	Details		Specific)		
CLUSTER1	2000-08-22T00:18:3	0 - 2019-12-31	T23:44:3	0 0	Details		Specific)		
CLUSTER2	2000-08-22T00:18:3	0 - 2019-12-31	T23:44:3	0 (Details		Specific)		
CLUSTER3	2000-08-22T00:18:3	0 - 2019-12-31	T23:44:3	0 0	Details		Specific)		V
CULISTERA	2000-08-22700-18-3	0 - 2010-12-31	тоз·ии-з	IN (Netsile		Sherific	ſ		
			_							
elected data fil	es									
SC	File name	Туре	R	ange				С	hoice	
SwarmA	swarma_orbit.bsp	ORBIT	20	013/1	1/26 00:10:0	00-2017	7/02/27 00:00:0	00 (Chang	e
SwarmA	swarma_orbit.bsp	ORBIT	20	013/1	1/26 00:10:0	00-2017	7/02/27 00:00:0	00 (Chang	le

One can then visualise the conjunction in 3D:



Or in 2D (*Camera* tab then *2DView*):

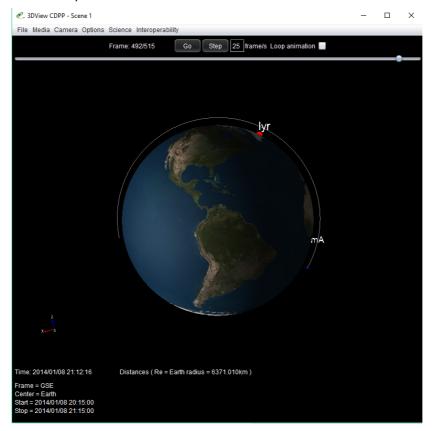


Step 5: exploitation of the conjunction

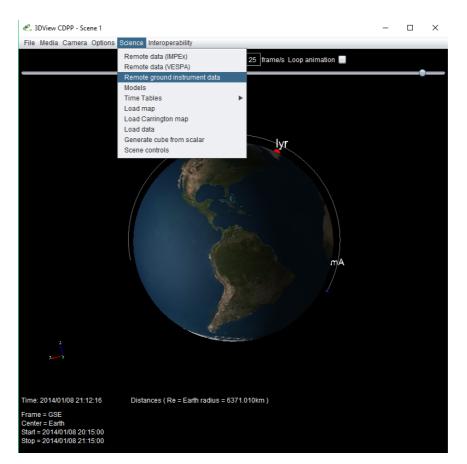
Let us add some data to the scene to exploit scientifically our conjunction. To the end, we extend a little the time interval to 20:15 – 21:15 in the *Manage scene* window.

			. —	-		a (
top time 2014	4/01/08 21:15:00	5	Step	7	seconds	Stars	No star		
		· · · · · · · · · · · ·							
Spacecraft G	round based facilities Na	tural bodies Sm	nall bodi	es					
vailable space	craft								
Spacecraft	Range			File list	Time	shift(Day	Select		
•	-	0040 40 00700	40.00				Seleci	_	
ACE	1997-08-27T00:00:00			Details		pecific	L		4
Akebono	2012-08-30T09:36:00			Details		<u>pecific</u>			
Alouette1	1965-01-01T00:20:00			Details		pecific)		-	
Alouette2 AMPTE-CCE	1966-01-27T00:10:00 1984-08-16T16:15:00			Details Details		pecific)		-	- 1
AMPTE-CCE	1984-09-12T00:12:00			Details		pecific)		-	al.
ARASE	No data	7- 1900-00-30100.	.00.00	Details		pecific)		-	-1
Cassini	2003-08-31T23:58:55	0017 00 01700	-50-50	Details		becific)		-	al.
Cassiope	2003-08-31123.38.30 2013-10-07T00:15:00			Details		becific)		-	-1
CHAMP	2000-11-09T00:10:00			Details		pecific)		-	-1
Chandra-1	1999-08-07T07:31:04			Details		pecific)		1	н
CLUSTER1	2000-08-22T00:18:30			Details		pecific)		-	- 1
CLUSTER2	2000-08-22T00:18:30			Details		pecific)	1	1	П
CLUSTER3	2000-08-22T00:18:30			Details		pecific)	-	1	÷.
CLUSTERA	2000_08_22T00:18:30			Detaile		necific	ſ	1	1
			_						
elected data fil	es								
SC	File name	Туре	Rang	e			Ch	oice	
SwarmA	swarma orbit.bsp	ORBIT	_	- 11/26 00:10:0	0-2017/02/	27 00:00:0	0	Chang	6
Sector General Sector S	enanna_oronoop	0.1011	2010		0 20111021	2. 00.00.0	- <u> </u>	singing	*

We now have about 2/3 of Swarm A orbit.



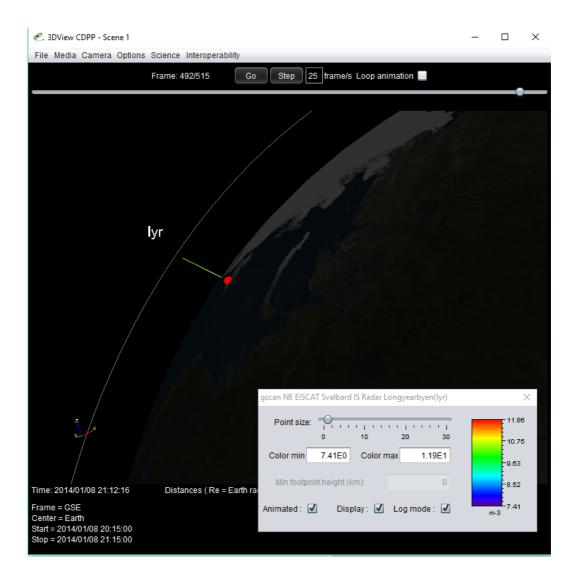
To add ESR data to the view, in *Science* tab, one has to select *Remote ground instruments data*:



In the *@Ionotool* data tree, only ISRadar should appear, as it is the only instrument category selected in *Manage scene*. Let us click on it and then appears *EISCAT Svalbard IS Radar Longyearbyen*, the only selected ground based instrument. Clicking on it makes 3D View connect to the Madrigal database, which returns a file containing the available parameters for the day. Let us choose Ne, the electron density and send Ne to the scene by clicking on *Add selected data to 3D scene*.

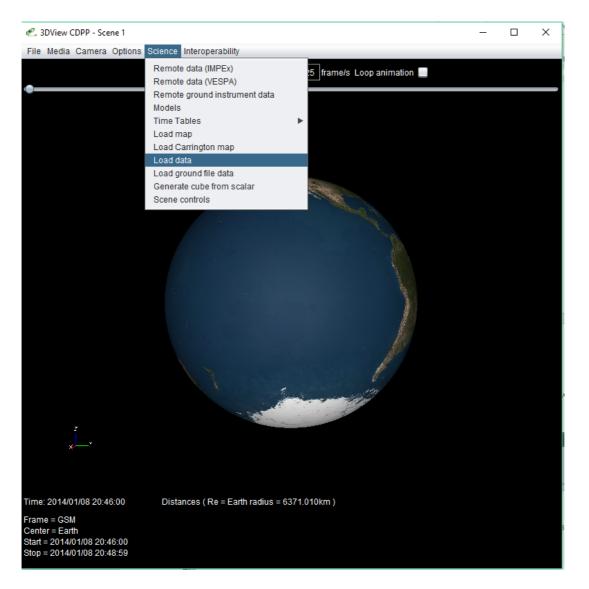
€. Ground instruments data - Scene 1	- 🗆 X
🔻 🚔 @lonoTool	Console
V 🚔 ISRadar	
EISCAT Svalbard IS Radar Longyearbyen(lyr)	New selected param: NE Electron density (Ne) NE
2014-01-08T18:01:23 ipy 60	NE loading
6800 GUISDAP Fitted Parameters NCAR 2014-01-08 ipy 6	
CO lon-neutral collision frequency	
COL Log10 (ion-neutral collision frequency)	
DCOL Error in Log10 (ion-neutral collision frequency)	
DNE Error in Electron density (Ne)	
DNEL Error in Log10(Ne in m-3)	
DPOPL Error in Log10(uncorrected electron density)	
DTE Error in Electron temperature (Te)	
DTI Error in Ion temperature (Ti)	
DTR Error in Temperature ratio (Te/Ti)	
DVO Error in Line of sight ion velocity (pos = away)	
FOF2 F2 critical freq	
HMAX_MODEL ISR-based empirical model of HMAX	
NE Electron density (Ne)	
NEL Log10(Ne in m-3)	
NEL_MODEL ISR-based empirical model of elec den	
NEL_MODELDIFF Diff measured-model log elec den NE MODEL ISR-based empirical model of elec den	Ground data loader
NE_MODEL ISR-based empirical model of elec den	Madrigal : NE Electron density (Ne)
NMAX_MODEL ISR-based empirical model of NMAX	
	Starting GroundData loader
Filters	
Refresh Scene Center Scene	
tree timerange ✓ body ✓ instruments	
	Add selected data to 3Dscene
	Aud Selected utila to SDSCelle

We get, on the 3D view, a coloured line that represents colour-coded Ne values along the radar beam.



Let us now add a Swarm data file. The attached file is from the Langmuir probe on Swarm A. We can upload it in *Science* and *Load data*

3DView 2.0 Tutorial



We select the file format (here .cdf) and choose one of the physical parameters contained in the file. Let us choose the electron density n.

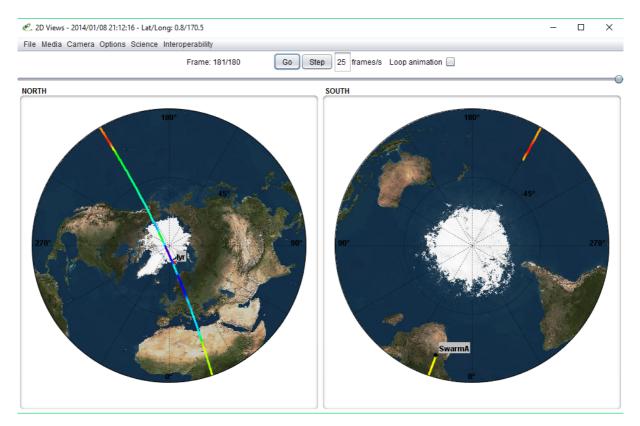
This data file can be downloaded from: https://nuage.irap.omp.eu/index.php/s/2L00mv4F3nsU6bq

3DView 2.0 Tutorial

R. Load science data from file	x
Spacecraft SwarmA Format CDF Browse	
File preview	
08-Jan-2014 00:00:00.197 31.110596648247903 158.11154106577527 499.03157825615506 6871.492529276768 57.9516773208412 -25.814886120179747 10.432879013191194 24.237336911959858 -131.2148879852216 27.667311721633723 10.558176550864715 28.61700481013494 -131.22137765100587 175362.484375 2921.0091605782275 2864.0535140758307 2854.0535140758307 -1.8863739967346191 - 1.642826131118774 - 1.6428362131118774 4194305 08-Jan-2014 00:00:00.696 31.142345318964956 158.11129450329918 499.03771541698063 6871.488217342288 57.979576440852256 -25.804407678312852 10.433001145795462 24.26877853267365 -131.2161594548474 27.694364745007988 10.558250312802215 28.643105048800225 -131.2224933260955 174502.453124 10754565 1341294303 2698.8017125876995 2698.8017125876995 -1.8766520023345947 -1.6528210639953613 -1.6528210639953613 4194305 08-Jan-2014 00:00:01.197 31.17422108238975 158.11104791907715 499.0438821599088 6871.48388289173 58.00758926148927 -25.793896540654885 10.433123823391608 24.300347301287843 -131.21743920897643 27.72153371412628 10.558324370383758 28.66941085156468 -131.2236225710518 174625.8125 2815.157907535393 2771.441440495439 2771.441440495439 -1.8789728879928589 -1.6365805864334106 -1.6365805864334106 4194305 08-Jan-2014 00:00:01.696 31.20596935129315 158.1100830847334 499.0500319447918 6871.4795767700025 58.03549314000737 -25.783441662439596 10.43324612830854 24.33171777302442 -131.21871838373772 27.748605772839255 10.558398132221258 28.695580114194996 -131.22473980181877 175769.953125 2879.393854840656 2815.1437280253394 2815.1437280253394 -1.88542902469633 -1.6517398357391357 -1.6517398357391357 4194305 08-Jan-2014 00:00:21.97 31.2784471014742 158.110559682551 499.05502154 2871.475248313136 58.06351073076841 -25.772954156122758 10.433368979058072 24.3633637884094 -131.21999967955753 27.775794605086844 10.558472377776638 28.72186339744764 -131.2256060735964 174594.984375 2940.56996752718672903.9622769114853 2903.9622769114853 -1.883424243434372 - 16487711065319519 4194305	
Skip rows: Select column(s) to load: AACGMLat AACGMLon Load selected data Close Te_hgn	

The electron density is added along Swarm A orbit:

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Frame: 492/515 Go Step 25 frame/s Loop animation 📃			
lyr			
Scalar SwarmA ne_swarma_for_3dview		×	
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AVG_STDDEV_MAX 7 AVG_STDDEV_MIN 7	-4.0 cm-3	76	5
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Frame = GSE Animated : ✓ Display : ✓ Log mode : ✓ Center = Earth Start = 2014/01/08 20:15:00 Stop = 2014/01/08 21:15:00	m	-7.41 ⊦3	



This can be viewed in 2D (*Camera* and *2DView*):

Step 6: generating a figure or a movie

For the need of a publication or a presentation, one may want to generate a picture or a movie of the scene. To these ends, in the *Media* tab, one have the choice.

Generate movie

Movie generatio	n	\times
Frame start:	1 Frame stop: 515	
Frame rate:	25 Movie length: 20 s.	
Quality:	Medium	
File name:	Browse	
	Generate Cancel	

Please be aware that the movie will actually start where you are in the view. If you want a movie from start time to end time, then you need to position the time cursor at the beginning of the time interval or set *Frame start* at 1 in the *Movie generation* window.