Asteroid 4179 Toutatis - a Cartes Du Ciel – HowTo

© Philipp Salzgeber 2004-08-24 / http://www.salzgeber.at/

The Asteroid Toutatis was discovered in 1989 and was named after the gallic god well known from the Asterix comic books. It's elliptical four year orbit stretches from inside Earth's orbit to the asteroid belt between Mars and Jupiter. Additionally the orbital plane of Toutatis is closer to the plane of the Earth than any other several-kilometer big Earth crosser. Toutatis'orbit is chaotic in it's nature, this could be because of the gravitational influence of Earth during the frequent encounters.

During the encounters 1992 and 1996 high resolution Radar observations using the Goldstone and Arecibo



On Sep., 29th 2004 Toutatis will pass Earth at a distance of "merely" 1.5 million kilometers, while this is a very long distance for any mode of transportation on Earth, it is very close as astronomical distances go.

It's nearness means it will be observable in modest telescopes. In this document I try to describe how to make a finder chart for this very special encounter with a very special asteroid...

Due to the small distance Toutatis will display parallax, that means it's location among the stars will be different for observers on different places on Earth. This and the fact that it's motion across will be perceivable make it impossible to create a finder chart which could be used, e.g. in Texas and Stockholm as well.

The first thing we have to do in Cartes Du Ciel is to select our observing location: selecting **Preferences** -> **Observatory** will bring up the dialogue window at right, her can you put in the geographical coordinates of your observing location, or select a city near you from the provided list. If you provide your own location, do not forget to save it, so you can retrieve it any time later.

Position of observatory:
Latitude Longitude Altitude Degree Min. Sec. 9 45 5 East Meter 47 28 38 North 9 45 5 East 417 Time zone World cities Time = UTC + 2 ¥ Wolfurt Image: Constraint of the sec. Image: Constraint of the sec.
Pressure (millibar) : 1010 Temperature (Celsius degrees) : 10
Position of observatory: Wolfurt
OK Help Save Cancel

Then we need the orbital data for Toutatis. When I first checked in the Asteroid catalog settings (Preferences -> Catalog and Object Parameters -> Asteroids) I didn't find Toutatis

Internet re	esource	×
	CBAT_asteroids	
	For more information : http://cfa-www.harvard.edu/iau/Ephemerides/	
Copy from	http://cfa-www.harvard.edu/iau/Ephemerides/Bright/2004/Soft06Bright.txt + Soft06U	nusual.
To file	cat\planet\ASTEROIDES.DAT	
	Connect Cancel Help	



so I updated CdC's asteroid file ASTEROIDES.DAT by clicking on: File -> Online Resources -> Asteroid elements. This brings up a confirmation window which asks you to connect to CBAT's home page and download the lists of bright and unusual asteroids. After that **4179 Toutatis** showed up:

Select catalogues as			than 32MB of mem	KITA.
Starz 1 Planetz	Starx 2 Cometx	Nebulae Azteroidz	Catalogues Magnitude	Imagers Size
1 Aspect C As symbol C Magnitude Source C CBAT C Astob 1 ==> Nan Nb SCO	3908 N/x 41 23 Toutais 41 83 Cano 41 97 1982 TA 4257 Ubesti 4503 Cleobulus 4548 Xenthus 4596 1981 0B 4690 Nereus 4769 Castalia 4947 Ninkasi	5		
Refresh Name 4179 Tou				
Equinoe 2000 e 0.633609 loci 0.4698	Epoch Peil	20040714 274.8048	N. anomaly Node	334.0766 128.1989
	a sid elements	2.511599 OK	Nagn H	15.30 6 0.10

Nebulae Stare	Catalogues Constellations	Solar System
C Planets		
C Comets		
 Asteroids 		
Asteroids	4179 Toutatis	
Help	ОК	Cancel

Afterwards it was possible to select Toutatis under the Solar System Tab in the Search -> Find window. After clicking or Toutatis will be centered in Cartes Du Ciel's main window. At the date of the minimum distance Toutatis is located in the Southern Sky which is invisible from my location in Central Europe, so I choose to display the location a few days earlier: Under Preferences -> Date/Time | selected Sep. 23rd 23:00 with 15 steps 24 hours apart. This results in CdC plotting the position of moving objects not only for the given date but for 15 more dates 24 hours apart.

This screen showed that Toutatis is moving in a southernly direction and will slip below the horizon after Sep. 26th.

To have a more detailed finder chart, I made another chart for a specific evening by selecting Sep. 25th and displaying the position for 15 steps with 15 minutes intervals starting at 20:00. I set the field with to 1 degree (View -> Field Width - 1°)





and changed to a black on white chart appearance (**Preferences** -> Chart appearance -> White/Black).



You can find more information about Toutatis here: http://echo.jpl.nasa.gov/asteroids/4179 Toutatis/toutatis.html

Cartes Du Ciel is a great freeware program made by Patrick Chevalley, it is available for download at: http://www.stargazing.net/astropc/

The Yahoo-Group for Cartes Du Ciel is THE place to look for answers for your questions/problems using CdC: <u>http://groups.yahoo.com/group/skychart-discussion/</u>