Dissemination of DUT1 through the use of Virtual Observatory

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What is a Virtual Observatory VO project?

- **Virtual observatory** (VO) is a collection of interoperating data archives and software tools which utilize the internet to form a scientific research environment in which astronomical research programs can be conducted.

- Same way as a real observatory consists of telescopes, each with a collection of unique astronomical instruments, the VO consists of a collection of data centres, each with unique collections of astronomical data, software systems and processing capabilities.

- The main goal is to allow transparent and distributed access to scientific data available worldwide (Votable standard file, XML format)

- Define services to access the data via Internet (ex Web service en soap, registry, Astrogrid for computation)

- Inter-operability of tools able to process these data (ex Topcat et Voplot for plots, Aladin celestial catalogs)

- This allows scientists to discover, access, analyze, and combine nature and lab data from heterogeneous data collections in a user-friendly manner.

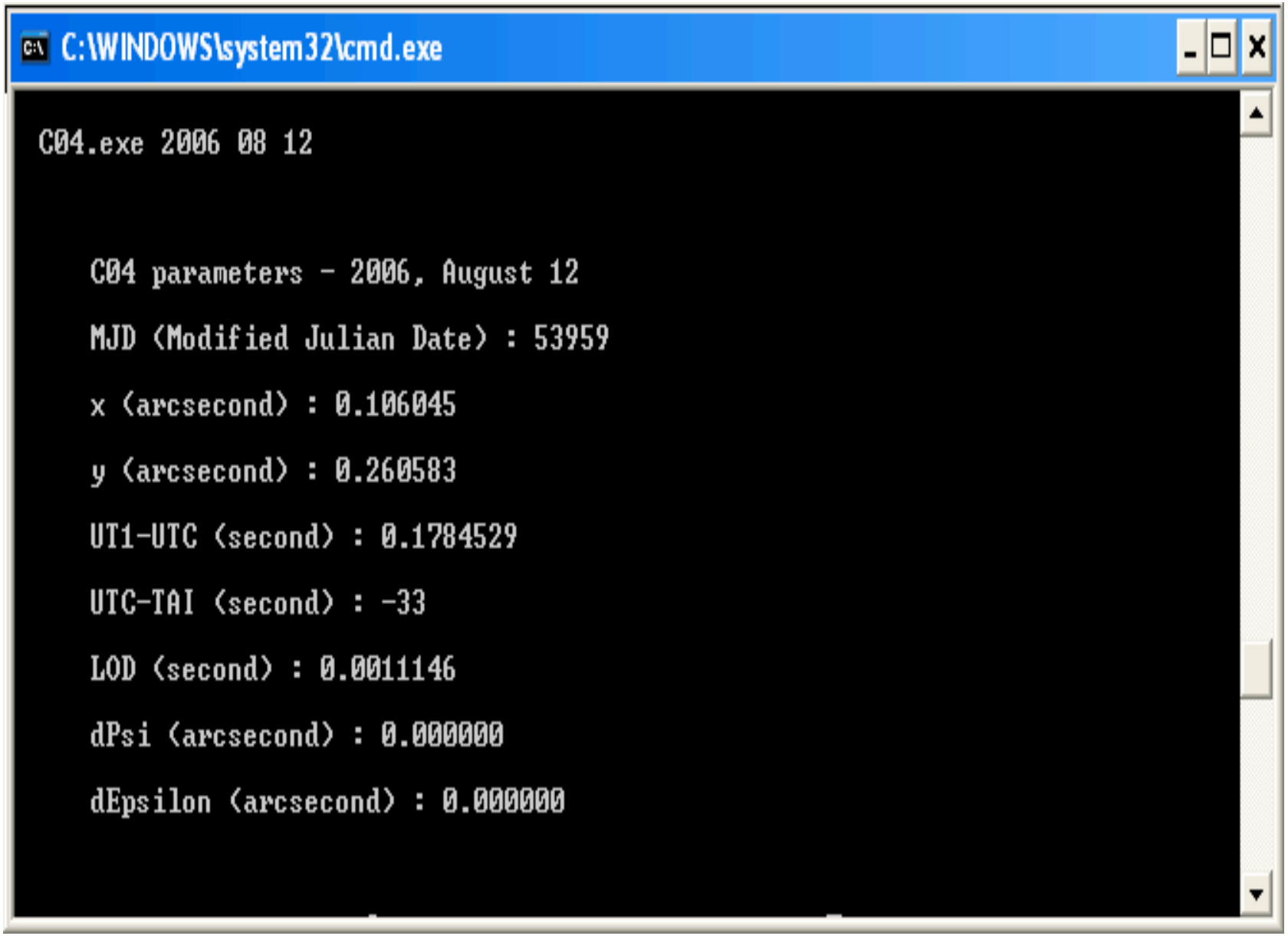
Objectives

- To make solutions of geodetic products be comparable in an homogeneous way
- Develop webservice to directly interact within scientific analysis softwares
- Develop an efficient interface between different scientific communities linked to geodesy
  - Between geophysics and astronomy
  - …

Specific VO Projects for IERS
Two approaches

- 1 – Execute program
- Make available EOP and in particular DUT1 using web service (.exe in a different language launched from outside
- Operational, however results not in XML format and the results only contains a single data line

http://hpiers.obspm.fr/eop-pc/index.php?index=webservice&lang=en - Windows Internet Explorer
EARTH ORIENTATION CENTER
BACK
HOME
SHOW THIS PAGE
THEORY AND MODELLING
EARTH ORIENTATION DATA
Synoptic of EOP series
Combined C04 series
Combined C01 series
EOP series: comparison
EOP series: analysis
Last evolution of EOP
Bulletins B, C, D
Rotation matrix/vector
WEB Service
GEOPHYSICAL EXCITATION
LINKS
WEB SERVICE
By executing the following programmes on your computer, obtain data from hpiers server.
The Windows programmes only work in the command line mode (with the msdos windows).
1- Earth orientation parameters from civil date (combined series C04 - click here for description)
Address of the webservice server : http://hpiers.obspm.fr/eop-pc/webservice/server_EOP2.php
Example of a php client calling this webservice :
http://hpiers.obspm.fr/eop-pc/webservice/files/client_EOP2.php
Getting the php client source : http://hpiers.obspm.fr/eop-pc/webservice/files/client_EOP2_php.txt
Inputs : date (YYYY MM DD)
Outputs : MJD x y UT1-UTC LOD dX dY x Err y Err UT1-UTC Err Lod Err dY Err dY Err
" " s s " " " " s s " "
Executable for Windows : DOWNLOAD
Executable for Linux : DOWNLOAD
2- Earth Orientation Matrix at a given instant - see also
Address of the webservice server :
http://hpiers.obspm.fr/eop-pc/webservice/server_MATRICE_EOP.php
Example of a php client calling this webservice :
http://hpiers.obspm.fr/eop-pc/webservice/files/client_MATRICE_EOP.php
Getting the php client source:
http://hpiers.obspm.fr/eop-pc/webservice/files/client_MATRICE_EOP_php.txt
Inputs: year month day hour minute seconde polar motion nutation diurnal/semi-diurnal tides.
(YYYY) (MM) (DD) (0-23) (0-59) (0-59) (0 or 1) (0 or 1) (0 or 1)


C:\WINDOWS\system32\cmd.exe
C04.exe 2006 08 12
C04 parameters - 2006, August 12
MJD (Modified Julian Date) : 53959
x (arcsecond) : 0.106045
y (arcsecond) : 0.260583
UT1-UTC (second) : 0.1784529
UTC-TAI (second) : -33
LOD (second) : 0.0011146
dPsi (arcsecond) : 0.000000
dEpsilon (arcsecond) : 0.000000

2 - Principles of the OV tool

- Requirements:
- The tool extracts and shows:
  - Times series of geodetic products:
    - EOP
    - Stations positions
    - Transformation parameters
  - Over a period chosen by the user
  - Output: ASCII or VO-Table
- The tool has to:
  - Be easy to use
  - Be compatible with: Internet Explorer, Firefox…
  - Be made up of independant sub-programs,
  - Be securised
  - Give results quickly

The VO-concept

- Use of data where they are stocked : VO-Table format (XML)
  - To facilitate links between communities
  - Data need not to be duplicated

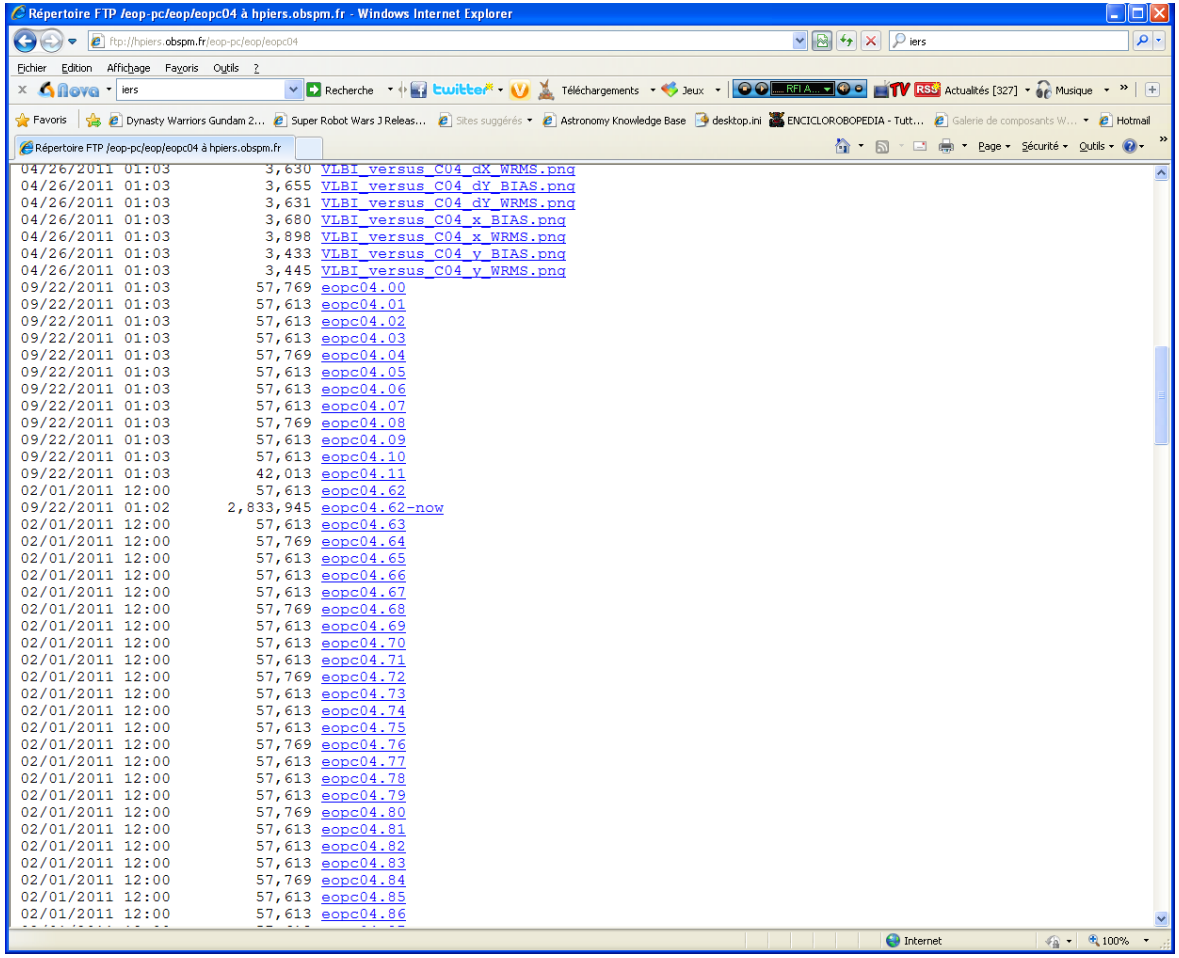
- Web services
  - Compatibilty between external softwares ensured by VO-Table format
  - Existing tools: top cat, VO-Plot

Format VO-Table

- Format VOTable is strutured
- It uses standard XML and is independent from the computer system
- The analyses are made easier

VO approach

- automatic retrieval of the EOP C04 file “c04.62-now” and conversion into VO(XML) format
- accessible via FTP
- The file contain the full data set
- Compatible with VO software packages


Répertoire FTP /eop-pc/eop/eopc04 à hpiers.obspm.fr - Windows Internet Explorer
ftp://hpiers.obspm.fr/eop-pc/eop/eopc04
Répertoire FTP /eop-pc/eop/eopc04 à hpiers.obspm.fr
04/26/2011 01:03 3,630 VLBI_versus_C04_dX_WRMS.png
04/26/2011 01:03 3,655 VLBI_versus_C04_dY_BIAS.png
04/26/2011 01:03 3,631 VLBI_versus_C04_dY_WRMS.png
04/26/2011 01:03 3,680 VLBI_versus_C04_x_BIAS.png
04/26/2011 01:03 3,898 VLBI_versus_C04_x_WRMS.png
04/26/2011 01:03 3,433 VLBI_versus_C04_y_BIAS.png
04/26/2011 01:03 3,445 VLBI_versus_C04_y_WRMS.png
09/22/2011 01:03 57,769 eopc04.00
09/22/2011 01:03 57,613 eopc04.01
09/22/2011 01:03 57,613 eopc04.02
09/22/2011 01:03 57,613 eopc04.03
09/22/2011 01:03 57,769 eopc04.04
09/22/2011 01:03 57,613 eopc04.05
09/22/2011 01:03 57,613 eopc04.06
09/22/2011 01:03 57,613 eopc04.07
09/22/2011 01:03 57,769 eopc04.08
09/22/2011 01:03 57,613 eopc04.09
09/22/2011 01:03 57,613 eopc04.10
09/22/2011 01:03 42,013 eopc04.11
02/01/2011 12:00 57,613 eopc04.62
09/22/2011 01:02 2,833,945 eopc04.62-now
02/01/2011 12:00 57,613 eopc04.63
02/01/2011 12:00 57,769 eopc04.64
02/01/2011 12:00 57,613 eopc04.65
02/01/2011 12:00 57,613 eopc04.66
02/01/2011 12:00 57,613 eopc04.67
02/01/2011 12:00 57,769 eopc04.68
02/01/2011 12:00 57,613 eopc04.69
02/01/2011 12:00 57,613 eopc04.70
02/01/2011 12:00 57,613 eopc04.71
02/01/2011 12:00 57,769 eopc04.72
02/01/2011 12:00 57,613 eopc04.73
02/01/2011 12:00 57,613 eopc04.74
02/01/2011 12:00 57,613 eopc04.75
02/01/2011 12:00 57,769 eopc04.76
02/01/2011 12:00 57,613 eopc04.77
02/01/2011 12:00 57,613 eopc04.78
02/01/2011 12:00 57,613 eopc04.79
02/01/2011 12:00 57,769 eopc04.80
02/01/2011 12:00 57,613 eopc04.81
02/01/2011 12:00 57,613 eopc04.82
02/01/2011 12:00 57,613 eopc04.83
02/01/2011 12:00 57,769 eopc04.84
02/01/2011 12:00 57,613 eopc04.85
02/01/2011 12:00 57,613 eopc04.86
Internet
100%

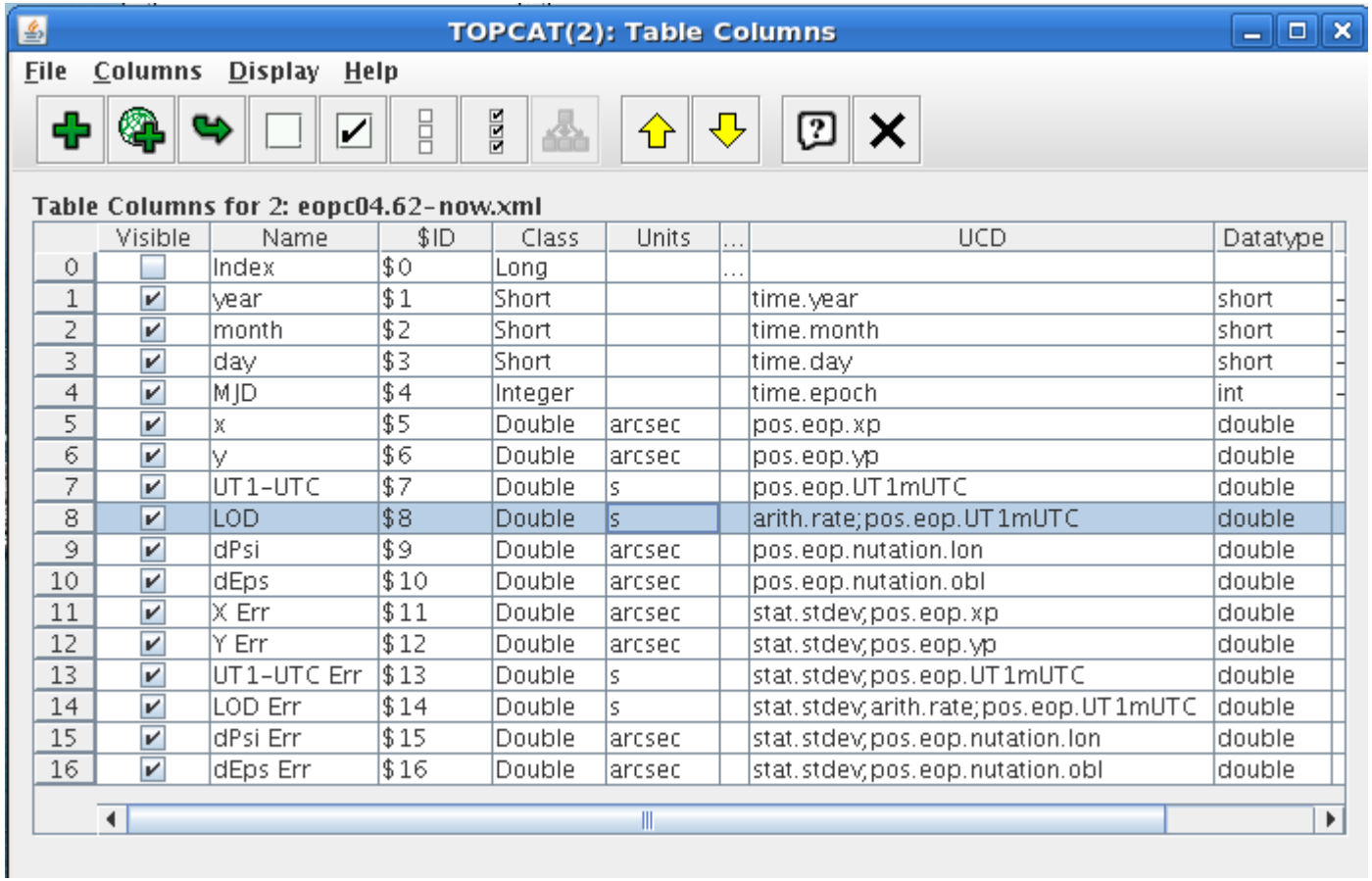
Description of the original C04 ASCII

INTERNATIONAL EARTH ROTATION AND REFERENCE SYSTEMS SERVICE
EARTH ORIENTATION PARAMETERS
EOP (IERS) 08 C04

FORMAT(3(I4),I7,2(F11.6),2(F12.7),2(F11.6),2(F11.6),2(F11.7),2F12.6)

Date (0h UTC)			MJD	x "	y "	UT1-UTC s	LOD s	dPsi "	dEps "	x Err "	y Err "	UT1-UTC Err s	LOD Err s	dPsi Err "	dEpsilon Err "
2006	1	1	53736	0.052623	0.383685	0.3388027	0.0001436	-0.056456	-0.002075	0.000078	0.000077	0.0000006	0.0000154	0.000156	0.000057
2006	1	2	53737	0.051696	0.383326	0.3385687	0.0003772	-0.056054	-0.001833	0.000079	0.000078	0.0000006	0.0000151	0.000150	0.000053
2006	1	3	53738	0.050889	0.383056	0.3380999	0.0006253	-0.055897	-0.001591	0.000076	0.000075	0.0000006	0.0000138	0.000145	0.000050
2006	1	4	53739	0.050099	0.382779	0.3374011	0.0008031	-0.055993	-0.001533	0.000073	0.000073	0.0000006	0.0000136	0.000140	0.000046
2006	1	5	53740	0.049502	0.382404	0.3365371	0.0009315	-0.056366	-0.001620	0.000071	0.000072	0.0000009	0.0000136	0.000187	0.000057
2006	1	6	53741	0.049406	0.382134	0.3355846	0.0009404	-0.056588	-0.001642	0.000074	0.000074	0.0000015	0.0000138	0.000196	0.000059
2006	1	7	53742	0.049534	0.382005	0.3346726	0.0008423	-0.056740	-0.001556	0.000077	0.000075	0.0000021	0.0000146	0.000187	0.000057
2006	1	8	53743	0.049461	0.381962	0.3339435	0.0005844	-0.056907	-0.001445	0.000076	0.000074	0.0000019	0.0000158	0.000177	0.000055
2006	1	9	53744	0.049453	0.381660	0.3334764	0.0003337	-0.057038	-0.001373	0.000070	0.000069	0.0000013	0.0000155	0.000167	0.000052
2006	1	10	53745	0.049529	0.381487	0.3332789	0.0000867	-0.057025	-0.001359	0.000066	0.000065	0.0000007	0.0000146	0.000158	0.000050
2006	1	11	53746	0.049197	0.381421	0.3333080	-0.0001256	-0.056877	-0.001452	0.000065	0.000064	0.0000031	0.0000143	0.000157	0.000051
2006	1	12	53747	0.048701	0.380999	0.3335043	-0.0002383	-0.056594	-0.001664	0.000066	0.000064	0.0000048	0.0000144	0.000159	0.000053
2006	1	13	53748	0.048506	0.380733	0.3337777	-0.0002628	-0.056342	-0.001936	0.000065	0.000064	0.0000016	0.0000146	0.000161	0.000054
2006	1	14	53749	0.048645	0.380271	0.3339990	-0.0001406	-0.056229	-0.002126	0.000067	0.000066	0.0000029	0.0000159	0.000218	0.000063

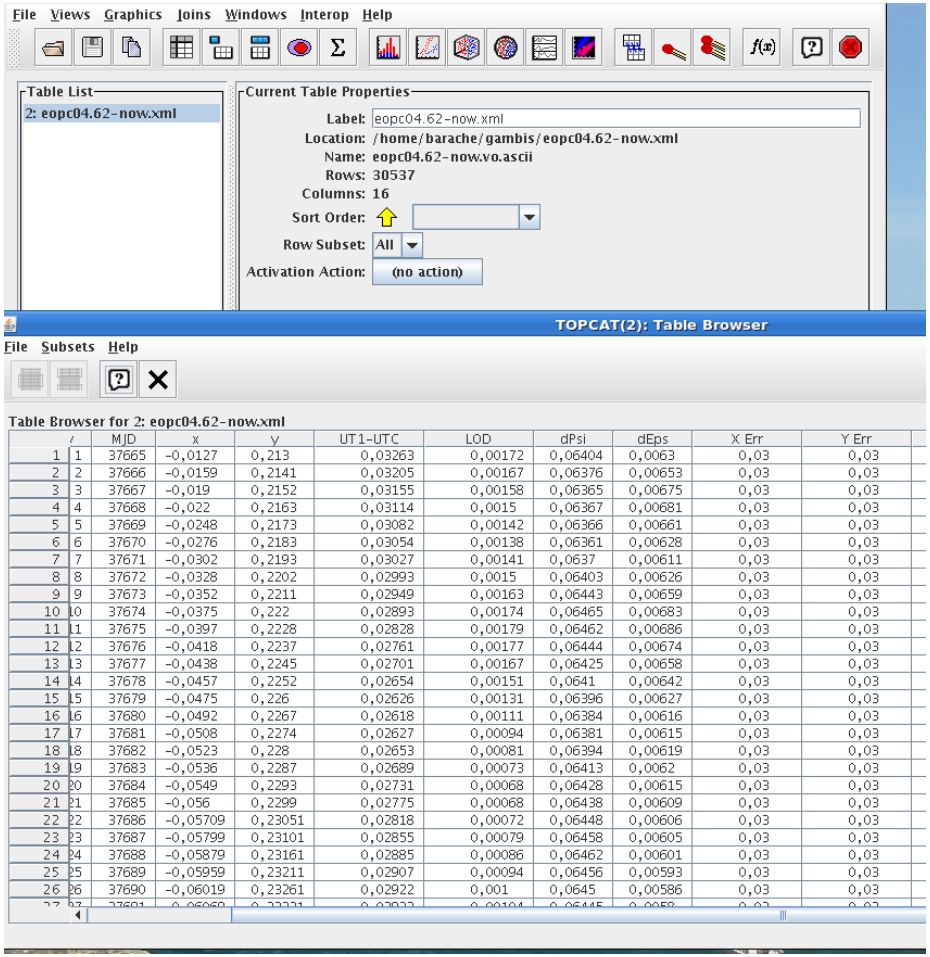
Format VO – XML (eopc04.year.XML)



	Visible	Name	$ID	Class	Units	...	UCD	Datatype
0	☐	Index	$0	Long		...		
1	☑	year	$1	Short			time.year	short
2	☑	month	$2	Short			time.month	short
3	☑	day	$3	Short			time.day	short
4	☑	MJD	$4	Integer			time.epoch	int
5	☑	x	$5	Double	arcsec		pos.eop.xp	double
6	☑	y	$6	Double	arcsec		pos.eop.yp	double
7	☑	UT1-UTC	$7	Double	s		pos.eop.UT1mUTC	double
8	☑	LOD	$8	Double	s		arith.rate;pos.eop.UT1mUTC	double
9	☑	dPsi	$9	Double	arcsec		pos.eop.nutation.lon	double
10	☑	dEps	$10	Double	arcsec		pos.eop.nutation.obl	double
11	☑	X Err	$11	Double	arcsec		stat.stdev;pos.eop.xp	double
12	☑	Y Err	$12	Double	arcsec		stat.stdev;pos.eop.yp	double
13	☑	UT1-UTC Err	$13	Double	s		stat.stdev;pos.eop.UT1mUTC	double
14	☑	LOD Err	$14	Double	s		stat.stdev;arith.rate;pos.eop.UT1mUTC	double
15	☑	dPsi Err	$15	Double	arcsec		stat.stdev;pos.eop.nutation.lon	double
16	☑	dEps Err	$16	Double	arcsec		stat.stdev;pos.eop.nutation.obl	double

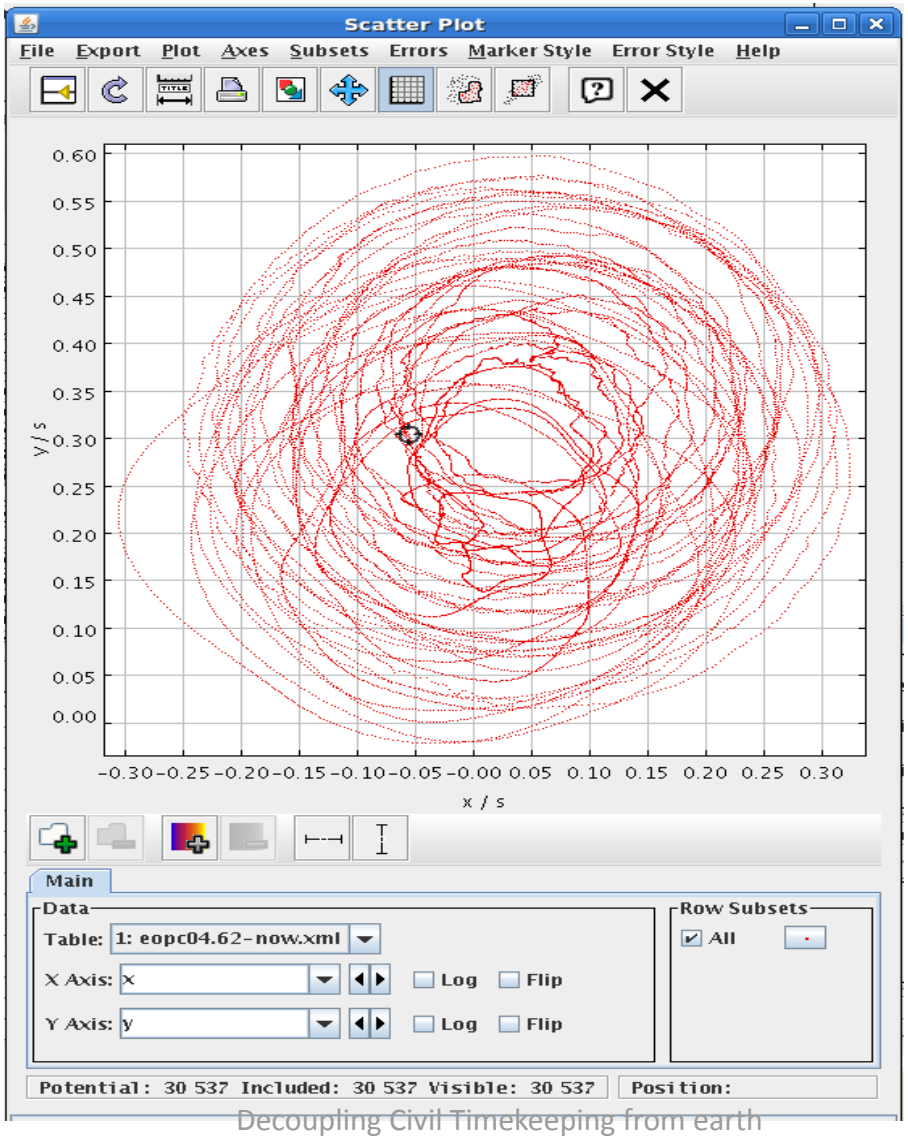
- Compatibility of file C04 VO (XML) with other tools like:

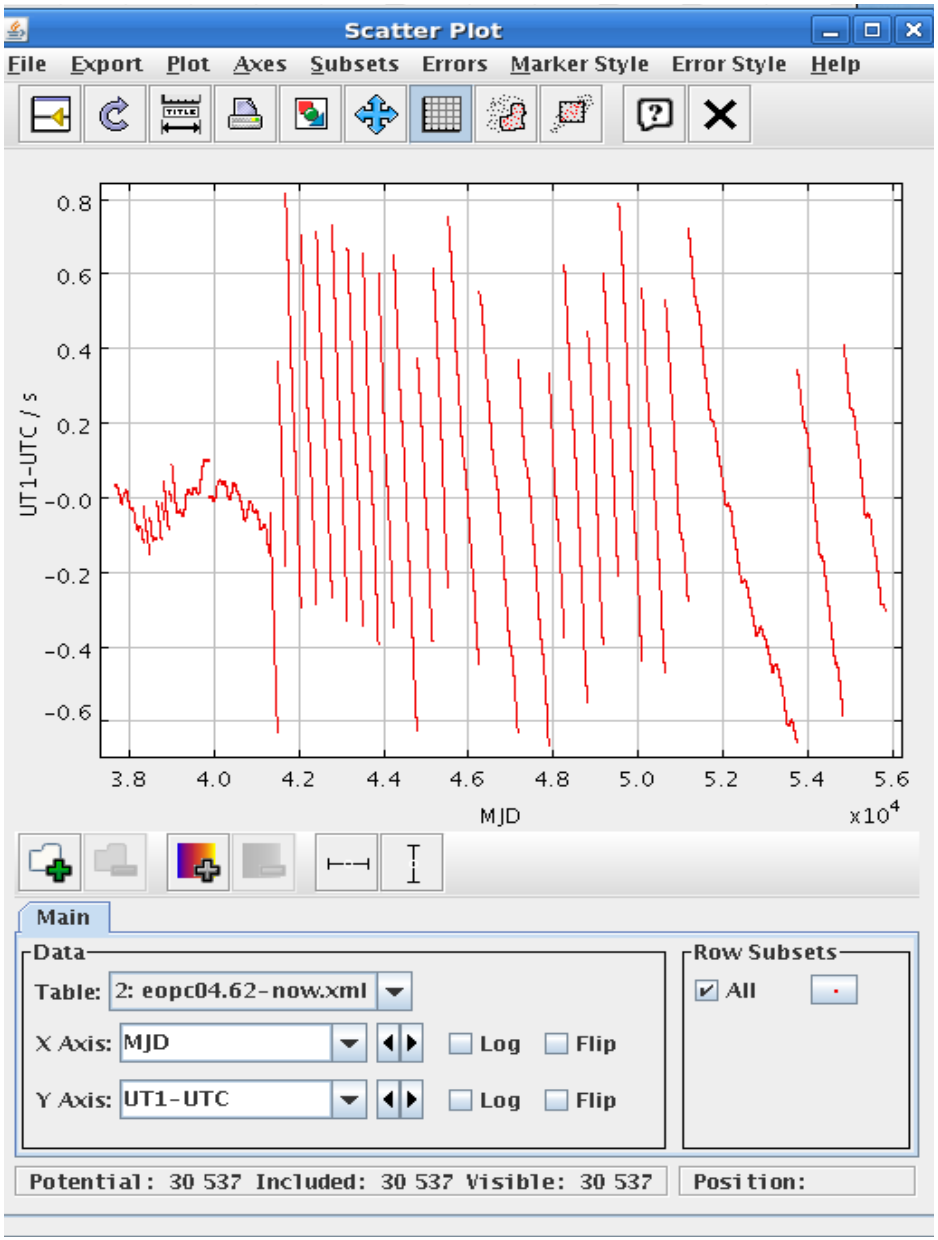
- TOPCAT
- VOPLOT
- ALADIN



/	MJD	x	y	UT1-UTC	LOD	dPsi	dEps	X Err	Y Err
1	37665	-0,0127	0,213	0,03263	0,00172	0,06404	0,0063	0,03	0,03
2	37666	-0,0159	0,2141	0,03205	0,00167	0,06376	0,00653	0,03	0,03
3	37667	-0,019	0,2152	0,03155	0,00158	0,06365	0,00675	0,03	0,03
4	37668	-0,022	0,2163	0,03114	0,0015	0,06367	0,00681	0,03	0,03
5	37669	-0,0248	0,2173	0,03082	0,00142	0,06366	0,00661	0,03	0,03
6	37670	-0,0276	0,2183	0,03054	0,00138	0,06361	0,00628	0,03	0,03
7	37671	-0,0302	0,2193	0,03027	0,00141	0,0637	0,00611	0,03	0,03
8	37672	-0,0328	0,2202	0,02993	0,0015	0,06403	0,00626	0,03	0,03
9	37673	-0,0352	0,2211	0,02949	0,00163	0,06443	0,00659	0,03	0,03
10	37674	-0,0375	0,222	0,02893	0,00174	0,06465	0,00683	0,03	0,03
11	37675	-0,0397	0,2228	0,02828	0,00179	0,06462	0,00686	0,03	0,03
12	37676	-0,0418	0,2237	0,02761	0,00177	0,06444	0,00674	0,03	0,03
13	37677	-0,0438	0,2245	0,02701	0,00167	0,06425	0,00658	0,03	0,03
14	37678	-0,0457	0,2252	0,02654	0,00151	0,0641	0,00642	0,03	0,03
15	37679	-0,0475	0,226	0,02626	0,00131	0,06396	0,00627	0,03	0,03
16	37680	-0,0492	0,2267	0,02618	0,00111	0,06384	0,00616	0,03	0,03
17	37681	-0,0508	0,2274	0,02627	0,00094	0,06381	0,00615	0,03	0,03
18	37682	-0,0523	0,228	0,02653	0,00081	0,06394	0,00619	0,03	0,03
19	37683	-0,0536	0,2287	0,02689	0,00073	0,06413	0,0062	0,03	0,03
20	37684	-0,0549	0,2293	0,02731	0,00068	0,06428	0,00615	0,03	0,03
21	37685	-0,056	0,2299	0,02775	0,00068	0,06438	0,00609	0,03	0,03
22	37686	-0,05709	0,23051	0,02818	0,00072	0,06448	0,00606	0,03	0,03
23	37687	-0,05799	0,23101	0,02855	0,00079	0,06458	0,00605	0,03	0,03
24	37688	-0,05879	0,23161	0,02885	0,00086	0,06462	0,00601	0,03	0,03
25	37689	-0,05959	0,23211	0,02907	0,00094	0,06456	0,00593	0,03	0,03
26	37690	-0,06019	0,23261	0,02922	0,001	0,0645	0,00586	0,03	0,03

Tools


Scatter Plot
File Export Plot Axes Subsets Errors Marker Style Error Style Help
0.60
0.55
0.50
0.45
0.40
0.35
0.30
0.25
0.20
0.15
0.10
0.05
0.00
y / s
-0.30 -0.25 -0.20 -0.15 -0.10 -0.05 -0.00 0.05 0.10 0.15 0.20 0.25 0.30
x / s
Main
Data
Table: 1: eopc04.62-now.xml
X Axis: x
Y Axis: y
Log
Flip
Log
Flip
Row Subsets
All
Potential: 30 537 Included: 30 537 Visible: 30 537
Position:


Scatter Plot
File Export Plot Axes Subsets Errors Marker Style Error Style Help
0.8
0.6
0.4
0.2
-0.0
-0.2
-0.4
-0.6
UT1-UTC / s
3.8 4.0 4.2 4.4 4.6 4.8 5.0 5.2 5.4 5.6
MJD
x10^4
Main
Data
Table: 2: eopc04.62-now.xml
X Axis: MJD
Log Flip
Y Axis: UT1-UTC
Log Flip
Row Subsets
All
Potential: 30 537 Included: 30 537 Visible: 30 537
Position:

Conclusion

Work still in progress on

- Development of ad hoc web service
- Interoperability concepts