

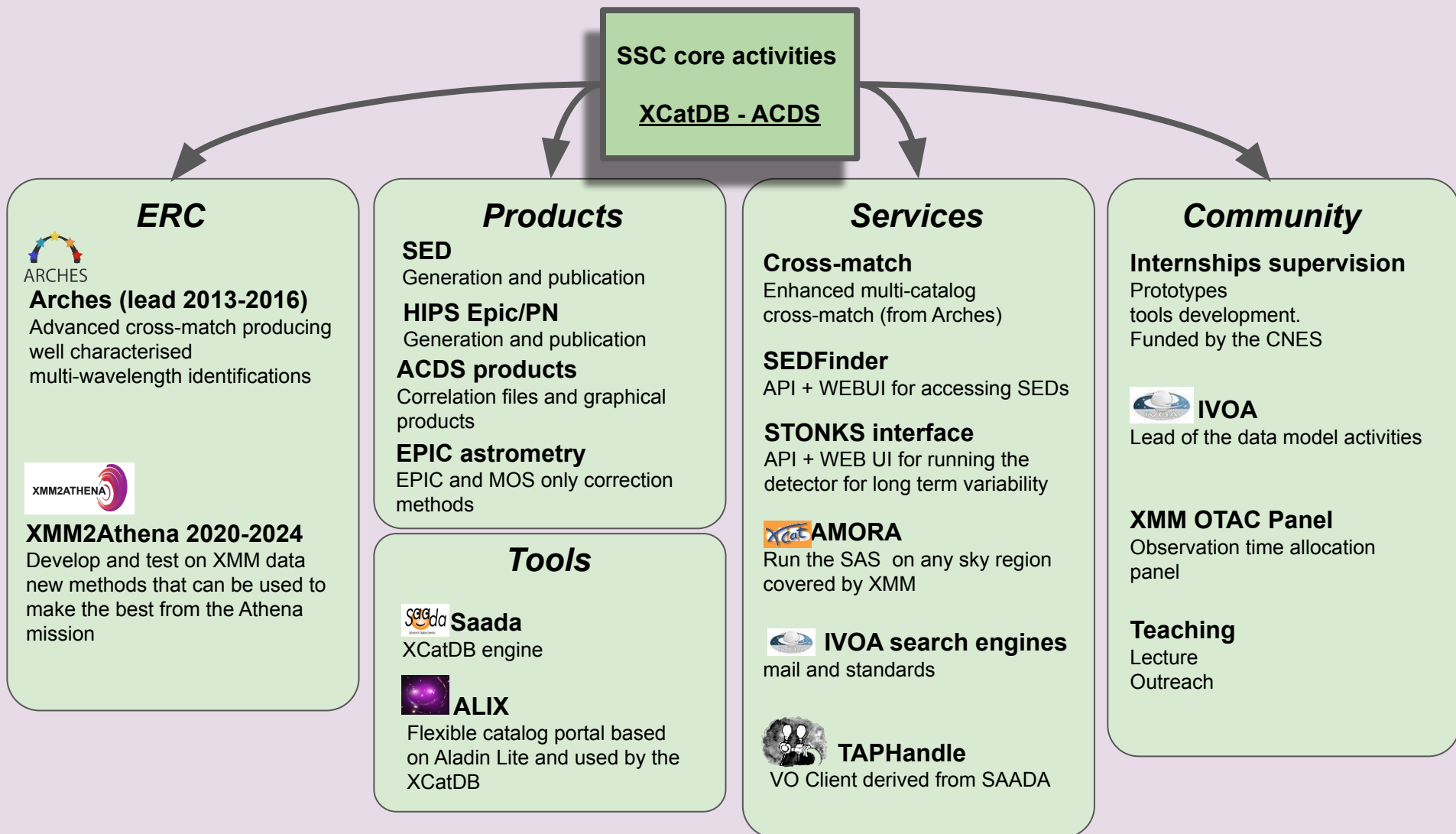
Strasbourg & SSC

Present Past and Future

Laurent Michel

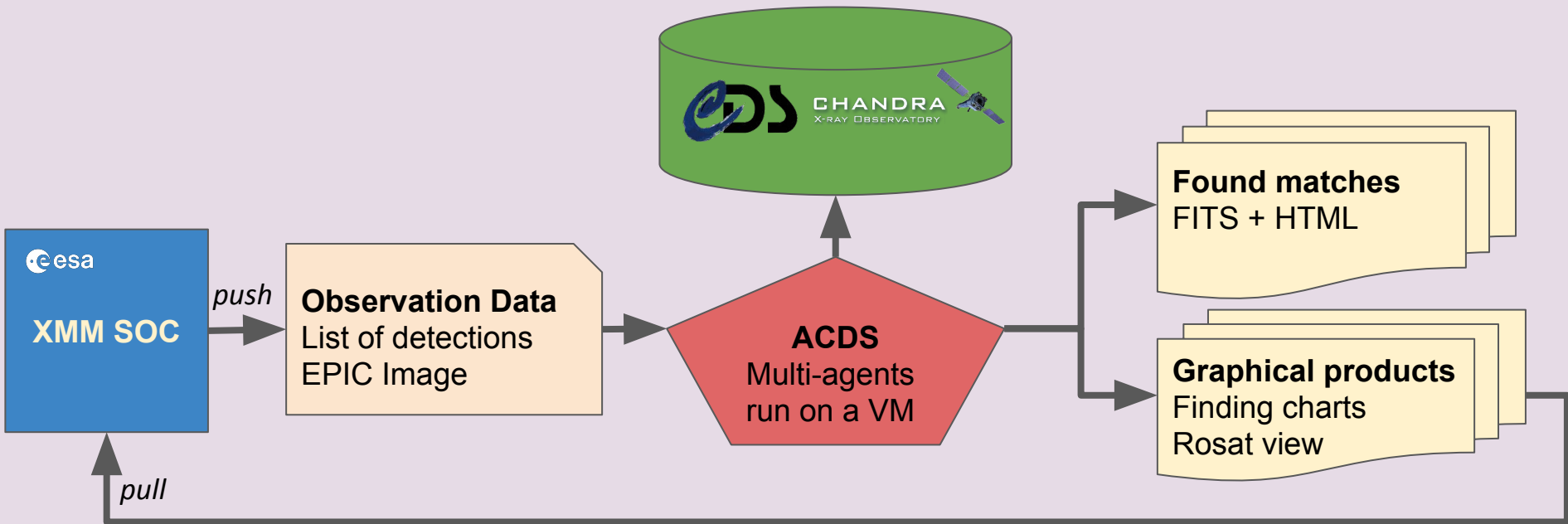
on behalf of C. Motch, M. Pakull, JM Hameury, P. Guillou, P.Maggi, F.X. Pineau, Hoan Nguyen, Ada Nebot, Olivier Marchal and all of the PHDs, postdoc and interns...

SSC Activities in Strasbourg

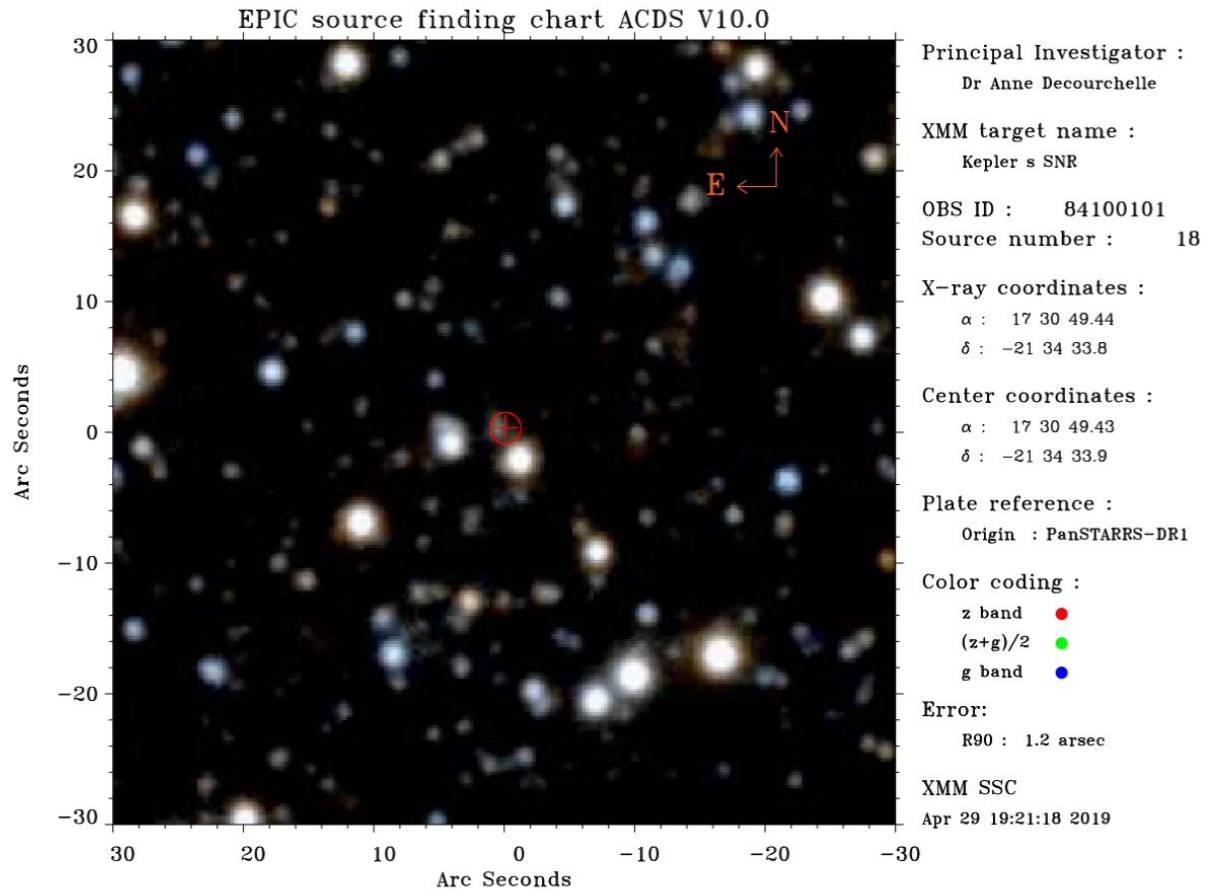


Core Activity: ACDS

- Compute correlations of XMM detections with ~220 archival catalogues
- Run 24/7 (JAVA/bash/IDL on a VM)
- Part of the PPS pipeline
- Low support activity
 - Monitoring by Email notifications
 - Very stable code
 - Management of the list of catalogs
- Data transfer handled by the DTS (Email notification + SSH transfert)



Core Activity: ACDS Finding Chart: NuSTAR 173049-2134.5





13 30 9.096 +47 12 46.16 M51

Bookmark views of interest

Draw regions and run the SAS on them

Plain text **search engine** to choose the **background image** survey

Plain text **search engine** to choose **catalogs** to be displayed along with XMM sources

filter displayed sources

Display **Simbad** sources filtered by **object types**

4XMM source plotted over any background sky

Web interface dedicated to the XMM catalogue

- Developed and operated in Strasbourg
- One classical interface (HTML forms)
- **One VO based interface (this slide)**

<https://xcatdb.unistra.fr/4xmm>

4XMM J132952.6+471144 13 29 52.621 +47 11 44.20 [IRAP](#) [NXSA](#)

Source Details	Det ML	HR1	HR2	HR3	HR4	Detections
▶ 2.55211E-13	237228.0	0.3815+0.0018	-0.5653+0.0017	-0.7064+0.0030	-0.1653+0.0082	11

ACDS sources | 2 SED(s) | **Details (11Detections)** | Gallery (11Detections) | Graphs (11Detections)

13:29:52.74+47:11:45.0±0.0861arcsec
Observation :0830191401
Date :25/5/2018 21:10:47
Quality :Source parameters may be affected (1)
Counts :72564±308
[More Information](#)

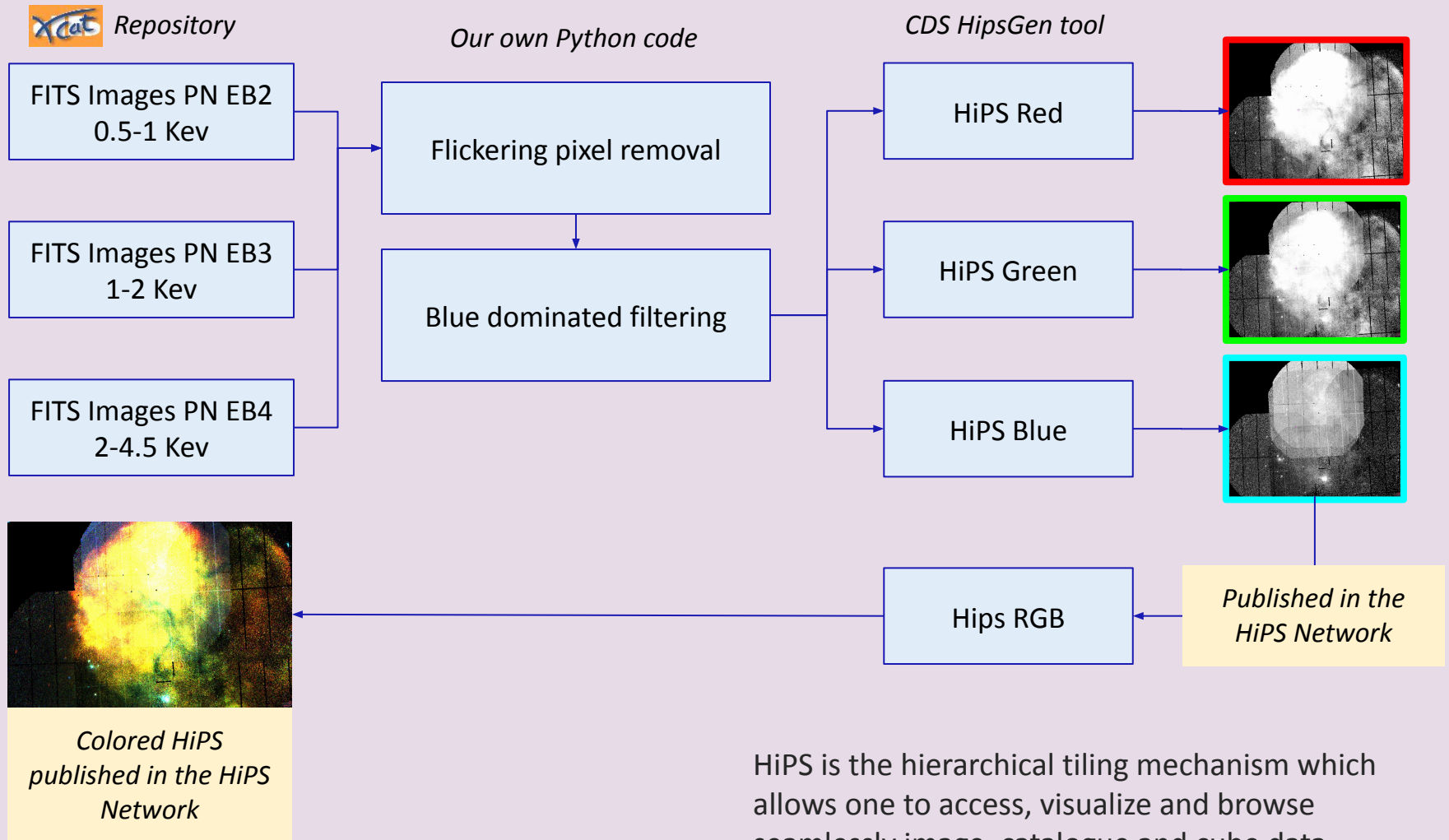
EP 0.2-12KeV
 EPw 0.2-12KeV
 ACDS FChart
 PN Spec. [Download](#)
 PN T.S. [Download](#)
 EPIC Img. [Download](#)
 EPN Img. [Download](#)
 EMOS1 Img. [Download](#)
 EMOS2 Img. [Download](#)

13:29:52.51+47:11:47.0±0.1645arcsec
Observation :0830191501
Date :13/6/2018 2:22:52

EP 0.2-12KeV
 EPw 0.2-12KeV
 ACDS FChart
 PN Spec. [Download](#)
 PN T.S. [Download](#)
 EPIC Img. [Download](#)
 EPN Img. [Download](#)
 EMOS1 Img. [Download](#)
 EMOS2 Img. [Download](#)

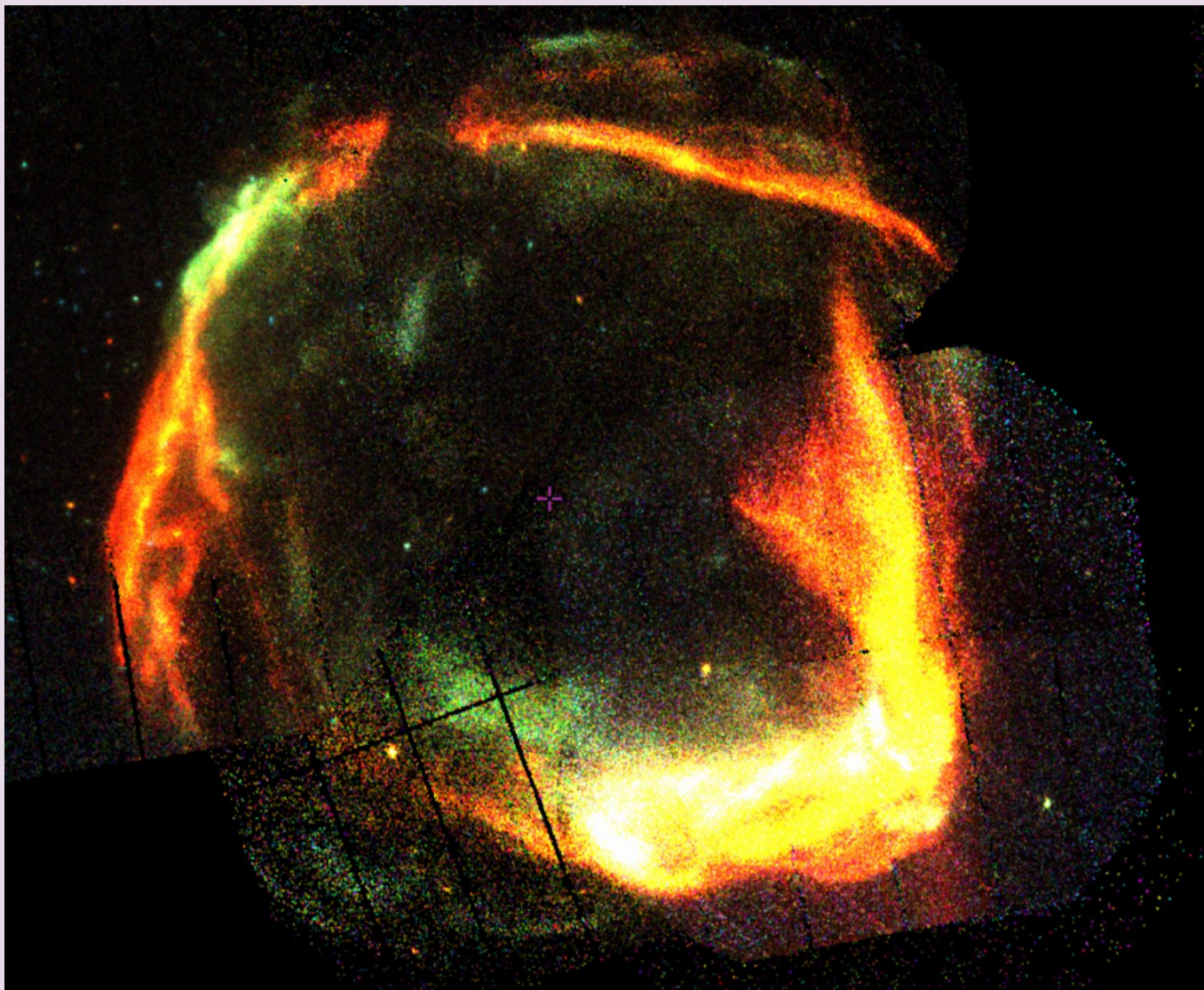
Get the detail of specific 4XMM sources

Products: Generation of HiPS of PN Sky



HiPS is the hierarchical tiling mechanism which allows one to access, visualize and browse seamlessly image, catalogue and cube data.

Products: HiPS : SNR 185



ObAS: project leader + 2 WP + outreach

Cross-correlation tool development & catalogue creation (WP4)

- A software tool allowing the **statistical cross-identification** of several archival astronomical catalogues.
- A reference catalogue which contains for each entry of the enhanced 3 XMM catalogue (outcome of WP3) the best multi-wavelength source identifications extracted from the selected archival catalogues (outcome of WP7)

Dissemination and outreach

- Database - ArchesWalker

http://www.arches-fp7.eu/arches/localhost_88/arches/index.html

ARCHES X-MATCH TOOL

Anonymous Web form

[Info about this page.](#)

Remote directory

Upload a file:
Parcourir... Aucun fichier sélectionné.

File list:

```
sdss9_174.10491_7.22343_12.3
galex5ais.174.10491_7.22343_1
2mass.174.10491_7.22343_12.3
3xmme_uniquesources_v1.2.fits
```

X-match script

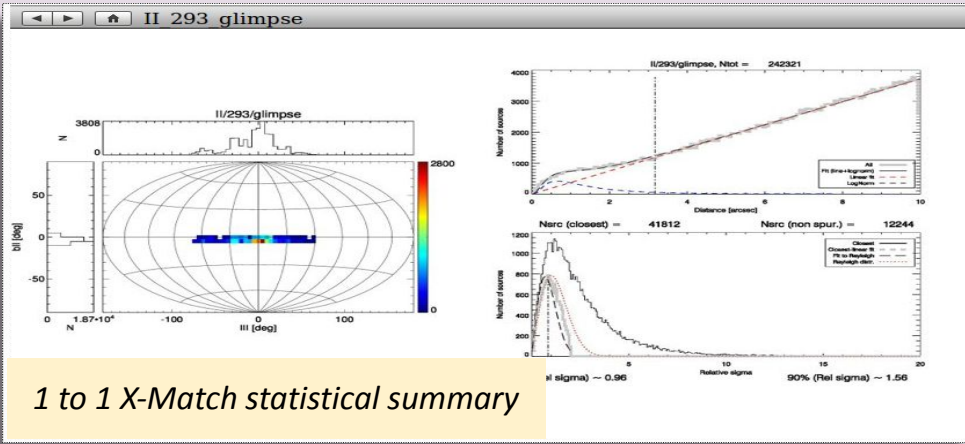
Script examples
Xmatch galex/sdss/2mass in a cone, with proba

Type, modify or copy/paste here the xmatch script to be executed:

```
1 #####
2 # Name: galex_sdss_2mass.xmls
3 # Description: Perform a probabilistic xmatch between galex, sdss and 2mass
4 # in a given cone of 12 arcminutes. Data is downloaded from Vizier.
5 # Input files: none
6 # Output files:
7 # - galex.vot: galex data
8 # - sdss9.vot: sdss data
9 # - 2mass.vot: 2mass data
10 # - galex_sdss_2mass.vot: cross-match result
11 # WARNING: the result may not be symmetric using successive full joins
12 #####
13
14 # Load galex data from Vizier
15 get VizierLoader tabname=II/312/ais mode=cone center="174.10491+7.22343" radius=12.0arcmin allcolumn
16 set cone radius=120000 dec=DEJ2000
17 CIRCLE param=0.6
18 /20000/(e_)?[FN]UV/
```

X-Match interface

<http://serendib.unistra.fr/ARCHESWebService/index.html>



M82: a(n) Active Galaxy Nuclei

Size 31 thousand light-years
Distance 11 million light-years

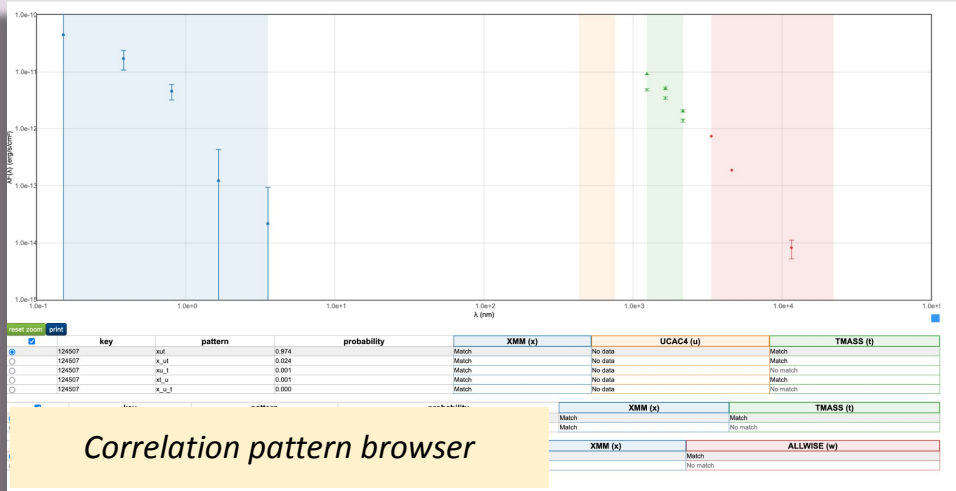
Arches Walker

AGN (Active Galactic Nuclei) are galaxies that contain a Supermassive Black Hole (which absorb matter and liberate energy converted in radiation) in their cores. They represent ten per cent of the galaxies.

A large variety of AGN can be observed, and that makes difficult the inquiry of these nucleus. However, X-Ray detection is very efficient at detecting AGN since they deliver a copious X-Ray emission. But a full picture of the nature of AGN can only be revealed by the combination of information from the entire electromagnetic spectrum.

To describe entirely an AGN, it would be necessary to study other properties which are unverified yet (frequency of absorption in AGN for instance).

<https://saada.unistra.fr/ArchesWalker/index.html#>



The SED creation starts from a source catalogue (stacked or detection)

- Create sensitivity maps (provided by AIP for the stacked catalogue)
 - keep observations with highest sensitivity for the detection catalogue
- Group sources by
 - flux, galactic latitude
 - archival catalogue coverage
 - Remove M31 and S/LMC
- Run the Arches cross-matching for each group
- SED creation using CDS standard magnitude to flux calibration.
- Plot generation

SED Availability

- XMM SOC
- SED finder at Strasbourg
- XCatDB

05 34 55.972 -05 23 12.94

4XMM J053455.9-052312 05 34 55.972 -05 23 12.94 IRAP NX

Source Details: 4.77665E-14

Det ML: 52147.9

HR1: 0.7223+

ACDS sources: 2 SED(s)

Details (4Detections)

SED of 4XMM J053455.9-052312

Download from SedFinder: **FITS Download**

SED of 4XMM J053455.9-052312

Energy [KeV]

Wavelength(μ m)

- 4XMM [4XMM J053455.9-052312] (EP5 EP4 EP3 EP2 EP1)
- XMM-SUSS5.1 (no match)
- APASS DR9 [19635837] (BI VI gp rp ip)
- SDSS DR12 (no match)
- Gaia DR2 [3017364613086735360] (G BP RP)
- 2MASS [05345597-0523130] (J H K)
- AllWISE [J053455.98-052312.9] (W1 W2 W3/8 W4)
- AKARI (no match)
- NVSS+FIRST (no match)

FITS file: SED202124803010014_0.fits

Source ID: 202124803010014

Probability: 80%

Flag: /1 : possible saturation - /2 : possible artifact - /4 : possible flux error - /8 : upper limit

SSC XMM-Newton - Observatoire Astronomique de Strasbourg - 2023

SEDs available from the XCatDB page.

XMM-NEWTON SURVEY

XMM SED

Retrieve SEDs for either Pointed Observations or Stacked Observations

Enter a SRCID or a sky position followed with an optional search radius. Ex:

- 209119902010157 in Obs mode
- 3000011010100001 in stacked mode
- 4XMM J143706.2+584002
- 4XMM J143706.2+584002 0.5arcmin
- 4XMM J143706.2+584002 48arcsec
- 219.275869 +58.6672877

Cone search radius is limited to 1 arcmin (6 arcsec by default)

Mode: Pointed Observations Stacked

3000011010100001

Submit

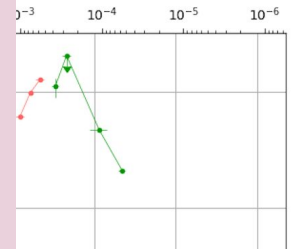
Response: 1 source(s) found including 1 with SED(s)

URL (curl): <https://xcatdb.unistra.fr/sedfinder/3000011010100001>

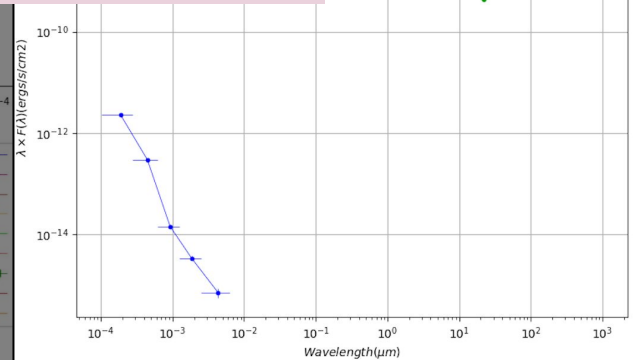
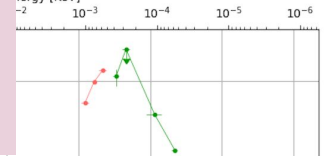
Provide **SEDs** for many sources in both the **detection catalog** and the **stacked catalog**.

- REST API (can be run from software)
- Graphical User Interface
- Source can be searched by
 - Position (cone search)
 - SRC_ID

SED of TBW



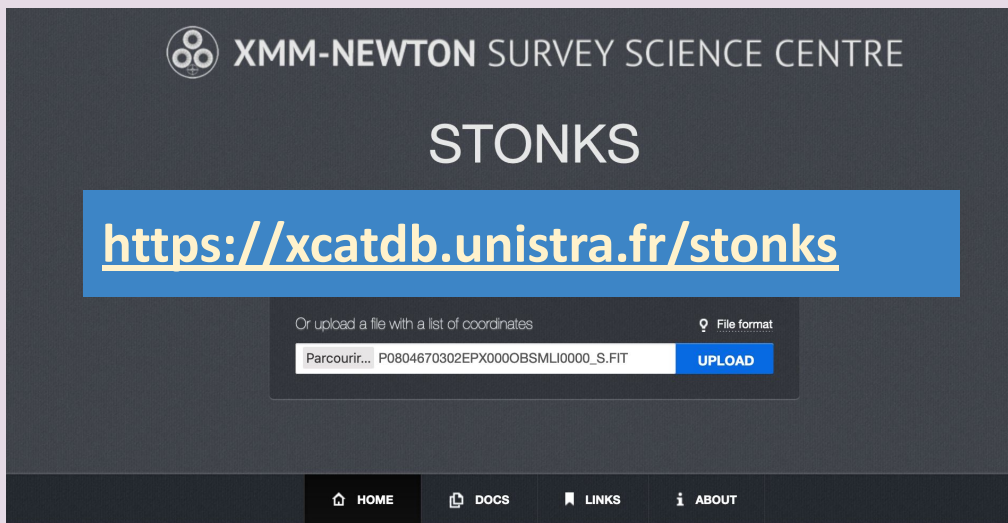
SED of TBW



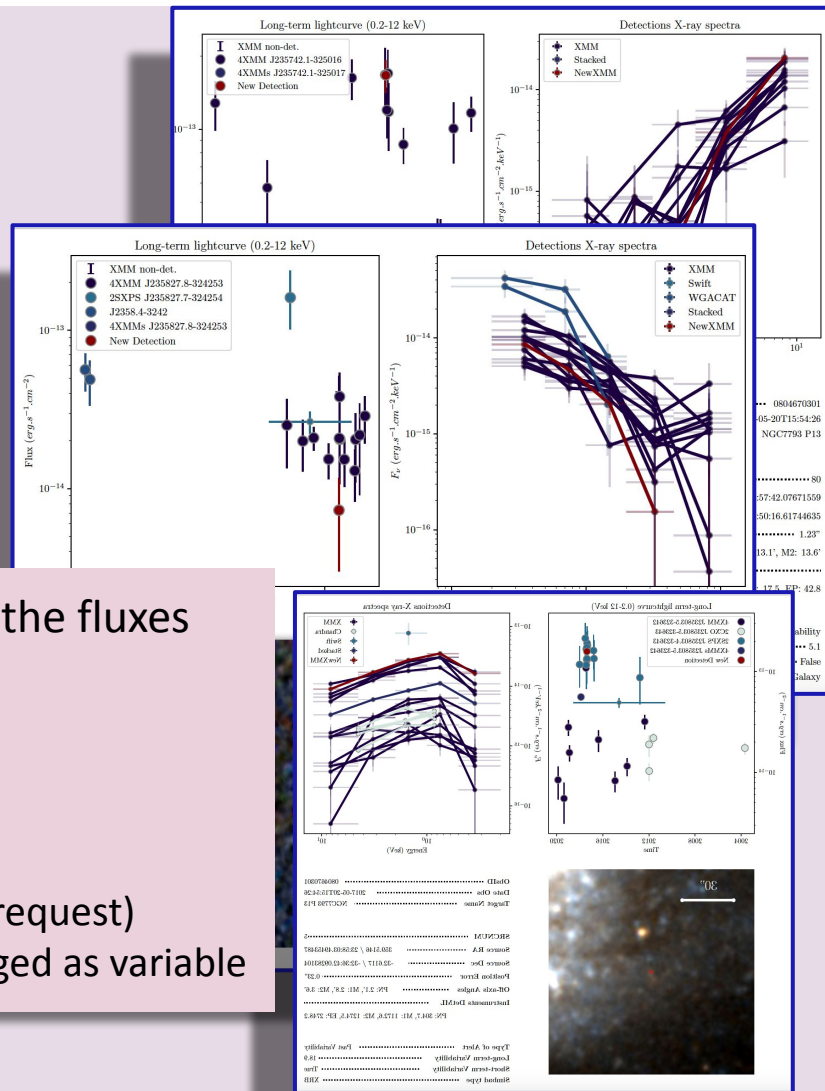
- 4XMM [TBW] (EP5 EP4 EP3 EP2 EP1)
- XMM-SUSS5.1 (no match)
- APASS DR9 (no match)
- SDSS DR12 (no match)
- Gaia DR2 (no match)
- 2MASS [041942.12+5559577] (J H K)
- AllWISE [J041942.13+555957.6] (W1 W2/8 W3 W4)
- AKARI (no match)
- NVSS+FIRST (no match)

FITS file SED3000011010100001_1.fits
Source ID 3000011010100001
Probability 7%
Flag /1 : possible saturation - /2 : possible artifact - /4 : possible flux error - /8 : upper limit

<https://xcatdb.unistra.fr/sedfinder>



- STONKS: Long term variability computed from the fluxes measured by different X-ray missions
- SSC front-end
 - REST API that can be run by software
 - Graphical User Interface
 - Upload an observation source list (POST request)
 - Get a variability plot for each source flagged as variable





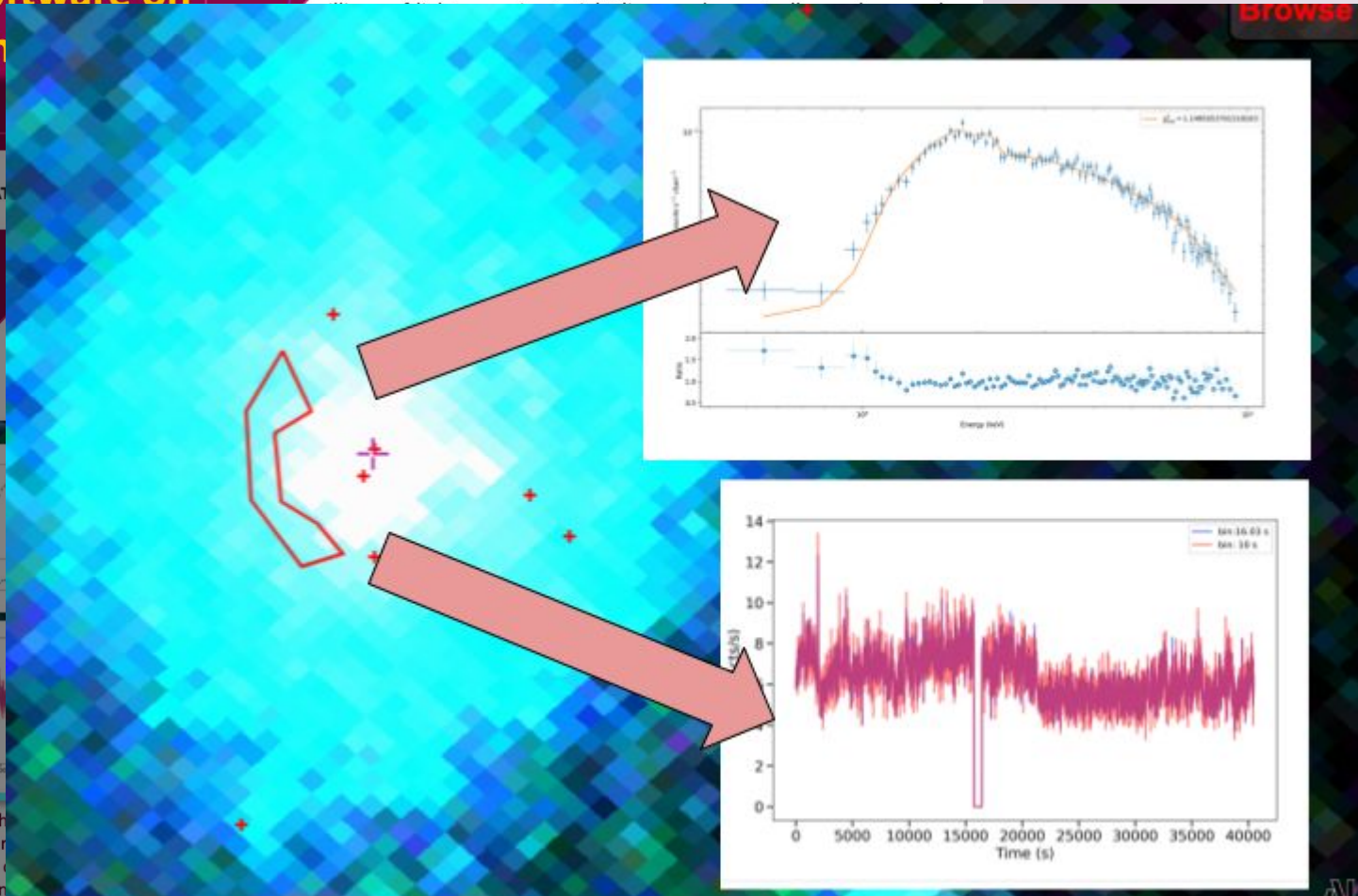
Science Analysis Software on of the XMM-Newton Amora

VIALA (intern)
Technique de Belfort-
liard - France
by Laurent MICHEL
e SSC Team
rg Observatory

XMM2AT

Many astrophysical objects emit photons in the X-ray energy band; the

Browse



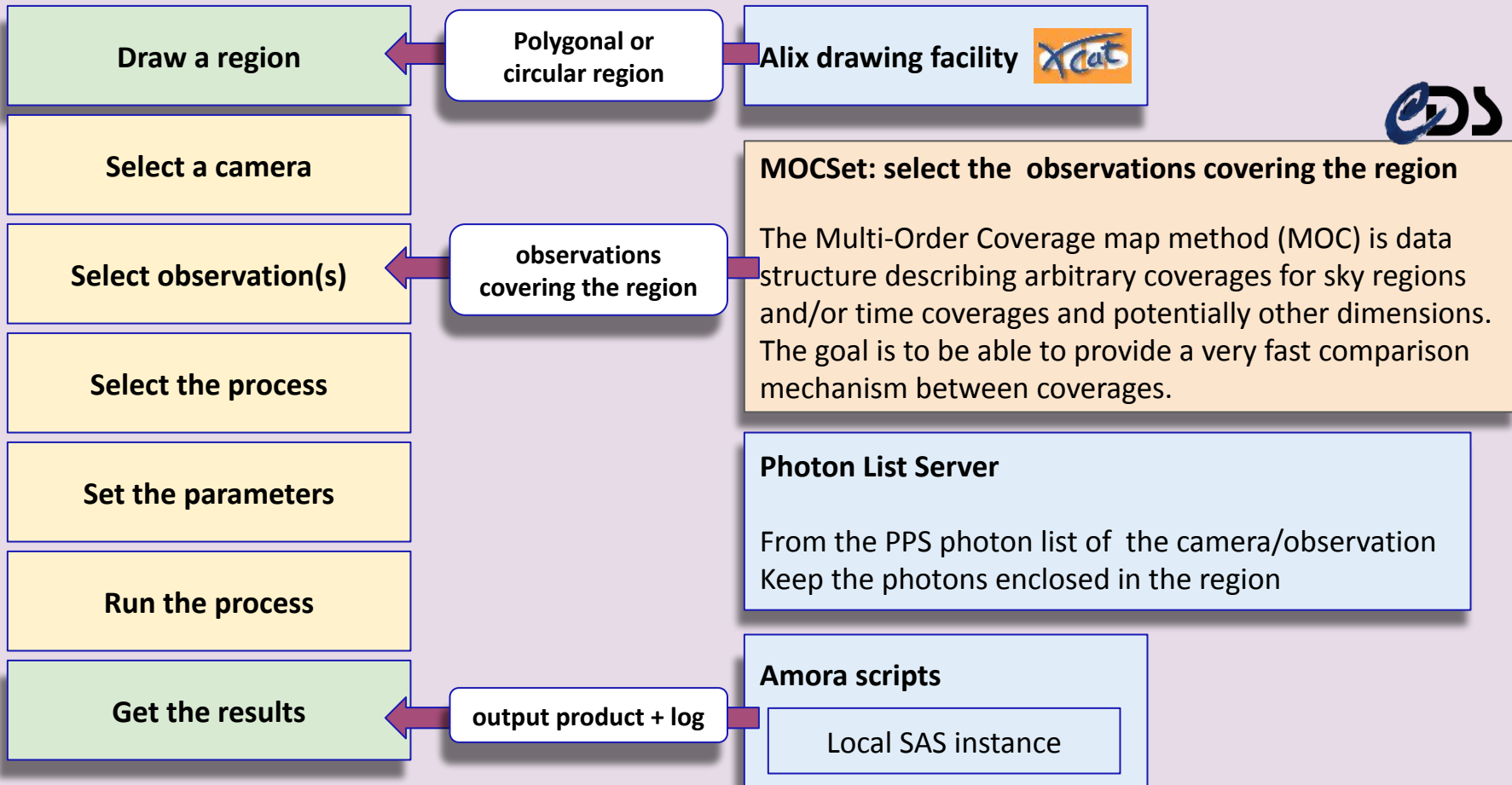
of a spectrum, fitted with a power law, and a light
from a region of the SNR G021.5-00.9 nebulae. The r
one observation (0804250201/PN) among those
ysis software on the subset of events that are en

https://xmm-ssc.irap.omp.eu/xmm2athena/wp-content/uploads/2023/02/laurent_nugget.pdf



User Side

Backstage



Processing

Observation selector

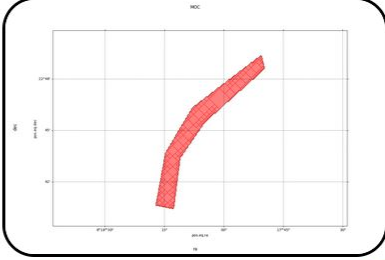
Process control

generate_light_curves.sh

Shell script to generate light curves from EventLists

No start date
00:00:00
No count
Not started

Searched region



order 16

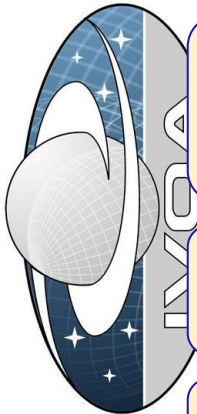
EPN camera

Enable all EPN observations

Search:

+	Obs ID	Object	RA Obj	DEC Obj	Observer	Date Obs	Date End	Obs Mode	Datamode	Filter	ExpIdstr	Exposure (s)	Overlap (%)	Area (deg ²)
<input type="checkbox"/>	0114100101	SNR IC443 ptg1	94.3666065	22.6955555	Dr Fred Jansen	2000-09-26T01:15:59	2000-09-26T08:44:43	POINTING	IMAGING	Medium	5003	26488	96.0	0.167
<input type="checkbox"/>	0301960101	IC443src11	94.517916	22.4591667	Dr Fabrizio Bocchino	2000-03-30T15:40:47	2000-03-31T13:56:35	POINTING	IMAGING	Medium	5003	67557	4.8	0.1071
<input type="checkbox"/>	0600110101	IC 443	94.275	22.7233334	Ms Eleonora Troja	2010-03-07T23:34:10	2010-03-09T00:23:01	POINTING	IMAGING	Medium	5003	74878	68.0	0.1603

This work has been achieved by Alexandre VIALA during an internship funded by the SSC-XMM and supervised by MICHEL Laurent, MOTCH Christian, VASILOPOULOS Georgios & MAGGI Pierre. © ObAS 2023.



XMM Hips generation

Lead of the data model group
Ended last May but still big involvement

TAP Service of 4XMMdr13
Operated along with the XCatDB
Test bench for new VO standards

HE Interest Group
Reflexion to adapt the VO standards to our data

TAPHandle
Database client re-using XCatDB elements

Search Engines
Search *à la Google* in both mails and standards.
Developed first as an XMM doc explorer

XMM-Newton
SURVEY SCIENCE CENTRE

➤ **Limit our ambitions**

- People get retired within next 3 years
- No (or very partial) replacement foreseen

➤ **ACDS**

- Adaptation to the 5XMM
- Evolution of the graphical products

➤ **XCatDB**

- Beautify and reliable the services
- Put the best effort on AMORA
 - faster (taking the PPS ARF/RMF)
 - documentation
 - New scripts

➤ **Something I'm thinking about**

- Gather all of our services in one single portal

BACKUP




- O2: a nice idea
 - OO DBMS
 - Persistent OO language: any variation of OO and retrieved in transparent way
- To be used for
 - The PPS management
 - The ACDS
 - The product database (XCatDB)
- But
 - Never reached maturity due to a very complex storage system
 - The company was purchased by company that have been purchased..'
 - .. finally ends with IBM assets
 - ... and disappeared

The most important thing about great ideas is knowing when to let them go.
Francois Bencilhon, founder of O2



- SAADA: a nice idea (by LM)
 - Designed to replace O2 on SSC purpose
 - developed in the context of a PhD (Hoan N'Guyen N'Goc 2002 _2005))
 - based on a RDBMS
 - JAVA layer on top of an RDMS
 - Internal data model designed for the astronomy
 - Optimized for join operation (not efficient at that time)
 - Very easy data loading
 - Powerfull Web inteface
 - Used (a bit) out of the SSC
 - Many VO tutorials
 - Vizier associated data
 - Gaia ground based spacecraft follow-up (GBOT)
 - Still the XCatDB engine
 - Dealing with correlated data



Simbad Summary for Position 13 29 57.570 +47 10 48.30 

main_id: [WMR2006] M51 XMM6
ra: 202.4898750000
dec: +47.1800833333
coo_err_maj: 0.700
coo_err_min: 0.700
coo_err_angle: 0
nbref: 16
ra_sesa: 13 29 57.57
dec_sesa: +47 10 48.3
coo_qual: C
coo_bibcode: 2014MNRAS.442.1054H
main_type: ULX?_Candidate
other_types: HXB|UX?|X
radvel:
radvel_err:

ID	Position	Type
[WMR2006] M51 XMM6	-13 29 57.57 +47 10 48.3	HighMassXBin,ULX_Candidate,ULX_Candidate,UL
[HL2008] 43673	-13 29 57.3450 +47 10 48.207	Cluster*
PAWS GMC	-13 29 57.630 +47 10 51.40	MolCId,MolCId
[HL2008] 42820	-13 29 57.3816 +47 10 45.502	Cluster*
[HL2008] 42270	-13 29 57.5317 +47 10 44.884	Cluster*
[HL2008] 44023	-13 29 57.2278 +47 10 47.617	Cluster*
PAWS GMC	-13 29 57.480 +47 10 52.38	MolCId,MolCId
PAWS GMC	-13 29 57.230 +47 10 50.96	MolCId,MolCId
[HL2008] 41707	-13 29 57.4914 +47 10 43.812	Cluster*
[HL2008] 42181	-13 29 57.5061 +47 10 43.263	Cluster*

First ← 1 2 3 4 5 ... 81 → Last



	SRCID	long		
	IAUNAME	String		
	SC_RA	double	deg	
	SC_DEC	double	deg	
	SC_POSERR	float	arcsec	
	SC_DET_ML	float		
	SC_EXTENT	float	arcsec	
	SC_EXT_ERR	float	arcsec	
	SC_EXT_ML	float		
	SC_CHI2PROB	float		
	SC_FVAR	float		
	SC_FVARERR	float		
	SC_VAR_FLAG	boolean		
	SC_SUM_FLAG	short		

Boolean Filters

With _sc_var_flag

Numerical Filters

_n_detections > 5

1 69

Filter 4XMM sources by any combination of parameter constrains



The screenshot shows the XCatDB interface overlaid on a multi-color astronomical image. On the left is a vertical toolbar with icons for zoom, favorite, catalog, edit, image, list, and filter. The main panel is titled 'Catalogs' and lists several sources: '4XMM Catalogue', 'ACDS Sources', 'Simbad' (with 'only' and 'Ultra-luminous X-' highlighted in a yellow circle), and 'NED'. Below the list are input fields for 'Find other Catalog' and a dropdown menu currently showing '--select--'. At the bottom of the panel is a 'Shape' selection bar with icons for cross, X, circle, triangle, diamond, and square. A bright source in the background image is marked with a red square and a crosshair.

Filter Simbad sources by classes



