The Survey Science Centre report to the XMM-Newton Users Group

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Topics

- SSC status/activities
- The 3XMM catalogue
- Development : 4XMM and the stacked catalogue
- SSC outreach webpages
- Future plans
- Summary

SSC Status/ Activities

- No major evolution in status since the 2015 Users Group meeting
- Regular teleconferences with the 9 SSC points of contact
- 30th Consortium meeting held April 2017 at MPE, Garching
- Continued SAS task development + support
- Continued data products screening
- Ongoing source identification activities
- Enhancement of catalogue servers
- Continued input into SAS and pipeline development via monthly SAS-CCB and SASWG meetings

SSC Status/ Activities

- 3XMM-DR6 released on 5th July 2016
- Published 3XMM paper, appeared June 2016 (63 citations)
- Worked on the stacked catalogue
- Participated in the SUSS 3.0 catalogue release
- Started putting together 3XMM-DR7
- Major improvements to the XMM-SSC outreach webpages

SSC Status/ Activities

- The Osservatorio Astronomico di Brera have unfortunately decided to retire from the XMM-Newton Survey Science Centre due to a lack of manpower

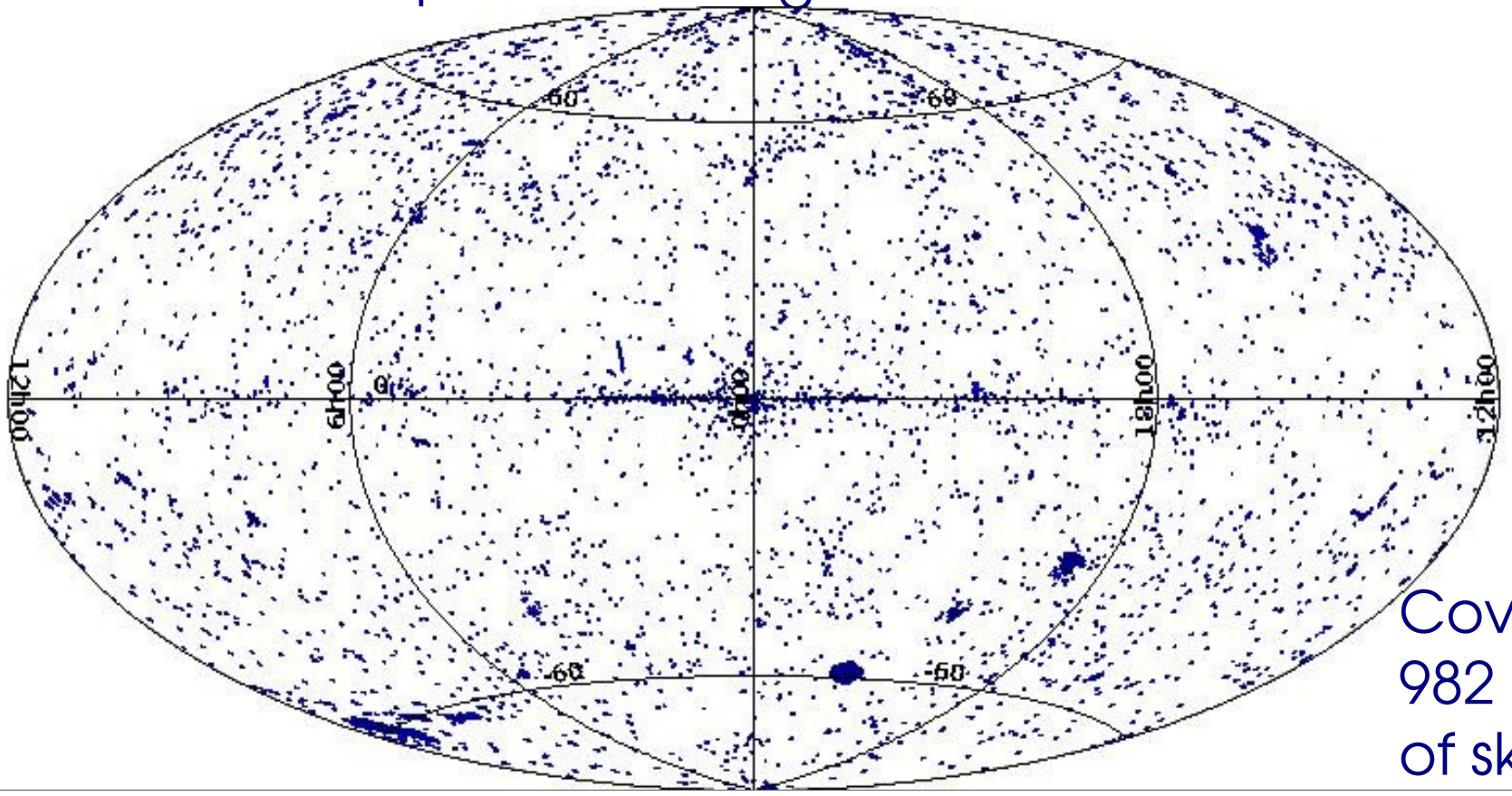
- They made a great success of the X-ray bright sample (XBS) : Bright Sample (BSS: selection 0.5-4.5 keV; 380 ID/389 total sources): IDrate=98%
  Hard Bright Sample (HBS: selection 4.5-7.5 keV; 67 ID/67 total sources): ID rate=100%

- They published 15 papers and contributed to other SSC papers

- We will miss their input for numerous SSC activities and thank them for their investment in the project and wish them all the best in future projects

3XMM-DR6

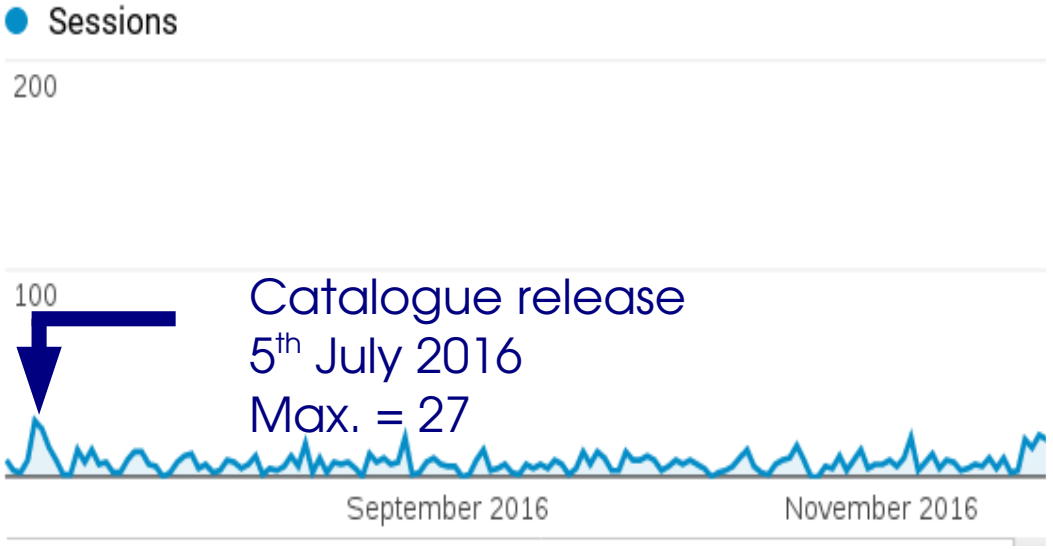
3 February 2000 – 4 June 2015
678680 detections, some sources up to 50 times
468440 unique sources
149968 sources with spectra and lightcurves



Covers
982 sq.deg
of sky

Google analytics, xmmssc.irap.omp.eu

More than 1300 users since the release of 3XMM-DR6, from 69 different countries



Google analytics, xmmssc.irap.omp.eu

More than 1300 users since the release of 3XMM-DR6, from 69 different countries

Moral : a workshop that is centred on the XMM-Newton catalogue(s) is great publicity!

A workshop on the XMM-Newton catalogues

3 day workshop to be held at IRAP, Toulouse in 2nd quarter 2018

Expect to include : 3XMM-DR7/DR8 and 4XMM
The stacked catalogue
The slew catalogue
The SUSS (OM) catalogue
and Swift, Chandra, Fermi, Integral + maybe Planck, Herschel,
and future observatories i.e. SVOM, Athena, CTA

SOC : Natalie Webb
Axel Schwope
Mike Watson
Christian Motch
Jean Ballet
Michael Freyberg
Francisco Carrera
Mat Page

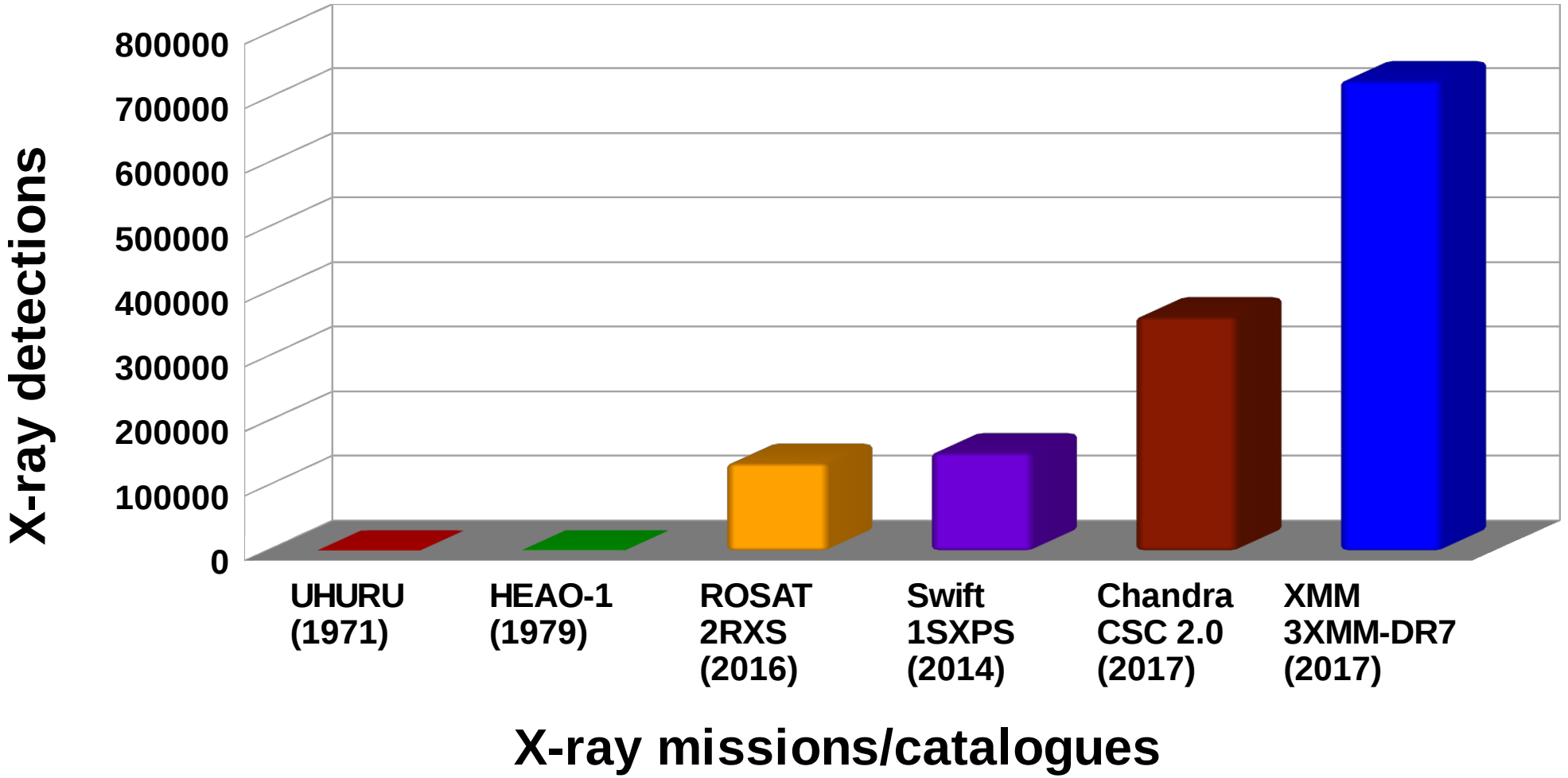
LOC : Mickaël Coriat
(TBC) Filippos Koliopanos
Olivier Godet
Didier Barret
Etienne Pointecouteau
Nicolas Clerc

3XMM-DR7

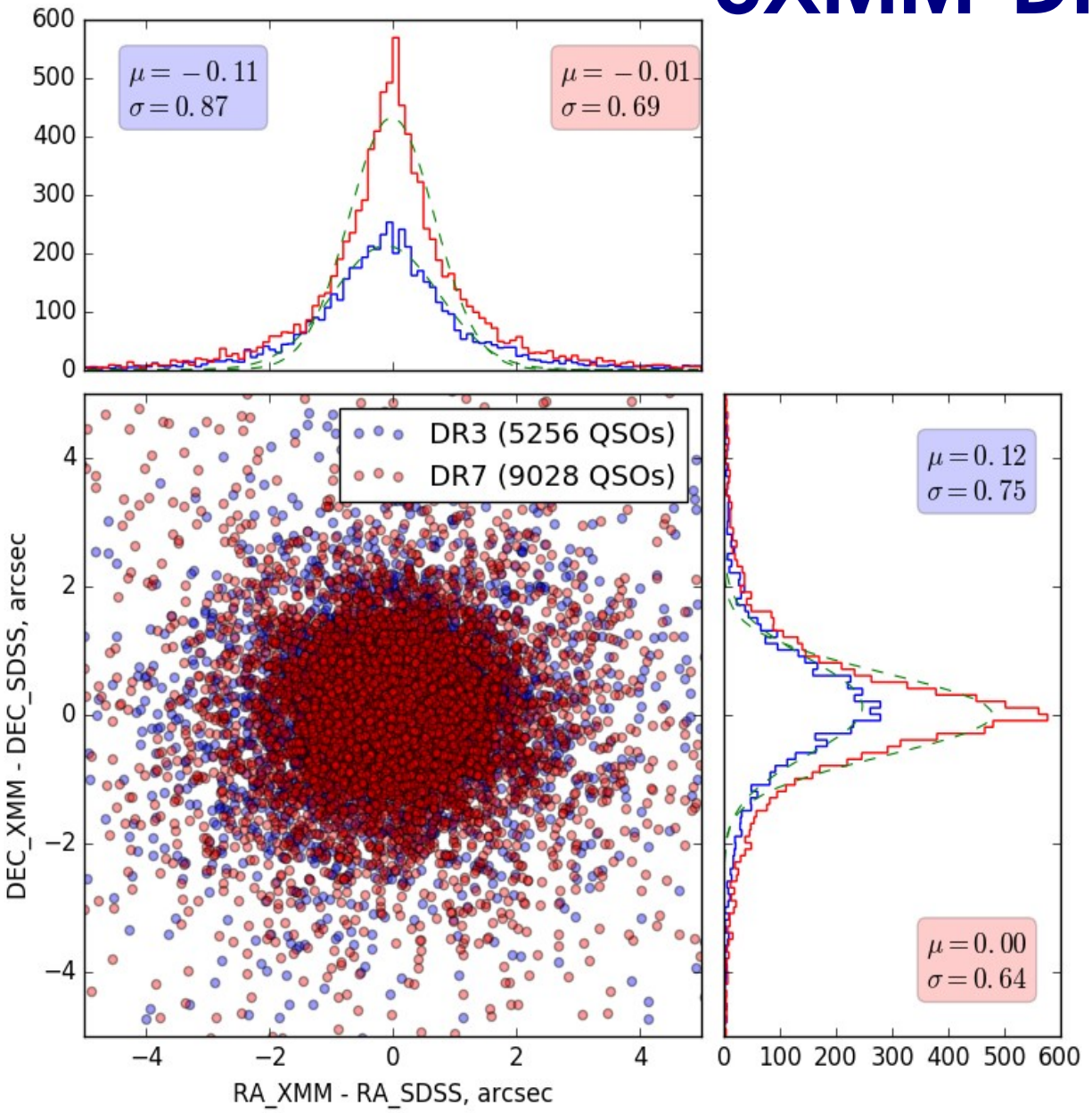
Preliminary numbers for 3XMM-DR7:

	DR7	DR6	Increment
Number of observations	9710	9159	551
Observing interval	03-Feb-2000 – 15-Dec-2016	03-Feb-2000 – 04-Jun-2015	1.5 yr
Sky coverage	> 982 sq.deg	982 sq.deg	> 0 sq.deg
Number of detections	727 790	678 680	49 110
Number of unique sources	499 266	468 440	30 826
Number of det. with spectra	162 082	149 998	12 084
Number of det. with time series	162 045	149 968	12 077

3XMM-DR7


X-ray detections
800000
700000
600000
500000
400000
300000
200000
100000
0
UHURU (1971)
HEAO-1 (1979)
ROSAT 2RXS (2016)
Swift 1SXPS (2014)
Chandra CSC 2.0 (2017)
XMM 3XMM-DR7 (2017)
X-ray missions/catalogues

3XMM-DR7



Astrometry

- Cross-match with latest version of SDSS quasars catalogue

- Comparison between 2XMM-DR3 and 3XMM-DR7

Planned release of catalogue within one month

Future catalogue versions

3XMM-DR8 planned for first half of 2018

4XMM anticipated for 2019
- full re-reduction of all data (~10500 obs.) starting in 2018

What should we improve for 4XMM?

- Variability between observations in catalogue?
- Added variability analysis?
- Flagging piled-up sources, sources around hotspots?

Should we provide two versions of 4XMM – one highly robust catalogue with very reliable sources for the non-experienced user & a second, similar to 3XMM, for the expert user?

Future catalogue versions

Examples for the DR7 catalogue (727790 detections, 332 columns):

- 412805 excellent detections (SUM_FLAG=0 & max. likelihood≥10)

- 524146 good detections (SUM_FLAG <2 & max. likelihood ≥8)

DR7 Slim catalogue (499266 sources, 44 columns)

Note:
Max. likelihood 10 ~ 4σ
Max. likelihood 8 ~ 3.5σ

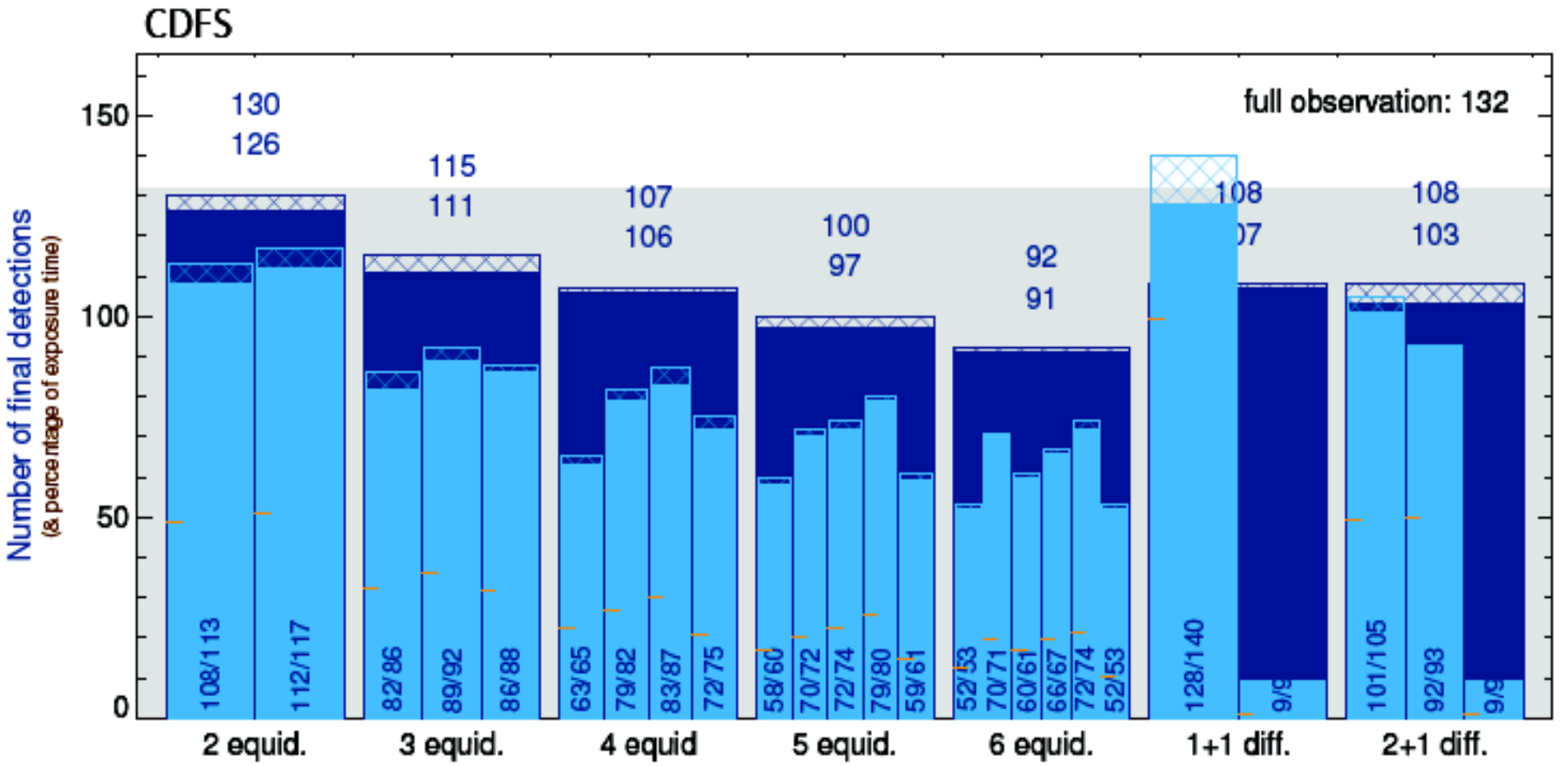
Future catalogues : the stacked catalogue

New stacked source detection tasks in SAS to
- provide a standardised source-detection method for overlapping observations
- more convenient handling of multiple pointings for the users
- optimize stacked source parameters
- basis of a "stacked catalogue" of repeatedly observed sources

Images stacked with *emldetect*
Source detection using *edetect_stack*

Testing to optimise the field and observation selection

Future catalogues : the stacked catalogue



dark blue: stacks

light blue: per sub-exposure

solid: with valid 3XMM counterpart

shaded: without valid 3XMM counterpart

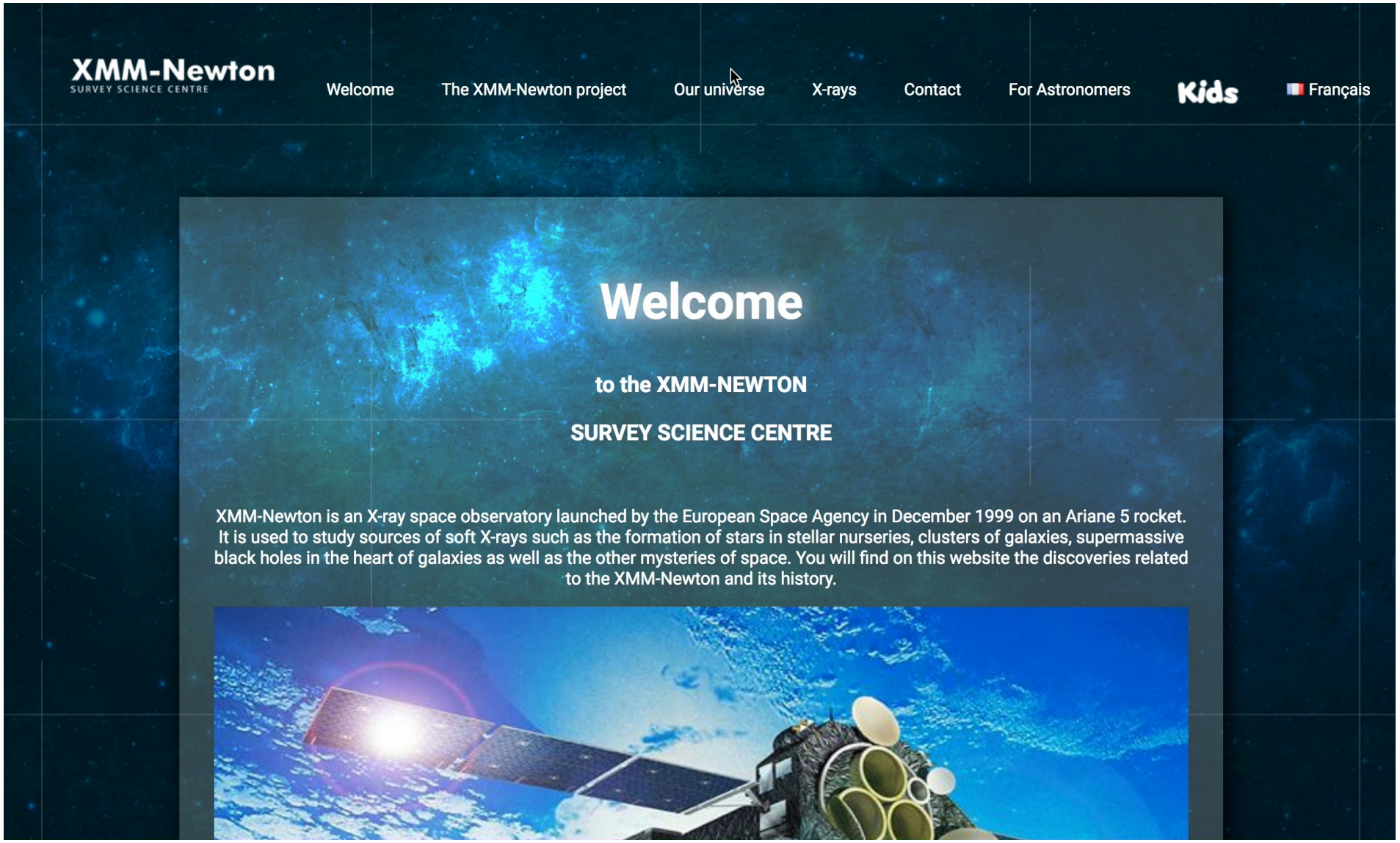
Future catalogues : the stacked catalogue

#OBS	#grps
2	204
3	40
4	10
5-8	4-6
9,10,12	1 each

Proto-catalogue: 736 observations, 278 stacks, ≥ 25,500 detections

Catalogue processing:
- several of the necessary scripts ready to use
- open: final field selection
- processing takes just a few weeks

SSC outreach webpages



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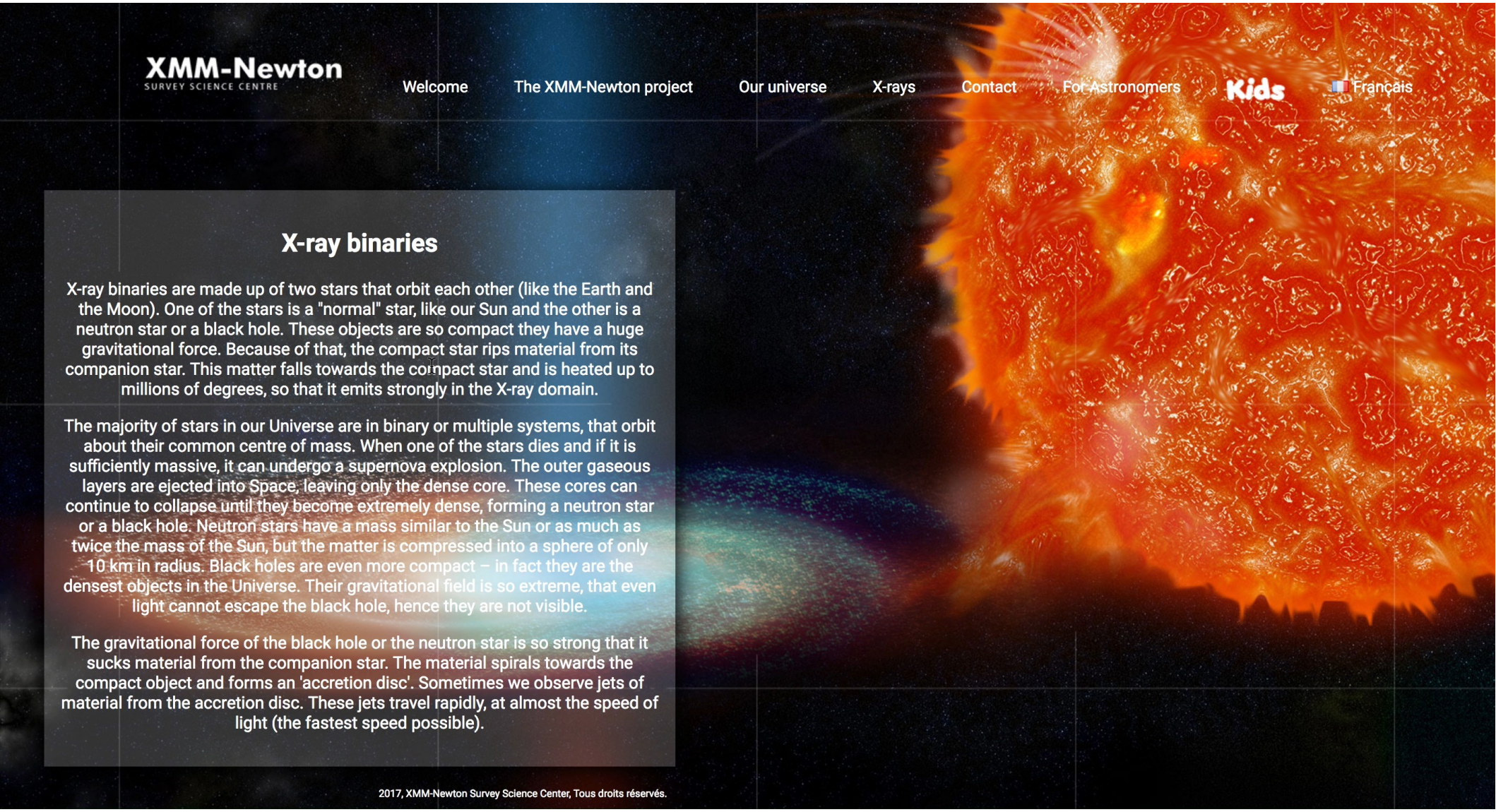

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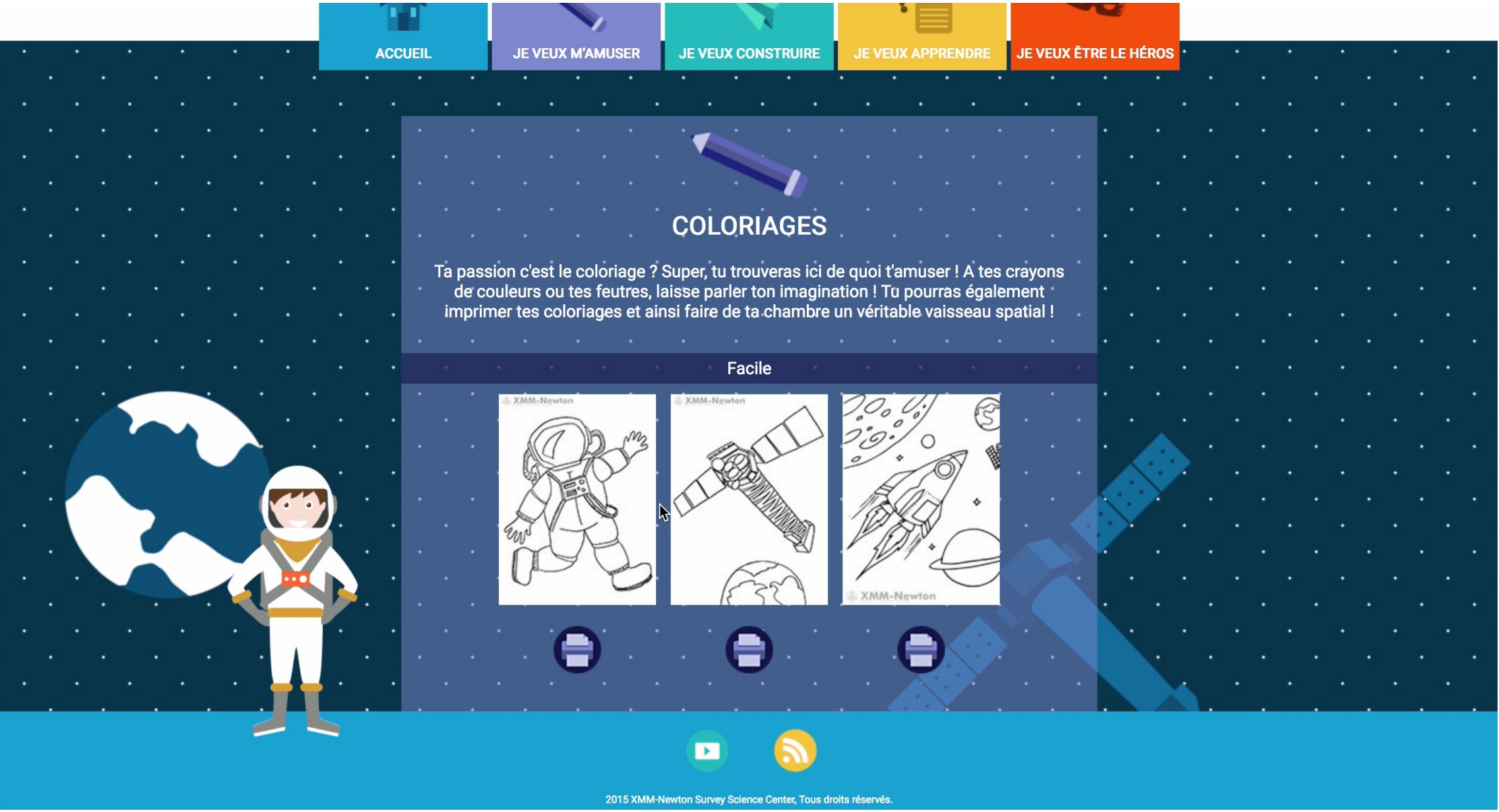

SSC outreach webpages

What else could we improve?

To date the variable sky has not been significantly exploited

A systematic search in the pipeline for variable sources :
- new or highly variable sources : γ-ray bursts, tidal disruptions, X-ray binaries, CVs, grav. wave events, supernovae, magnetars
- sources that become bright for a very short time (few seconds) but not detected as lost in noise: bursting sources, giant pulses, ...

This would require :
- new algorithms
- PI to tick a box in RPS form (like was for XID project) to say that their data can be searched automatically and any new source announced (either to them or via an ATEL created automatically)

Summary

Continued SAS task development + support

Continued data products screening

Ongoing source identification activities

3XMM-DR7 expected for next month, 3XMM-DR8 for next year

Stacked source catalogue expected this year

Enhanced catalogue servers helping to disseminate data products

Planning for 4XMM started, re-reduction using new methods and upgraded products next year for release in 2019

Thanks to strong support from SSC members and the SOC, we are continuing to provide XMM-Newton legacy products to the astronomical community