STIX preview image archive and web imaging tools

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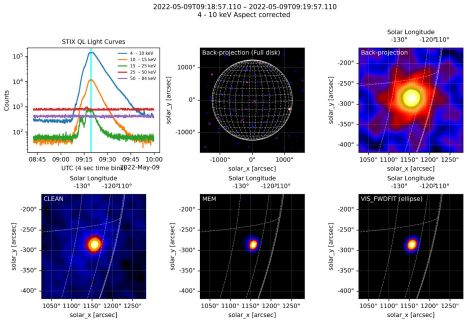
July 14, 2022

Flare image processing pipeline

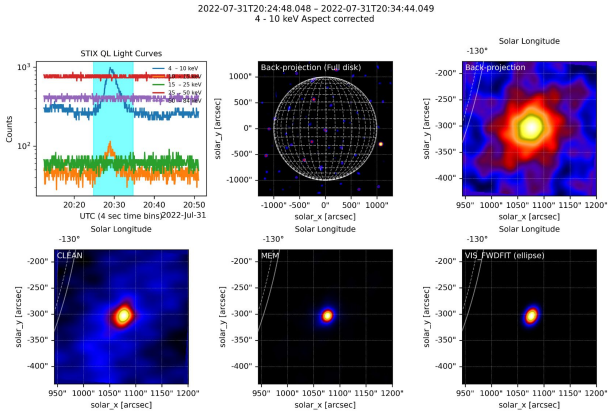
- The pipeline uses STIX IDL imaging software in SSWIDL
- BP, BP CLEAN, EM and forward-fit algorithms included
- FITS files created by the pipeline can be plotted with sunpy.map
- Web tools for interactive image reconstruction developed

IDL code: https://datacenter.stix.i4ds.net/pub/misc/stix_imaging/

Imaging and spectroscopy pipeline on the platform



A big flare



A micro-flare

- One image at the peak created for each detected flares
- Integration time 60 seconds for big flares
- Full flaring time for small flares
- Two energy ranges
  - 4 - 10 keV
  - 16 - 28 keV
- Minimal counts to create an image 10, 0000 (BKG not subtracted)
- The closet in time background data selected for background subtraction
- thick2 model included automatically when spectral fitting

7320 automatic created runs in the database

Imaging using the web tool on STIX data center

On science data browser

1. Select a science data file
2. Click the button “**interactive analysis**” then click the tab “**image reconstruction**”
3. Select time and energy ranges
4. Select data for BKG subtraction
5. Click “Submit”
6. After about 30 sec, clicking the button “check status”
7. Images will be displayed at the bottom of the page if success

https://datacenter.stix.i4ds.net/view/list/bsd/id/9925

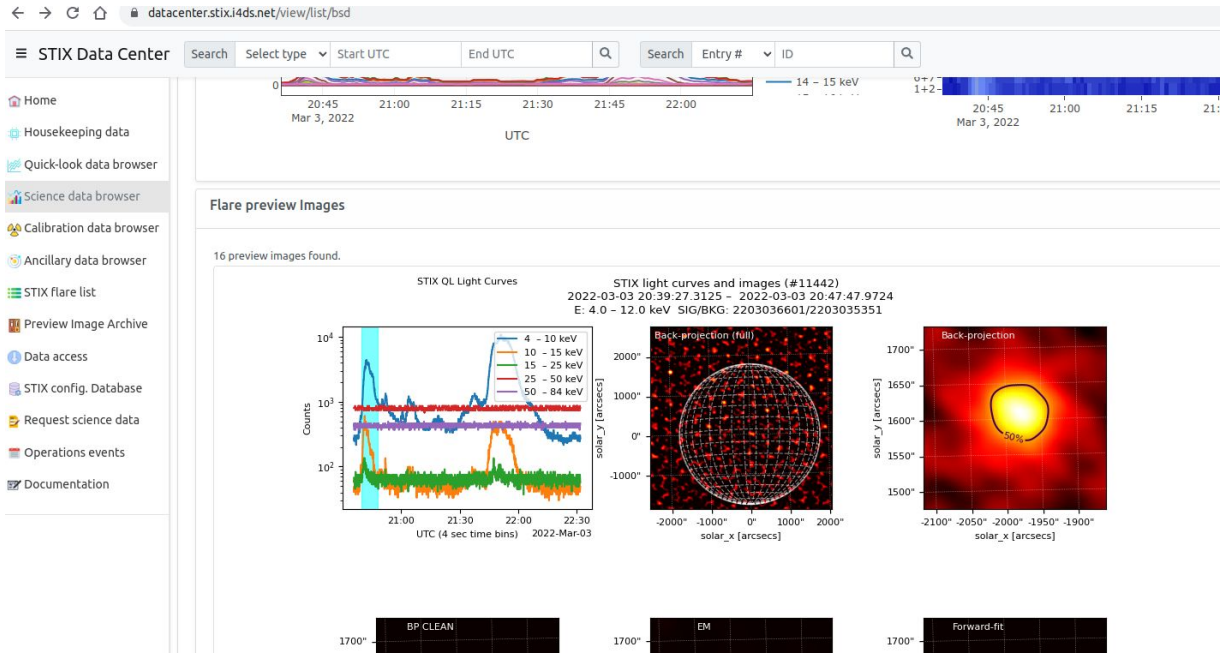
Only register users are allowed to submit processing requests!

Where to find preview images

Preview images are displayed on three web pages

- Bulk science data page
- Preview image manager
- Quick-look data browser
    - Click the icon “IMG” in the top toolbar

Browsing preview images on the science data browser

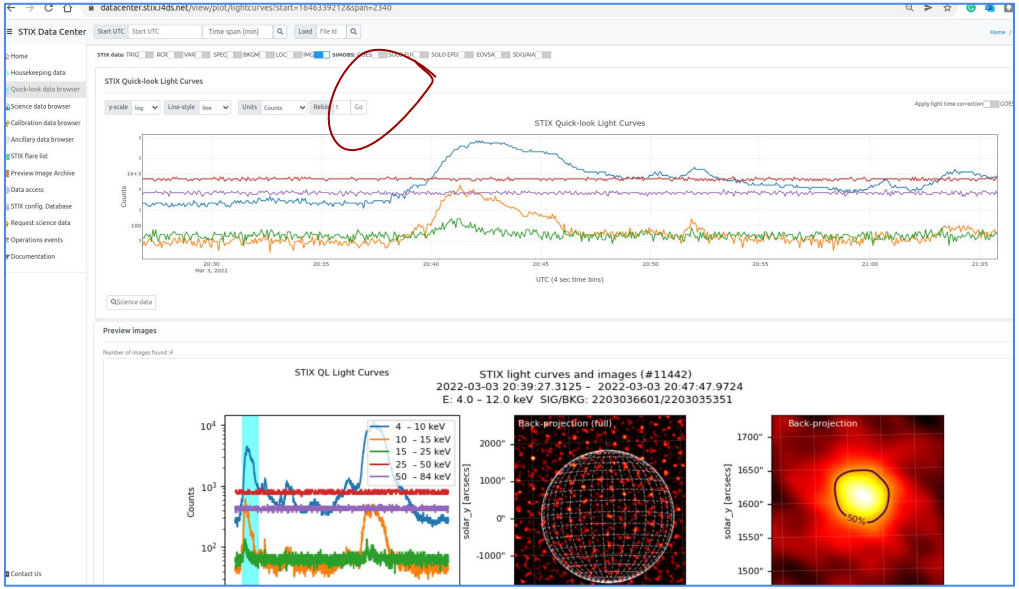


Available preview images for the current loaded science data are displayed at the bottom of the “preview” tab on the science data browser

Demo: https://datacenter.stix.i4ds.net/view/list/bsd/id/9831

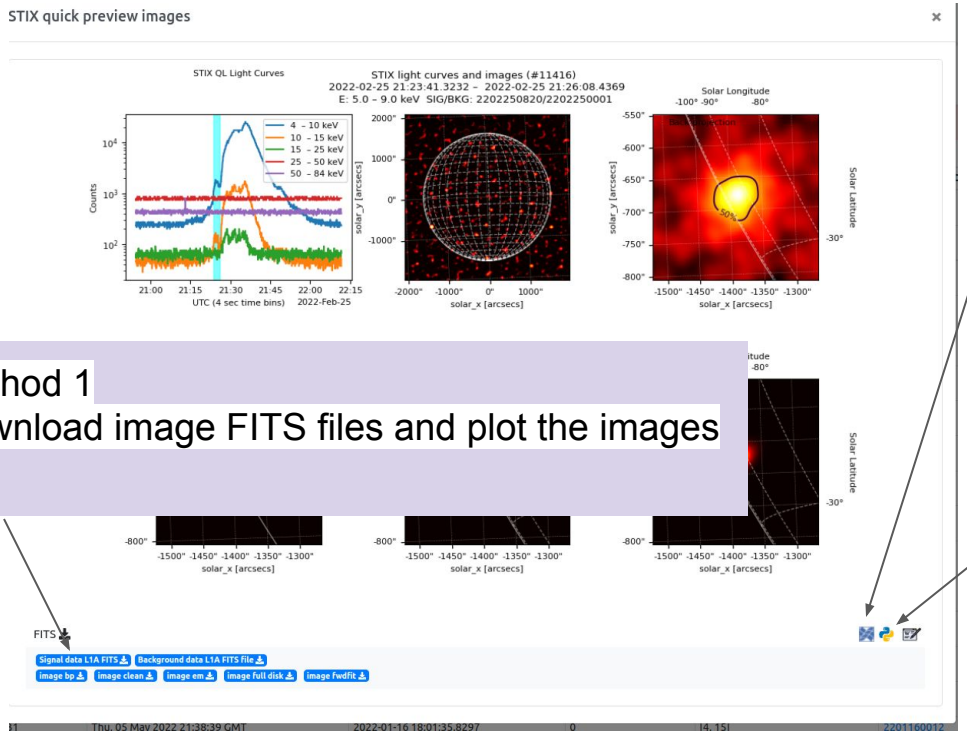
Browsing preview images on QL light curve page

Preview images for the current time frame are loaded after clicking the button “**IMG**” on the top



Demo:
https://datacenter.stix.i4ds.net/view/plot/lightcurves?start=1648163410&span=2340
Open the page at the link above then click the icon “IMG”

How to reproduce preview images on your computer



Method 1
Download image FITS files and plot the images

Method 2
Clicking the “IDL” icon to download the IDL script then recreating the images in IDL

Method 3
Clicking the “Python” icon to download the IDL script the recreating the images in IDL

IDL code template created by the web tool

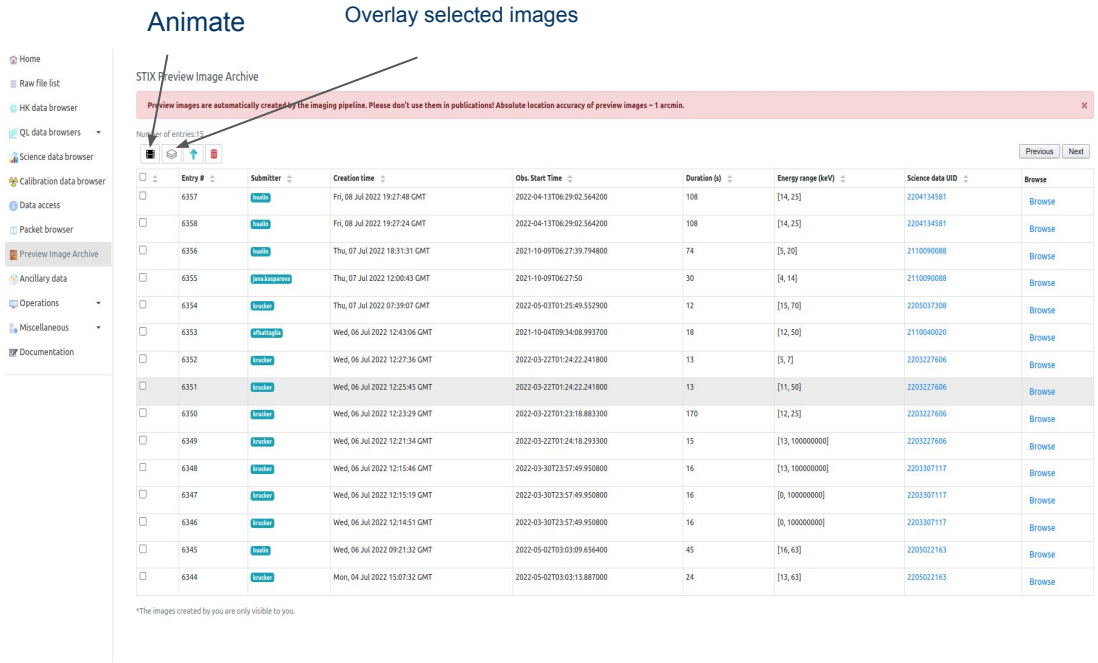
```
;Created at 2022-05-19T17:30:12.940411 by STIX data center online image reconstruction tool
;To run this script, sswidl and stix IDL software must be installed on your computer.
; Download FITS files from STIX data center
wget("https://datacenter.stix.i4ds.net/download/fits/filename/solo_L1A_stix-sci-xray-l1-2203208964_20220320T115721-20220320T134401_055142_V01.fits",filename="solo_L1A_stix-sci-xray-l1-2203208964_20220320T115721-20220320T134401_055142_V01.fits") ; background file,
wget("https://datacenter.stix.i4ds.net/download/fits/filename/solo_L1A_stix-sci-xray-l1-2203241574_20220324T231923-20220324T233037_055791_V01.fits", filename="solo_L1A_stix-sci-xray-l1-2203241574_20220324T231923-20220324T233037_055791_V01.fits") ; signal file,
; Uncomment the following lines if you don't have stix_image_reconstruction.pro and stixmap2fits.pro on your local disk,
;wget("https://datacenter.stix.i4ds.net/pub/misc/stix_imaging/stx_image_reconstruction.pro", filename="stx_image_reconstruction.pro"),
;wget("https://datacenter.stix.i4ds.net/pub/misc/stix_imaging/stx_map2fits.pro", filename="stix_map2fits.pro"),
;.run stx_image_reconstruction.pro
;.run stix_map2fits.pro

sig_filename="solo_L1A_stix-sci-xray-l1-2203241574_20220324T231923-20220324T233037_055791_V01.fits"
bkg_filename="solo_L1A_stix-sci-xray-l1-2203208964_20220320T115721-20220320T134401_055142_V01.fits"


path_sci_file="./"+sig_filename
path_bkg_file="./"+bkg_filename
start_utc='2022-03-24T23:23:59.719'
end_utc='2022-03-24T23:24:59.719'

bp_elow=6 ; back-projection energy range lower limit
bp_ehigh=10
; energy range in  units of keV, used to make a back-project full image
; the result will be used to locate the source(s)

elow=4
ehigh=10
;energy range for EM, BP and forward-fit


; s/c emphemeris data, computed using SPICE kernel toolkits.
B0=-1.1384376751263139
L0=63.994372215521075
RSUN=2957.616313971497
; apparent radius  of the sun in  units of arcsec
dsun=48514944360.77641
;distance between the sun and s/c in units of meters
roll_angle=4.18105822864051
;Spacecraft roll angle in units of degrees.
sun_center_x=-0.4041528737468275
sun_center_y=-0.3867359627245103
x_offset_arcsec=-sun_center_x
y_offset_arcsec=-sun_center_y
;Note that the off-pointing should be further corrected using the stix aspect solution


vis_fwdfit_source_type='circle'
;Change the source shape if necessary. The source shape can be also "ellipse" or "multi"  (multi-circle).


bp_fname="bp_map.fits"
full_disk_bp_fname="full_disk_bp_map.fits"
vis_fwdfit_fname= "vis_fwdfit_map.fits"
em_fname= "em_map.fits"
```

To select different collimators for imaging, please modify stx_image_reconstruction.pro

You may need to include the aspect solution here

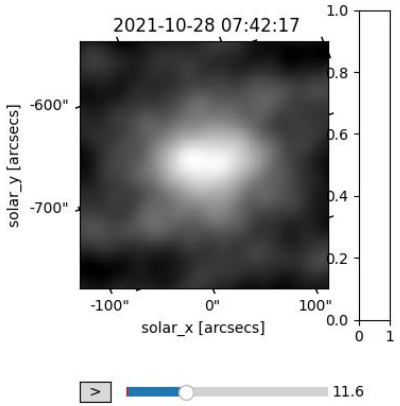
- Run the template with sswidl you may see the preview images

Animate/overlay images using web tools



On flare image archive page

- Select images in the table
- Click the button “ animation …”
- Save the python template to you local disk
- Run the script



The tools can be found on the web page at the link:
https://datacenter.stix.i4ds.net/view/image-archive