



# Version 2.3







**Revision History** 

Version	Date	Released by	Detail
1.7	June 26 <sup>th</sup> 2015	Michel Gangloff (IRAP)	Initial version
1.11	October 6 <sup>th</sup> 2016	Michel Gangloff (IRAP)	CDPP version including EuroPlaNet H2020
2.0	January 3 <sup>rd</sup> 2018	Michel Gangloff (IRAP)	Addition of Conjunction Search Tool
2.1	December 2 <sup>nd</sup> 2021	Laurent Beigbeder (INETUM) Dominica LEUNG (CNES)	Updating 3DView application screenshots Updating §3.5.4.8 View ground station Adding §3.5.1.5 Add 3D dataset from file Adding §3.5.1.7 Add user spherical simulation
			Removing §3.5.4.11 Toggle objects Adding §3.5.5.11 Scene controls
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2.3	June 6 <sup>th</sup> 2024	Laurent BEIGBEDER(AKKODIS)	Added §3: How to launch 3DView

Note: Any notes here.

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# **1 INTRODUCTION**

3DView offers 3D visualization of position and orientation of spacecraft and planetary ephemerides.

# **2 PREREQUISITES**

Java Runtime Environment version 1.8 or later, available at http://www.java.com

3DView is provided as a **Java Web Start** application. Java Web Start is a framework provided by Oracle that allows users to start application software for the Java Platform directly from the Internet using a web browser.

# **3** How to launch **3D** view on different operating systems

When it was launched, 3DView could be easily launch from a navigator. But as security increased and java client popularity decreased, launching 3dView became more and more complicatedly

This page tries to list the easier way to launch it on most common platforms.

# 3.1 Windows 10/11 - Firefox

You need JRE (Java Runtime Environment) 1.8 to launch 3DView. You can download from https://www.java.com/. When you click on the "Launch 3dview" button, the jnlp file is downloaded.

Then click on the downloaded jnlp file to launch application.



# 3.2 Ubuntu 22 - Firefox

On ubuntu, you need to install the JNLP launcher Icedtea with  $\verb"sudo"$  apt <code>install</code> icedtea-netx

```
Then, download the jnlp file with Firefox by clicking on the button "Launch 3dview".
Then, in a terminal, go the downloaded file folder and launch javaws
launch3dview.jnlp
```

# 3.3 Fedora 39 - Firefox

On Fedora, you need to install the JNLP launcher  $Icedtea\,$  with sudo  $\,$  yum install icedtea-web

Clicking on the button "Launch 3dview" should launch the application. If not, in a terminal, go the the downloaded file folder and launch javaws launch3dview.jnlp

# 3.4 Mac OSX 10 - Safari

You need to install JRE (Java Runtime Environment) 1.8 to launch 3DView. You can download from https://www.java.com/. When you click on the "Launch 3dview" button, the jnlp file is downloaded.

Then click the download icon



and then simultaneously hit CTRL key and click on the downloaded file:



# 4 USE 3DVIEW

3DView is available at the following address:

http://3dview.cdpp.eu

		<b>Oirap</b>				
Posteries: A consequences and end of the set of the se	XOnes a a scence har har des increades to resolution of spaces of profiles and effects places and as a scenthic data scenario, service and as a scenario, but hard effects and					
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	eur@planet					
	Introduced 2019 first and an end of the second seco					
	molecular united					

Click the **Launch 3DView** button to start. A Java application is started using "Java Web Start" technology. This means that a file named launch3dview.jnlp is downloaded. You must execute this file to start 3Dview.

# 4.1 LAUNCH

When launch3dview.jnlp is executed the desktop bar is displayed.

C 3DView CDPP desktop bar	_	×
File Windows Help		

# 4.2 Desktop Bar

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

Select:

- **New** to open a new 3D scene
- Conjunction Search Tool to search conjunctions between instruments
- **Open all** to open a set of 3D scenes previously saved in a local file
- Save all to save the current scenes in a local file
- Exit to stop 3DView

# 3DView 2.3 user guide



Select **Properties** to change the frame's colour of displayed scenes.





Animation is used to animate several scenes at the same time.

	3DView so	cenes animatio	on		×
	Fram	ie/s 25	Go Step Step	-1 se	с
	0		-		_
	Scene 1		0	- 0 s	;
	Scene 2		0	0 s	;
		(	Apply OK Cancel		
DVie	w CDPP de	esktop bar		_	
Win	idows Hel	p			

Select **About** to display the current version details.

Select **Commands** to display the list of navigation commands, using the mouse and keyboard.

# 4.3 Conjunction Search

#### 4.3.1 Conjunction search window

This menu opens a window allowing the search of favorable conjunctions between up to three instruments. These conjunctions may then be used in a 3D scene.

🐔 Conjunction Search Tool	_		×
Conjunction search Result			
Pick the facilities to conjugate			_
✓       valbard IS Radar Longyearbyen(lyr) ▼ ✓ NH SH         ✓       SwarmA(SwA)         ✓       ✓ NH SH         ✓       ✓ NH SH         ✓       ✓ NH SH	Same o	only te only	
Pick the time period           Start time         2014/01/01 00:00:00          Lock time           Stop time         2014/01/15 00:00:00          Duration:         14	day 🔻		
Pick the region			
Pick the quality factors			
Minimum duration:     minute     Exclusive       Max distance from the region center:     km     Inclusive	▼ ▼		
Search Abort Save	e Load	Rese	et

The conjunction search window is divided into four parts:

# • Pick the facility to conjugate

Up to three instruments. *All* means search all instruments, but limited to 24 hours and to a specific region of the magnetosphere

- **Pick the time period** Freeze may be used to cancel the automatic adjustment to the common operation time of the selected instruments.
- **Pick the region** Opens a new window to select the region to search
- **Pick the quality factors** Minimum duration of the conjunction and maximum distance from the centre of the searched region

# 4.3.2 CST 2DView window

The **Visualization interface type – 2D View** button opens the following window in which the region may be picked up.



# 4.3.3 Result window

C. (	Conjunction Search Tool				— C	; ב	×		
Co	Conjunction search Result								
					🗹 Sel	ect All/N	one		
Id	Time	Flag	Durati	Distanc	Facilit	Select	T		
1	2014/01/01 20:06:59 - 2014/01/01 20:10:00	high	3	0	2	<b>v</b>			
2	2014/01/01 21:42:00 - 2014/01/01 21:45:00	high	3	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 19:49:00	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	$\checkmark$			
18	2014/01/06 23:04:59 - 2014/01/06 23:07:59	high	3	0	2	$\checkmark$			
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	$\checkmark$			
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	201 4/04/00 00:40:00 004 4/04/00 (0:48:59	hiah	3	0	2	$\checkmark$			
24	201 Plot to Current s	cene	3	0	2	$\checkmark$			
25	201 Download ephemeris  New sce	<b>n</b> 0	3	0	2	$\checkmark$			
26	2014010921.39.39-201401092		3	0	2	$\checkmark$	1		
27	2014/01/09 23:35:00 - 2014/01/09 23:37:59	high	3	0	2	$\checkmark$	V		
	Save Results Load Results	Export Tin	neTable	Interope	erability				

From the *Result* window, right click on a conjunction to :

- plot conjuntion in the current scene or a new one, *or*
- download ephemeris in XML or ASCII

*Interoperability* may be used to open a SAMP HUB and send results to the HUB.

Results may be saved for further load or exported as Time table.

# 4.4 3D WINDOW

# 4.4.1 Main view

A 3D window is composed of 5 parts:

- Menu,
- Animation control
- 3D scene,
- Information panel
- Control box

# 3DView 2.3 user guide



#### 4.4.2 Menu bar

The Menu bar provides access to advanced features: change display settings, display models, save images, access and display data...

# 4.4.3 Animation control

You can **start or stop the animation** via the button Go / Stop.

The **Step** button allows to advance step by step.

The number of frames defines the animation speed (it can be modified to change the speed).

It is also possible to play the animation by changing the cursor position directly with the mouse.

Loop animation allows to automatically and indefinitely restart the animation.

#### 4.4.4 3D scene

The 3D scene is the main view of the application. It shows bodies selected in selection page and all other items added from menus (models, instrument views, ground traces, data...).

You can navigate through the 3D scene using mouse and keyboard.

To **rotate 3D scene** around its center, click with the left mouse button and drag. To **zoom in and zoom out** (or forward and backward), use left button and Shift key on the keyboard. The mouse wheel can also be used for this purpose. To **move** left or right, use the left button and the Ctrl key. Finally, to "**look around**", use right mouse button and drag.

# 4.4.5 Information panel

The information panel is divided into two parts. On the left side, static information is displayed (coordinate systems, time range...). The right side is reserved for real-time display of distances or time shifts.

# 4.5 Menu Bar

File Media Camera Options Science Interoperability

# 4.5.1 File

4.5.1.1 **Open file** 

This option opens a scene that was previously saved

# 4.5.1.2 Save file

This option saves the current scene.

# 4.5.1.3 Manage scene

This option opens a dialog box, which allows the selection of attributes of the 3D scene that will be displayed:

- Time interval
- Coordinate System
- Time step
- Center body
- Spacecraft
- Natural Body
- Time shift

# 3DView 2.3 user guide

top time 201	8/01/02 10:00:00	Ot	1010	essende	Ctore	No ator	
op une 201	8/01/03 10:00:00	) 50	1212	seconds	Stars	INO STAF	_
Spacecraft G	Ground based facilities N	atural bodies Smal	Ibodies				
ailable space	craft						
Spacecraft	Range		Kernel list	Time	shift	Select	
Akebono	2012-08-30T09:36:0	0 - 2017-05-26T23:50	5:00 see full l	ist )	set		
Alouette1	1965-01-01T00:20:0	0 - 1972-09-25T00:00	0:00 see full li	ist )	set		
Alouette2	1966-01-27T00:10:0	0 - 1975-07-31T00:00	0:00 see full l	ist 🗆 💷	set		
MPTE-CCE	1984-08-16T16:15:0	0 - 1989-07-31T23:55	5:00 see full li	ist 🗆	set		
MPTE/RM	1984-09-12T00:12:0	0 - 1986-08-30T08:00	0:00 see full l	ist C	set		
RASE	2016-12-20T00:10:0	0 - 2021-12-12T00:00	0:00 see full li	ist 🗆 💷	set	) 🔲	
Aureol-3	1981-09-21T13:00:0	0 - 1986-12-17T20:00	0:00 see full l	ist 🗆	set		
BepiColombo	2018-10-19T02:04:2	5 - 2025-12-19T18:3	1:00 see full li	ist 🗆 💷	set		
Cassini	1997-10-15T09:34:3	9 - 2017-09-15T10:5	3:52 see full l	ist )	set		
Cassiope	2013-10-07T00:15:0	0 - 2017-04-22T00:00	0:00 see full I	ist 🗌 💷	set		
CHAMP	2000-11-09T00:10:0	0 - 2010-10-10T00:00	0:00 see full li	ist )	set		
Chandra (CXC	) 1999-08-07T07:31:0	4 - 2019-09-02T12:0	1:09 see full I	ist 🗌 💷	set		
Chandrayaan-	1 2008-10-22T01:10:1	9 - 2010-12-26T00:00	):21 eee full l	ist_)	set		
CLUSTER1	2000-08-22T00:18:3	0 - 2022-01-01T00:0	2:30 🛛 see full l	ist 🗆 🚞	set	<b>v</b>	2
CILIQTER?	2000-08-22T00-18-3	0 - 2022-01-01700-0	-20 Ceas full I	iet )(	cat		
lected kernel	s		·				
SC	File name	Туре	Range			Modify k	ernel
	chustert 20211121 02	ORBIT	2000/08/22 00:18	30-2022/01	01 00:02:3	30 Cli	ck

#### 4.5.1.4 Add user object from orbit

This option is used to upload to the scene, the trajectory of a body, defined in a file (VOTable format).

It is possible to browse the local disk directory, or to give the URL of a remote file.

# 4.5.1.5 Add 3D dataset from file

This option can be used to display scatter plot from a 3D dataset file. The control box allows changing the plot shape, colour and size.





# 4.5.1.6 Add user field line from file

This option is used to add outputs from a field lines generator in the heliosphere contained in a local file. Each file contains only one field line with point position, field value, and optional parameters. The format is described below:

R(R\_SUN) Theta(rad) Phi(rad) Br(G) Btheta(G) Bphi(G)

It is possible to plot a quantity along this line, typically the velocity.

#### 4.5.1.7 Add user spherical simulation

This option can be used to add user spherical simulation to the 3D scene.

	Add user spherical simulation ×	
	Browse	
	Parameter	
	Add to scene Close	
C. Ouvrir		×
Rechercher <u>d</u> ans	: 📾 wso_CR1888_cube_CDPP_REDMINE_14	
wso_CR188	85_cube_CDPP_REDMINE_14.bt	
Nom du fichier :	wso_CR1888_cube_CDPP_REDMINE_14.bt	
<u>Type</u> de fichier :	Tous les fichiers	<b>•</b>
		Ouvrir Annuler
	Add user spherical simulation X	
	WS0_CR1888_CUDe_CDPP_REDM	
	Parameter Voar	
	Parameter Vpar	
	Parameter Vpar	

#### 4.5.1.8 Add Earth spacecraft from TLE file

This option is used to add a spacecraft to the scene from a local file. This file must be in ASCII and compatible with the TLE format. See below an example:

```
NOAA 14
1 23455U 94089A 97320.90946019 .00000140 00000-0 10191-3 0 2621
2 23455 99.0090 272.6745 0008546 223.1686 136.8816 14.11711747148495
```

#### 4.5.1.9 Add attitude to object from file

This option is used to add attitude data from a local file to a spacecraft of the scene. The format may be VOTable or ASCII. The file may contain:

- matrices (Time,xx,xy,xz,yx,yy,yz,zx,zy,zz) or
- quaternions (Time,x,y,z,w).

# 4.5.1.10 Add instrument FOV to object from file

This option is used to add several instruments with data related to the Field of View from a local file. The file must contain lines with the following format: Vx,Vy,Vz, angle plein, commentaire. Example of line: 1 ;0 ;0 ;90 ;X axis 90°

#### 4.5.1.11 Save orbits and trajectories

This option saves orbit and attitude of spacecraft and planets in an ASCII file.

#### 4.5.1.12 **Exit**

This option closes the 3D scene.

#### 4.5.2 Media

This menu is dedicated to the generation of images and movies.

#### 4.5.2.1 Save image

**Save image** takes a snapshot of displayed 3D scene as an image in PNG format. The image is saved as displayed on the screen.

# 4.5.2.2 Save high res image

**Save high res image** takes a snapshot of displayed 3D scene as an image in PNG format. This option generates an image three times bigger or three times more accurate.

*NB*: Different graphics cards have a maximum size limit:

- Intel: 1024x1024
- ATI: 2048x2048
- NVidia: 4096x4096

If any of these manufacturers is detected, the limit of 1024 is used. This limit also applies to movies.

If the limit is reached, the application will reduce the size factor to reach the largest possible picture on the basis of capacity of the card.

#### 4.5.2.3 Generate movie

**Generate movie** is used to record all or part of the animation.

Movie generati	on X				
Frame start:	41 Frame stop: 500				
Frame rate:	25 Movie length: 18 s.				
Quality:	Medium				
File name:	Browse				
Generate Cancel					

Frame start and **Frame stop** define the range of the animation to be generated.

**Frame rate** is the number of images per second during the movie (one image = one frame). The lower the frame rate is, the longer the movie is, but below 10 fps, the film will look jerky. Go beyond 25 is unnecessary because the eye does not see the difference. **Movie length** is the length of the generated movie, depending on frame start / stop / rate.

"**Quality**" is used to adjust the movie size:

- *Good*: 2 times the screen size
- *Medium*: screen size
- *Poor*: 0.5 times the screen size

Click on **Browse** to select the file in which the movie will be saved, then start the recording with **Generate**.

Warning: the generation of a movie may take some time and a lot of memory if a large time range and good image quality are selected.

#### 4.5.3 Camera

3D view menu allows changing the view of the 3D scene. *Two options* allow viewing the planes for the selected coordinates system:

- View the planes
- Set the camera perpendicular to the plane to be viewed.

#### 4.5.3.1 XY View (reset view)

Sets the camera in front of the XY plane.

#### 4.5.3.2 **ZY View**

Sets the camera in front of the ZY plane.

#### 4.5.3.3 XZ View

Sets the camera in front of the ZX plane.

4.5.3.4 Chase camera

Sets the camera which follows an object.

# 4.5.3.5 **2DView**

The menu opens a 2DView window. This window is associated to the 3D scene, with a similar menu, but with some differences in *Camera* and *Science*.

# 4.5.3.5.1 Camera

In this menu, users can choose the Projection Type, Coordinate System, and Limits. According to the source of the data and regions of interest, cylindrical or pseudocylindrical **projections** are proposed (for a global 2D view of the planet and visualization of data at middle and low latitudes. Polar projections are proposed for high latitudes.

The following projections are proposed:

- Cylindrical (Mercator)
- Pseudo cylindrical(Mollweide)
- Azimuthal Polar North
- Azimuthal Polar South
- Azimuthal Polar South/North

# Four **coordinate systems** are available:

- Geographic
- Quasi-dipole
- APEX
- AACGM

**Limits** allows the selection of a region (latitude, longitude) on a planet.

# 4.5.3.5.2 Science

The science menu in the 2DView window is similar to the 3D Science Menu with three additions:

# • Satellite tracks

Multiple ways: *radial* to the center of the Earth or *along the magnetic field lines*, with several magnetic field models (Tsyganenko 96, 02, 05)

# • Interhemispheric mode

Find the magnetic conjugate from every position pointed by the mouse

# 4.5.4 Options

# 4.5.4.1 Preferences

This menu allows changing some display options.

	Preferences ×
	Scene
Coone diaplay change	Display axes 🔲 Ticks number 🛶
Scene display change	Ambiant light — Reverse colors 🗌
	Antialiasing
	Center body Mars
Center body display change	Name 🗹 Shape 💿 Planet 🔿 Model
	Display axes 🗌 Long & Lat None 🔽
	Shadow cone Size Reset
	Bodies
Bodies display change	Body All  Properties
	Name 🗹 Size Reset
	0 100 200 300 400 Axes ☑ Length
	Trajectory
Trajectories display change	Display Progressive Thickness
	Antialiasing 🗹 Transparency 🔶 Length ————————————————————————————————————
	Close

# 4.5.4.1.1 Trajectory display

Thickness and display mode of bodies' trajectory may be changed. Three display modes are available:

*Full*: all trajectories are shown completely independently of the state of the animation *Progressive*: trajectories of natural bodies (planets and satellites) are fully displayed while spacecraft are shown as the progression of the animation *None*: no trajectory is shown.

#### 4.5.4.1.2 Bodies display

In this part, the interface allows:

- *Displaying* or not the names of bodies,

- *Modifying* the size of the spacecraft. This is useful to adapt spacecraft size to display after a zoom.

# 4.5.4.1.3 Central body display

The central body is always a natural body (planet, satellite, asteroid...) Several options are available to change the display of the central body: **Body shape**: to choose a sphere (Planet) or a 3D model (Model) to represent the body (only available for asteroids).



**Display axes**: displays the axes X, Y, Z on central body

**Body size**: changes the size of the central body. This is useful when flying over an asteroid, for example, where the difference between asteroid size and the fly-by distance does not allow to clearly distinguishing the two objects in the same scene. **Long & Lat**: Displays a grid representing the longitudes and latitudes.

**g & Lat**: Displays a grid representing the longitudes and latitudes

Normal and Precise modes



# 4.5.4.2 XYZ planes



**XYZ planes** can be displayed as a shape of grids, points or translucent plans.

To view planes, check the boxes. Clicking on it can change the colour. The selection box allows selecting the plane display mode:

Points (POINT)



Matrix (LINE)



Translucent plane (FILL)



The width of the grid corresponds to the display unit (radius earth, Mars, astronomical unit...)

# 4.5.4.3 Distance between 2 objects

#### 4.5.4.3.1 Show distance

This option is used to define a distance between two objects.

🕙 Distance definition		×
Object 1	Object 2	ОК
Venus	VEX	Cancel

Selecting **Show distances** provides a link between the objects in the 3D scene. The distance value is displayed on the right side of the information panel.



# 4.5.4.3.2 2DPlot

This option may be used to plot the evolution of the distance. The first launch may last a little due to 2D package loading.



#### 4.5.4.4 Show angles

#### 4.5.4.4.1 Angle definition

This menu allows users to see an angle between one direction (referred to an instrument) and a body. This allows for example to get the angle between the sun and the bore sight of a camera.

	Angle definition	×	
Spacecraft	Object:	VEX	
	1st direction		
	0.5.1	X 0	Boresight
	• Fixed	Y 0 Z 1	
	O Pointing	Venus	Object to point at
	2nd direction		
Second object to point at	Vanua		
	Venus		
	ОК	Cancel	

Result in the 3D scene:



#### 4.5.4.4.2 2DPlot

This option displays angle values as a function of time.



#### 4.5.4.5 Show instrument FOV

This menu allows users to simulate an instrument view. It may be useful to simulate a camera or a detector. It is possible to run several times this function to simulate different instruments simultaneously.

The configuration window appears:

	View instrument FOV X	
Spacecraft choice	Spacecraft VEX VMC_NIR-1	Instrument choice
	X/Y full FOV Angles (deg) 19.045 / 19.375 Direction type	
Direction type	Fixed on attitude X 0.231 Y 0.184 Z 2.997	
	Pointing a target     Venus     Venus     Representation type	
	Cine O Cone Cone	Display parameters
Representation type	Cone/line length  Fixed  Fixed  Adapted on  Venus  Venus  Venus  Venus  Venus  Venus  Venus  Venus  Venus Ve	
	View simulation window  New view VEX VMC_NIR-1	Show simulation in a separate view
	O Set view in main window Reset View Add Close	

#### 4.5.4.5.1 Spacecraft and instrument choice

The list allows choosing a body among those displayed in the 3D scene and the instrument for which the field of view is displayed.

#### 4.5.4.5.2 Direction type

The type allows choosing between a **fixed direction** in the spacecraft coordinate system or a **target to point at**.

The first option allows simulating an instrument while attitude data is available. You must enter the direction vector relative to spacecraft coordinate system. It is not necessarily normalized.

With the second option, you can choose to point instrument direction to an object in the scene. The right ascension / declination of the direction in EMEJ2000 will be displayed if the simulation is displayed in a separate view (New View).

Depending on the instrument you choose, the direction type is set by default.

#### 4.5.4.5.3 Representation type

Three types of representation are available:

- Cone
- Line
- Tetra

The first option allows representing an instrument bore sight with a cone such as a camera:



The second one draws a line in the axis of the entered vector.



The third option allows representing an instrument bore sight with a tetra such as a camera:



The third is different from the previous ones: it places the user in place of the instrument so that he sees on the screen what the instrument sees. The view is centered on the spacecraft and follows the orbit and attitude. The navigation functions remain active but, except the zoom, any movement will loose the direction defined at the outset. To return to the starting view, select the menu **Camera/ZY view**.

# 4.5.4.5.4 Cone/line length

The length of lines, cones and tetra can be set to "Fixed" or "Adapted on".

<u>Fixed</u> A slider allows changing the length of lines, cones and tetra:

# Adapted on

The length of the lines, cones and tetra is adapted to the object selected in the adjacent drop down list.

the colour of the line or cone is editable by clicking on the coloured area.

# 4.5.4.5.5 Simulation view in separate window

To represent the instrument view by a cone and simulate at the same time the view of the instrument in a separate window, select **New view** in the "View simulation window" panel. A text box allows naming this window in addition to the information already recorded in the title.



Closing the window automatically removes the cone in the main window.

# 4.5.4.6 View Positions

Used to display the position of the bodies selected in the scene. For example:

C Position in frame GSE X					
Coord. Cartesian Vinit R_E V 2DPlot					
Current Time : 2011-09-26T08:00:00					
Earth : 0.000000 / 0.000000 / 0.000000					
Sun : 23519.122866 / -0.000000 / -0.057666					
CLUSTER1:-9.954212/8.632841/-5.893296					

# 4.5.4.7 Show ground traces

Used to display the ground trace of a spacecraft on the central body.

Zy-	Ground trace MEX	×
zy	Display     Width     1     0     25     50     75     100     km	
Time: 2008/11/28 21:36:36 Frame = MSO Center = Mars Start = 2008/11/26 08:00:00 Stop = 2008/12/03 08:00:00	Distances ( Rm = Mars radius = 3396.190km )	

The maximum generation altitude of the ground trace allows generating the ground trace only once the distance between the spacecraft and central body surface is below this limit.

# 4.5.4.8 Show ground stations

When the central body is the Earth and a spacecraft in scene has ground stations defined (e.g., THEMIS-A), this menu allows visualizing the location of ground stations and their zone of influence.

Ground stations setting	×				
Ground stations: Display all Display ADS & LOS	•				
Properties					
Name:					
Visibility angle: 60 Degrees					
Cone length: O					
Longitude: Degrees					
Latitude: Degrees					
Color:					
Update properties					
Close					

To view a ground station:

- 1. Choose the desired station among those proposed,
- 2. Activate the display in the 3D scene,
- 3. Modify the properties (only the angle of the cone of vision, its length and its colour can be modified),
- 4. Validate changes: "Update properties". These changes will not be retained after a restart of the application.



# 4.5.4.9 Show ground labels

This menu allows setting labels on a body. Select Options>View ground labels



# 4.5.4.10 Show Angular momenta/Velocities

This menu allows displaying Angular momenta and/or velocities of a Spacecraft on its trajectory or as time series in a 2D plot. Select Options>View Angular momenta/Velocities

#### 3DView 2.3 user guide



#### 4.5.5 Science

#### 4.5.5.1 Remote data (IMPEx)

This option is used to display the following dialog box, which allows the selection of data, from databases of simulations or observations, implementing the IMPEx protocol. The hierarchy of data displayed in the dialog box corresponds to the Body and Time selection chosen previously in the **Manage scene** dialog box.

Y → Model data     Addle data     Addle data     Addle data     Addle data     Addle data     Constructional datatataataataataataataataataataata	Console	
Filters Refresh tree Scene timerange ✓ Center body ✓ Scene spacecraft ✓	Add selected data to 3Dscene	

Figure 1 All filters ON

C. IMPEx parameters selection - Scene 9			-	×
🔻 🚞 Model data	11	Console		
► 🗩 @LATMOS				_
▶ 🔐 @SINP				
▶ 🛞 @FMI				
► C. @3DVIEW				
▶				
🕈 📄 Observational data				
▶ 💁 @AMDA				
► 💼 @CDAWeb				
▶ . @AMDA				
► 💼 @CDAWeb				
▶ 🔍 @AMDA				
► 💼 @CDAWeb				
► 💼 @CSA	0			
► 🗐 @CSA	U.			
E CSA				
🖷 Timetables				
► ∞_ @AMDA				
▶ R. @AMDA				
► CLWeb				
▶ m @CLWeb				
► C @AMDA				
P CLWeb				
Filters				
Refresh Querter Country				
tree timerance body spacecraft				
Currerange Cooly Spacecrait		Add colorted data to 2Dec		_
	/111	Add selected data to 3Dsc	ene	

Figure 2 All filters OFF

Three filters may be used to modify the displayed hierarchy :

- **Scene timerange** to extend the selection outside the scene time range. A link to a new database is displayed.
- **Center body** to extend the selection to all bodies. A link to a new database is displayed.
- **Scene spacecraft** to extend the selection to all spacecraft. A link to a new database is displayed.

Add selected data to 3Dscene is used to display the selected data in the 3Dscene.

# 4.5.5.2 Remote data (VESPA)

This option is used to search for data provided through VESPA.

. Data discover	ry with EPN+TAP			12	- 2.5					- 0
Target name	Saturn	Start time	2005/010	00.00.00						nb rows/page
Product type	AL	Stop time	2005/02/	03 09:00:00	Selec	tregion	Search	. Je		Page
Ser	vices	Туре	Target	Time min	Time max	Access Format	Granule uid	Size (ko)	Access URL	Thumbnail
Resul Clims Resul dynat	0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	imageMap	Saturn	2005/01/27 04_	2006/01/27 04	image(peg	2939	46	http://pvol2.ehu	۲
Resul scopk Resul pvol	ns D onet ns D	ImageMap	Satum	2005/01/28 14_	2005/01/28 14	image(peg	6850	52	http://pvol2.ehu.	
Result Note Note	8 39 r 4: 0									
Repui Repui	15. U 15. U	ImageMap	Saturn	2006/01/28 15	2006/01/28 15	Image(peg	6861	36	http://pvol2.enu	

# 4.5.5.3 Remote ground instrument data

This menu is similar to the *Remote Data (IMPEx)* menu, for ground instruments.

T 🚔 @lonoTool	Console
ISRadar	1
* 📺 Ionosonde	1
ULowell Digisonde MLH Radar(uld)	
Sondre Stromfjord Digisonde(ssd)	
Sodankylä lonosonde (SO166)(sdi)	
Qaanaaq Digisonde ST/MEDAC Radars(qad)	
EISCAT Tromsø Dynasonde(trd)	
EISCAT Svalbard Dynasonde(Ird)	
IRF Dynasonde at EISCAT site Kiruna(krd)	
Imager	0
HFRadar	
Magnetometer	
Filters	
Refresh Scene Center Scene	
tree timerange body spacecraft	
	Add selected data to 3Dscene

# 4.5.5.4 *Models*

For some central bodies (Earth, Mars and Venus for the moment), static physical models are available. Here is the list of implemented models.



4.5.5.4.1 Earth models



For all models except the South Atlantic anomaly, it is possible to choose the colour. For each radiation belt, it is possible to select different display modes (point (POINT), wired (LINE) and full (FILL)) and cutting (no cutting,  $\frac{1}{2}$ ,  $\frac{1}{4}$ ,  $\frac{3}{4}$ ). Here are some examples showing different models:



South atlantic anomaly



#### 4.5.5.4.2 Mars and Venus models

For Venus and Mars, only bow shock is available. Bow shock on Mars and Venus



#### 4.5.5.4.3 Parker spiral

Three options are provided to display the Parker Spiral

• Free (Yellow): displays a set of lines

Parker spiral control		×
Display 🗹		
Solar Wind speed (km/s)	100 350 600 850 1100	
R_source (solar radii)	0 5 10 15 20 25 30	
Longitude line number	1 1 1 1 1 1 1 1 1 1 1 0 25 50	
Latitude line number	0 5 10 15 20	
Line width	0 10 20 30	
Max. range (0.1 AU)	0 100 200 300 400 500	

- Fixed point (Brown): displays one line depending on one point defined by the user
- Follow scene object (Blue): displays one line depending on the trajectory of a spacecraft

Parker spiral control - (20, 20, 20	) AU X	]	Parker spiral control - ULYSSES	Parker spiral control - ULYSSES
Display 🗹			Display 🗹	Display 🗹
Solar Wind speed (km/s)	100 350 600 850 1100		Solar Wind speed (km/s)	Solar Wind speed (km/s)
R_source (0.1 solar radii)	0 50 100 150 200 250 300		R_source (0.1 solar radii)	R_source (0.1 solar radii) 0 50 100 150 200 29
Line width	0 10 20 30		Line width	Line width
Max. range (0.1 AU)	0 100 200 300 400 500		Max. range (0.1 AU)	Max. range (0.1 AU)



#### 4.5.5.5 *Time Tables*

#### 4.5.5.5.1 Create from scene

The generation of Time Tables from a 3DView scene is made by selecting time intervals on the time bar in the following way:

1) Open the selection interface



2) Put the cursor at the starting point of the interval on the time bar.

File Media Camera Options Science Interoper	rability
Frame: 105/500 < Step	Go Step > 25 frame/s Loop animation
Time table generation Start 2014-05-15T02:00:48 Stop No Stop time	Add time range
Start	Stop
Generate Tim           Time: 2014/05/15 02:00:48         Distances ( #           Frame = GSE         Center = Earth           Start = 2014/05/13 15:00:00         Stop = 2014/05/20 15:00:00	eTable Cancel Re = Earth radius = 6378.140km )

- 3) Add the start time with the START button.
- 4) Put the cursor at the ending point of the interval on the time bar. Add the stop time with a button of the selection.

Frame: 301/500	< Step Go	Step > 25 frame/s Lo	op animation
Time table generation Start 2014-05-15700 Stop 2014-05-17720	2:00:48	Add time ran	ye
Start	Stop		
	Generate TimeTable	Cancel	
Time: 2014/05/17 20:00:00 Frame = GSE Center = Earth Start = 2014/05/13 15:00:00 Stop = 2014/05/20 15:00:00	Distances ( Re = Earth	n radius = 6378.140km )	

6) Addition of a new interval in the same way as 2)7) Or stop and generate the Time Table.

File Media Camera Options Scie	ance Interoperability	
Frame: 301/500	< Step Go Step > 25 frame/s	Loop animation
Time table generation		×
Start 2014-05-15T02.0 Stop 2014-05-17T20.0	10:48 Add time	range
Start	Stop	
	Generate TimeTable Cancel	
Time: 2014/05/17 20:00:00 Frame = GSE Center = Earth Start = 2014/05/13 15:00:00 Stop = 2014/05/20 15:00:00	Distances ( Re = Earth radius = 6378.140km )	

8) Select a directory and enter a file name, which will be created with a ".xml" extension

Rechercher <u>d</u> ans : <b>C</b> Documents	
about Stacks.lpdf	📄 CU CDPP 2015
📄 Avocat	Doc_val_Draft_1.6
BOURSE	葿 Données utilisateurs Microsoft
Christine Perez_files	EPNResources
COMMUN_3DView	GD1_GANGLOFF_Otto
Nom du fichier :	
Type de fichier : XML files	•
	Enregi <u>s</u> trer Annuler

# 4.5.5.5.2 Upload and display along S/C trajectory

Users can upload Time Tables in 3DView. Corresponding data are attached to a spacecraft of the scene.

Time Table upload	I	×
Scene body traj	jectory to be plot on: CLUSTER1	
File location		
URL 🖲		
Local 🔾	Browse	
	Load Cancel	

# 4.5.5.6 Load Map

This option allows displaying a projected map from a list on the 3DView server or from the users' disk.

Add projection map X
Body: Mars
Choose a map from those available on server
Crustal Morsc 🔹 Morschhauser map at 180km
O Auroral images from APIS
Show maps
O Load a map file (Equirectangular projection)
URL O
Local  Browse
Altitude: 180.0 km
Add Close

Figure 3 Load Map Control Window



Figure 4 Example of Map over Mars

# 4.5.5.7 Show Lagrange Points

This option allows displaying the 5 Lagrange point in 3D scene based on two bodies.

	Lagrange points	Sun - Earth X
	Display : 🗹	After Seidov, <u>The Roche problem</u> , ApJ, 2004
Select two hodies - M1>>M2	Roche normalized	I potential
	yRange	3E0 0 10 20 30 40 50 60 70 80 90 100
M1 Sun M2 Earth OK	Amplitude	0 10 20 30 40 50 60 70 80 90 100
	Transparency	0 10 20 30 40 50 60 70 80 90 100
	Resolution	
	xMin	-3.4E0
	xLength	0 10 20 30 40 50 60 70 80 90 100 
	Appearance	0 10 20 30 40 50 60 70 80 90 100
	Display : 🗹	Color min3.5 Color max3
	Lagrange Points	
	Size	Show distances
	0 10 20	



This option is used to add Carrington maps from STEREO, EIT or SDO to the Sun as central body.



# 4.5.5.9 Load connect-tool map

This option is used to load a Carrington map provided by the Magnetic Connectivity Tool (http://connect-tool.irap.omp.eu/).



#### 4.5.5.10 Load data

							~
Object	Stereo-B	•	Local 💿			Browse	(?
Format	VOTABLE	•				Load	
ile previev	N				 		
ile previev	N						
ile previev	N						
ile previev	w						
Show	25 li	ines					
how [	25 li 0 li	ines	Select column(	s) to load:			

This option is used to upload a data file related to a *spacecraft*.

#### 4.5.5.11 Load ground file data

This option is used to upload a data file related to a *ground facility*.

Coad science data from file		×
Format Supermag 🔻	Local  URL	Browse
File preview		
	Load data Close	

#### 4.5.5.12 Generate cube from scalar

This option allows the display of 3D histograms along a trajectory. The values of a parameter along the trajectory of a spacecraft are accumulated in a grid of parallelepipeds. Users may set the size of these parallelepipeds.

#### 4.5.5.13 Generate iso surface from scene cube

This option displays a surface within a simulation cube corresponding to points with a single scalar value. The user can select the isovalue, the drawing mode (FILL, LINE, POINT) and the transparency of the surface.

Z X Magnetic Field	
Time: 2023/02/17 10:00:00 Distances ( Rm = Mars radius = 3396. Frame = MSO Center = Mars	90km )
Time: 2023/02/17 10:00:00 Distances (Rm = Mars radius = 3396. Frame = MSO Center = Mars Create iso surface from Cube	90km )
Time: 2023/02/17 10:00:00 Distances ( Rm = Mars radius = 3396. Frame = MSO Center = Mars Create iso surface from Cube × Select cube	90km )
Time: 2023/02/17 10:00:00 Distances (Rm = Mars radius = 3396. Frame = MSO Center = Mars Create iso surface from Cube × Select cube 3DCube Bx	90km ) Iso surface 9nT on 3DCube Bx

4.5.5.14 Scene controls

This option is used to control plots in the 3D scene. It lists all the available controls related to the current scene.

Depending on the scene and the options enabled, the content of the window can be different.

Scene science data controls	×
Distance Earth - Sun	Show Control
BOWSHOCK Fairfield, D.H 1971	Show Control
Field lines CLUSTER1 3DView Tsyganenko	Show Control

# 4.5.6 Interoperability

# 4.5.6.1 **SAMP**

This option is used to set up a connection between 3DView and a SAMP Hub. A SAMP Hub must be active, via TOPCat or AMDA for example. Data provided to 3DView via SAMP are displayed along the trajectory of a spacecraft.

🙆 3DView Samp Client Monitor		-	×
Re	gister with Hub		
Clients	Registration Public ID: Metadata Subscriptions		
Unre	egister from Hub		

Click on **Register with Hub** to connect 3DView to the Hub. This opens the following window:

<b>● ○ ○</b> 30	Vie	ew Samp Client Monitor
		Register with Hub
Clients		Registration
🗕 Hub		Public ID: hub
🍪 topcat	•	Metadata
2 3DView/IMPEx - Scene 1		samp.name:
		Hub
		samp.description.text:
	n	org.astrogrid.samp.hub.HubServiceMode\$2\$1
	U	samp.icon.url:
		http://127.0.0.1:2525/export/1/hub.png
		A. Y ==
		Subscriptions
		samp.app.ping
		samp.query.by-meta
		x-samp.query.by-meta
		Unregister from Hub

As soon as data are available on the SAMP Hub, the following pop-up window is displayed by 3DView. Select the spacecraft name. Data are then displayed along its trajectory.

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

# 4.5.6.2 AMDA login

This menu allows users to give their ID (login, password) in AMDA. This information is used to give access to personal data in AMDA (e.g. Time Tables).

Amda			
Login			Store in a local file
Password	*****		
			]
		Apply	Close

If the ID information given by the user is correct, the following message is displayed "Login successful"

If the ID information given by the user is not correct, the following message is displayed "AMDA login procedure failed".

As soon as the ID information is validated, the **Remote Data(IMPEx)** window is updated with the list of user owned Time Tables.

The "Store in a local file" option is used to save the given values. These values will be used for further sessions.

# 4.5.6.3 IMPEx configuration

#### 4.5.6.3.1 Services

This option displays the URL of IMPEx services providing access to observations and simulations.

Services De	efault trees Cache/Common space User defined trees	
LATMOS	http://impex.latmos.ipsl.fr/Methods_LATMOS.wsdl	]
FMI	http://impex-fp7.fmi.fi/ws/Methods_FMI.wsdl	]
SINP	http://smdc.sinp.msu.ru/impex/SINP_methods.wsdl	]
LESIA	http://maser.obspm.fr/IMPExWS/Methods_LESIA-Mag.wsdl	]
AMDA	http://amda.irap.omp.eu/public/wsdl/Methods_AMDA.wsdl	
CLWeb	http://clweb.irap.omp.eu/Methods_CLWEB.wsdl	]

# 4.5.6.3.2 Default trees

This option displays the URL of IMPEx files providing the description of simulation resources:

Services	Default trees	Cache/Common space	User defined trees		
LATMOS	http://im	pex.latmos.ipsl.fr/tree.xml;	http://impex.latmos.ips	sl.fr/tree_EGM.xml	
FMI	fmi.fi/w:	s/Tree_FMI_GUMICS.xml;h	http://impex-fp7.fmi.fi/w	s/Tree_FMI_HYB.xml	
SINP	http://sn	ndc.sinp.msu.ru/impex/SIN	IP_tree.xml		
LESIA	http://m	aser.obspm.fr/IMPExWS/tr	ee_Mag.xml		
CCMC	http://ap	us.irap.omp.eu/AMDA-IMP	EX/public/trees/Tree_(	CCMC_chablon5.xml	
or multiple t		aparator			
n multiple t	rees, use , se	sparator.			

#### 4.5.6.3.3 Cache/Common space

This option is used to give the name of a local directory used to store shared information and data.

IMPEx configuration		×
Services Default trees	ache/Common space User defined trees	
For downloaded data, use		
Local cache location	C:\Users\leungdo/.impex3dview	Browse
O Common space location		Browse
Purge cache		
	Apply Close	

# 4.5.6.3.4 User data only trees

This option is used to add a new tree of simulation data. This tree of data is made accessible via the Remote data (IMPEx) menu.

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Name: Tree Uri: http:// Add IMPEX_2DCUT_4 http://impex.latmos.ipsl.fr/tree_TD.xml	d to list
IMPEX_2DCUT_4 http://impex.latmos.ipsl.fr/tree_TD.xml	
sel	elected