

VO ツール利用法

TOPCAT



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TOPCAT

(Tool for Operations on Catalogues And Tables)

- カタログ・テーブルデータの処理
- グラフの作成
- サポートするデータ形式
 - FITS, VOTable, ASCII, CSV ...
- VOサービスから直接データ取得可能
- ホームページ
 - <http://www.star.bris.ac.uk/~mbt/topcat/>

インストール

- Java と topcat 両方インストール
- <http://www.star.bris.ac.uk/~mbt/topcat/#install>

Standalone Jar File

The most convenient form for downloading is to pick up a single Jar file containing the required classes:

- [topcat-full.jar](#) (27.2M) – core facilities plus some optional extras
- [topcat-lite.jar](#) (20.7M) – core facilities

(Note: if you try to download these directly your browser may say something about a failed security check. Make sure that you save it to a file, for instance by right-clicking in Firefox).

On Unix-like operating systems, download one or other of these jar files and the startup script [topcat](#) into the same directory, then “chmod +x topcat”, and you can just run the command:


MacOS X

If you have an Apple Mac, you can pick up the following for easy installation:

[topcat-full.dmg](#) (31.9M)

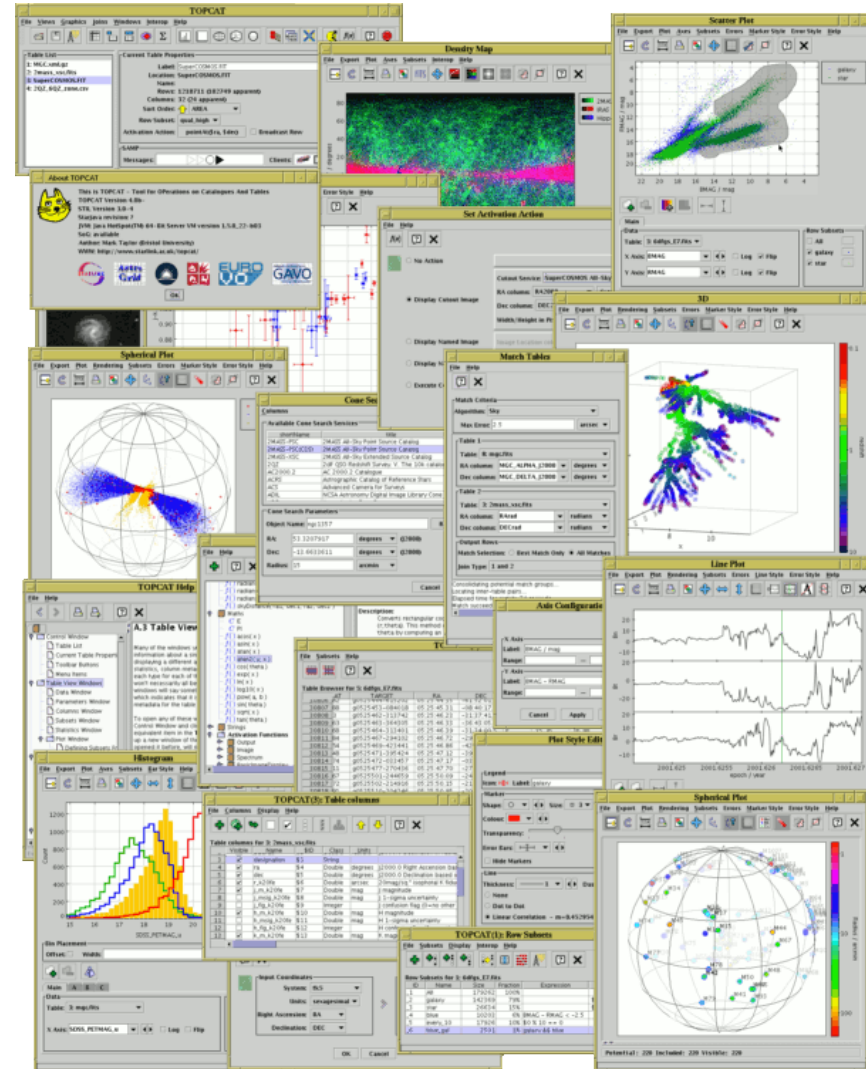
A couple of FAQ entries are relevant: [how to set flags for memory usage etc](#) and [problem with “damaged” dmg file](#).

マニュアル類

- 講習会ページ
 - <http://jvo.nao.ac.jp/vos2015a/>
- 本家マニュアル
 - <http://www.star.bristol.ac.uk/~mbt/topcat/#docs>
 - FAQ、スクリーンショット集、利用例の紹介などもある。
- Euro VO による使用例
 - <http://www.euro-vo.org/?q=science/scientific-tutorials>
- Help
 - TOPCAT 画面上の  をクリックすると Help 画面が表示される。

機能

- テーブルデータの表示・編集
- カラム間演算によるカラム追加
- ソート、フィルタリング
- テーブルデータサブセット(条件式、グラフ上での範囲指定)
- 統計量の計算
- 二つのテーブルのジョイン(座標一致なども)
- 3次元まで対応したプロット
- VO サービスからの直接データ取得
- SAMP によるアプリケーション間連携
- 等

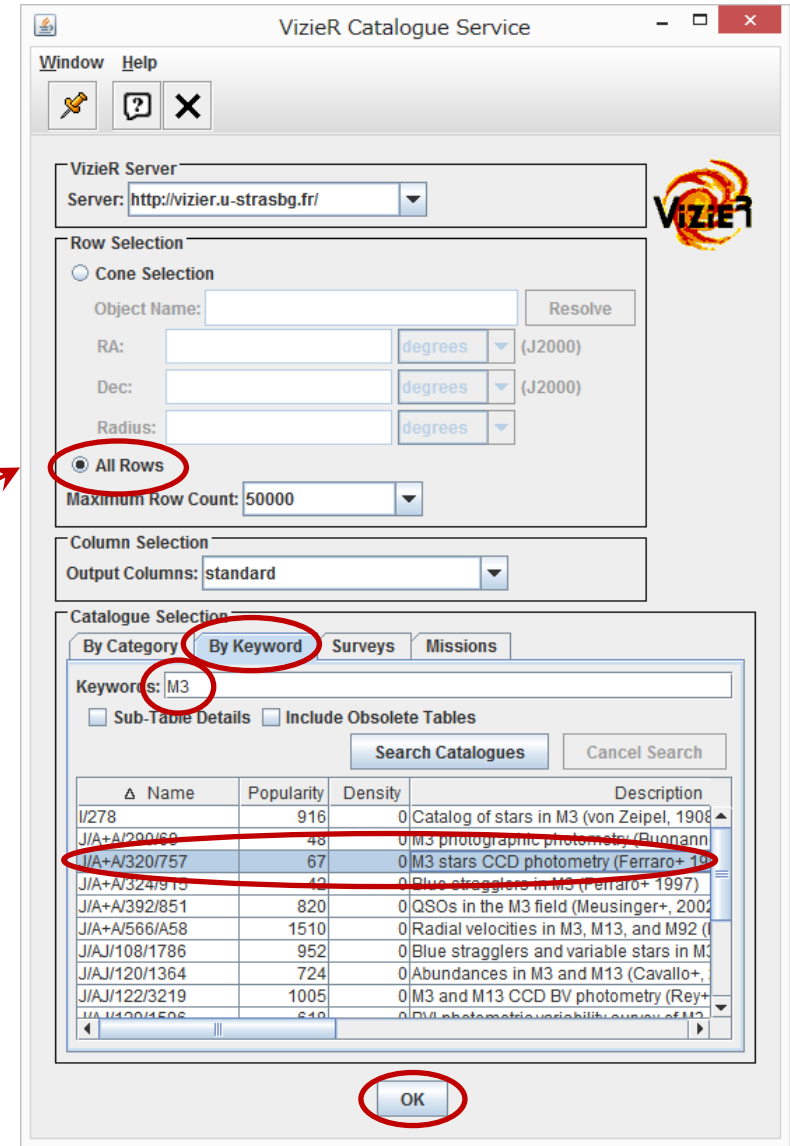
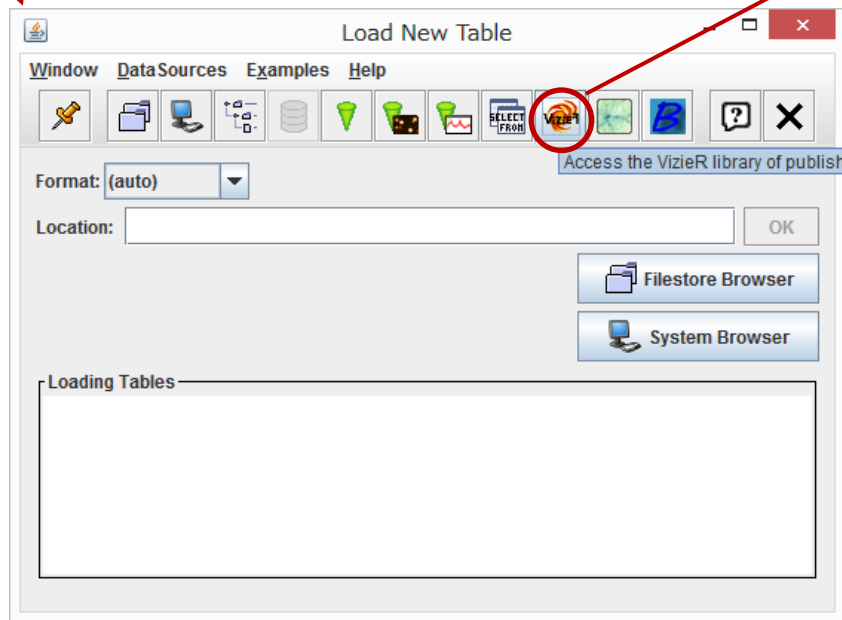
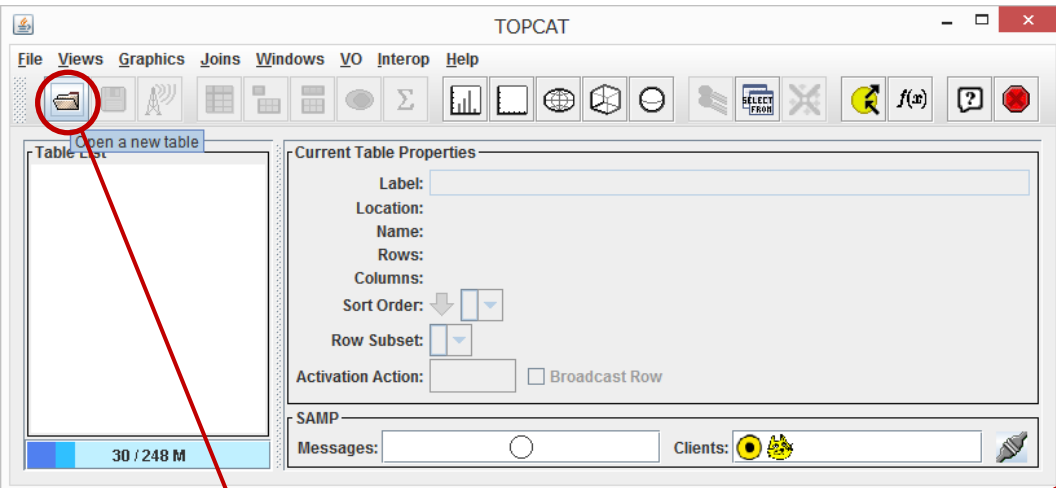


使用例1

球状星団 M3 の HR図の作成

- 講習会ページの TOPCAT 簡易マニュアル参照
 1. TOPCAT から VizieR Catalog Service にある「M3 stars CCD photometry (Ferraro+1997)」を取得する。

VizieR Catalog Service 検索ウィンドウ



テーブルデータを表示

TOPCAT

File Views Graphics Joins Windows VO Interop Help

Table List

1: J_A+A_320_757_tables

Current Table Properties

Label: J_A+A_320_757_tables
Location: J_A+A_320_757_tables
Name: J/A+A/320/757/tables
Rows: 20,191
Columns: 9
Sort Order:
Row Subset: All
Activation Action: (no action) Broadcast Row

SAMP

Messages: Clients:

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TOPCAT(1): Table Columns

Window Columns Display Help

Table Columns for 1: J_A+A_320_757_tables

	Visible	Name	\$ID	Class	Units	Description
0	<input type="checkbox"/>	Index	\$0	Long		Table row index
1	<input checked="" type="checkbox"/>	recno	\$1	Integer		Record number assigned by the VizieR team. Should Not be used for
2	<input checked="" type="checkbox"/>	Name	\$2	Integer		Star designation (this paper)
3	<input checked="" type="checkbox"/>	Vmag	\$3	Float	mag	V magnitude
4	<input checked="" type="checkbox"/>	Bmag	\$4	Float	mag	B magnitude
5	<input checked="" type="checkbox"/>	Imag	\$5	Float	mag	I magnitude
6	<input checked="" type="checkbox"/>	Xpos	\$6	Float	arcsec	X coordinate (arcsec)
7	<input checked="" type="checkbox"/>	Ypos	\$7	Float	arcsec	Y coordinate (arcsec)
8	<input checked="" type="checkbox"/>	Star	\$8	Short		Name of the stars (if variable) in the 3rd Sawyer-Hogg catalog (1973F
9	<input checked="" type="checkbox"/>	n_Star	\$9	Short		[0-1] 0: constant stars, 1: variable stars

TOPCAT(1): Table Browser

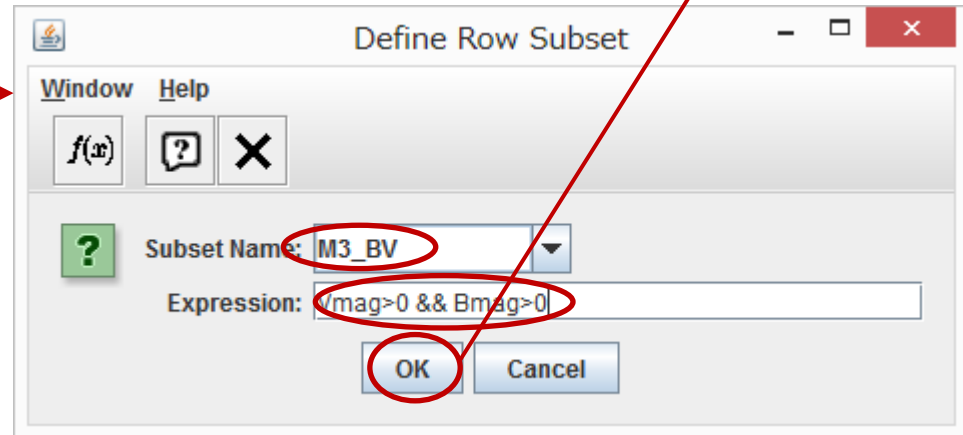
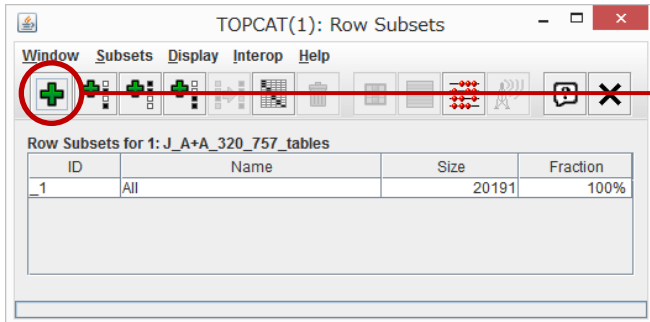
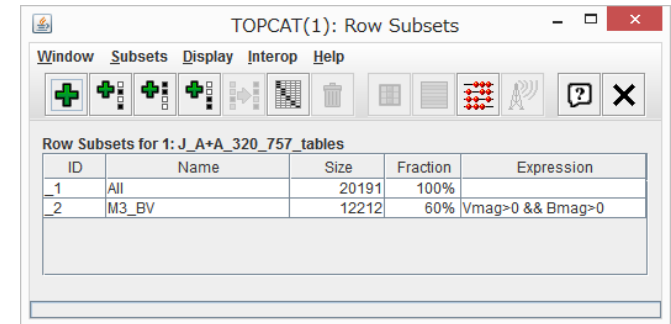
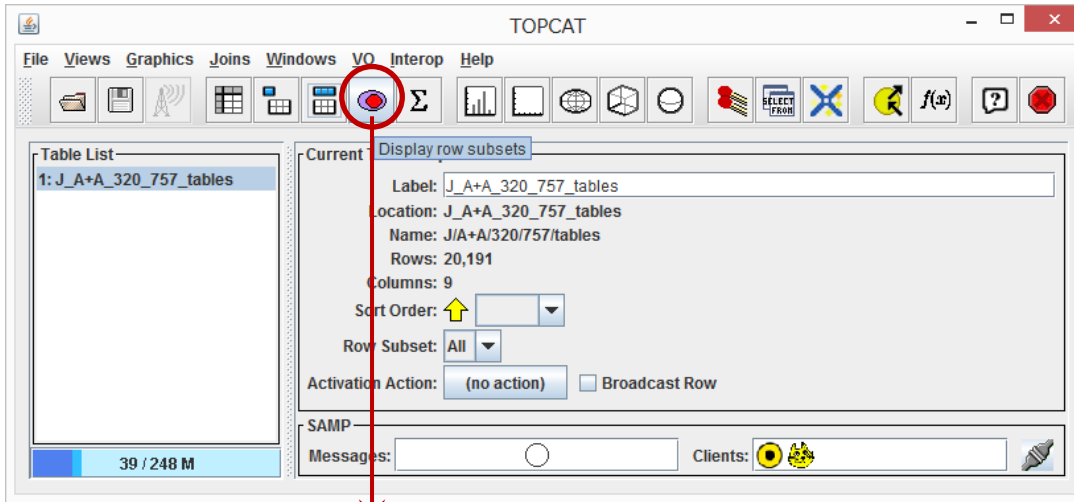
Window Subsets Help

Table Browser for 1: J_A+A_320_757_tables

	recno	Name	Vmag	Bmag	Imag	Xpos	Ypos	Star	n_Star
1	1	1	17.024	17.746	0.	-87.	-460.	0	0
2	2	2	15.737	16.137	0.	142.	-440.6	17	1
3	3	3	17.618	18.305	0.	163.	-436.	0	0
4	4	4	16.304	17.028	0.	-3.	-433.	0	0
5	5	5	15.745	16.215	0.	127.	-431.	0	0
6	6	6	17.715	18.384	0.	218.	-421.	0	0
7	7	7	16.411	17.526	0.	269.	-417.	0	0
8	8	8	15.89	16.715	0.	126.	-411.	0	0
9	9	9	12.844	14.286	0.	-178.	-410.	0	0
10	10	10	15.685	16.036	0.	-29.4	-408.7	92	1
11	11	11	15.199	15.951	0.	-84.	-398.	430	1
12	12	12	16.106	16.886	0.	40.	-398.	0	0
13	13	13	15.908	16.655	0.	-301.	-397.	0	0
14	14	14	15.938	16.652	0.	-358.	-396.	0	0
15	15	15	17.618	18.49	0.	-61.	-383.	0	0
16	16	16	17.995	18.636	0.	285.	-378.	0	0
17	17	17	15.745	16.215	0.	101.	-377.	0	0
18	18	18	17.636	18.306	0.	230.	-375.	0	0

サブセットを作成

- B, V バンドのデータがあるサブセットを作成



B-V カラムを作成

TOPCAT

File Views Graphics Joins Windows VO Interop Help

Table List
1: J_A+A_320_757_tables

Current Table Properties
Label: J_A+A_320_757_tables
Location: J_A+A_320_757_tables
Name: J/A+A/320/757/tables
Rows: 20,191 (12,212 apparent)
Columns: 9
Sort Order: [dropdown]
Row Subse: **M3_BV**

Activation Action: (no action) Broadcast Row

SAMP
Messages: [input] Clients: [icons]

Define Synthetic Column

Window Help

$f(x)$ [?] [X]

? Name: **B-V**
Expression: **Bmag-Vmag**
Units: [input]
Description: [input]
UCD: [input] no UCD
Index: [input] 10 [input]

OK Cancel

TOPCAT(1): Table Columns

Window Columns Display Help

+ [?] [X]

Add a new column defined algebraically from existing ones

Table Columns for 1: J_A+A_320_757_tables

	Visible	Name	\$ID	Class	Units	
0	<input type="checkbox"/>	Index	\$0	Long		Table row index
1	<input checked="" type="checkbox"/>	recno	\$1	Integer		Record number assigned by the
2	<input checked="" type="checkbox"/>	Name	\$2	Integer		Star designation (this paper)
3	<input checked="" type="checkbox"/>	Vmag	\$3	Float	mag	V magnitude
4	<input checked="" type="checkbox"/>	Bmag	\$4	Float	mag	B magnitude
5	<input checked="" type="checkbox"/>	Imag	\$5	Float	mag	I magnitude
6	<input checked="" type="checkbox"/>	Xpos	\$6	Float	arcsec	X coordinate (arcsec)
7	<input checked="" type="checkbox"/>	Ypos	\$7	Float	arcsec	Y coordinate (arcsec)
8	<input checked="" type="checkbox"/>	Star	\$8	Short		Name of the stars (if variable) in

TOPCAT(1): Table Columns

Window Columns Display Help

+ [?] [X]

Table Columns for 1: J_A+A_320_757_tables

Display help for this window in browser



	Visible	Name	\$ID	Class	Units	Description
1	<input checked="" type="checkbox"/>	recno	\$1	Integer		Record number assigned by the VizieR team. Should Not be used
2	<input checked="" type="checkbox"/>	Name	\$2	Integer		Star designation (this paper)
3	<input checked="" type="checkbox"/>	Vmag	\$3	Float	mag	V magnitude
4	<input checked="" type="checkbox"/>	Bmag	\$4	Float	mag	B magnitude
5	<input checked="" type="checkbox"/>	Imag	\$5	Float	mag	I magnitude
6	<input checked="" type="checkbox"/>	Xpos	\$6	Float	arcsec	X coordinate (arcsec)
7	<input checked="" type="checkbox"/>	Ypos	\$7	Float	arcsec	Y coordinate (arcsec)
8	<input checked="" type="checkbox"/>	Star	\$8	Short		Name of the stars (if variable) in the 3rd Sawyer-Hogg catalog (197
9	<input checked="" type="checkbox"/>	n_Star	\$9	Short		[0-1] 0: constant stars, 1: variable stars
10	<input checked="" type="checkbox"/>	B-V	\$10	Float		


HR図のプロット

TOPCAT

File Views Graphics Joins Windows VO Interop Help

Table List
1: J_A+A_320_757_tables

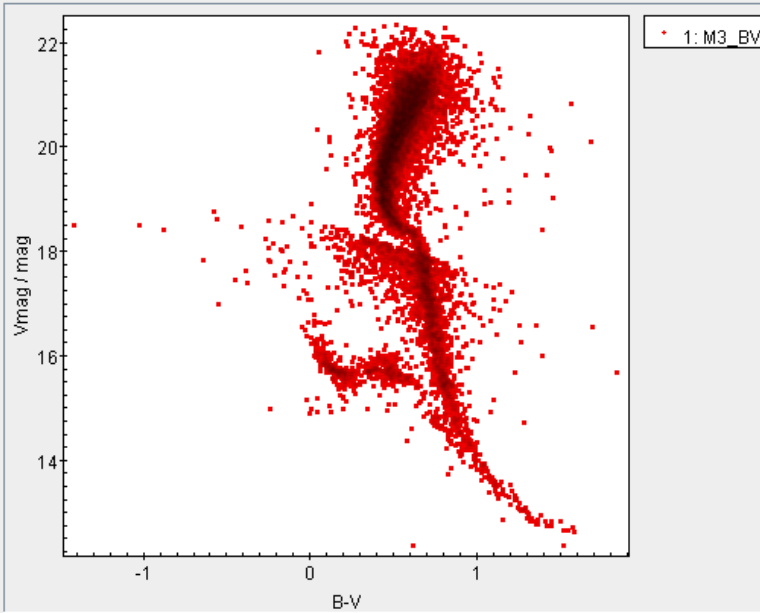
Current Table Properties
Label: J_A+A_320_757_tables
Location: J_A+A_320_757_tables
Name: J/A+A/320/757/tables
Rows: 20,191 (12,212 apparent)
Columns: 10
Sort Order:  
Row Subset: M3_BV
Activation Action: (no action) Broadcast Row

SAMP
Messages: Clients: 

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Plane Plot

Window Layers Subsets Plot Export Help



Vmag / mag

B-V

1: M3_BV

Frame

Position Subsets Form

Table: 1: J_A+A_320_757_tables

X: B-V

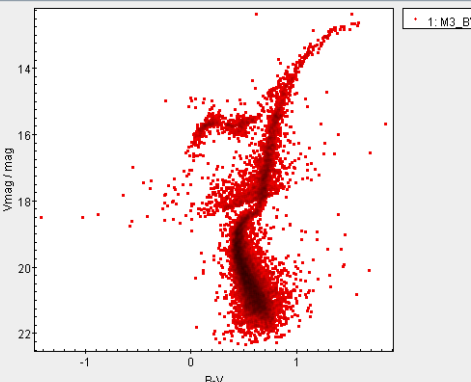
Y: Vmag

Position: Count: 12,212 / 20,191

Select Pan X/Y Stretch X/Y Frame X/Y Zoom Iso

Plane Plot

Window Layers Subsets Plot Export Help



Vmag / mag

B-V

1: M3_BV

Frame

Coords Navigation Range Grid Labels Font

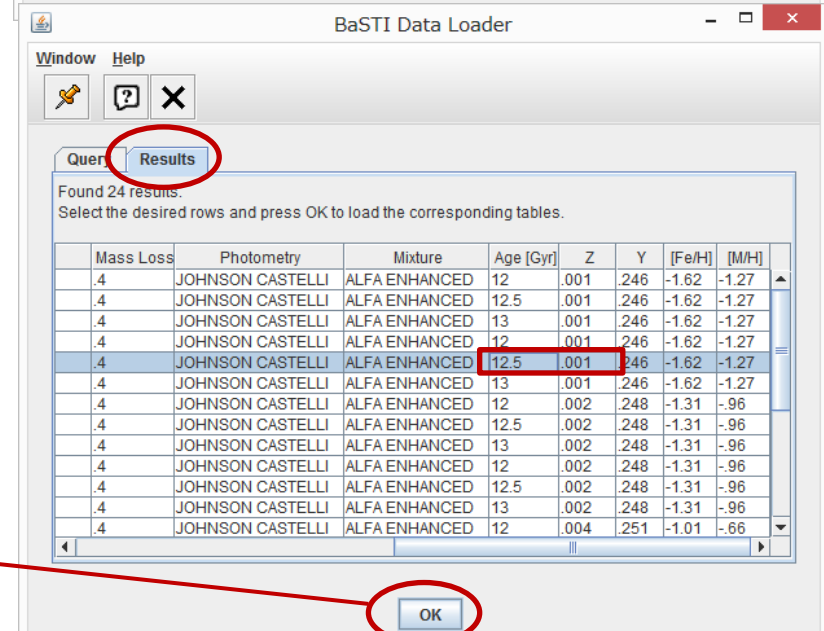
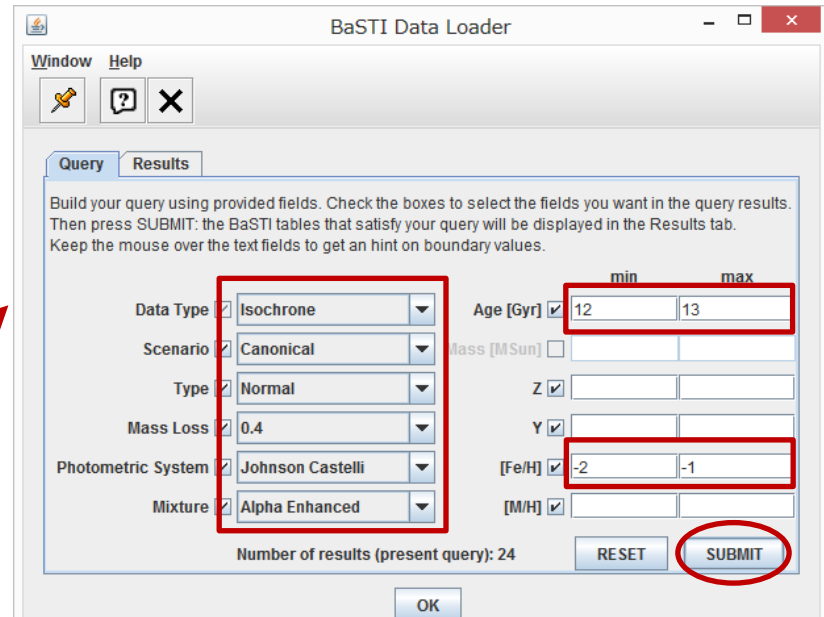
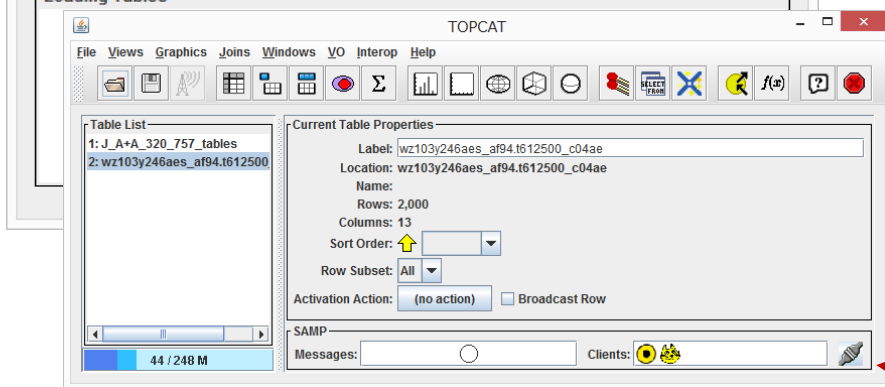
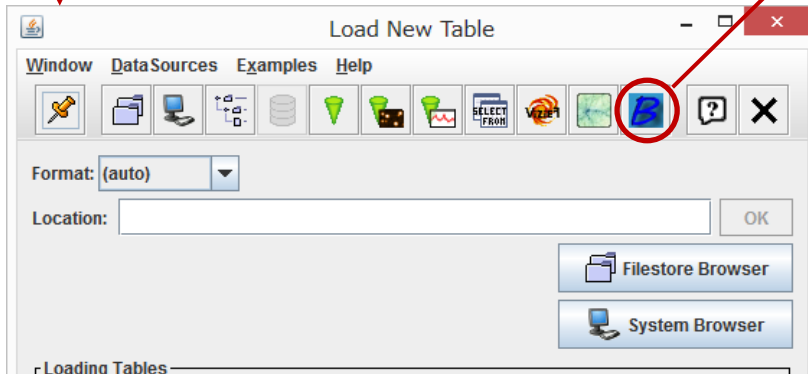
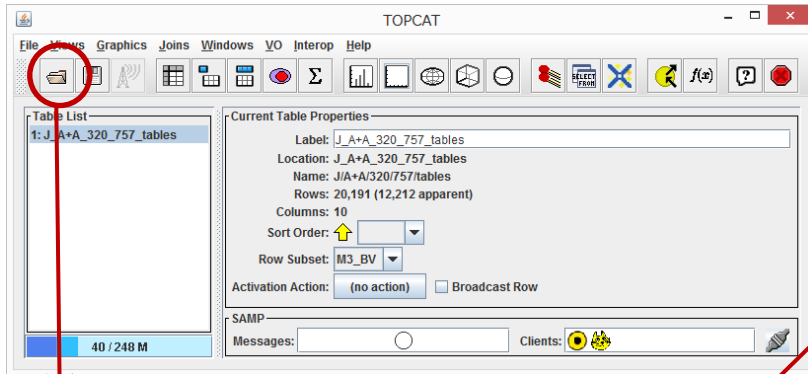
Axes

X Log:
Y Log:
X Flip:
Y Flip:
Aspect Lock:

Position: Count: 12,212 / 20,191

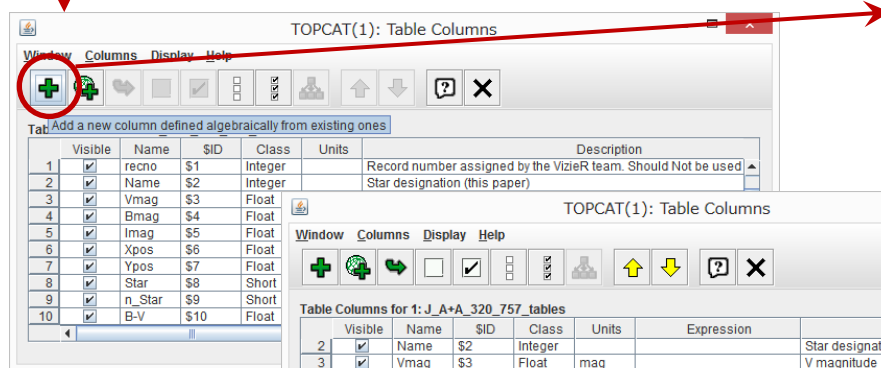
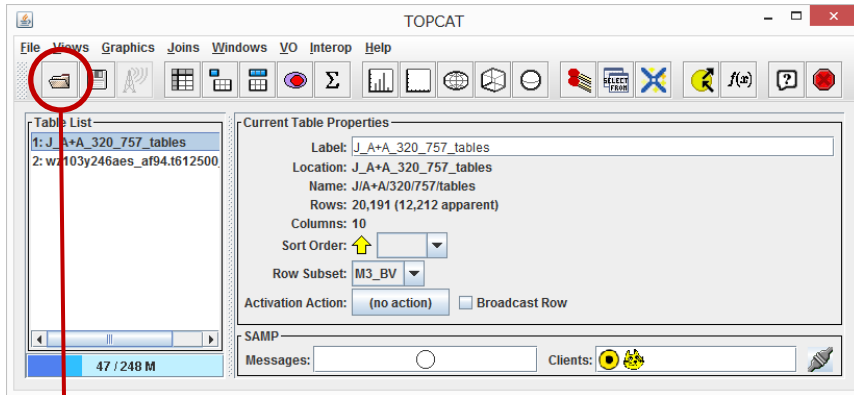
Select Pan X/Y Stretch X/Y Frame X/Y Zoom Iso

理論モデル曲線を取得



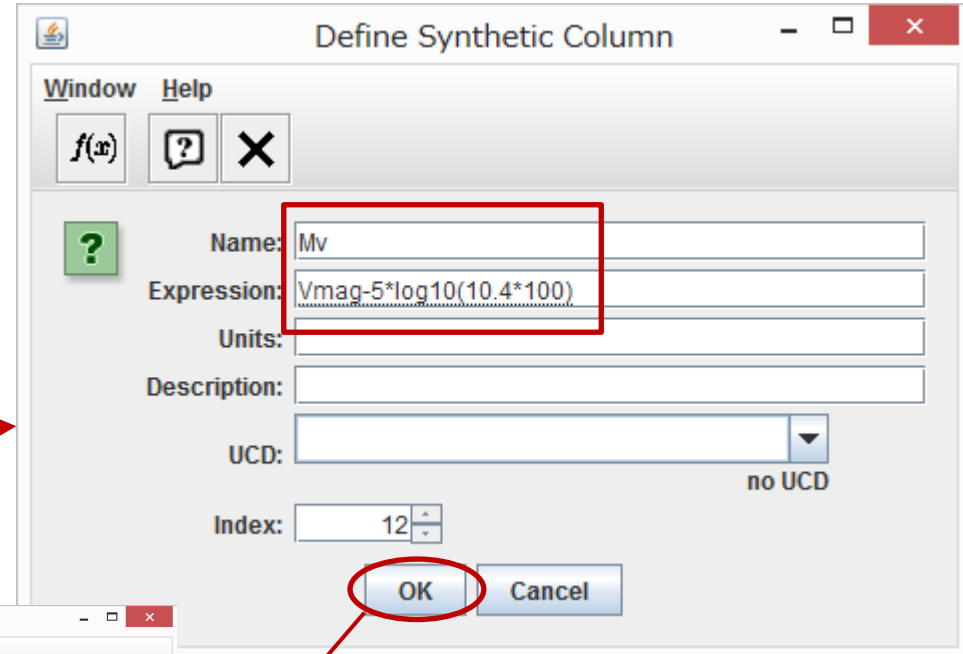
絶対等級カラムを追加

- 最初に取得した M3 カタログのサブセットテーブルに絶対等級カラムを追加します。

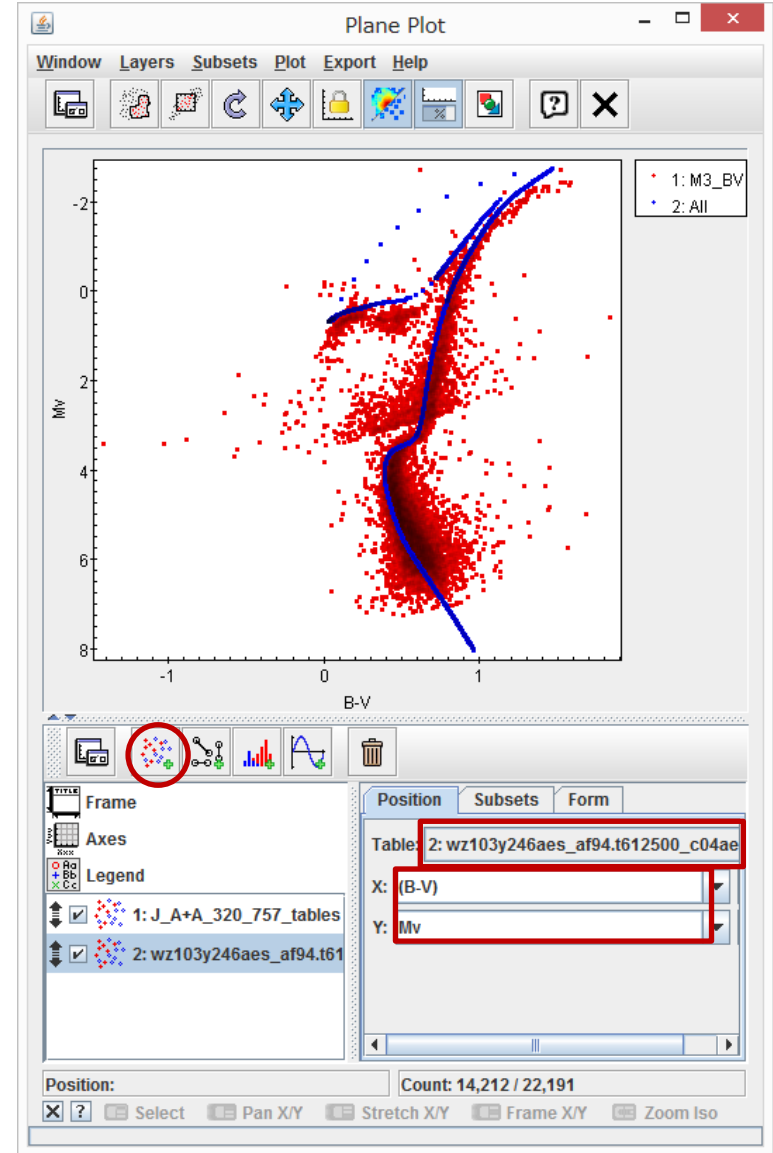
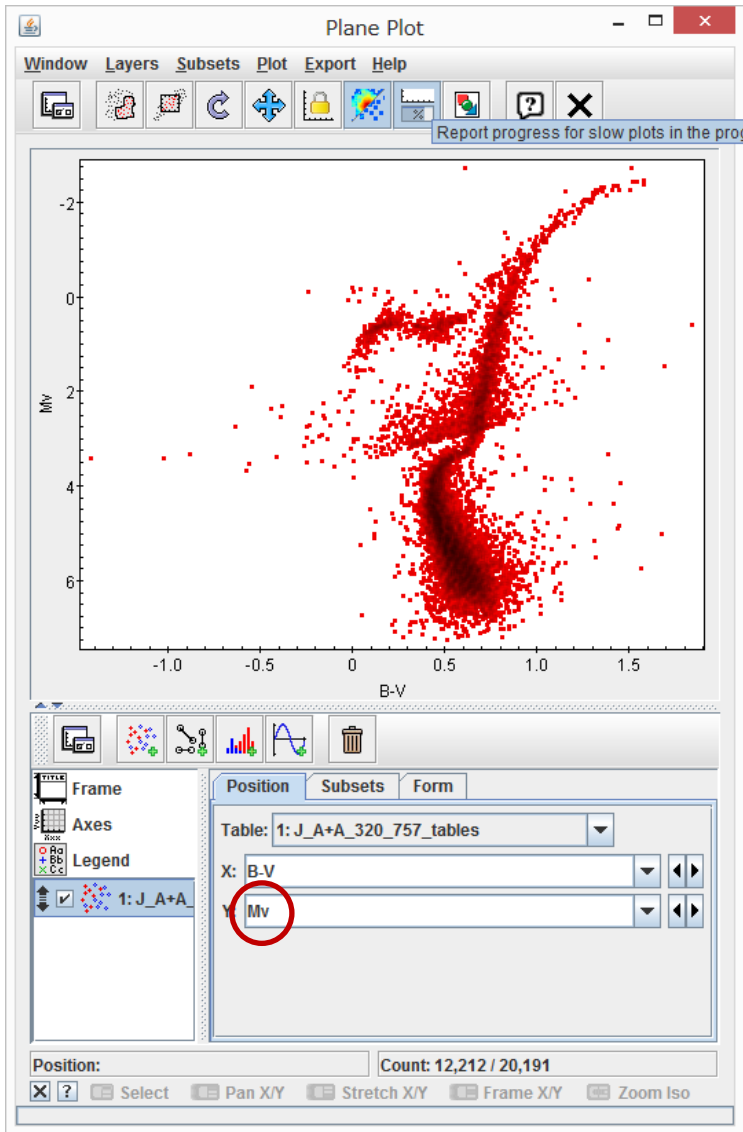


The screenshot shows the 'TOPCAT(1): Table Columns' dialog box with the column list expanded. The table below shows the details for each column, including its name, ID, class, units, and description.

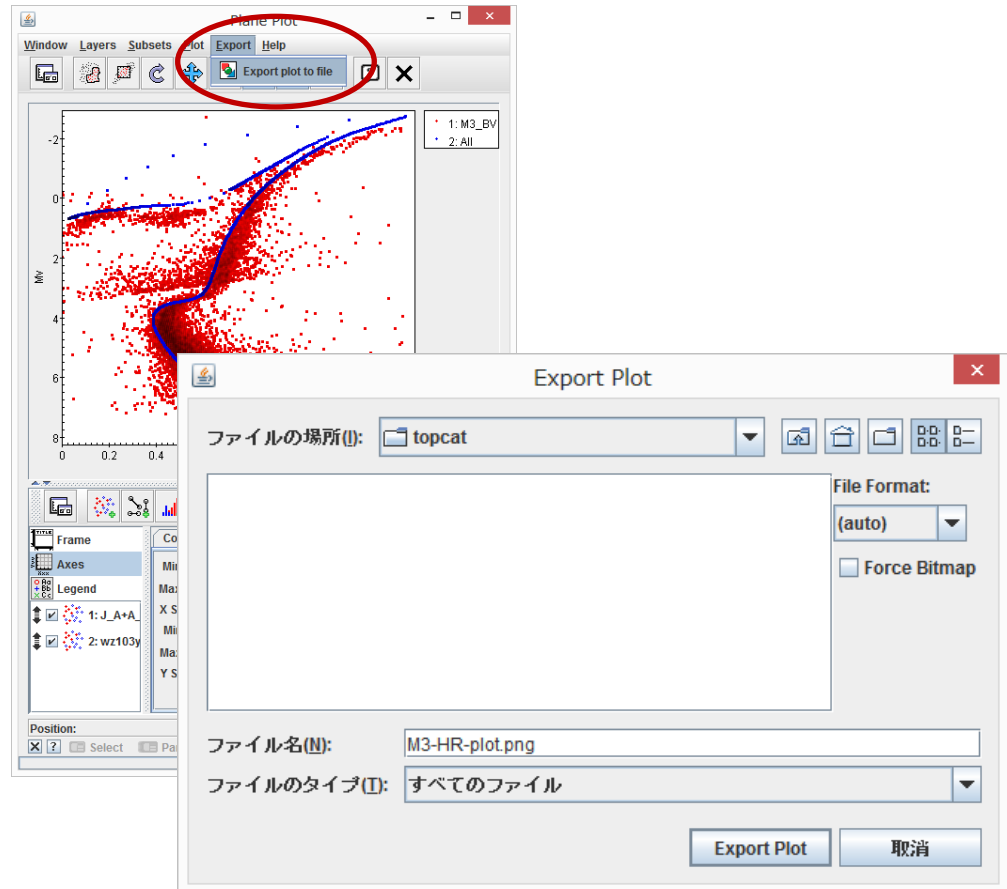
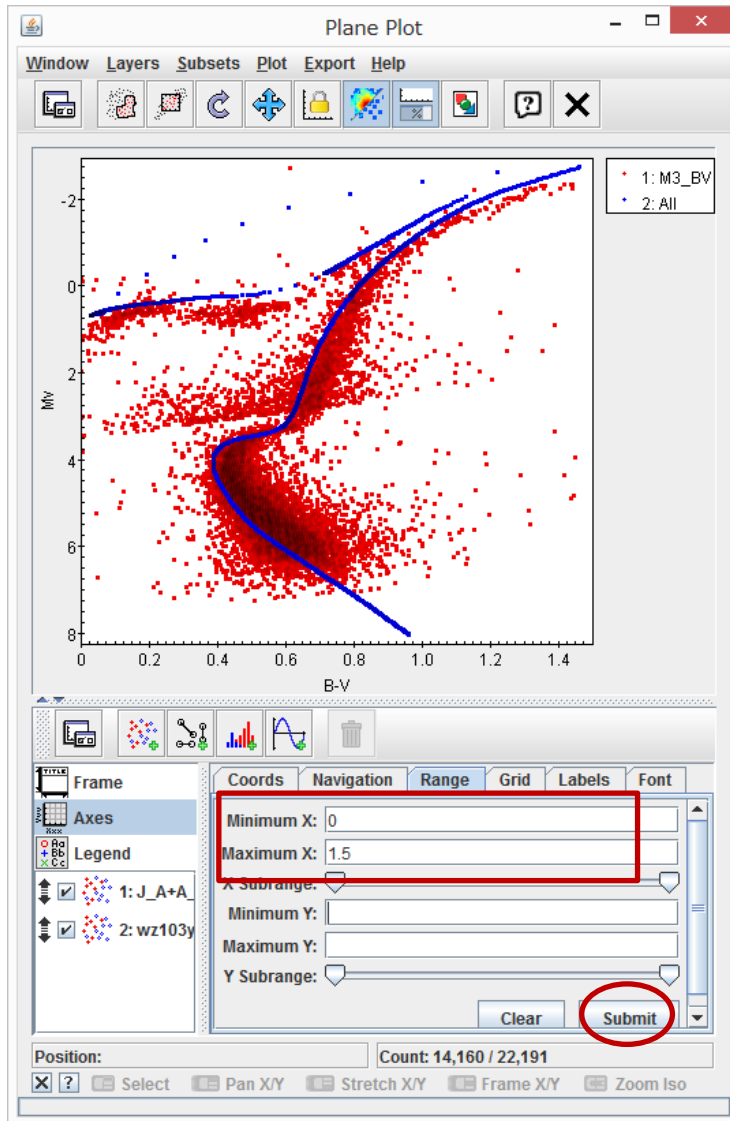
Visible	Name	\$ID	Class	Units	Description
<input checked="" type="checkbox"/>	recno	\$1	Integer		Record number assigned by the VizieR team. Should Not be used
<input checked="" type="checkbox"/>	Name	\$2	Integer		Star designation (this paper)
<input checked="" type="checkbox"/>	Vmag	\$3	Float	mag	V magnitude
<input checked="" type="checkbox"/>	Bmag	\$4	Float	mag	B magnitude
<input checked="" type="checkbox"/>	Imag	\$5	Float	mag	I magnitude
<input checked="" type="checkbox"/>	Xpos	\$6	Float	arcsec	X coordinate (arcsec)
<input checked="" type="checkbox"/>	Ypos	\$7	Float	arcsec	Y coordinate (arcsec)
<input checked="" type="checkbox"/>	Star	\$8	Short		Name of the stars (if variable) in the 3
<input checked="" type="checkbox"/>	n_Star	\$9	Short		[0-1] 0: constant stars, 1: variable star
<input checked="" type="checkbox"/>	B-V	\$10	Float		Bmag-Vmag
<input checked="" type="checkbox"/>	Mv	\$11	Double		Vmag-5*log10(10.4*100)



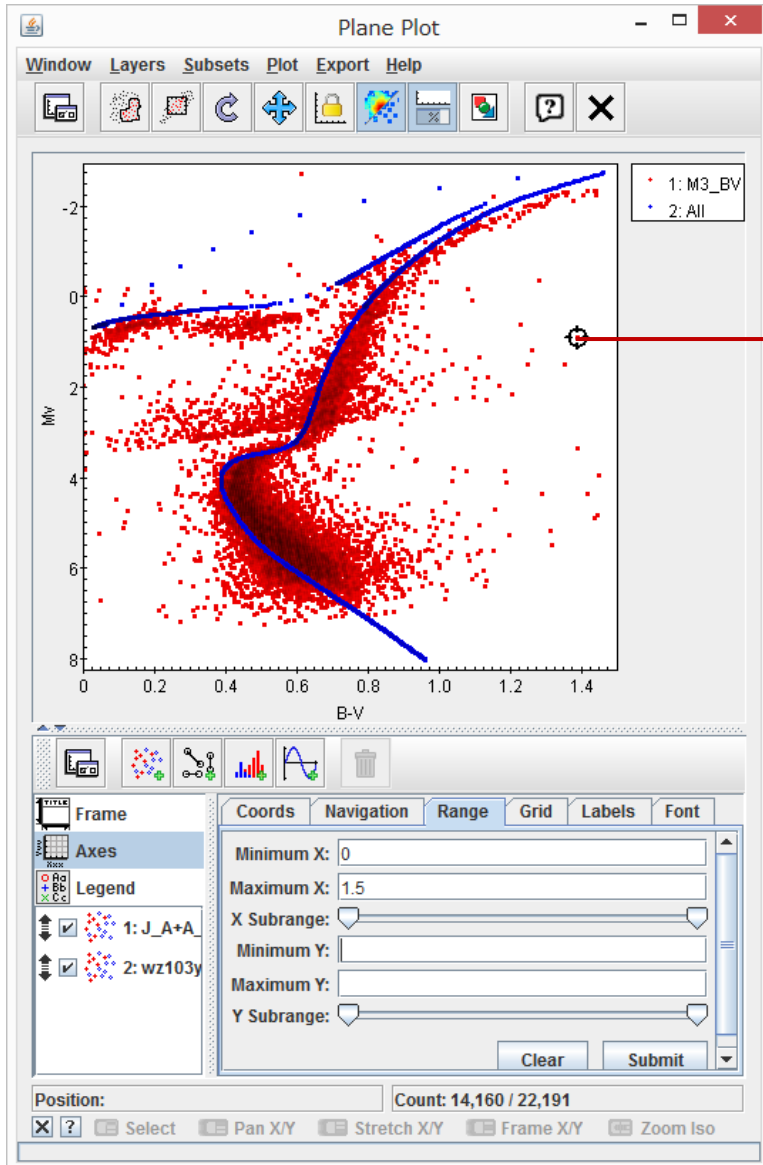
理論曲線をオーバープロット



プロット範囲指定と画像の保存



プロットとテーブルデータの対応



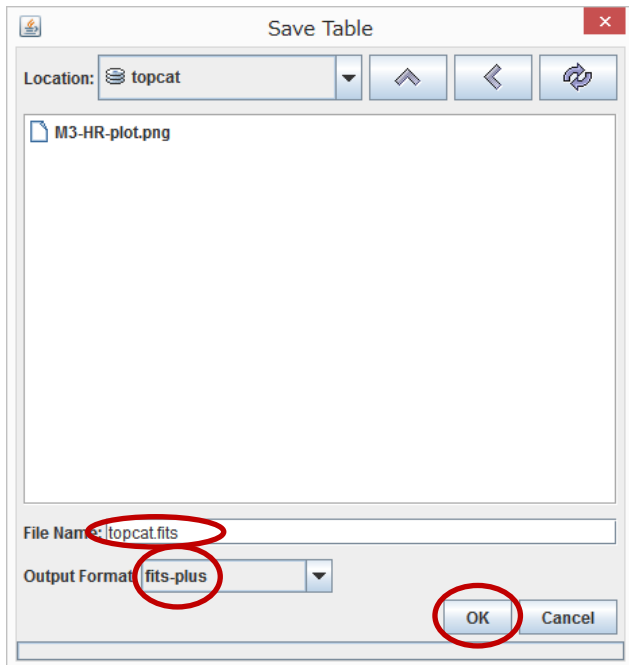
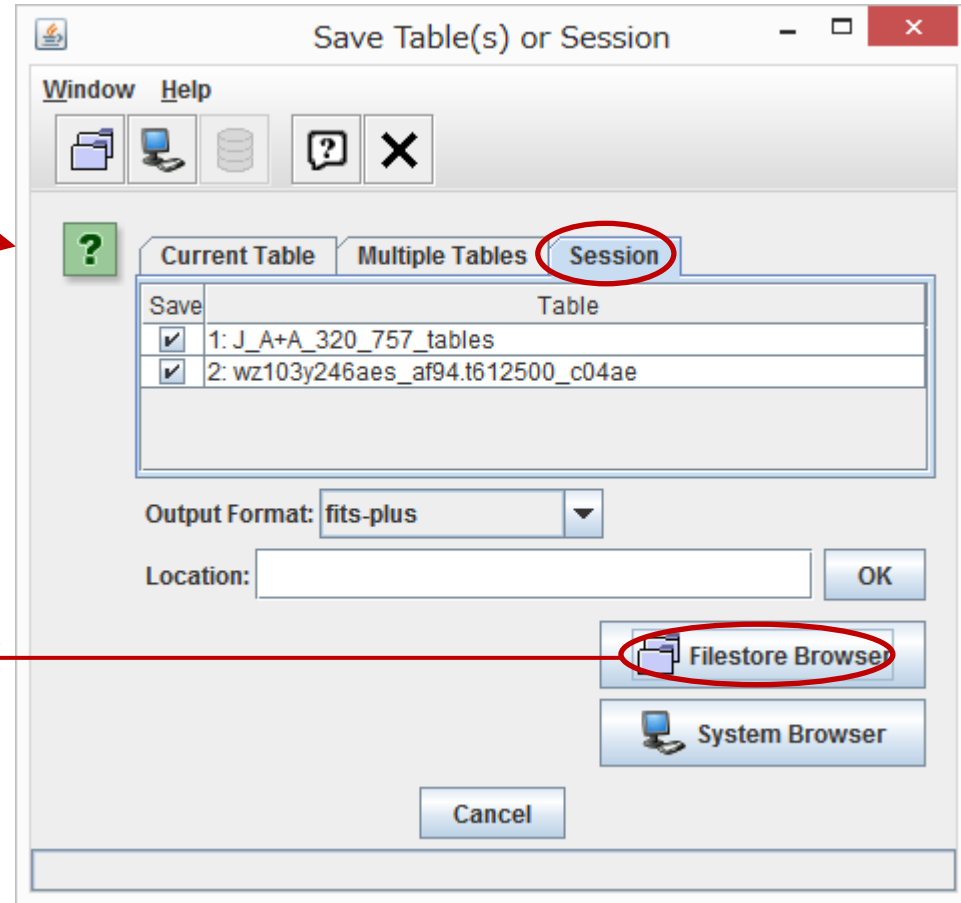
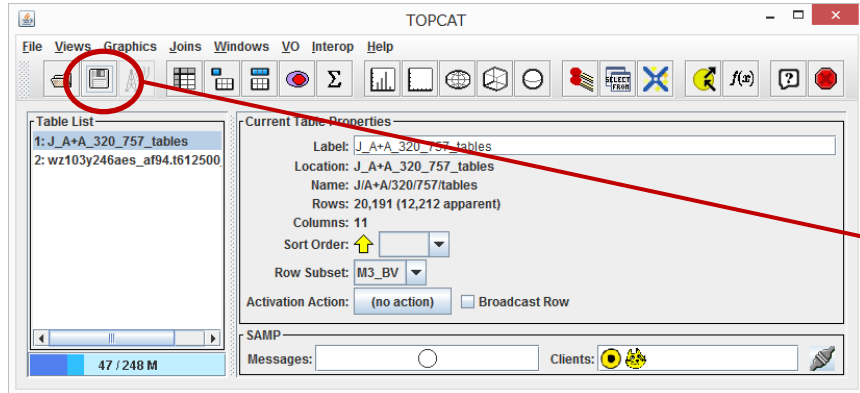
TOPCAT(1): Table Browser

Table Browser for 1: J_A+A_320_757 tables

Name	Vmag	Bmag	Imag	Xpos	Ypos	Star	n_Star	B-V
12719	18.706	18.181	0.	-927.	38.	0	0	0.475
12720	20.411	20.988	0.	347.	38.	0	0	0.577002
12723	17.646	18.291	16.86	41.	38.1	0	0	0.645
12724	16.718	17.448	15.851	37.8	38.1	0	0	0.73
12725	15.814	16.566	14.873	-15.3	38.1	0	0	0.752
12726	16.462	17.153	15.564	101.1	38.1	0	0	0.691
12731	16.059	16.944	15.129	-7.7	38.2	0	0	0.885
12737	15.011	15.876	13.999	13.3	38.4	0	0	0.865001
12739	15.985	17.374	15.319	-26.9	38.4	0	0	1.389
12742	15.923	16.375	15.262	-27.	38.4	135	1	0.452
12743	16.592	17.352	15.705	30.3	38.5	0	0	0.76
12748	17.866	18.54	17.116	63.8	38.5	0	0	0.674002
12749	17.213	17.719	16.379	-45.8	38.6	0	0	0.506001
12754	17.532	18.328	16.681	25.1	38.7	0	0	0.796
12755	15.348	16.188	14.362	42.7	38.7	0	0	0.85
12760	17.356	17.996	16.555	107.3	38.8	0	0	0.639999
12768	17.464	18.127	16.61	-123.1	38.9	0	0	0.663

セッションの保存

- サブセットの定義や追加されたカラムなどすべての操作結果を保存



使用例2

X線カタログと可視光カタログのクロスマッチ

XMM AGN Catalog のデータを取得

The image shows a workflow in TOPCAT and Cone Search. In the 'Load New Table' dialog, the 'DataSources' icon is circled in red. In the 'Cone Search' window, the 'Keywords' field contains 'XMM AGN' (circled in red), and the 'Submit Query' button is also circled in red. The search results table lists several catalogs, with 'CAIXA' (Catalog of AGN in the XMM-Newton Archive) highlighted in blue. Below the table, the 'Cone Parameters' section shows 'RA: 170 degrees (J2000)', 'Dec: 30 degrees (J2000)', and 'Radius: 20 degrees', all circled in red. The 'OK' button at the bottom is also circled in red. A red arrow points from the 'OK' button to the 'Table List' in the TOPCAT window, where 'CAIXA-20d' is now listed as the selected table.

TOPCAT - Load New Table

Format: (auto)
Location:
Filestore Browser
System Browser

Cone Search

Registry: RegTAP
Keywords: And
Match Fields: Short Name Title Subjects ID Publisher Description
 Accept Resource Lists
Cancel Query Submit Query

Short Name	Title
ICNSDSSXMM	Sloan Digital Sky Survey/XMM-Newton AGN Spectral Properties Catalog
CAIXA	Catalog of AGN in the XMM-Newton Archive
JJA+A/444/73	XMM observations of Lockman Hole brightest AGNs (Mateos+, 2005)
JJA+A/457/501	XMM-Newton survey of the ELAIS-S1 field (Puccetti+, 2006)
JJA+A/471/1105	XMM-LSS at 240MHz and 610MHz (Tasse+, 2007)
JJA+A/473/105	Lockman Hole AGN variability with XMM (Mateos+, 2007)
JJA+A/474/473	XMM-LSS survey: AGN classifications (Garcat+, 2007)
JJA+A/487/119	AGN in XMM-Newton Hard Bright Survey (Della Ceca+ 2008)

Resource Count: 30

Cone Parameters

Cone URL:
Object Name:
Resolve

RA: degrees (J2000) Accept Sky Positions
Dec: degrees (J2000)
Radius: degrees

OK

Load Selected Table

TOPCAT - Table List

1: J_A+A_320_757_tables
2: wz103y246aes_af94.t612500
3: CAIXA-20d

Current Table Properties

Label: CAIXA-20d
Location: CAIXA-20d
Name: coneGet.pl?table=caixa&RA=170.0&DEC=30.0&SR=20.0
Rows: 14
Columns: 9
Sort Order:
Row Subset: All
Activation Action: (no action) Broadcast Row

SDSS QSO カタログのデータ取得

Cone Search

Window Columns Registry Interop Help

Available Cone Services

Registry: RegTAP

Keywords: And

Match Fields: Short Name Title Subjects ID Publisher Description

Accept Resource Lists

Short Name	Title
SDSSQSO	Sloan Digital Sky Survey QSO Catalog
SDSSUNUQSR	Sloan Digital Sky Survey Unusual Quasars Catalog
SDSSXMMQSO	Sloan Digital Sky Survey (DR5)/XMM-Newton Quasar Survey Catalog
SWSDSSQSO	Swift Simultaneous UV, Optical, and X-Ray Observed Quasar Catalog
VII/242	SDSS quasar catalog III. (Schneider+, 2005)
VII/252	SDSS-DR5 quasar catalog (Schneider+, 2007)
VII/260	The SDSS-DR7 quasar catalog (Schneider+, 2010)
VII/269	SDSS Quasar Catalog, DR9Q (Paris+, 2012)

AccessURL Description Version

http://vizier.u-strasbg.fr/viz-bin/Vo...		
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Resource Count: 61

Cone Parameters

Cone URL:

Object Name:

RA: degrees (J2000) Accept

Dec: degrees (J2000)

Radius: degrees

TOPCAT

File Views Graphics Joins Windows VO Interop Help

Table List

- 1: J_A+A_320_757_tables
- 2: wz103y246aes_af94.t612500
- 10: CAIXA-20d
- 11: VII_252-20d

Current Table Properties

Label: VII_252-20d

Location: VII_252-20d

Name: VII/252/dr5qso

Rows: 8,335

Columns: 14

Sort Order:

Row Subset: All

Activation Action: (no action) Broadcast Row

SAMP

Messages:

Clients:

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座標と redshift でクロスマッチ

TOPCAT

File Views Graphics Joins Windows VO Interop Help

Table List

- 1: J_A+A_320_757_tables
- 2: wz103y246aes_af94.t612500
- 10: CAIXA-20d
- 11: VII_252-20d

Current Table Properties

Label: VII_252-20d
Location: VII_252-20d
Name: VII/252/dr5qso
Rows: 8,335
Columns: 14
Sort Order: ↑
Row Subset: All
Activation Action: (no action) Broadcast Row

SAMP

Messages: Clients:

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Match Tables

Window Tuning Help

Match Criteria

Algorithm: Sky + X
Max Error: 2 arcsec
Error in X: 0.02

Table 1

Table: 10: CAIXA-20d
RA column: ra degrees
Dec column: dec degrees
X column: redshift

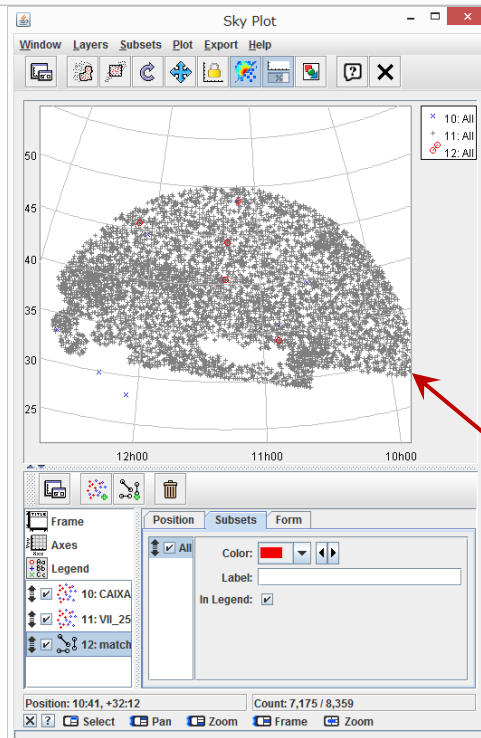
Table 2

Table: 11: VII_252-20d
RA column: RAJ2000 degrees
Dec column: DEJ2000 degrees
X column: z

Output Rows

Match Selection: Best match, symmetric
Join Type: 1 and 2

Eliminating multiple row references...
Elapsed time for match: 0 seconds
Match succeeded



Successful Match

5 pairs found
New table created by match: 12: match(10,11) (5 rows)

OK Plot Result

マッチした天体の SDSS 画像を表示

The image shows a sequence of steps in the TOPCAT software to display SDSS images for matched objects. The main window shows the 'Current Table Properties' for 'match(10,11)' with 5 rows and 23 columns. The 'Activation Action' is initially set to '(no action)'. The 'Set Activation Action' dialog is open, showing the configuration for 'SDSS Colour Images' with RA and Dec columns set to 'ra' and 'dec' respectively, and a width/height of 100 pixels. The 'Table Browser' window shows a table of objects with SDSS image links highlighted in red. The 'OK' button in the 'Set Activation Action' dialog is also highlighted.

Table Browser for 12: match(10,11)

	name	ra	dec	_RAJ2000	_DEJ2000	hb_flux	hb_flux_error
1	PG 1048+342	162.9325	33.99056	162.9329	33.99075	1.730000E-12	6.000000E-14
2	PG 1115+407	169.82621	40.43167	169.82619	40.43167	1.120000E-12	9.000000E-14
3	PG 1114+445	169.27667	44.22592	169.27666	44.22592	2.240000E-12	6.000000E-14
4	PG 1206+459	182.24172	45.87683	182.24171	45.87682	1.700000E-13	4.000000E-14

Aladin との連携

The image displays the Aladin v8.0 interface with three overlapping windows illustrating data integration:

- TOPCAT Window:** Shows a table list with '12: match(10,11)' highlighted in red. A red circle highlights the 'Joins' menu item in the toolbar.
- Aladin v8.0 (Top):** Shows the 'Location' field set to '11:16:52.88 +44:12:27.5' and the '2MASS' catalog selected in the source list. A red circle highlights the '2MASS' entry.
- Aladin v8.0 (Bottom Left):** Shows a zoomed-in view of the 'match(10,11)' source, with a red arrow pointing from the TOPCAT table to this source.
- Aladin v8.0 (Bottom Right):** Shows a zoomed-in view of the '2MASS colored' source, with a red arrow pointing from the TOPCAT table to this source.

The interface includes a toolbar with various tools (select, pan, list, phot, draw, tag, filter, cross, epoch, size, opac, zoom, crop, cont, pixel, prop, del) and a search bar at the bottom.

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