

DataLink & Activation in TOPCAT

Mark Taylor (Bristol)

IVOA Interop
Victoria

1 June 2018

`$Id: tcactiv.tex,v 1.9 2018/05/31 04:27:34 mbt Exp $`

Outline

- TOPCAT Activation Action overhaul
- DataLink in TOPCAT

Activation Actions

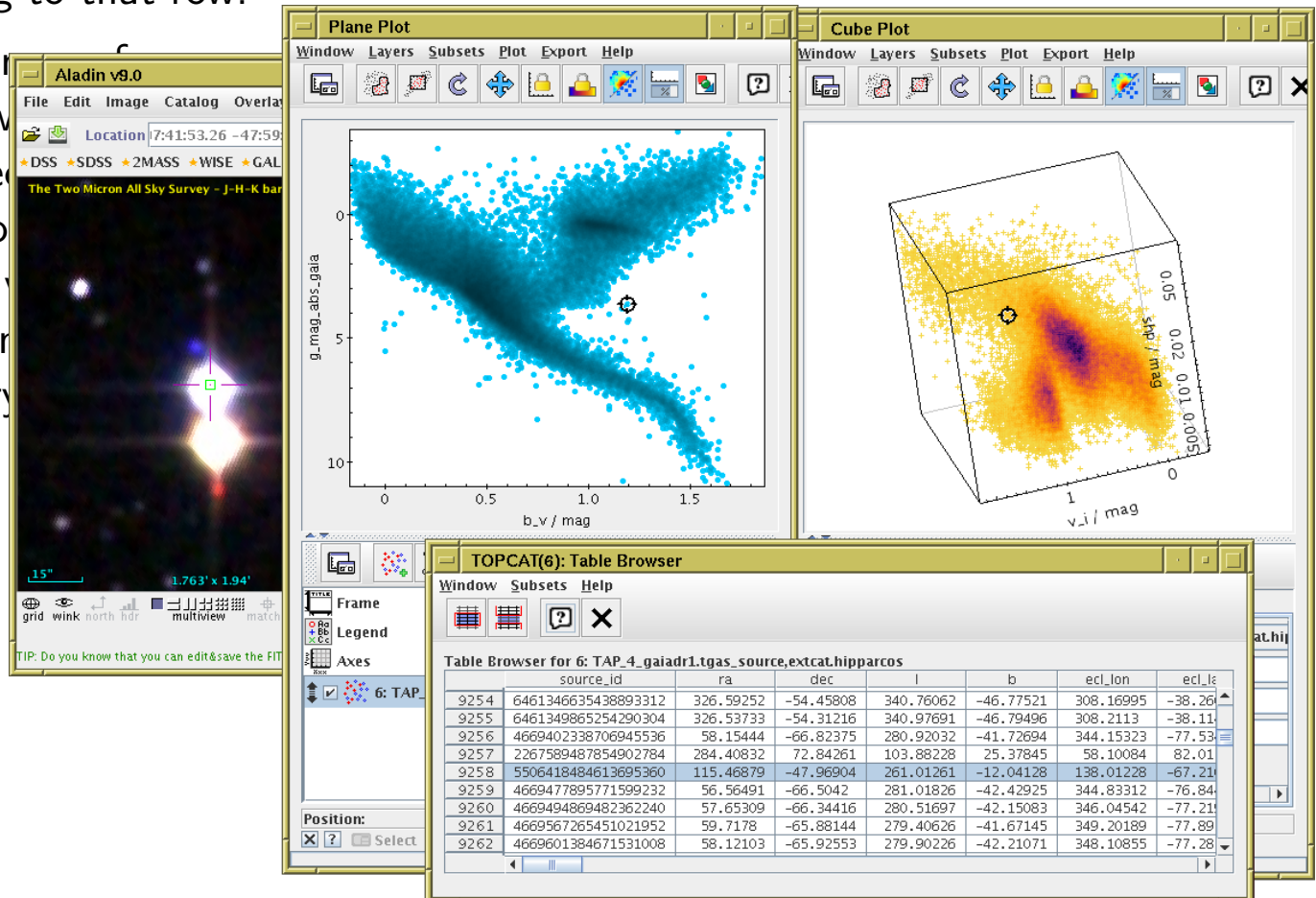
“Activation Action”: TOPCAT’s term for configurable per-row action

- Invoked per row by user action:
 - ▷ Select row in table view
 - ▷ Click on point in scatter plot
- Does something relating to that row:
 - ▷ Display cutout image from service (near sky coordinates in row)
 - ▷ View image in window (from URL/filename given in row)
 - ▷ Send image/spectrum via SAMP (from URL/filename given in row)
 - ▷ Send sky position via SAMP (from sky coordinates in row)
 - ▷ Send row index via SAMP (to client looking at same table)
 - ▷ Open resource in web browser (from URL/filename given in row)
 - ▷ Execute arbitrary code/run script (using any values in row)
 - ... etc?

Activation Actions

“Activation Action”: TOPCAT’s term for configurable per-row action

- Invoked per row by user action:
 - ▷ Select row in table view
 - ▷ Click on point in scatter plot
- Does something relating to that row:
 - ▷ Display cutout in image
 - ▷ View image in window
 - ▷ Send image/spectrum to external application
 - ▷ Send sky position to external application
 - ▷ Send row index to external application
 - ▷ Open resource in external application
 - ▷ Execute arbitrary command
 - ... etc?

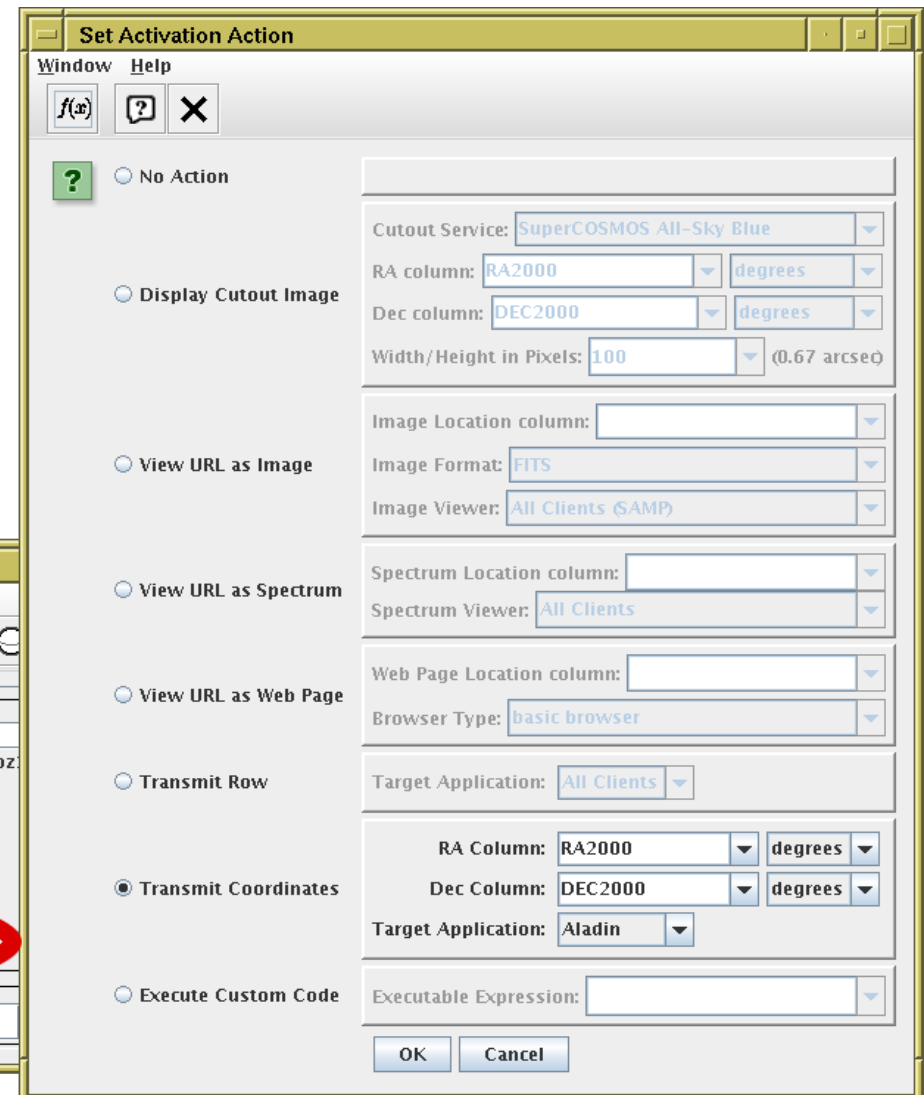
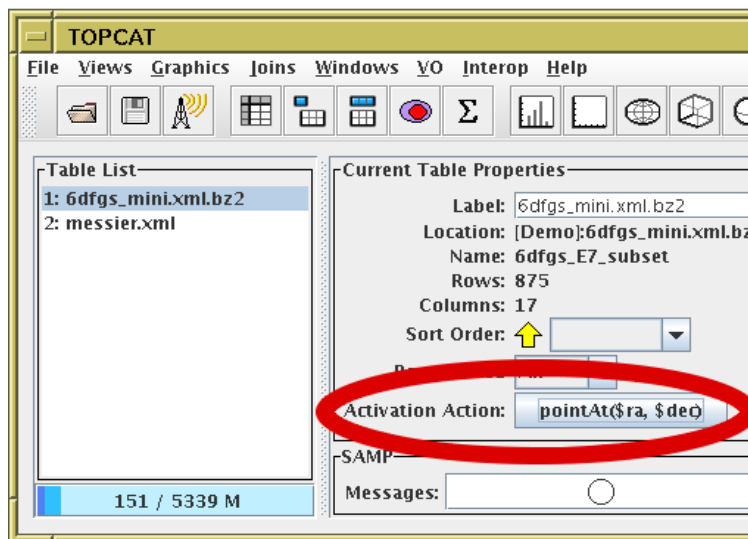


Existing Activation Window

Various issues

- Limited number of options
- Only one option at a time
- Too tall!
 - ▶ Cramped configuration GUI
 - ▶ Not extensible
- No Datalink
- Poor feedback on action outcome (stdout)
- Not persisted

Due for an overhaul



New Activation Window

From TOPCAT v4.6 (04/2018), improved v4.6-1 (05/2018)



- Better configurability
- Visual report of action outcome
- SAMP action response reported
- Better explanation of capabilities
- Can have multiple actions at once
- Better feedback on available/useful options
- Invoke directly or by row selection
- Can schedule activation for all rows (or selected row subset)
- Pluggable interface
- Many more options

Activation Actions for 2: messier.xml

Actions

- Use Sky Coordinates i
- Send Sky Coordinates
- Send FITS Image
- Display image
- Load Table
- Plot Table
- Send Spectrum
- Display Cutout Image
- Download URL
- View in Web Browser

Description

Send sky coordinates using SAMP

Configuration

RA Column: RA

Dec Column: DEC

Target Application: All Clients (1)

Status

Invoke now on row 76

Results

Seq	Row	Status	Message
4	68	OK	(189.75209, -26.75) Successfully sent to Aladin
5	1	OK	(83.50208, 22.016666) Successfully sent to Aladin
6	37	OK	(88.00166, 32.55) Successfully sent to Aladin
7	76	OK	(25.501667, 51.566666) Successfully sent to Aladin

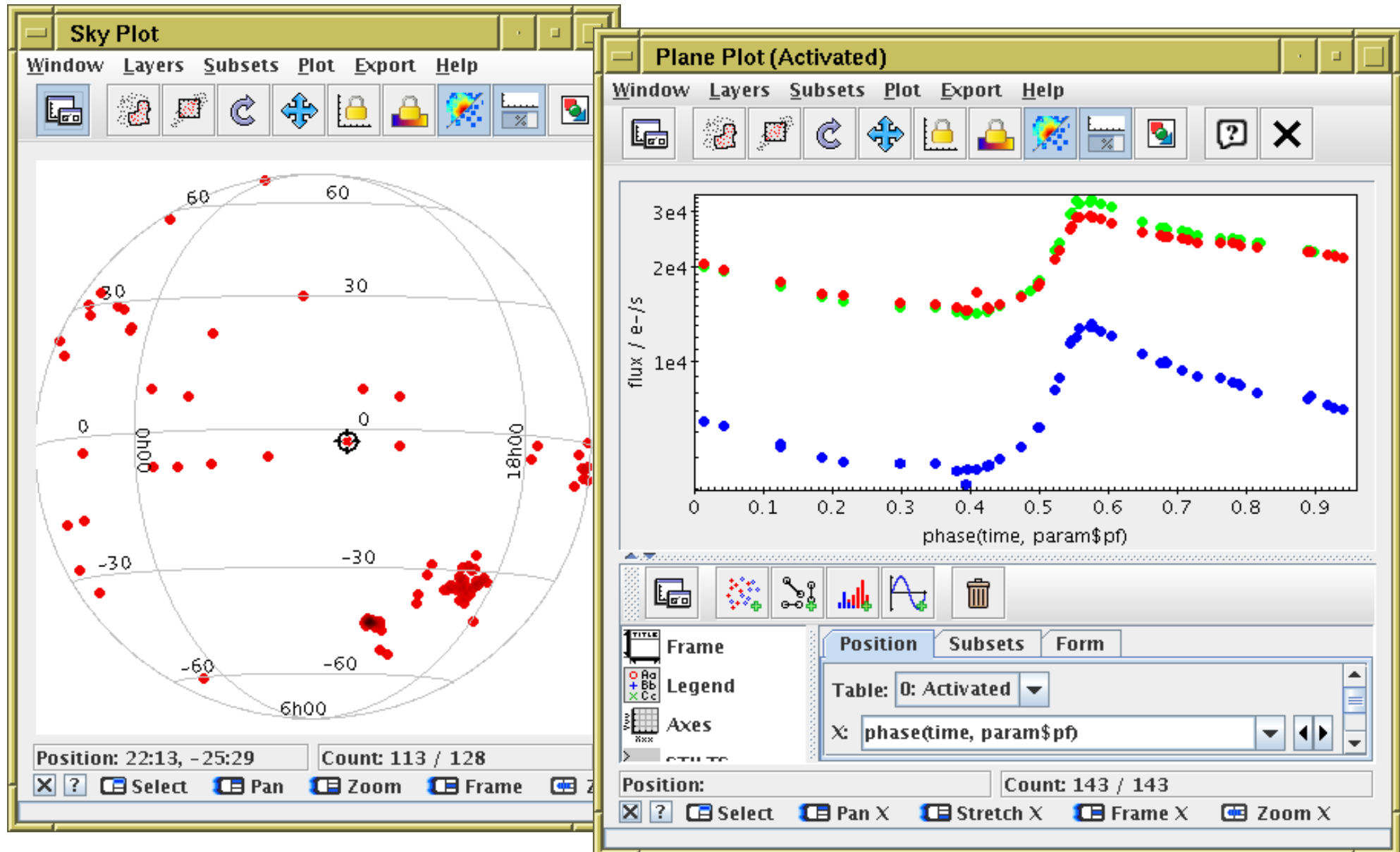
Activation Options

- Use Sky coordinate columns:
 - Use coordinates in TOPCAT (e.g. update Cone Search parameters)
 - Send coordinates (`coord.pointAt.sky`)
 - Display cutout image near coordinates (SuperCOSMOS, 2MASS, SDSS)
- Use URL column:
 - Image URL: View image internally, Send FITS image (`image.load.fits`)
 - Spectrum URL: Send spectrum (`spectrum.load.ssa-generic`)
 - Table URL: **Load Table**, **Plot Table**, **Send VOTable** (`table.load.votable`)
 - Generic URL: View in web browser, **Download to local file**
- DataLink-related:
 - **View DataLink table** (for a URL pointing to {links}-response table)
 - **Invoke DataLink row** (for rows in a {links}-response table)
 - **Invoke Service** (defined by a Service Descriptor)
- Other
 - Send row index (`table.highlight.row`)
 - Execute custom code (expression language expression)
 - **Run system (shell) command**

New options in red

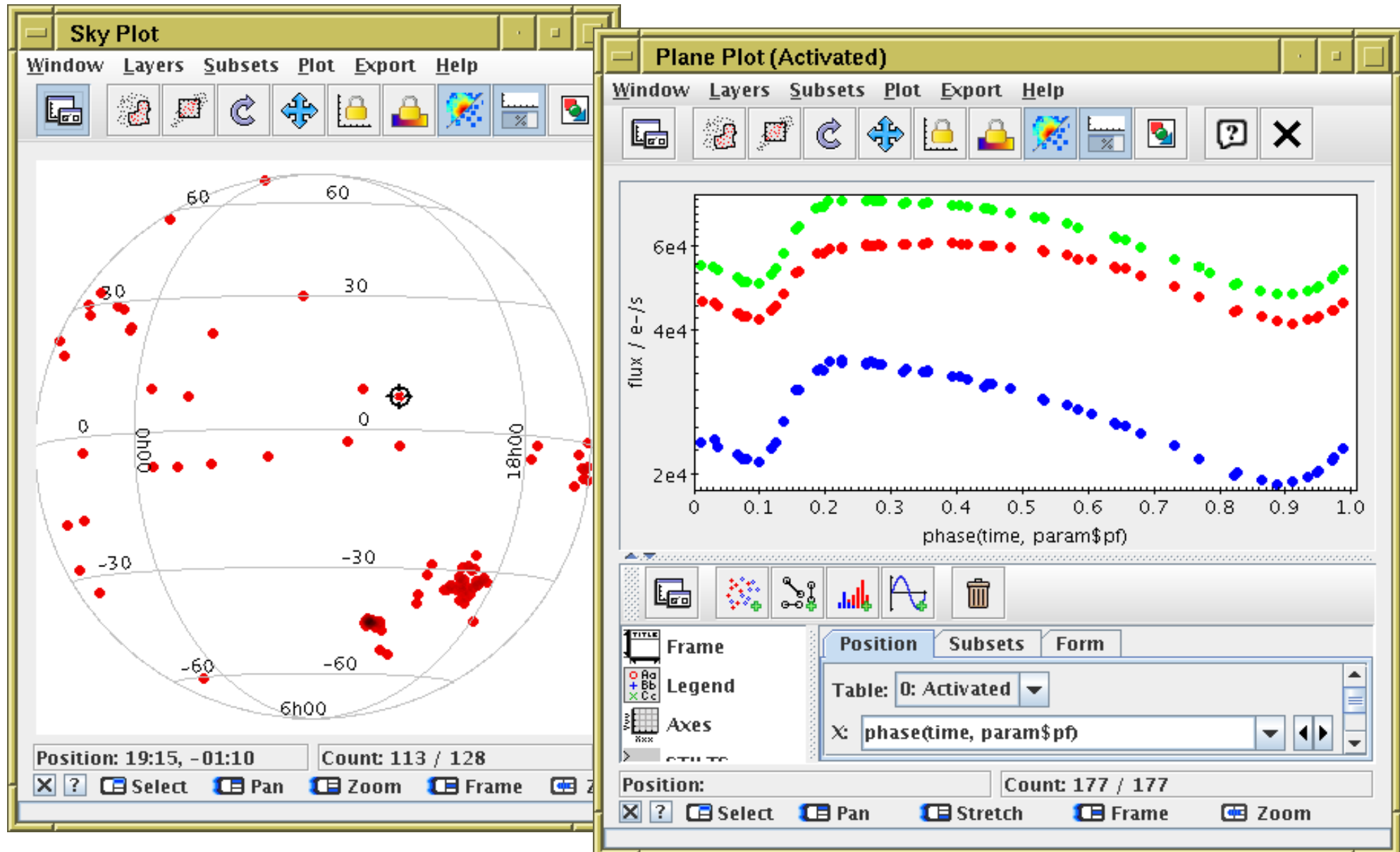
Activation Example: Plot Table

Plot Table action with Gaia DR2 `epoch_photometry_url` column



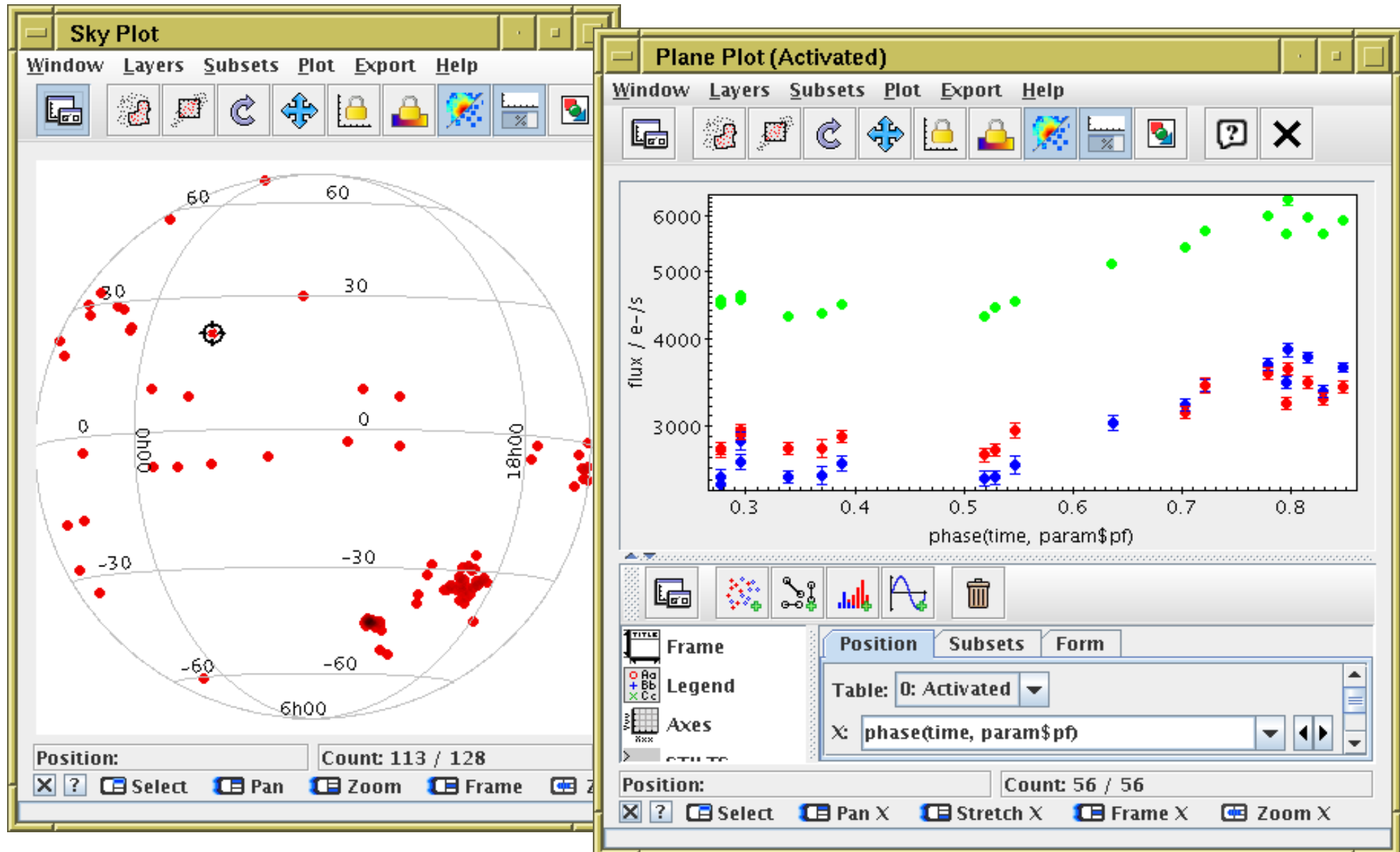
Activation Example: Plot Table

Plot Table action with Gaia DR2 `epoch_photometry_url` column



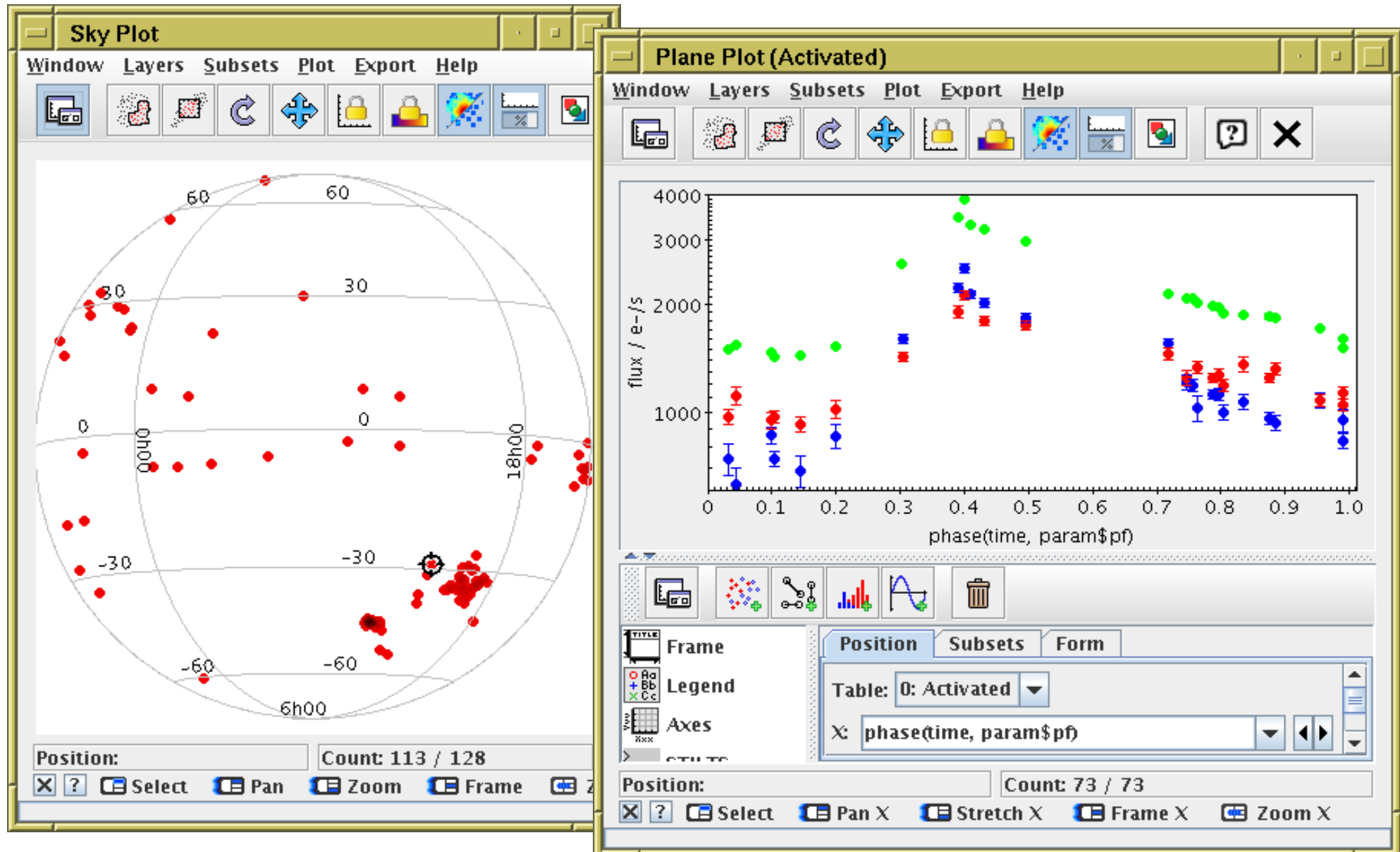
Activation Example: Plot Table

Plot Table action with Gaia DR2 `epoch_photometry_url1` column



Activation Example: Plot Table

Plot Table action with Gaia DR2 `epoch_photometry_url` column



Activation Example: Sequence



Sequence for Messier objects

- Display Image action using internal viewer
- Execute Code action with command `sleep(5)`

The screenshot shows two windows from the TOPCAT software. The main window, titled "TOPCAT(2): Activation Actions", displays a configuration for a sequence of actions for Messier objects. The "Actions" list includes "Use Sky Coordinate", "Display image", and "Execute code". The "Description" field explains that the "Display image" action uses an internal image display tool. The "Configuration" section shows "Image Location" set to "ImageURL" and "Image Viewer" set to "Basic". The "Status" section includes a lightning bolt icon and the text "Invoke now on row 1". The "Results" table shows the following data:

Seq	Row	Status	Message
126	105	OK	http://messier.obspm.fr/jpg/m105.jpg
127	106	OK	http://messier.obspm.fr/jpg/m106.jpg
128	107	OK	http://messier.obspm.fr/jpg/m107.jpg
129	108	OK	http://messier.obspm.fr/jpg/m108.jpg
130	109	OK	http://messier.obspm.fr/jpg/m109.jpg

The second window, titled "ImageURL(2)", displays a black and white image of a Messier object, likely a galaxy or nebula, with a bright central region and several smaller stars or galaxies scattered around it.

DataLink Refresher

DataLink defines (approximately) 2 things:

1. {Links} service — response is a table of a fixed form

name	description	required	UCD
ID	Input identifier	yes	meta.id;meta.main
access_url	link to data or service	one only	meta.ref.url
service_def	reference to a service descriptor resource		meta.ref
error_message	error if an access_url cannot be created		meta.code.error
description	human-readable text describing this link	no	meta.note
semantics	Term from a controlled vocabulary describing the link	yes	meta.code
content_type	mime-type of the content the link returns	no	meta.code.mime
content_length	size of the download the link returns	no	phys.size;meta.file

Table 1: Required Fields for Links

2. Service Descriptors — define how to invoke a service from a row

```
<RESOURCE name="EpochPhotom" type="meta" utype="ad hoc:service">
  <DESCRIPTION>Epoch photometry</DESCRIPTION>
  <PARAM name="accessURL" ucd="meta.ref.url" arraysize="*" datatype="char"
    value="http://gaia.ari.uni-heidelberg.de/timeseries/gaiadr1"/>
  <GROUP name="inputParams">
    <PARAM name="sourceid" datatype="long" value="" ref="source_id_col"/>
    <PARAM name="resolution" datatype="double" unit='d' value="20"/>
    <PARAM name="band" datatype="double" value=""/>
  </GROUP>
</RESOURCE>
```

DataLink in TOPCAT

 View table as DataLink table

 Datalink activation actions:

- View DataLink table (identified by URL in row)
- Invoke row in {links}-response table (using {links}-response format)
- Invoke Service Descriptor

 View Service Descriptors in Parameter window

 Service Descriptors survive TOPCAT/STILTS save→load cycle

DataLink Window



Datalink View Window

- For use with {links}-response tables
- Top panel displays row data
- Bottom panel shows indicated link:
 - ▷ fixed URL
 - ▷ service descriptor
 - ▷ error
 - ▷ non-compliant
- For URL-like links, you can perform some configurable action
- For service descriptors, you can view/edit service parameters
currently only provides basic GUI
- Available from top-level **Views** menu (not very prominent)

TOPCAT(1): DataLink View

Window Help

DataLink View for 1: gavo-califa.vot

DataLink Table

	ID	access_url	service_def	
6	ivo://org.gavo.dc/~?califa...		procsvc0	
7	ivo://org.gavo.dc/~?califa...		procsvc1	
8	ivo://org.gavo.dc/~?califa...		procsvc2	
9	ivo://org.gavo.dc/~?califa...	http://dc.zah.uni-heidelb...		
10	ivo://org.gavo.dc/~?califa...	http://dc.zah.uni-heidelb...		
11	ivo://org.gavo.dc/~?califa...	http://dc.zah.uni-heidelb...		
12	ivo://org.gavo.dc/~?califa...	http://dc.zah.uni-heidelb...		
13	not-a-real-identifier			NotFc

Row Link Type

Fixed Access URL

Row Detail

access_url: http://dc.zah.uni-heidelberg.de/getproduct/califa/datadr3/COMB/

content_type: image/jpeg

content_length:

description: A preview for the dataset.

semantics: #preview

URL: http://dc.zah.uni-heidelberg.de/getproduct/califa/datadr3/COMB/ARP220.CC

Type: IMAGE Action: View image internally Invoke

DataLink Window



Datalink View Window

- For use with {links}-response tables
- Top panel displays row data
- Bottom panel shows indicated link:
 - ▷ fixed URL
 - ▷ service descriptor
 - ▷ error
 - ▷ non-compliant
- For URL-like links, you can perform some configurable action
- For service descriptors, you can view/edit service parameters
currently only provides basic GUI
- Available from top-level **Views** menu (not very prominent)

TOPCAT(1): DataLink View

Window Help

DataLink View for 1: gavo-califa.vot

DataLink Table

	ID	access_url	service_def	
6	ivo://org.gavo.dc/~?califa...		procsvc0	
7	ivo://org.gavo.dc/~?califa...		procsvc1	
8	ivo://org.gavo.dc/~?califa...		procsvc2	
9	ivo://org.gavo.dc/~?califa...	http://dc.zah.uni-heidelb...		
10	ivo://org.gavo.dc/~?califa...	http://dc.zah.uni-heidelb...		
11	ivo://org.gavo.dc/~?califa...	http://dc.zah.uni-heidelb...		
12	ivo://org.gavo.dc/~?califa...	http://dc.zah.uni-heidelb...		
13	not-a-real-identifier			NotFc

Row Link Type
Service Invocation

Row Detail

content_type:
description: An interactive service on this dataset.
semantics: #proc
Standard ID: ivo://ivoa.net/std/SODA#sync-1.0
Resource ID:
URL: http://dc.zah.uni-heidelberg.de/califa/q3/dl/dlget?ID=ivo%3a%2f%2forg.gavo.
 Type: UNKNOWN Action: Send FITS Image Invoke

Parameters

ID: ivo://org.gavo.dc/~?califa/datadr3/COMB/IC1078.COMB.rscube.fits
DEC:
RA:
SCALE:
BAND:

DataLink Window



Datalink View Window

- For use with {links}-response tables
- Top panel displays row data
- Bottom panel shows indicated link:
 - ▷ fixed URL
 - ▷ service descriptor
 - ▷ error
 - ▷ non-compliant
- For URL-like links, you can perform some configurable action
- For service descriptors, you can view/edit service parameters
currently only provides basic GUI
- Available from top-level **Views** menu (not very prominent)

TOPCAT(1): DataLink View

Window Help

DataLink View for 1: gavo-califa.vot

DataLink Table

	ID	access_url	service_def	
6	ivo://org.gavo.dc/~?califa...		procsvc0	
7	ivo://org.gavo.dc/~?califa...		procsvc1	
8	ivo://org.gavo.dc/~?califa...		procsvc2	
9	ivo://org.gavo.dc/~?califa...	http://dc.zah.uni-heidelb...		
10	ivo://org.gavo.dc/~?califa...	http://dc.zah.uni-heidelb...		
11	ivo://org.gavo.dc/~?califa...	http://dc.zah.uni-heidelb...		
12	ivo://org.gavo.dc/~?califa...	http://dc.zah.uni-heidelb...		
13	not-a-real-identifier			NotFc

Row Link Type

Link Error

Row Detail

Error:
NotFoundFault: Not a pubDID from this site.

View DataLink Activation Action

Activation action for column with {links}-response URL

- Pops up Datalink table view on activation
- From that window links can be invoked (configurable actions)
- Q: How to identify a datalink URL column?

The image shows two overlapping windows from the TOPCAT software. The top window is titled 'TOPCAT(5): Activation Actions' and shows a list of 'Defined Actions' for a column named 'boydende1.vot'. The 'View Datalink Table' action is selected. The bottom window is titled 'TOPCAT(5): Activation - View Datalink Table' and displays a table of data links. The table has columns for ID, access_url, and service_desc. Row 3 is highlighted. Below the table, there is a 'Row Link Type' section set to 'Fixed Access URL' and a 'Row Detail' section showing metadata for the selected row, including the full URL and a type of 'FITS_IMAGE'. An 'Invoke' button is visible at the bottom right of the detail section.

TOPCAT(5): Activation Actions

Window Actions Help

Activation Actions for 5: boydende1.vot

Defined Actions

- Use Sky Coordinates in TO
- View Datalink Table
- Send Spectrum
- Transmit Sky Coordinates

Description

View the data in a file or URL column as a DataLink table

Configuration

Datalink Location Column: datalink_url

TOPCAT(5): Activation - View Datalink Table

DataLink Table

	ID	access_url	service_desc
1	1 ivo://org.gavo.dc/~?boydende/d...	http://dc.zah.uni-heidelberg.de/...	
2	2 ivo://org.gavo.dc/~?boydende/d...		procsvc
3	3 ivo://org.gavo.dc/~?boydende/d...	http://dc.zah.uni-heidelberg.de/...	
4	4 ivo://org.gavo.dc/~?boydende/d...	http://dc.zah.uni-heidelberg.de/...	

Row Link Type

Fixed Access URL

Row Detail

access_url: http://dc.zah.uni-heidelberg.de/getproduct/boydende/data/fits/HAR081_006478.fits

content_type: image/fits

content_length: 403292160

description: The full dataset.

semantics: #this

URL: http://dc.zah.uni-heidelberg.de/getproduct/boydende/data/fits/HAR081_006478.fits

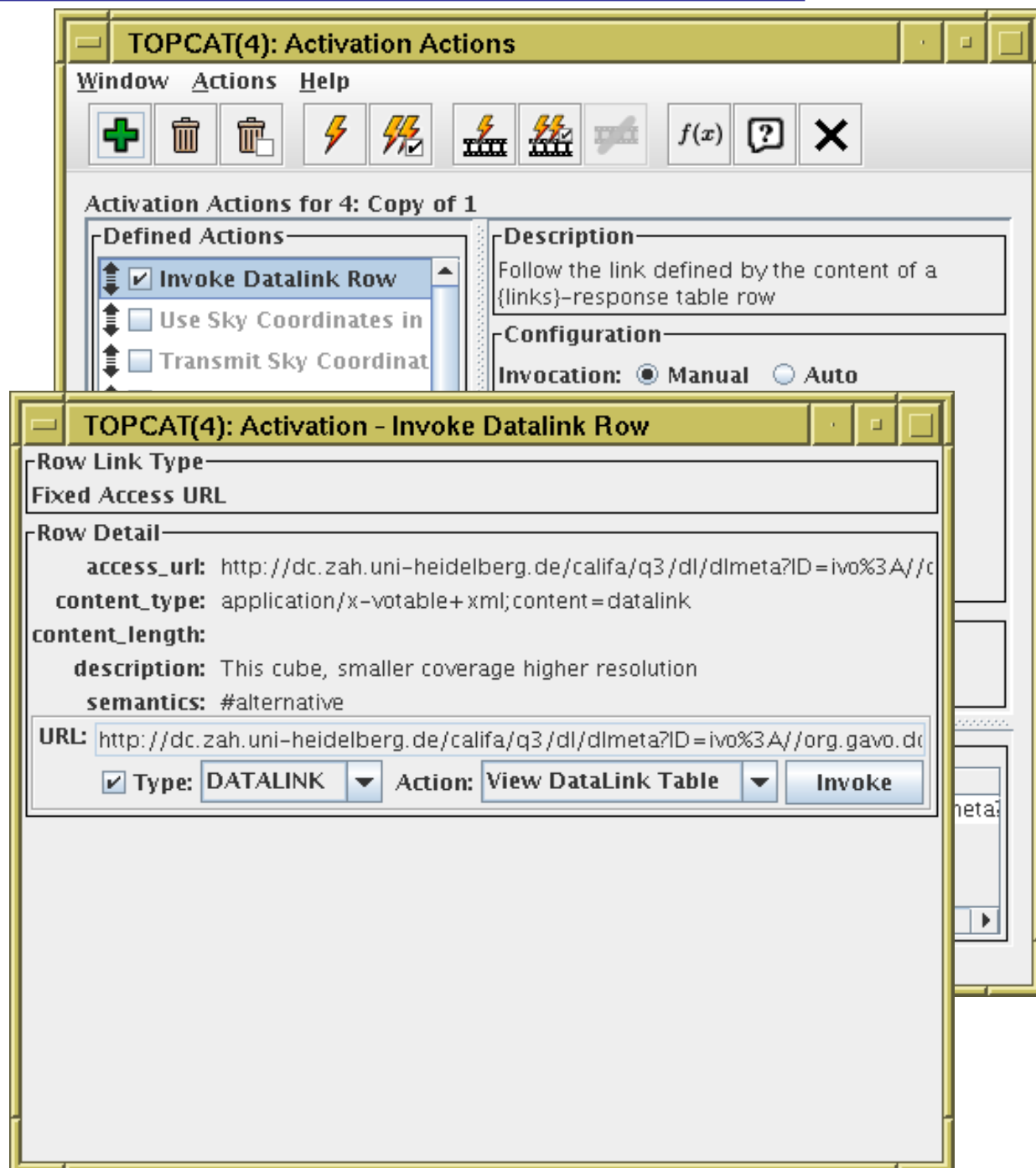
Type: FITS_IMAGE Action: View image internally Invoke

Invoke DataLink Row Activation Action

Activation action for rows of {links}-response table

- Pops up window for activated row's link:
 - ▷ fixed URL
 - ▷ service descriptor
 - ▷ error
- For URL-like links, you can perform a configurable action
- For service descriptors, you can view/edit service parameters
currently only has basic GUI

*DataLink window
(similar functionality)
may be more convenient
than this activation action*

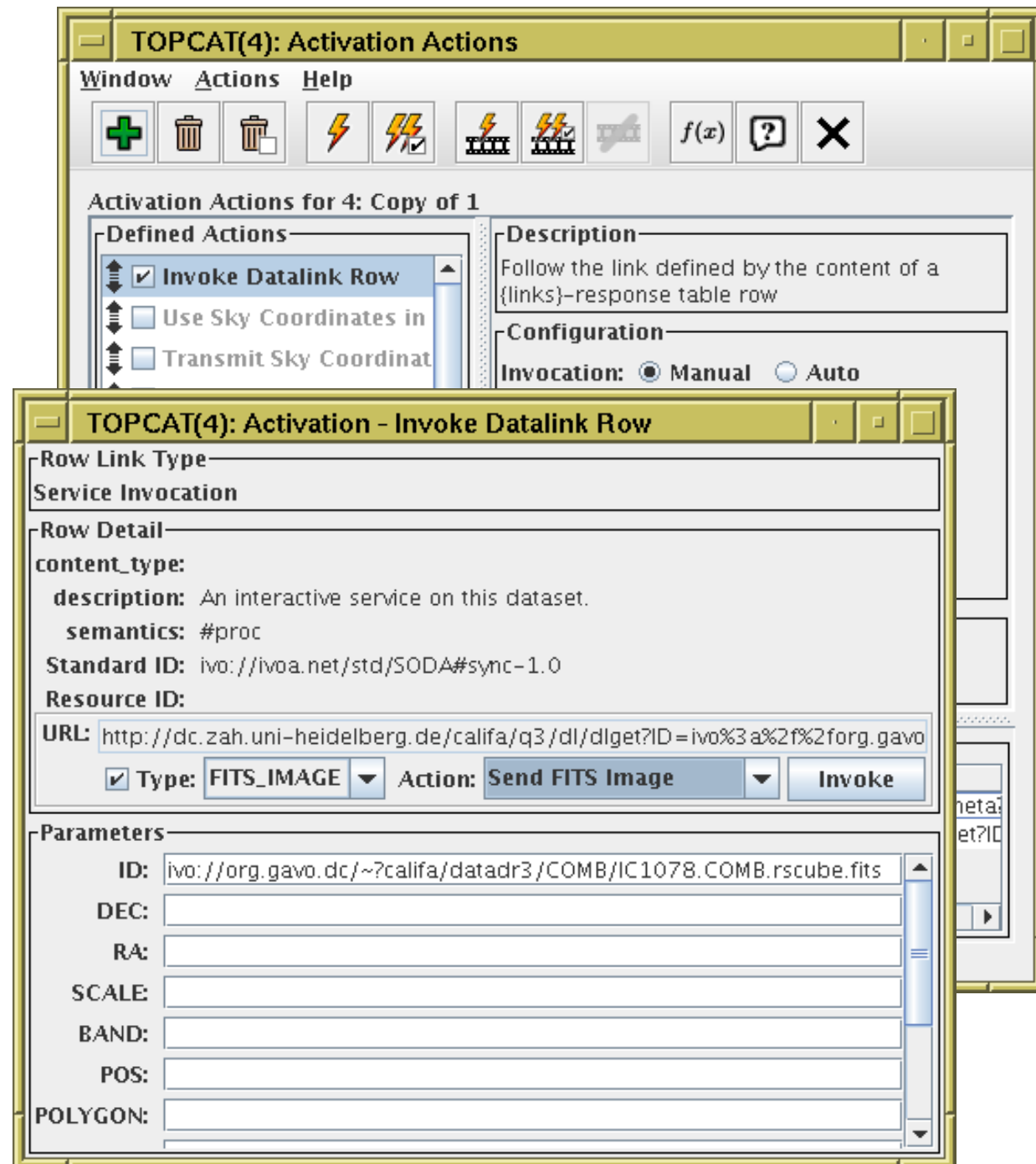


Invoke DataLink Row Activation Action

Activation action for rows of {links}-response table

- Pops up window for activated row's link:
 - ▷ fixed URL
 - ▷ service descriptor
 - ▷ error
- For URL-like links, you can perform a configurable action
- For service descriptors, you can view/edit service parameters
currently only has basic GUI

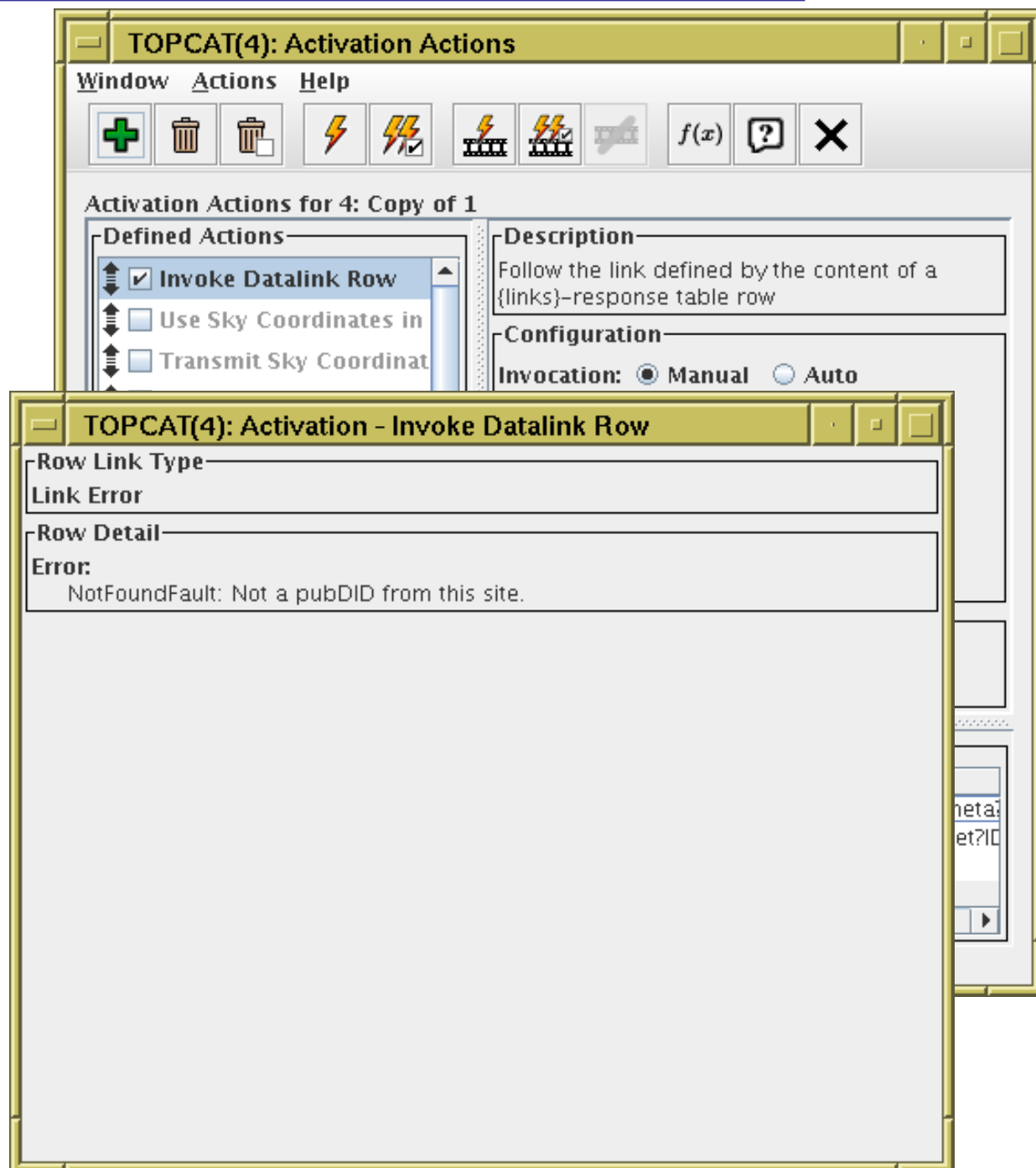
DataLink window (similar functionality) may be more convenient than this activation action



Invoke DataLink Row Activation Action

Activation action for rows of {links}-response table

- Pops up window for activated row's link:
 - ▷ fixed URL
 - ▷ service descriptor
 - ▷ error
- For URL-like links, you can perform a configurable action
- For service descriptors, you can view/edit service parameters
currently only has basic GUI



*DataLink window
(similar functionality)
may be more convenient
than this activation action*

Invoke Service Activation Action

Activation action for non-`{links}`-response table with Service Descriptor(s)

- Fills in service inputParams
 - ▷ column-referenced values filled in from table
 - ▷ fixed/defaulted values displayed for possible editing
 - ▷ undefaulted values can be filled in
currently only has basic GUI
- Configurable options to invoke the resulting URL
- Q: Are there services out there serving this kind of table?

TOPCAT(3): Activation Actions

Window Actions Help

Activation Actions for 3: rrlyrae_serv.vot

Defined Actions

- Invoke Service
- Use Sky Coordinates
- Transmit Sky Coordi
- Display Cutout Imag
- Execute code
- Transmit row

Description

Invoke a service defined by a ServiceDescriptor attached to the table

Configuration

Action: Load Table

Service: (unnamed)

Name: EpochPhotom

Description: Multi-band epoch photometry

Base URL: http://gaia.ari.uni-heidelberg.de/tim

IVOID:

Standard ID:

dummy:

fixed: dflt value

Status

Invoke now on row 13

Results

Seq	Row	Status	Message
1	8	OK	4: gaiadr1?fixed=dflt%20value&sourceid=465888365458...
2	16	OK	5: gaiadr1?fixed=dflt%20value&sourceid=465889314215...
3	13	OK	6: gaiadr1?fixed=dflt%20value&sourceid=465889187084...

Service Descriptors as Parameters

Service Descriptors are now considered table *Parameters*

- Can be viewed in TOPCAT **Parameters Window**
 - ▷ Most useful for non-`{links}`-response tables with Service Descriptors
- Can be saved and loaded
 - ▷ VOTable-like formats only
- Done by STIL VOTable handler
 - ▷ Available to third-party applications code

The screenshot shows the TOPCAT(1): Table Parameters window. The window title is 'TOPCAT(1): Table Parameters'. The menu bar includes 'Window', 'Parameters', 'Display', and 'Help'. Below the menu bar are icons for adding, deleting, help, and closing. The main area displays 'Table Parameters for 1: rrlyrae_serv.vot' with a table of parameters. The table has columns for Name, Value, and Description. The 'Service-EpochPhotom' parameter is highlighted. Below the table, the details for 'Service-EpochPhotom' are shown, including Name, Class, Shape, Units, Description, UCD, Utype, and Value.

Name	Value	Description
Name	sync	Table name
Column Count	16	Number of columns
Row Count	2595	Number of rows
QUERY_STATUS	OK	
PROVIDER	ARI (Astronomisches Rechen Institut - Hei...	ARI's TAP access to the Gaia Archive.
QUERY	select * from gaiadr1.rrlyrae	
Service-EpochPhotom	accessURL: http://gaia.ari.uni-heidelber...	Datalink-style service descriptor

Name: Service-EpochPhotom
Class: ServiceDescriptor
Shape:
Units:
Description: Datalink-style service descriptor
UCD:
Utype:
Value:
accessURL:
http://gaia.ari.uni-heidelberg.de/timeseries/gaiadr1
Input parameters:
sourceid (column=source_id)
dummy (type=char[*])
fixed (default="dflt value")

Future

- More activation options
 - Improve Display Cutout Image action
 - Reload Table?
 - Others?
- Improve service descriptor parameter GUI
- Feedback welcome!