X
X
L

The ultimate
XMM extragalactic survey

die Kunst
über
in der Wissenschaft

An overview of XXL

Hot spots in the XMM sky

Marguerite PIERRE
CEA Saclay

Mykonos, June 2016

LSS Surveys Roadmap

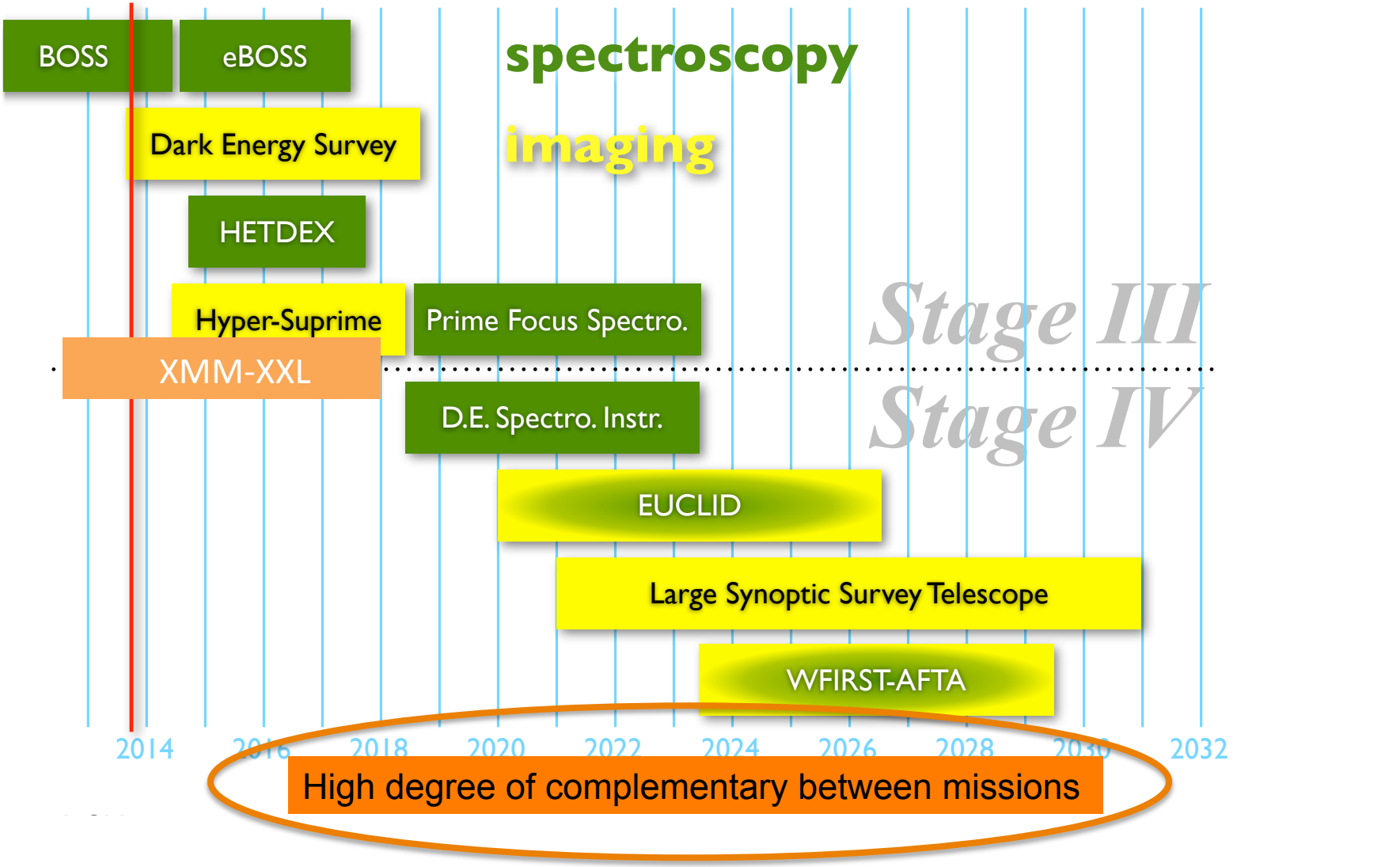


Image: Ian Shipsey

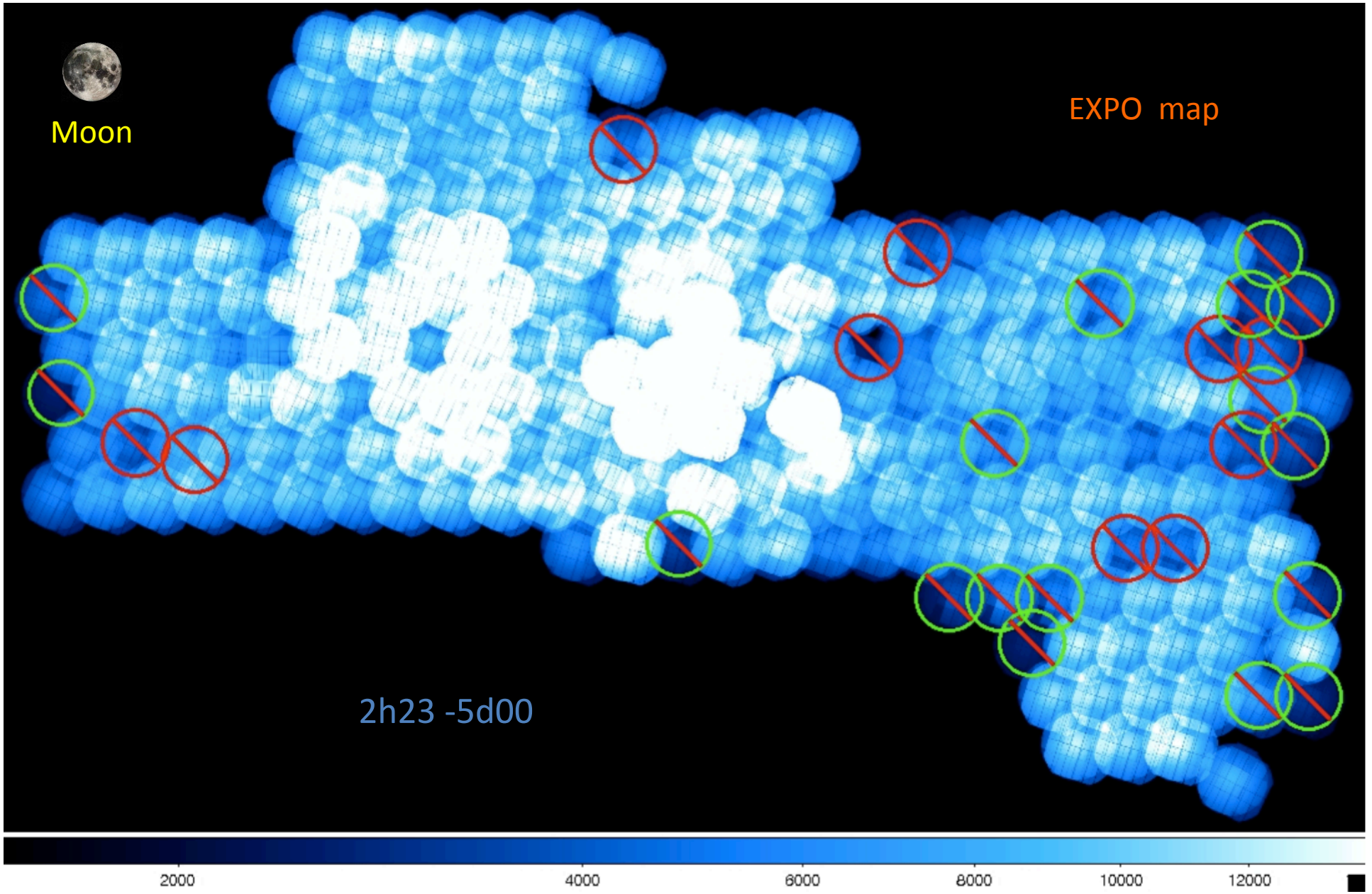
The XXL survey

XMM VLP (AO-10)

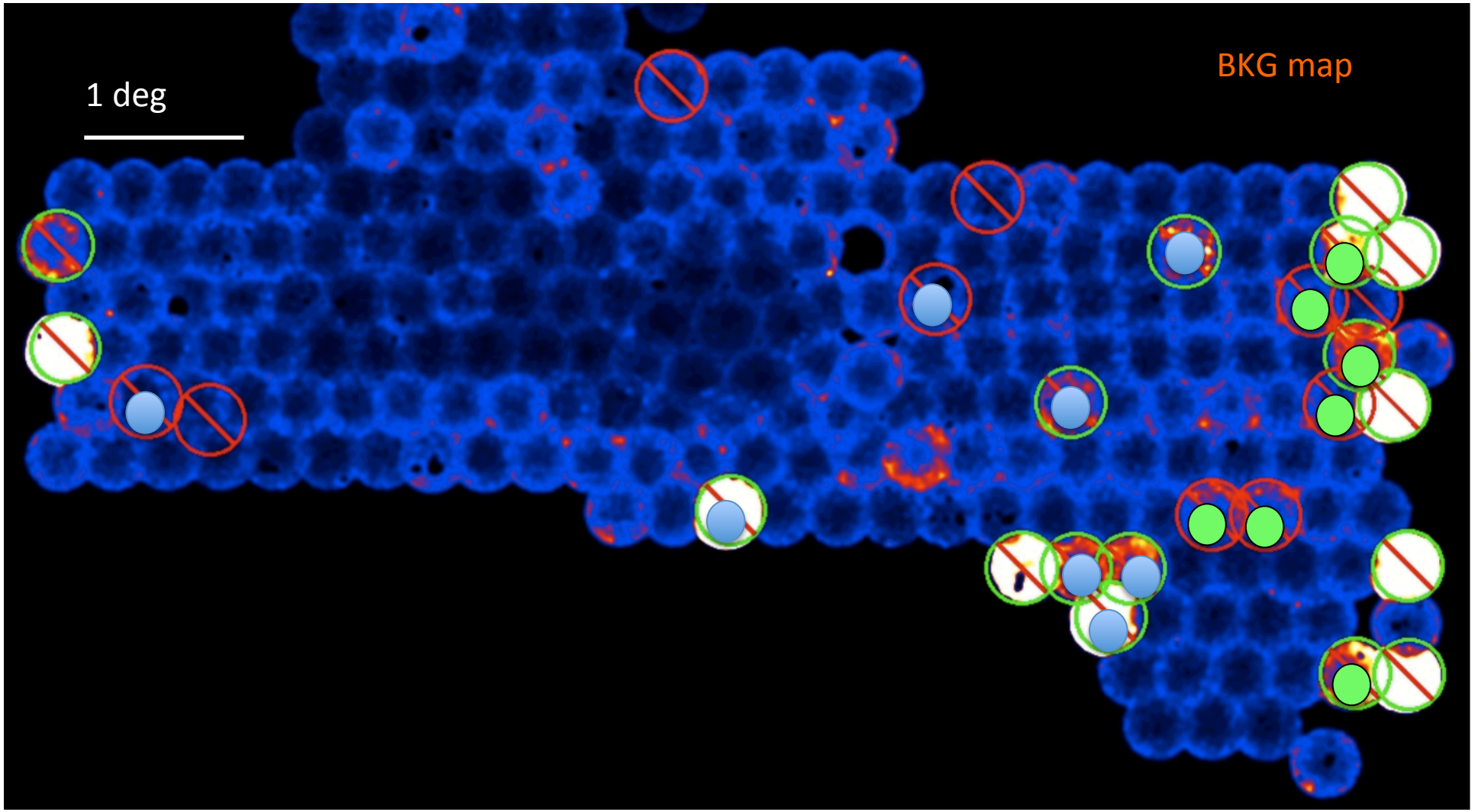
- 2 x 25 deg^2 areas
- 6.9 Ms – 452 XMM observations 2011-2013
- Nominal XMM exposure time : 10 ks

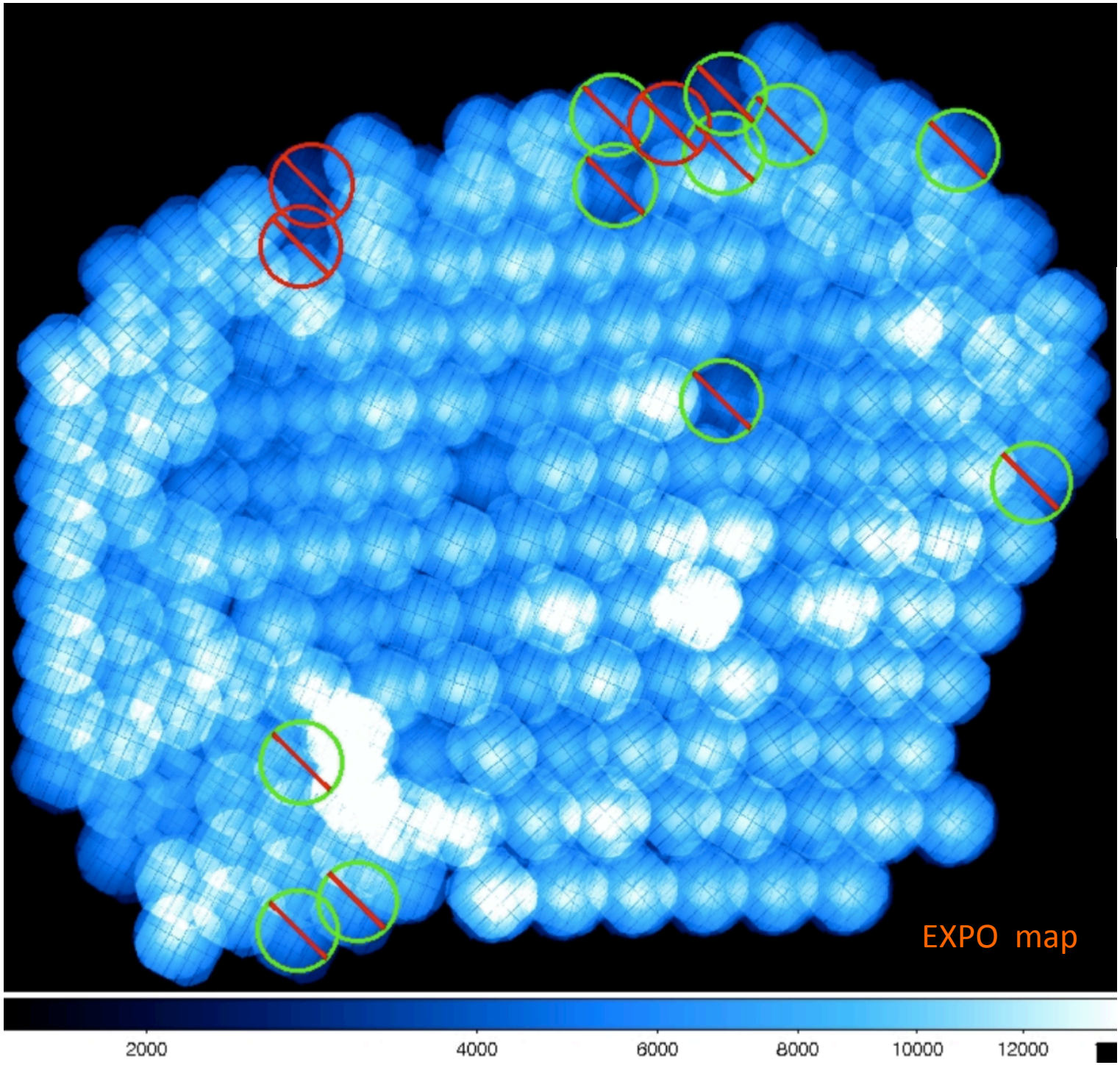
- Some 100 scientists
- ESO LP and numerous associated surveys from UV to 74 MHz

XXL-N 25 deg^2



XXL-N

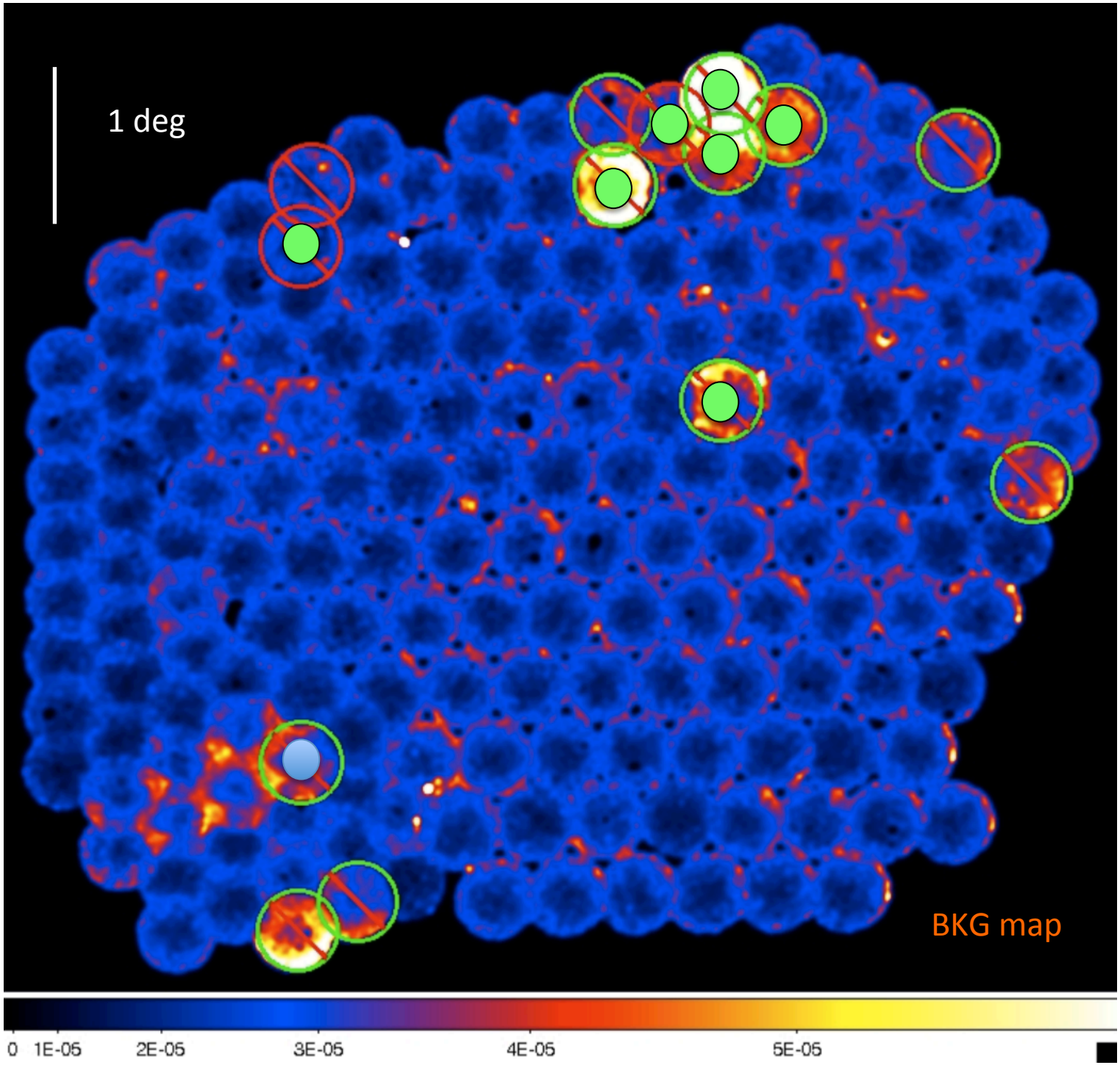




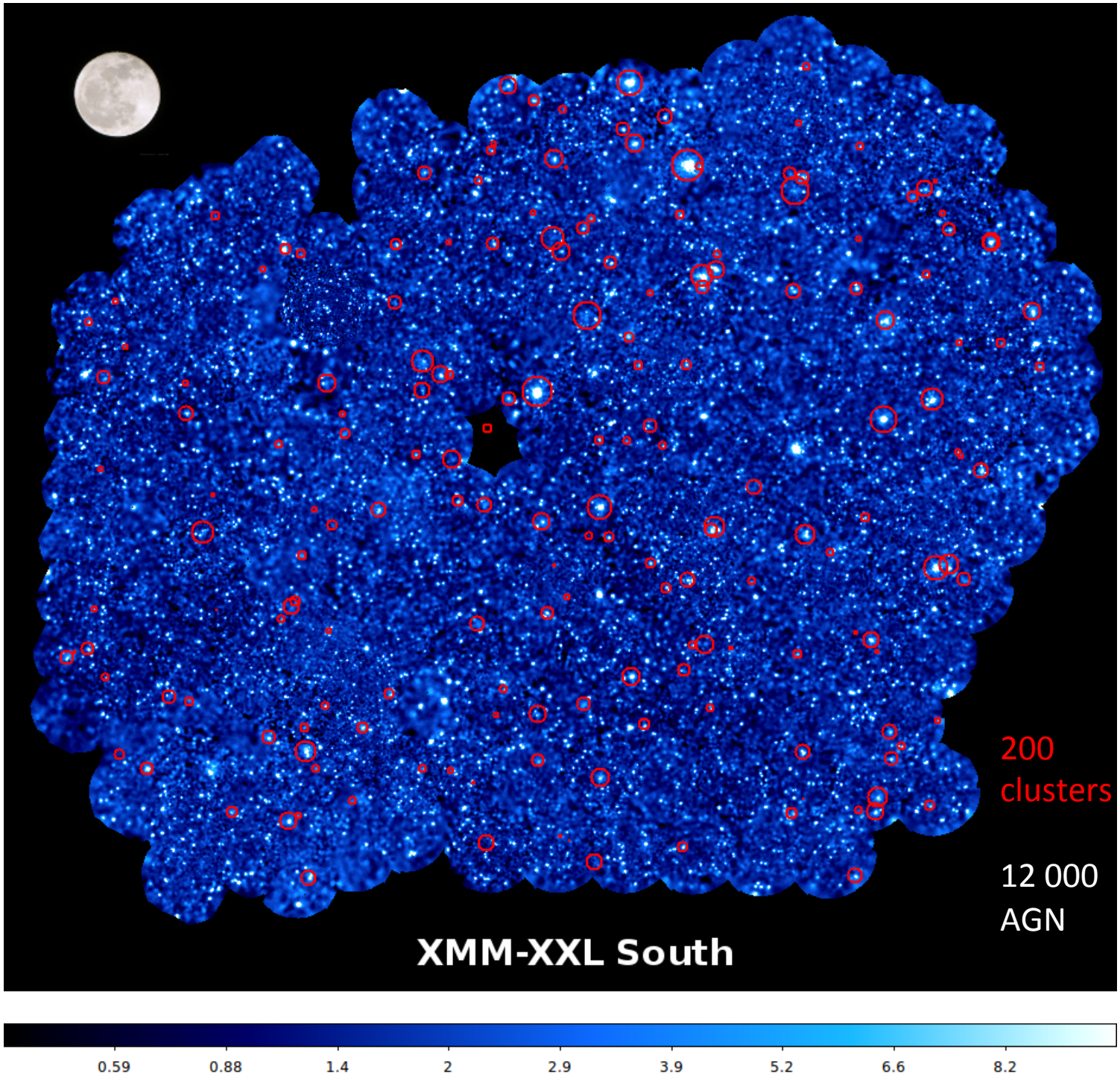
XXL-S
25 deg^2

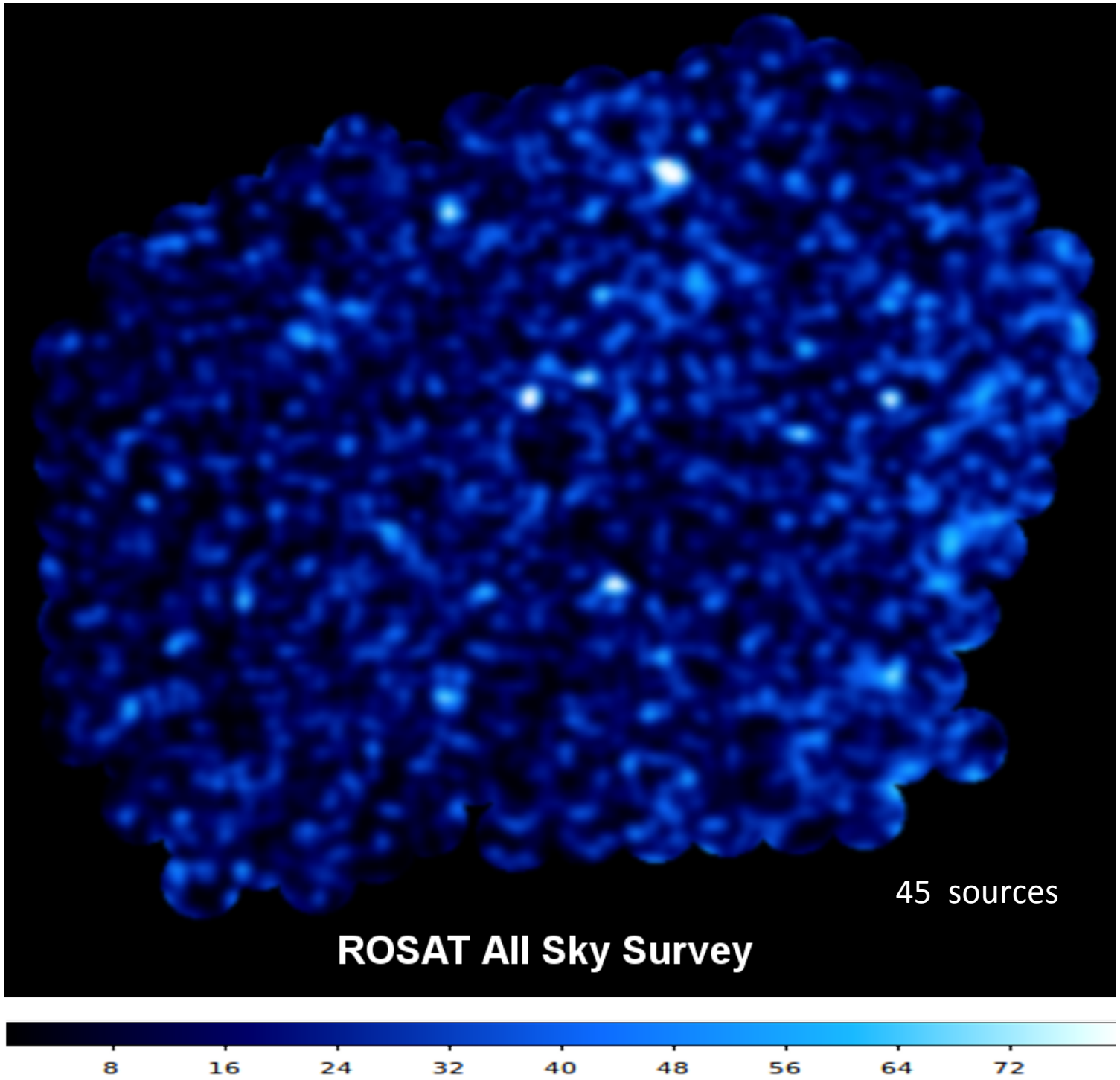
23h30 -55d00

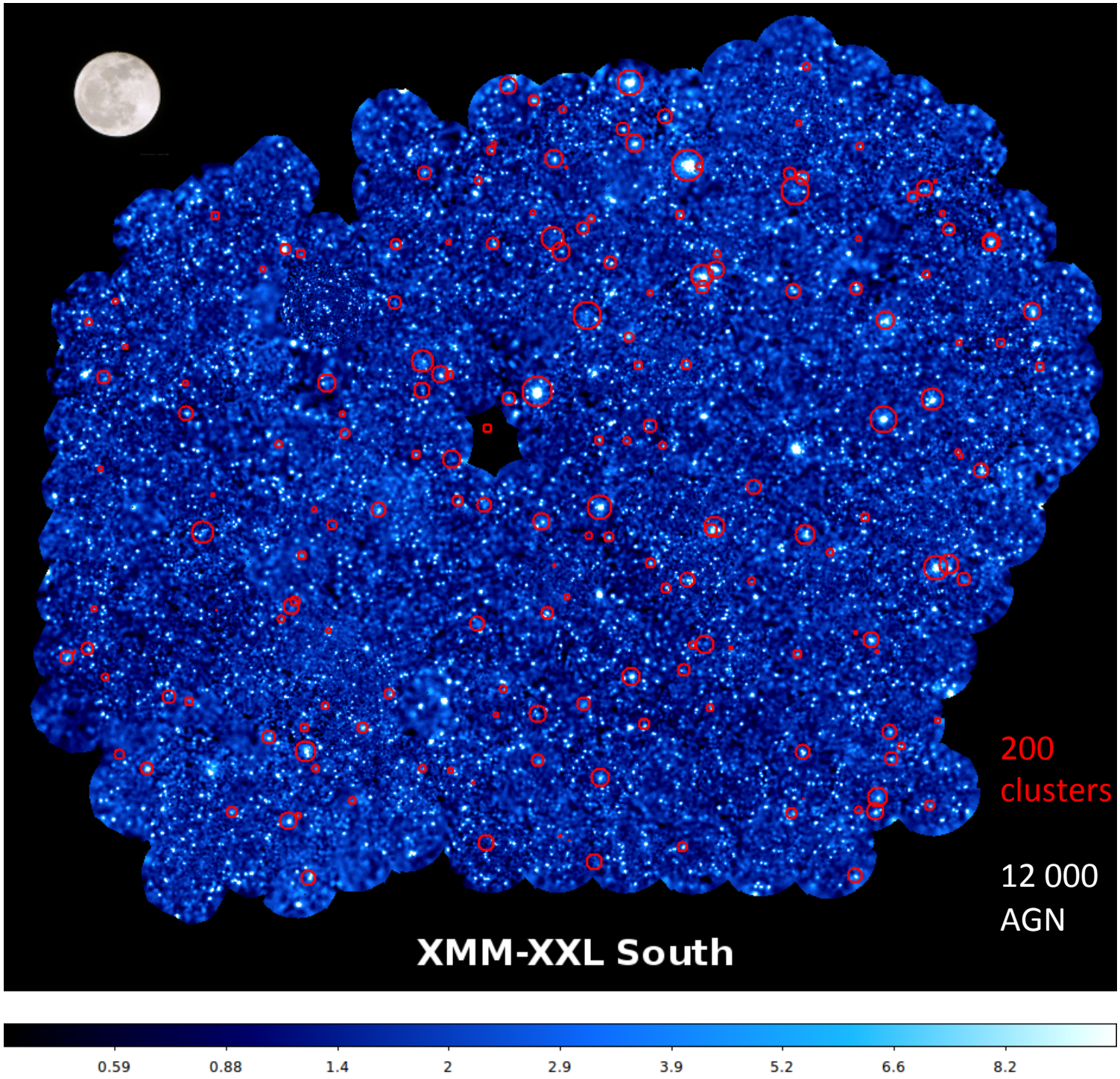
within the SPT
100 deg2
Deep Field



XXL-S


200
clusters
12 000
AGN
XMM-XXL South
0.59
0.88
1.4
2
2.9
3.9
5.2
6.6
8.2


45 sources
ROSAT All Sky Survey
8
16
24
32
40
48
56
64
72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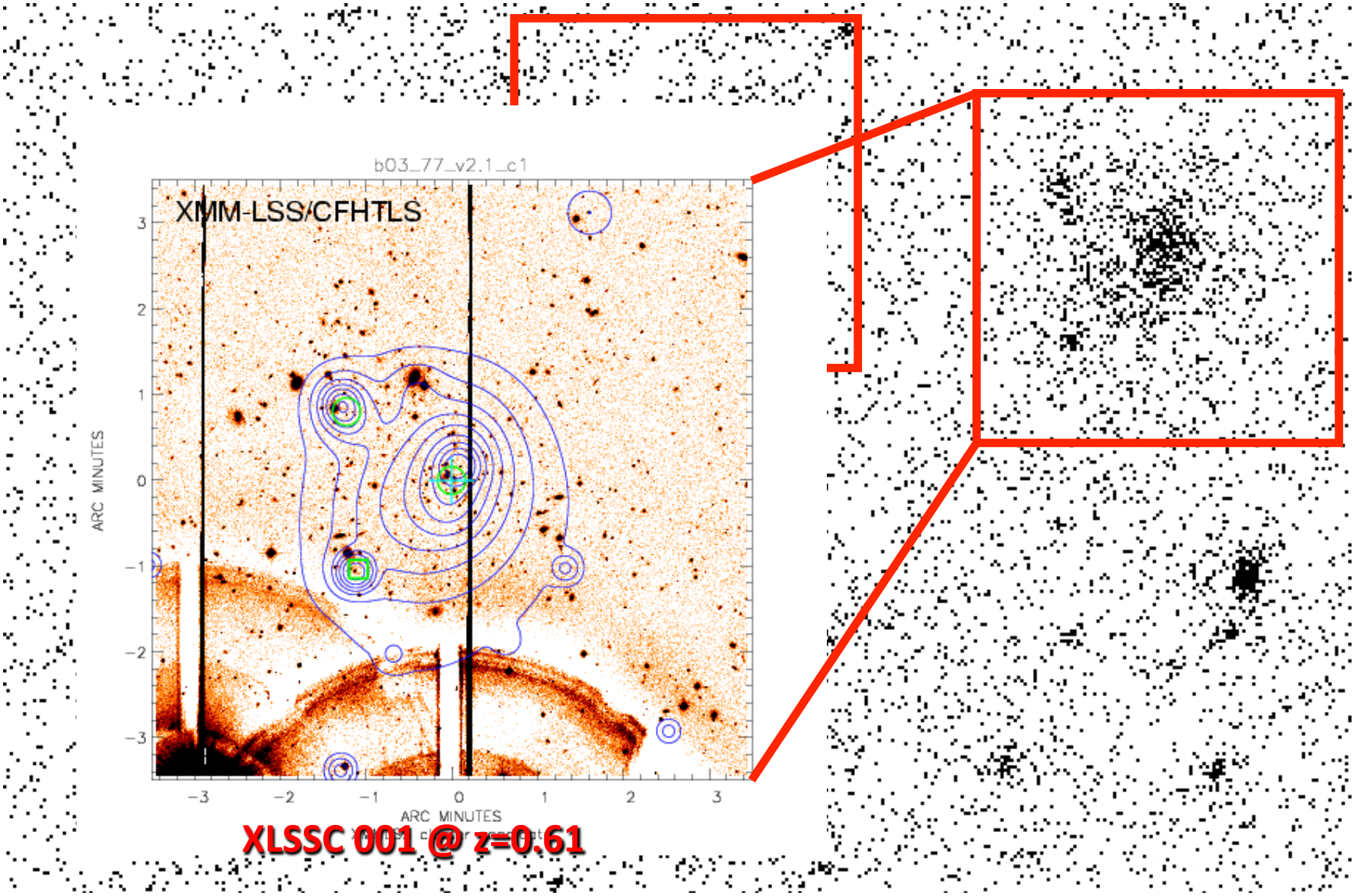
Typical 10ks XMM image of an ‘empty field’



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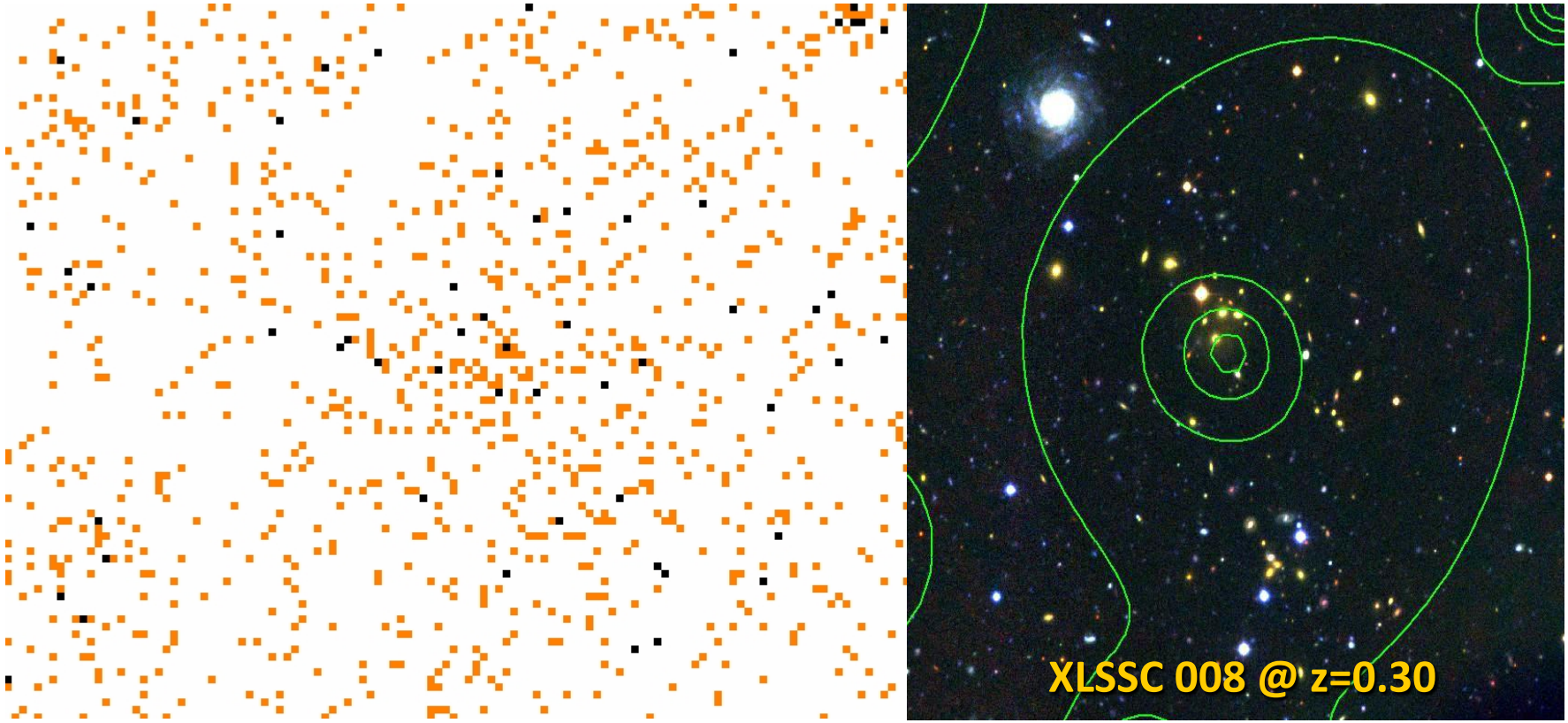


Working with these data : difficult !

: misleading (Poisson)

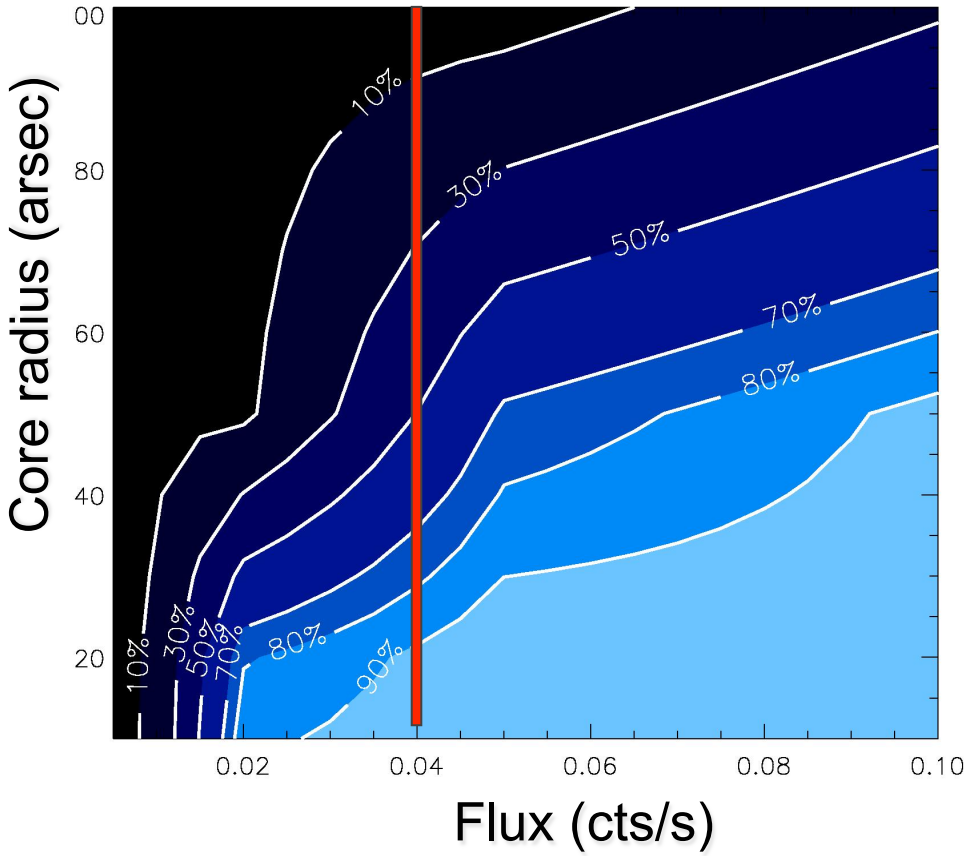
: ambitious

… but feasible and exciting !

Detection rates

from analytical simulations

Class 1 sample



Not a flux limit !

Pacaud et al 2006

The XXL survey

December 2015: first series of papers out

- **Officially published today in an** A&A special issue !
  - 14 articles
  - brightest 100 clusters released (spectro z, L , T)
  - brightest 1000 AGN released (z, multi-λ)
  - XMM images released

Main results (clusters)

- We find 17 (40)% less clusters than expected from WMAP9 (Planck)
  (see discussion by F. Pacaud)

- The measured cluster evolution is compatible with self-smilar

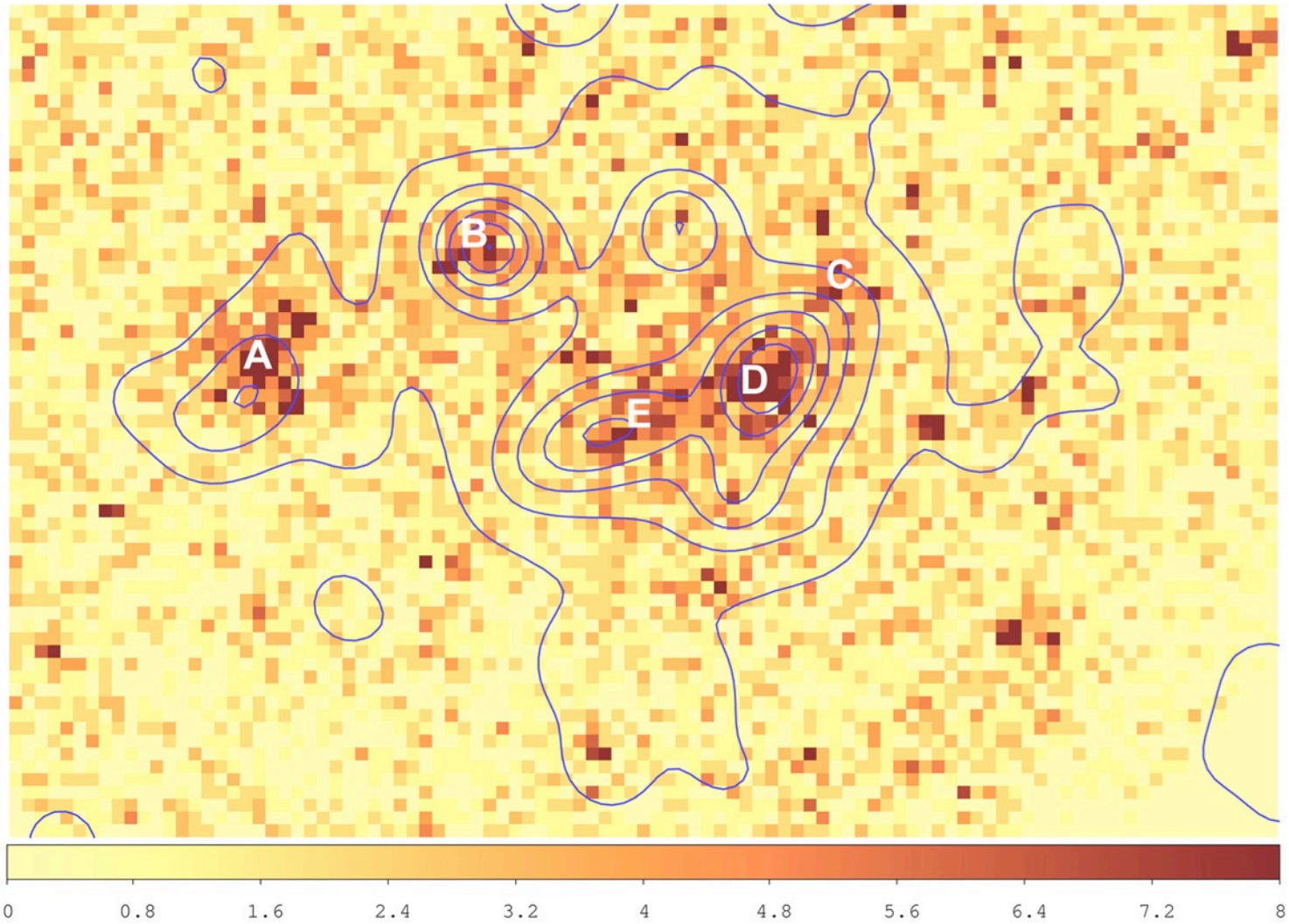
- . . . but strongly dependent on the slope assumed for the $z \sim 0$ relations

➔ we favour internal calibration of the SR

➔ the precise knowledge of the cluster selection function (including scatter) is critical for any SR and evolutionary study (not only for cosmology!)

- Do visit :
  - Our website: http://irfu.cea.fr/xxl
  - Our databases: clusters (Lyon) and AGN (Milan)

A supercluster at z~0.45

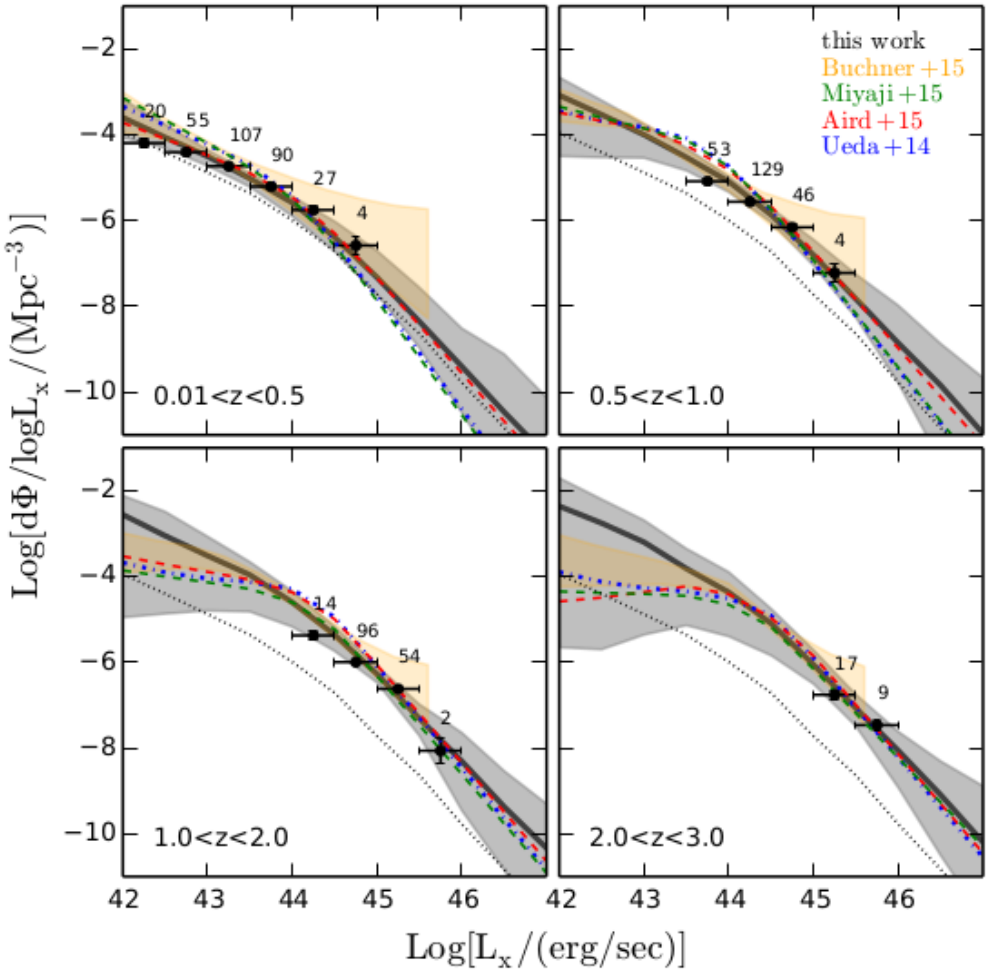


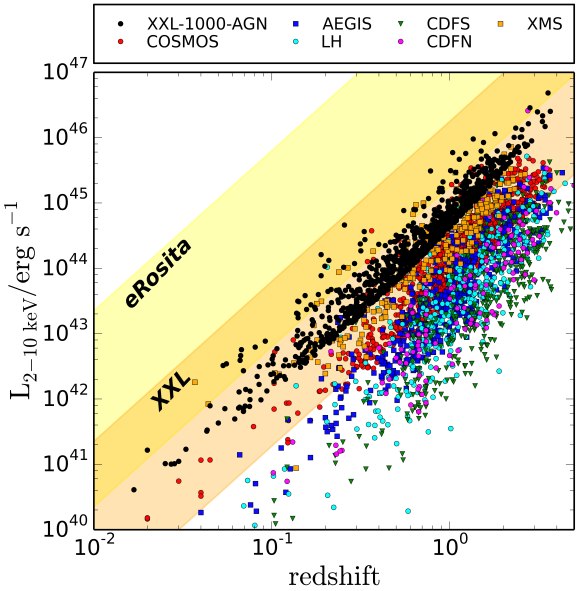
XMM photon map

Optical galaxy density contours

Image size 20’x13’

XXL-1000-AGN: in the Cosmic web



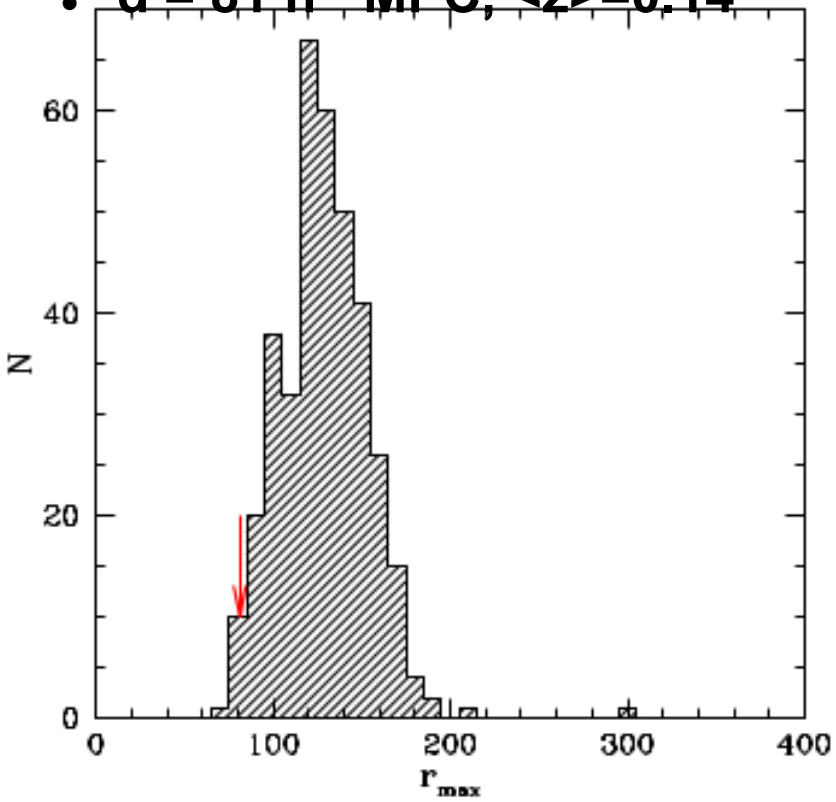


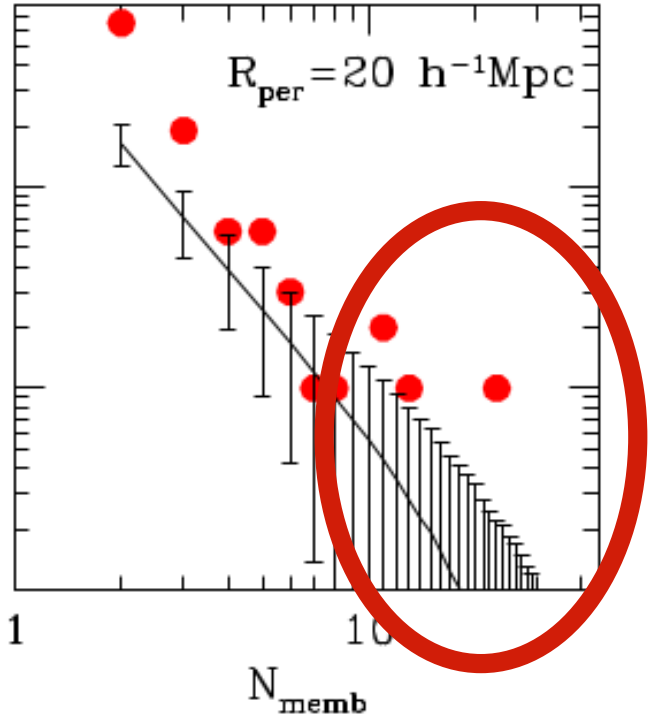
- **2-10 keV *intrinsic***
- **luminosity function**
- **LDDE model**
- **0.01 < z < 3.0**
- **faint end at low z**
- **bright end at high z**

Fotopoulou et al., 2016

XXL-1000-AGN: in the Cosmic web

- friends – of – friends analysis to search for structures
- significant groupings 2 – 3 members
- structure with 23 members, associated to a supercluster
- identified in the XXL-100-GC sample.
- d = 81 h^{-1} MPC, <z>=0.14





Fotopoulou et al., 2016

NEXT FUTURE

Important step:
advanced cluster selection function

Switch from regular β=2/3 clusters to SAM and hydro-simulations

➔ Test the impact of

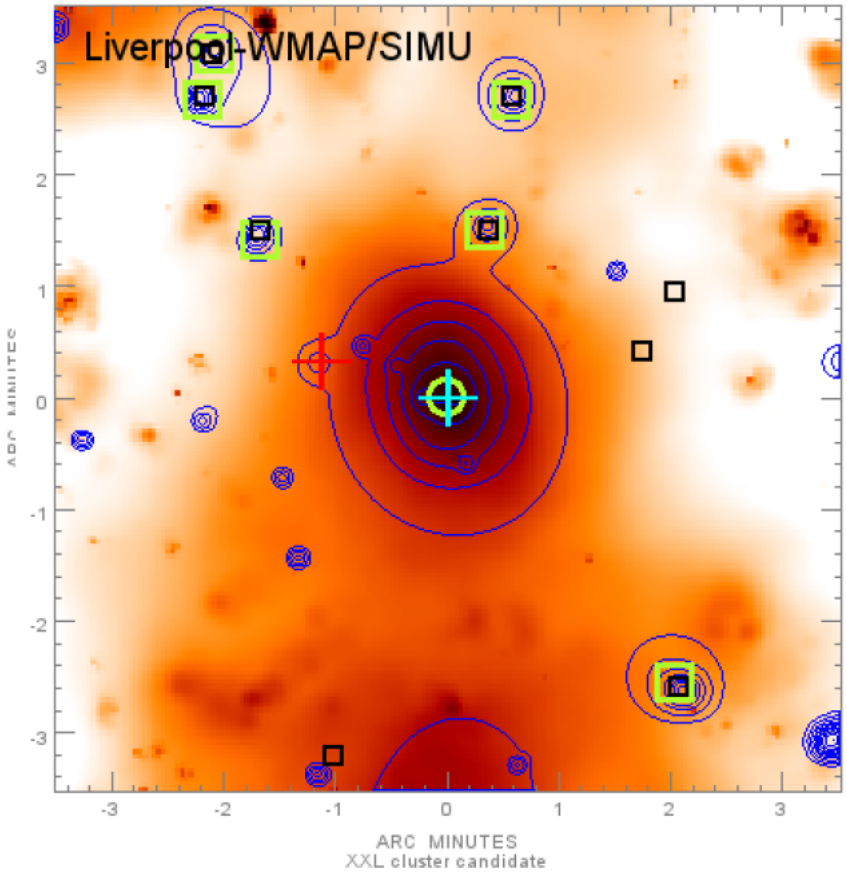
- cool cores
- AGN
- irregular emission profiles

on the cluster detection rate

(see talks by I. McCarthy, E. Koulouridis, and G. Evrard)

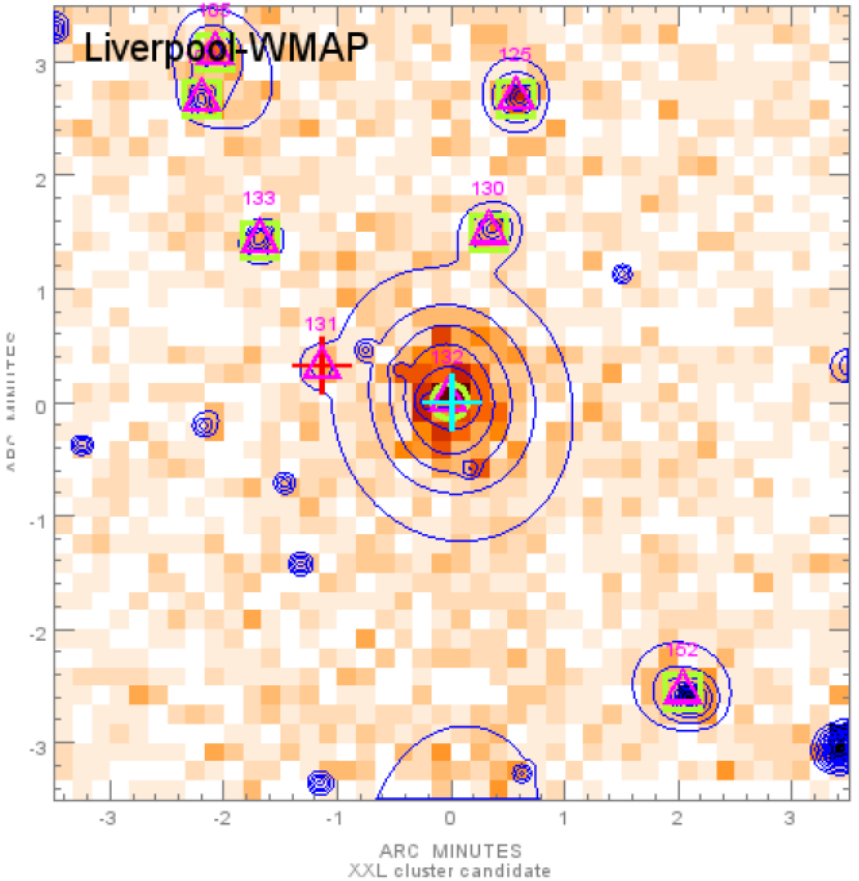
An outlook onto simulated XXL

OWLS simulations (X-ray flux)
McCarthy, Le Brun, 2014



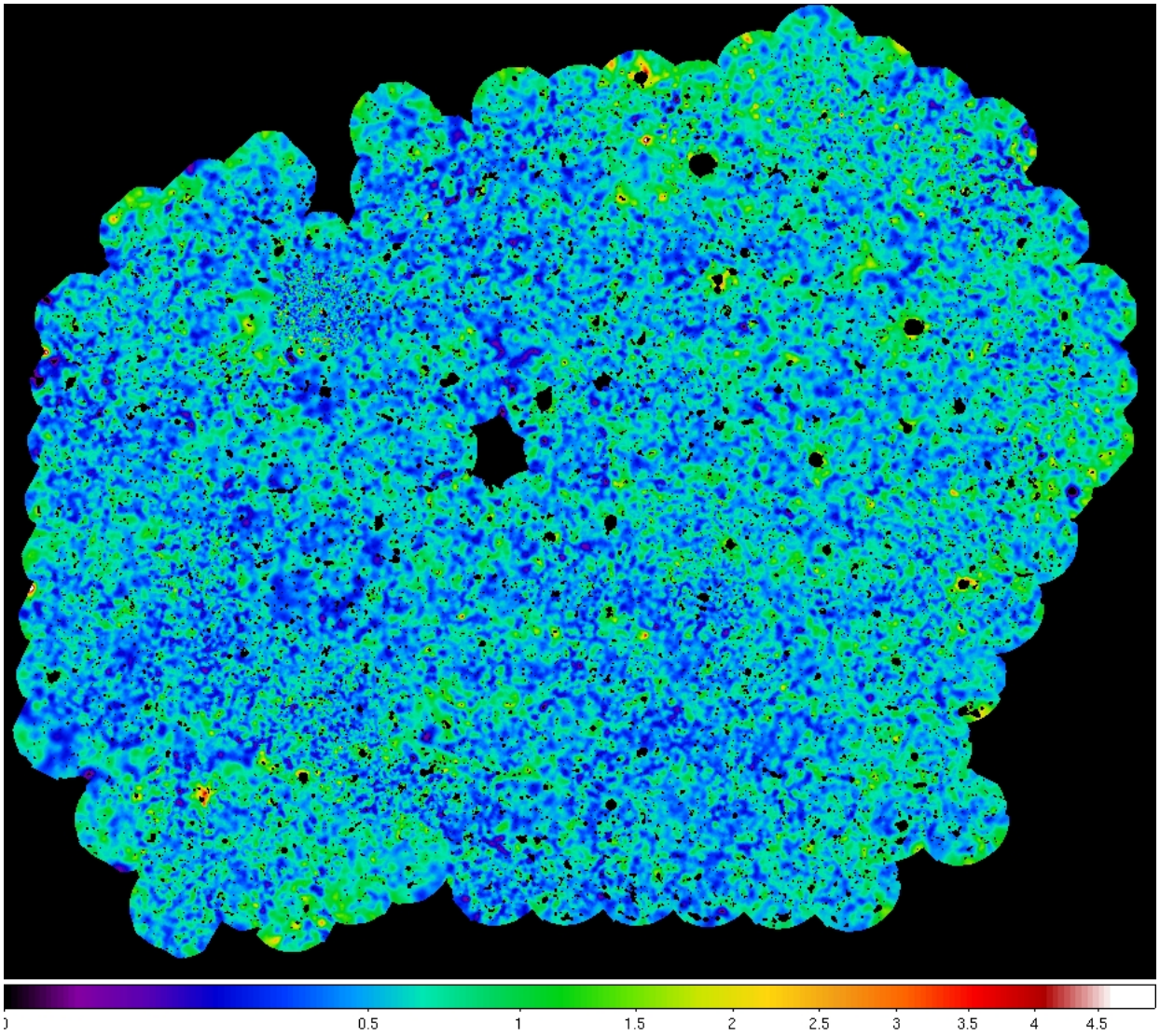
Photon band image + X-ray Wavelet Contours.
log10(photons/cm2/sec): -9.500, -6.500

10ks XMM photon image



Raw X-ray photon image + X-ray Wavelet Contours.

Great potential for XRB studies



- Sources subtracted

- Exposure Correction of the Count

- Minus Particle and Soft Proton Background Image

(Snowden 2016)

Final series of XXL papers by the end of 2018

- Full cluster catalogue (z_{spec}, X parameters) : 450 objects
- Full AGN catalogue (z_{spec} z_{phot}, X and multi-λ parameters): 25 000 objects
- Cluster selection functions

- Cosmological analyses and many others

➔Stay tuned! (2^{nd} series by the beginning of 2017)

Further ideas:

XXL^2

XXL^2

- XMM is expected to last until 2028

- Last month : *XMM next decade* prospective workshop at ESA

- There are several compelling arguments for going much further

➔ listen to this week's talks!

- Going deeper, wider , elsewhere? Willing to contribute?

➔ Let's discuss this at the end of the meeting, on Saturday!

(temporary) end