

STEP 0: software

Other software for images and tables.

<http://www.star.bristol.ac.uk/~mbt/topcat/>

<https://aladin.cds.unistra.fr/aladin.gml>

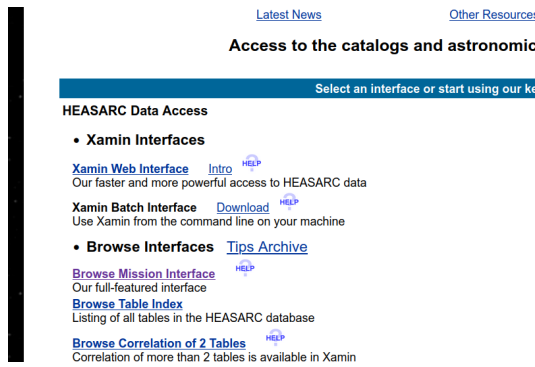
<https://sites.google.com/cfa.harvard.edu/saomageds9>

STEP 1

Download data from nasa archive

<https://heasarc.gsfc.nasa.gov/docs/archive.html>

Select browse mission interface



STEP 2

We can select a favorite source, and a telescope.

E.g. "SMC X-2" (object name) and Swift (tick box)

1. Do you want to search around a position ... ?

(If you want to search on parameters other than object name or coordinates, select "Detailed Mission/Catalog Search".)

Object Name or Coordinates: **and/or** **Select Local File:** No file selected.

e.g. Cyg X-1 or 12 00 00, 4 12 6 or
Cyg X-2; 12.235, 15.345 (Note use of semi-colons (;) to separate multiple object names or coordinate pairs)

Coordinate System:

Search Radius:

Default uses the optimum radius for each catalog searched.

... and/or search by date?

Observation Dates: YYYY-MM-DD hh:mm:ss or MJD: DDDDD.ddd

Not all tables have observation dates. For those that do, the time portion of the date is optional. Separate multiple dates/ranges with semicolons (;). Range operator is '..' (e.g. 1992-12-31; 48980.5; 1995-01-15 12:00:00; 1997-03-20 .. 2000-10-18)

2. What missions and catalogs do you want to search? (Bold text indicates mission is active)

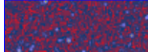
- Most Requested Missions
 - Chandra [CXC, CSC]
 - XPE [MSFC]
 - ROSAT
 - WMAP
 - Fermi
 - MAXI [JAXA]
 - RXTE
 - XMM-Newton [XSA]
 - HaloSat
 - NICER
 - Suzaku
 - Hitomi
 - NuSTAR [Caltech]
 - Swift

STEP 3

Start searching... wait, and select query results

Query Information Query Results Data Products Retrieval Help Processing Query...

Images generated by [SkyView](#)
Click on image to see full SkyView image



Search was based on: _____

Query Information Query Results Data Products Retrieval Help Processing Query...

swift

swiftmastr swift2sxps swifttdrss swiftuvlog swbatmontr swiftbalog

STEP 4

You will see a long... long list of observations. These are all SWIFT observations around SMC X-2, many of them might target nearby sources as well (e.g. SXP 15.3, this is a pulsar with a spin period of 15.3 seconds).

Remember swift takes short exposures (<2000 sec) and exposures are grouped within 1 day bins

Data Products: Click checkbox to add row to Data Product Retrieval List

Swift Master Catalog (swiftmastr) Bulletin
Search radius used: 25.00'

Select	Related Links	Services	name	obsid	ra	dec	start time	processing date	xrt_exposure	uvot_exposure	bat_exposure	archive_date
<input type="checkbox"/>	BAT UVOT XRT	O R N S D B	SwiftSMCtransient	00032075003	00 51 31.33	-73 27 48.2	2011-08-25 08:36:00	2016-09-29	10551.91400	10519.08500	10604.00000	2011-09-05
<input type="checkbox"/>	BAT UVOT XRT	O R N S D B	MAXIJ0051-736	00034073044	00 54 36.43	-73 41 07.4	2015-10-22 02:53:57	2015-11-01	8337.38500	8322.36300	7591.00000	2015-11-02
<input type="checkbox"/>	BAT UVOT XRT	O R N S D B	SwiftSMCtransient	00032075002	00 52 05.23	-73 28 12.2	2011-08-24 00:43:00	2016-09-29	6271.78600	6235.32100	6084.00000	2011-09-04
<input type="checkbox"/>	BAT UVOT XRT	O R N S D B	MAXIJ0051-736	00034073034	00 54 32.01	-73 39 36.9	2015-10-17 04:52:57	2015-10-27	4540.64100	4518.93000	3952.00000	2015-10-28
<input type="checkbox"/>	BAT UVOT XRT	O R N S D B	MAXIJ0051-736	00034073036	00 54 35.18	-73 41 11.2	2015-10-18 09:34:58	2015-10-28	4438.67900	4430.26900	4148.00000	2015-10-29
<input type="checkbox"/>	BAT UVOT XRT	O R N S D B	MAXIJ0051-736	00034073040	00 54 32.32	-73 41 08.2	2015-10-20 04:40:58	2015-10-30	4381.69300	4370.87900	4082.00000	2015-10-31
<input type="checkbox"/>	BAT UVOT XRT	O R N S D B	MAXIJ0051-736	00034073050	00 54 35.90	-73 41 08.9	2015-10-25 09:03:58	2015-11-04	4378.86000	4370.41600	3947.00000	2015-11-05
<input type="checkbox"/>	BAT UVOT XRT	O R N S D B	MAXIJ0051-736	00034073032	00 54 37.52	-73 39 42.7	2015-10-16 12:55:58	2015-10-26	4018.53800	4010.14600	3666.00000	2015-10-27
<input type="checkbox"/>	BAT UVOT XRT	O R N S D B	XMM_J004855.5-734946	00034599009	00 48 53.62	-73 48 07.3	2021-11-19 15:40:35	2021-11-29	3978.01000	3952.65400	4004.00000	2021-11-30
<input type="checkbox"/>	BAT UVOT XRT	O R N S D B	MAXIJ0051-736	00034073042	00 54 36.84	-73 41 20.9	2015-10-21 14:08:58	2015-10-31	3962.11500	3950.16100	3671.00000	2015-11-01
<input type="checkbox"/>	BAT UVOT XRT	O R N S D B	MAXIJ0051-736	00034073052	00 54 34.49	-73 40 46.2	2015-10-26 05:48:58	2015-11-05	3961.62500	3951.33000	3644.00000	2015-11-06
<input type="checkbox"/>	BAT UVOT XRT	O R N S D B	MAXIJ0051-736	00034073046	00 54 35.62	-73 41 02.3	2015-10-23 08:00:58	2015-11-02	3958.51500	3948.38800	3739.00000	2015-11-03
<input type="checkbox"/>	BAT UVOT XRT	O R N S D B	MAXIJ0051-736	00034073062	00 54 33.72	-73 41 13.5	2015-10-31 05:32:58	2015-11-10	3917.61100	3904.05400	2533.00000	2015-11-11
<input type="checkbox"/>	BAT UVOT XRT	O R N S D B	MAXIJ0051-736	00034073060	00 54 34.88	-73 40 37.0	2015-10-30 00:48:58	2015-11-09	3698.32800	3688.01400	3321.00000	2015-11-10
<input type="checkbox"/>	BAT UVOT XRT	O R N S D B	MAXIJ0051-736	00034073056	00 54 32.15	-73 41 00.0	2015-10-28 00:54:58	2015-11-07	3492.90900	3478.53700	3266.00000	2015-11-08

Lets select the first one... 00032075003, ore just one at random

[Swift Master Catalog \(swiftmastr\)](#) [Bulletin](#)

Search radius used: 25.00'

Select	Related Links	Services	name	obsid
<input type="checkbox"/>	All			
<input checked="" type="checkbox"/>	BAT UVOT XRT	O R N S D B	SwiftSMCtransient	00032075003
<input type="checkbox"/>	BAT UVOT XRT	O R N S D B	MAXIJ0051-736	00034073044
<input type="checkbox"/>	BAT UVOT XRT	O R N S D B	SwiftSMCtransient	00032075002
<input type="checkbox"/>	BAT UVOT XRT	O R N S D B	MAXIJ0051-736	00034073034

Then we can download the data... scroll way down and select everything but NOT BAT... then click on retrieve data products

Data Product Retrieval

- Select the checkboxes for the rows of interest above,
- Un-check any data products below you are not interested in
- Select the Data Product Retrieval tab for retrieval options

Data Products available for swiftmastr:

- All
- Full Swift Observation (swift.obs)
- Auxil Data (swift.obs.aux)
- BAT All Data (swift.obs.bat)
- Log Files (swift.obs.log)
- UVOT All Data (swift.obs.uvot)
- XRT All Data (swift.obs.xrt)

[Retrieve Data Products for selected rows](#)

STEP 5

You can download data with a script (advanced users) or simply by “retrieve”

[Query Information](#) | [Query Results](#) | [Data Products Retrieval](#) | [Help](#)

Data Products Download Options and Other Services

Data Products Download Options	Other Services
<input type="button" value="Create Download Script"/> for data products for selected rows <input type="button" value="Preview and Retrieve"/> data products for selected rows <input type="button" value="Retrieve"/> data products for selected rows <input type="button" value="Save to Hera"/> data products for selected rows What is Hera?	<input type="button" value="Display all the data"/>
Optionally, add a file name constraint to specify product types, e.g., */hri/*.gif* Use a semicolon (;) for multiple constraints, e.g., *fits*;*.gif* <input type="text" value="File name filter"/>	Web-based services: NED SIMBAD SkyView:ROS SkyView:DSS CoCo Web-based services

Data products that you have selected will appear below

This will open a new window and you will see a link and the compressed size of the data

Main Search Form
Data Products Retrieval for selected rows

Estimated size of TAR file: 172 MB

Your TAR file is being created now. When finished you may retrieve it via the following link

<https://heasarc.gsfc.nasa.gov/FTP/retrieve/w3browse/w3browse-179122.tar>

Please wait until the "TAR complete" message appears below before retrieving.

Below are data products included in the TAR file: (filenames ending in '.gz' or '.Z' have been compressed for faster downloading.)

Tarred: /FTP/swift/data/obs/2011_08//00032075003

TAR complete: Actual size: 172 MB.

Remote files are not included in the tar file. Use the **Create Download Script** option to retrieve remote files.

STEP 6

Extract the zip/tar file in some folder and you can see several folders and subfolders.

X-ray data are in

“xrt/events/”

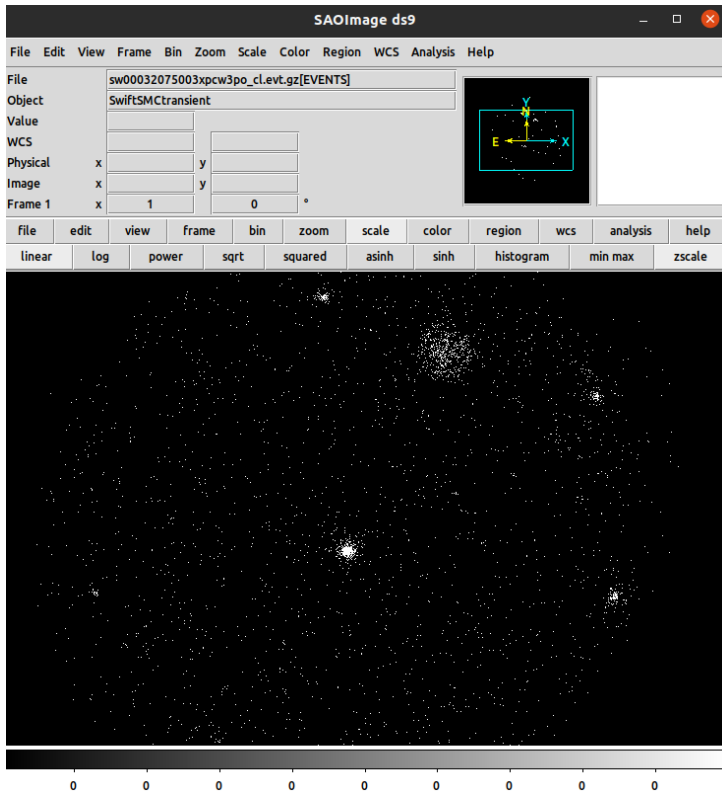
```
(base) vasilopoulos@obas-rech-gv:~/Downloads$ cd 00032075003
(base) vasilopoulos@obas-rech-gv:~/Downloads/00032075003$ ls
auxil  bat  log  uvot  xrt
(base) vasilopoulos@obas-rech-gv:~/Downloads/00032075003$ cd xrt
(base) vasilopoulos@obas-rech-gv:~/Downloads/00032075003/xrt$ ls
event  hk  products
(base) vasilopoulos@obas-rech-gv:~/Downloads/00032075003/xrt$ cd event/
(base) vasilopoulos@obas-rech-gv:~/Downloads/00032075003/xrt/event$ ls
sw00032075003xpcw3po_cl.evt.gz  sw00032075003xwtw2sl_uf.evt.gz  sw00032075003xwtw2st_uf.evt.gz
sw00032075003xpcw3po_uf.evt.gz  sw00032075003xwtw2sl_ufre.evt.gz  sw00032075003xwtw2st_ufre.evt.gz
sw00032075003xwtw2sl_cl.evt.gz  sw00032075003xwtw2st_cl.evt.gz
(base) vasilopoulos@obas-rech-gv:~/Downloads/00032075003/xrt/event$
```

“*pc*” files are in imaging mode, while *wt* files are in window timing mode, i.e. projection of ccd in 1D.

cl files are cleaned from the HEASOFT pipeline, *uf* files are unfiltered so they contain all these BAD events from corrupted pixels and columns and from background.

STEP 7

So **sw00032075003xpcw3po_cl.evt.gz** file contains clean events in imaging “pc” mode, try opening it in ds9. Try open all files with ds9 and see what is there

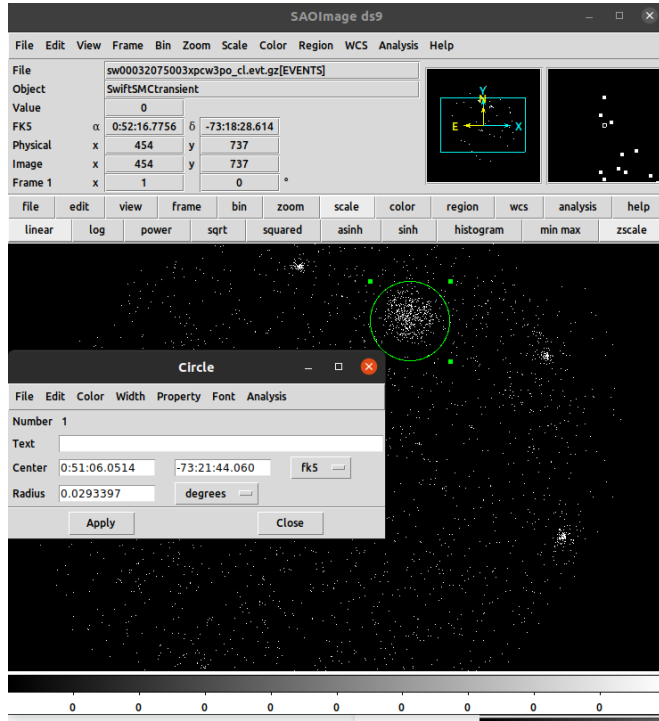


STEP 8

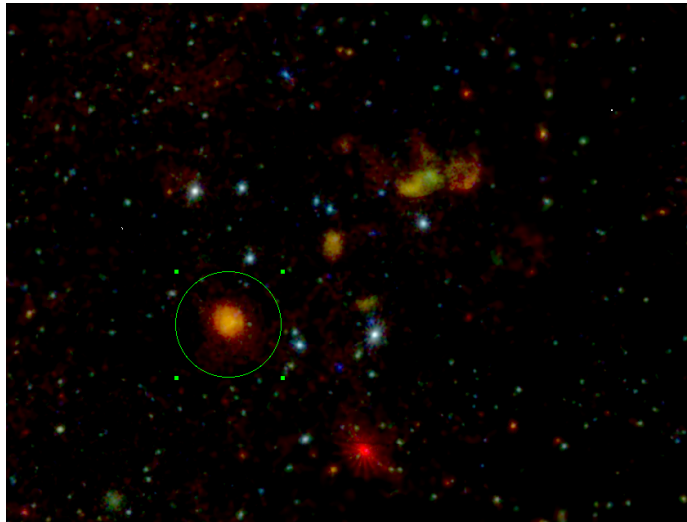
You may see some point-like sources... but also look at this extended source, this is a SNR.

If you go >edit>region

You can select a circle, and by double click see its coordinates



This is in fact the SNR you saw in our zoom call in SMC mosaic

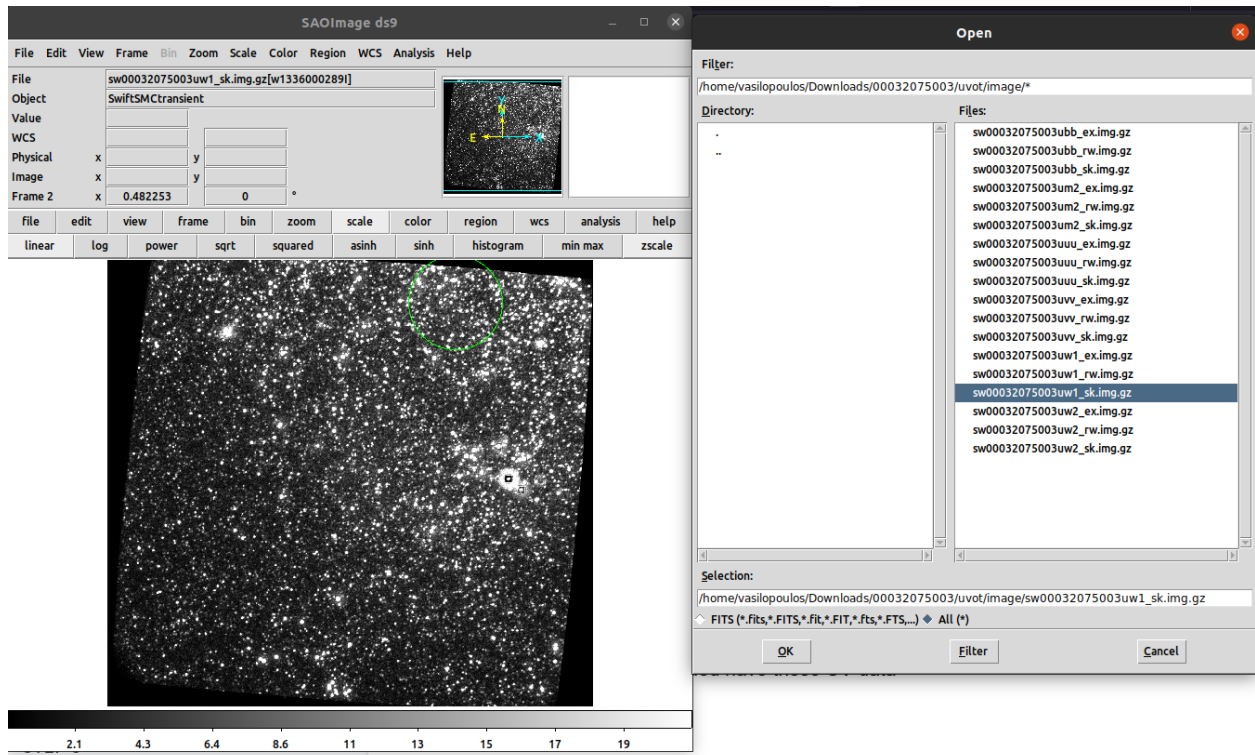


STEP 9

Swift is a space “observatory”, which means it has multiple telescopes and detectors. Apart from “XRT” the X-ray telescope, it has UVOT detector, an optical telescope with multiple optical and UV filters. Remember we do not observe UV from earth...

The data you downloaded have these UV images, which you can also open in ds9.

See `uvot/image`



STEP 10

Learn more about Swift

https://swift.gsfc.nasa.gov/about_swift