Optical properties of XXL - Radio sources

PAOLO CILIEGI

INAF - BOLOGNA OBSERVATORY

Collaboration

All the XXM team and in particular:

Minh Huynh
Vernesa Smolcic
Jacinta Delhaize
Marco Bondi

for the radio data

and

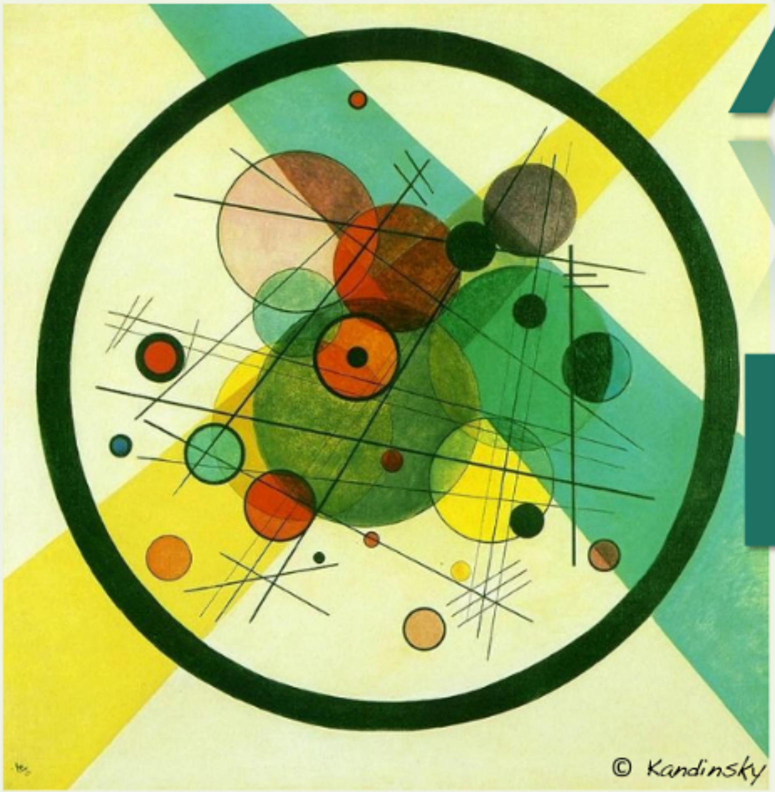
Sotiria Fotopoulou

for the optical data

The Ultimate XMM Extragalactic Survey

XXL

die Kunst



über

in der Wissenschaft

Available Images

XXL North

Telescope	Survey	Filters
GALEX	AIS	FUV NUV
	MIS	
	DIS	
	GI	
CFHT	CFHTLS	u, g, r, i, z
	WIRcam	K
	XXL	g, r, z
SDSS	DR10	u, g, r, i, z
XUDS	DR1	B, V, R, i, z
UKIDSS	DXS	J, K
	UDS	J, H, K
VISTA	VHS	Y, J, H, K
	VIKING	z, Y, J, H, K
	VIDEO	z, Y, J, H, K
IRAC	XXL	[3.6], [4.5]
WISE	ATLAS	W1, W2, W3, W4

XXL South

Telescope	Survey	Filters
GALEX	AIS	FUV NUV
	MIS	
	GI	
BCS	Rutgers	g, r, i, z
	Desai	
	Bleem	
DECam	Desai	g, r, i, z
	public	g,r,i,z,Y
VISTA	VHS	J, H, K
IRAC	XXL	[3.6], [4.5]
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*not used in this release

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Dark Energy Survey

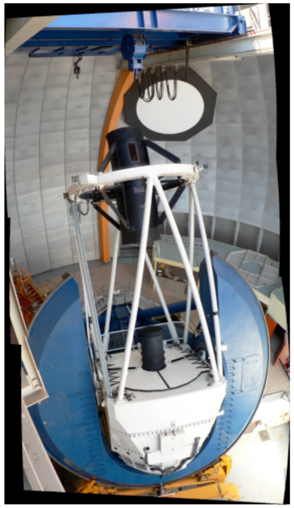
DARK ENERGY SURVEY

DES is 5000^2 degree grizY Imaging survey of Southern hemisphere to map out dark energy equation of state.

CTIO Blanco 4m telescope. Replace PF cage with 2.2 deg. FOV 570 Mpixel Camera.

525 nights from Oct 11- Feb 16

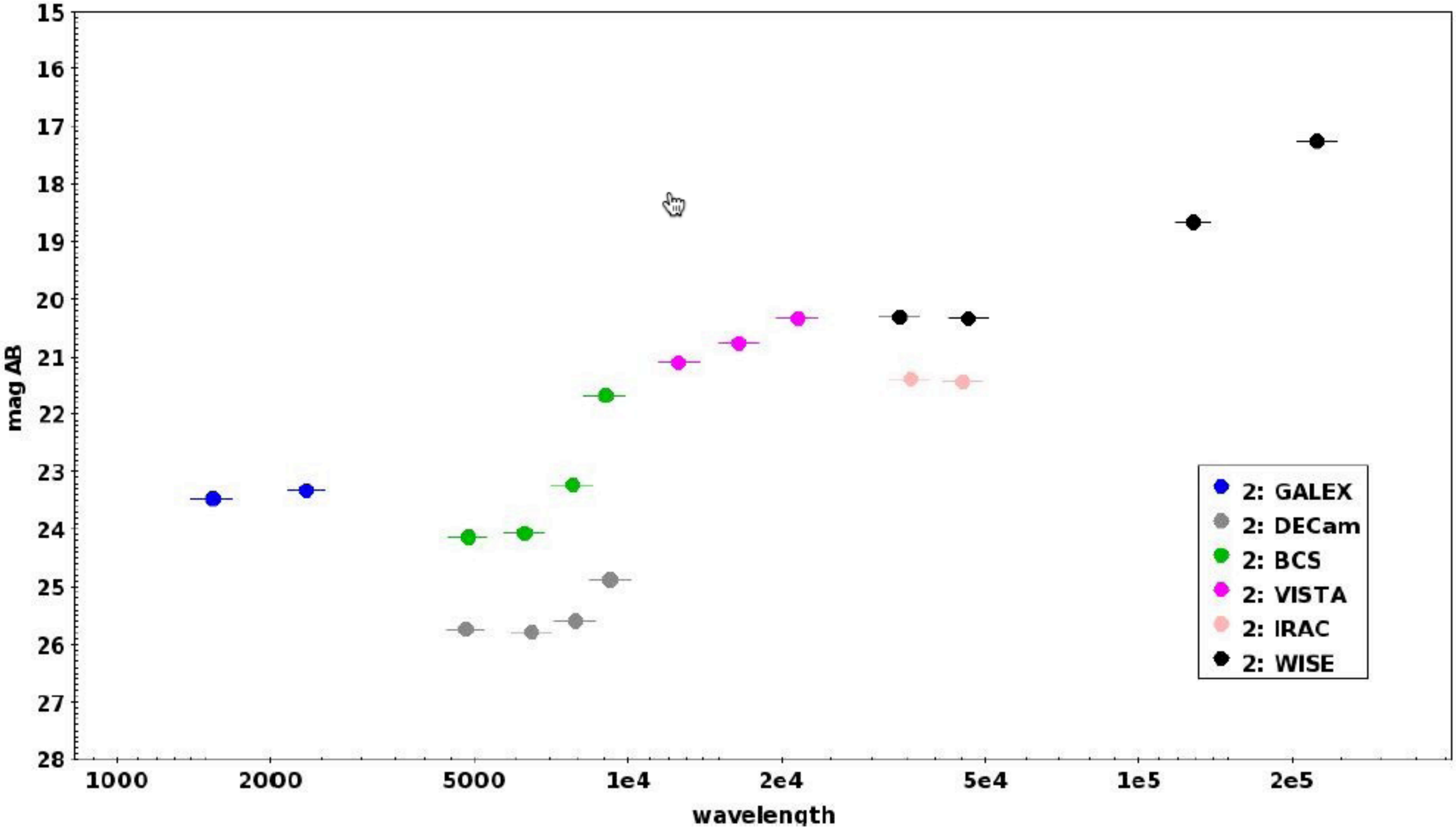
(1 TB of compressed data per night)



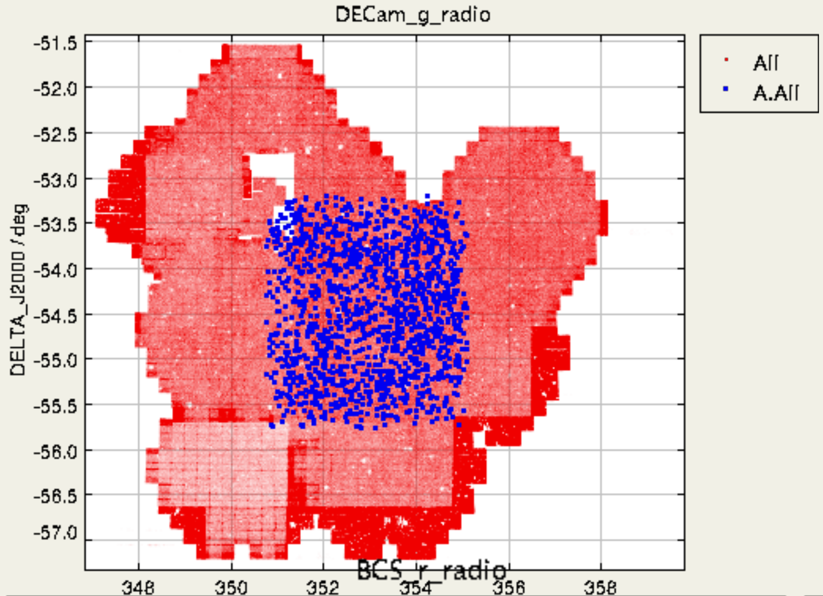
Multiwavelength catalog

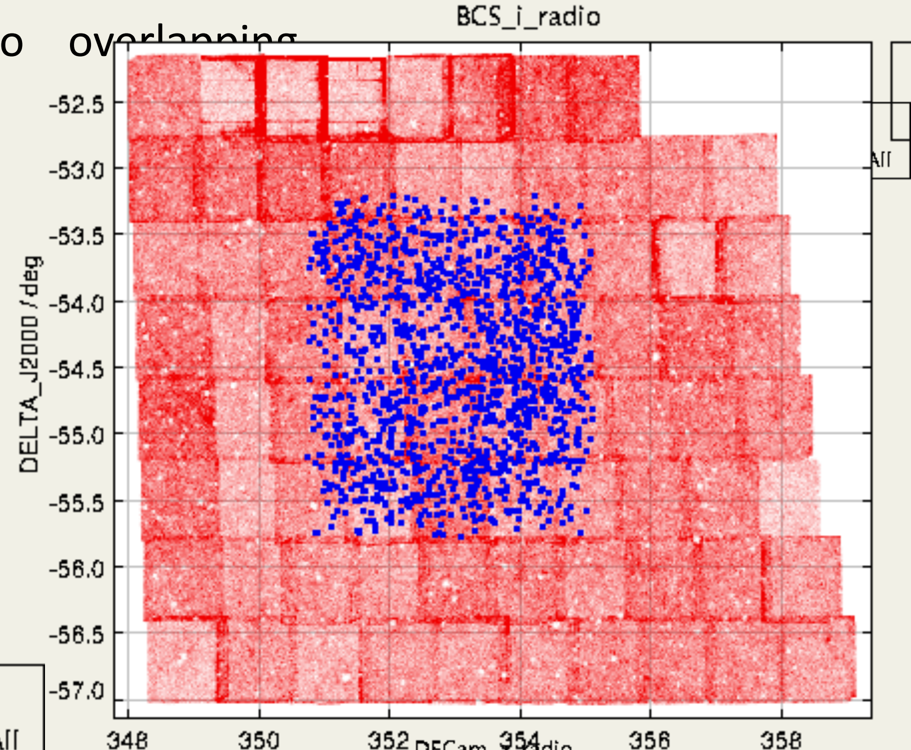
non-homogeneous catalogs in terms of spatial resolution, depth, area

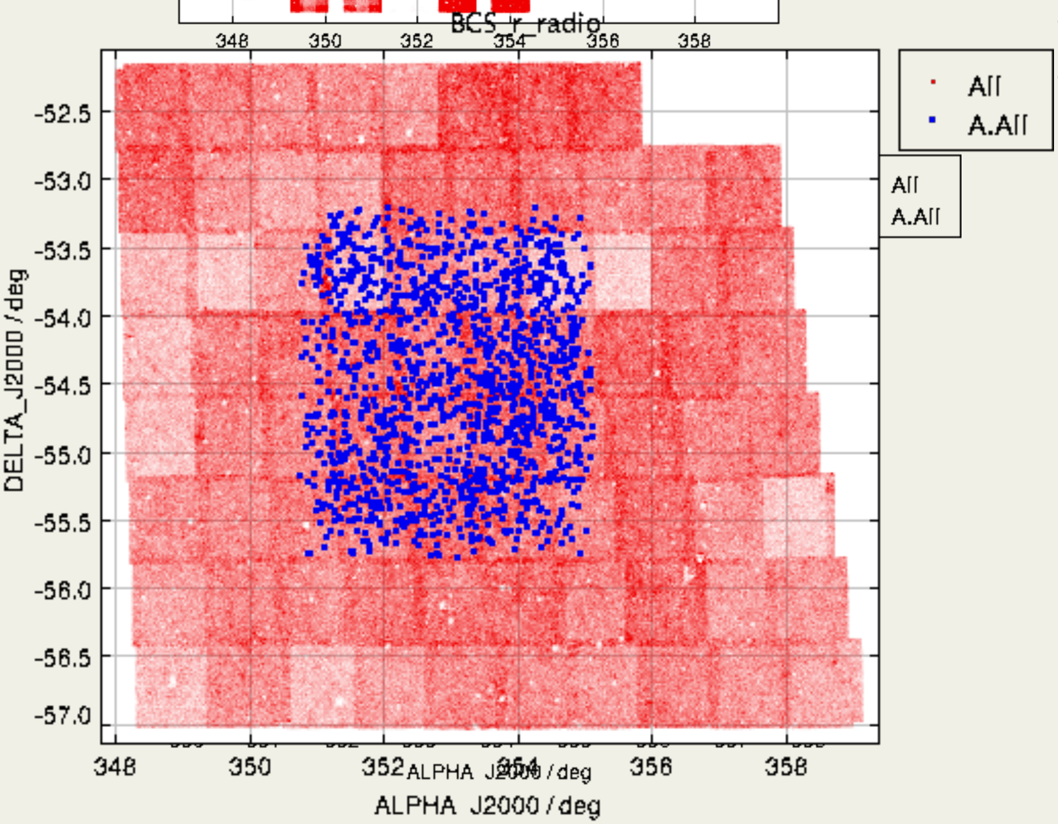
XXL - South

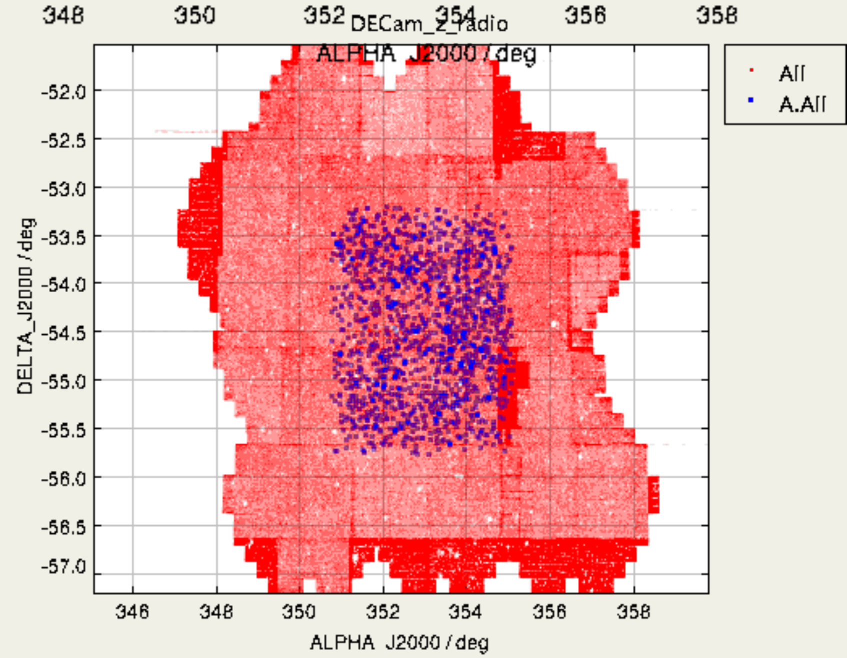


DECam --- radio overlapping









RADIO - OPTICAL ASSOCIATIONS

LIKELIHOOD RATIO TECHNIQUE.

The LR is defined as the ratio between the probability that the sources is the correct identification and the corresponding probability of being a background unrelated object :

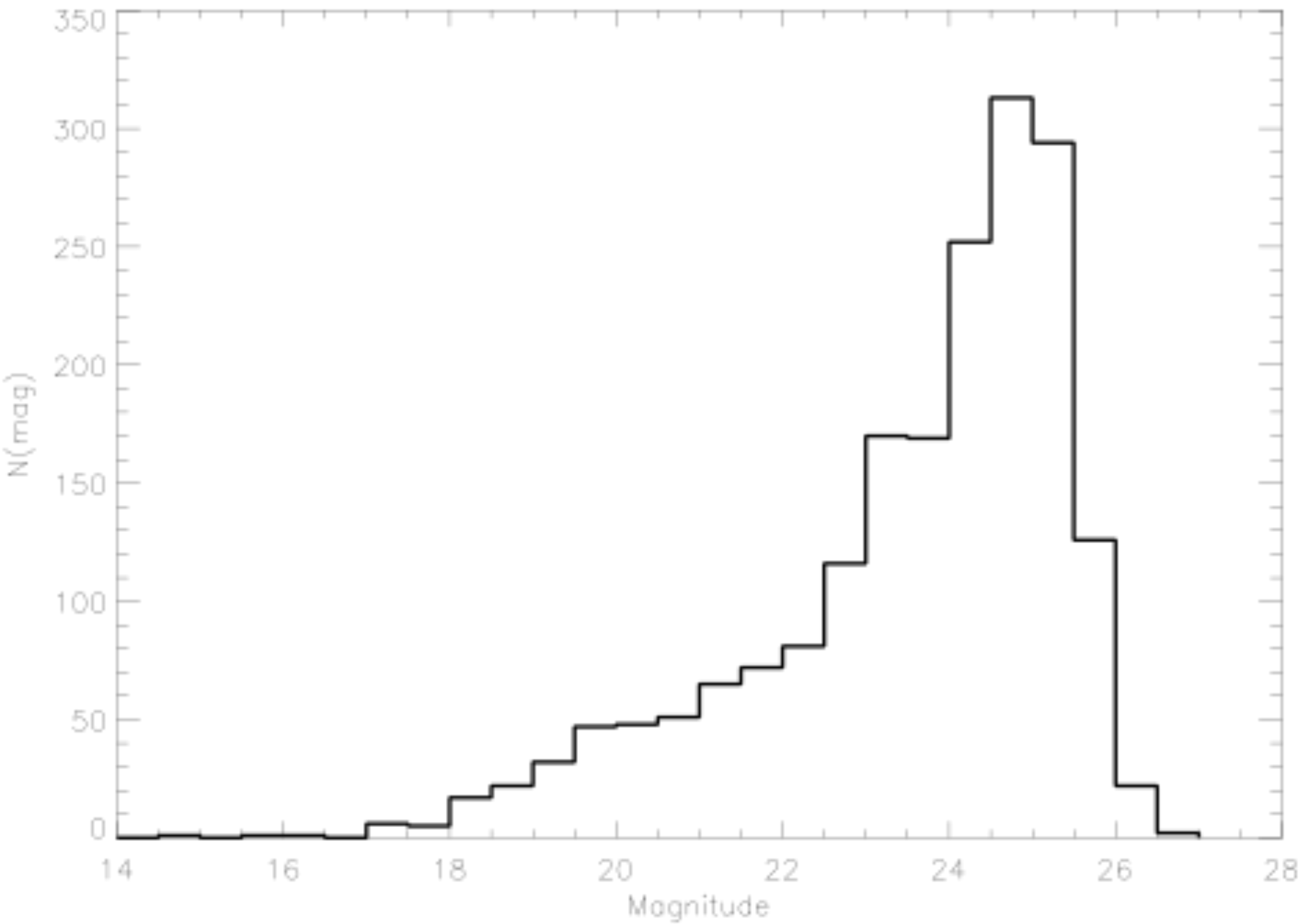
$$LR = \frac{q(m)\ f(r)}{n(m)}$$

q(m) is the expected probability distribution

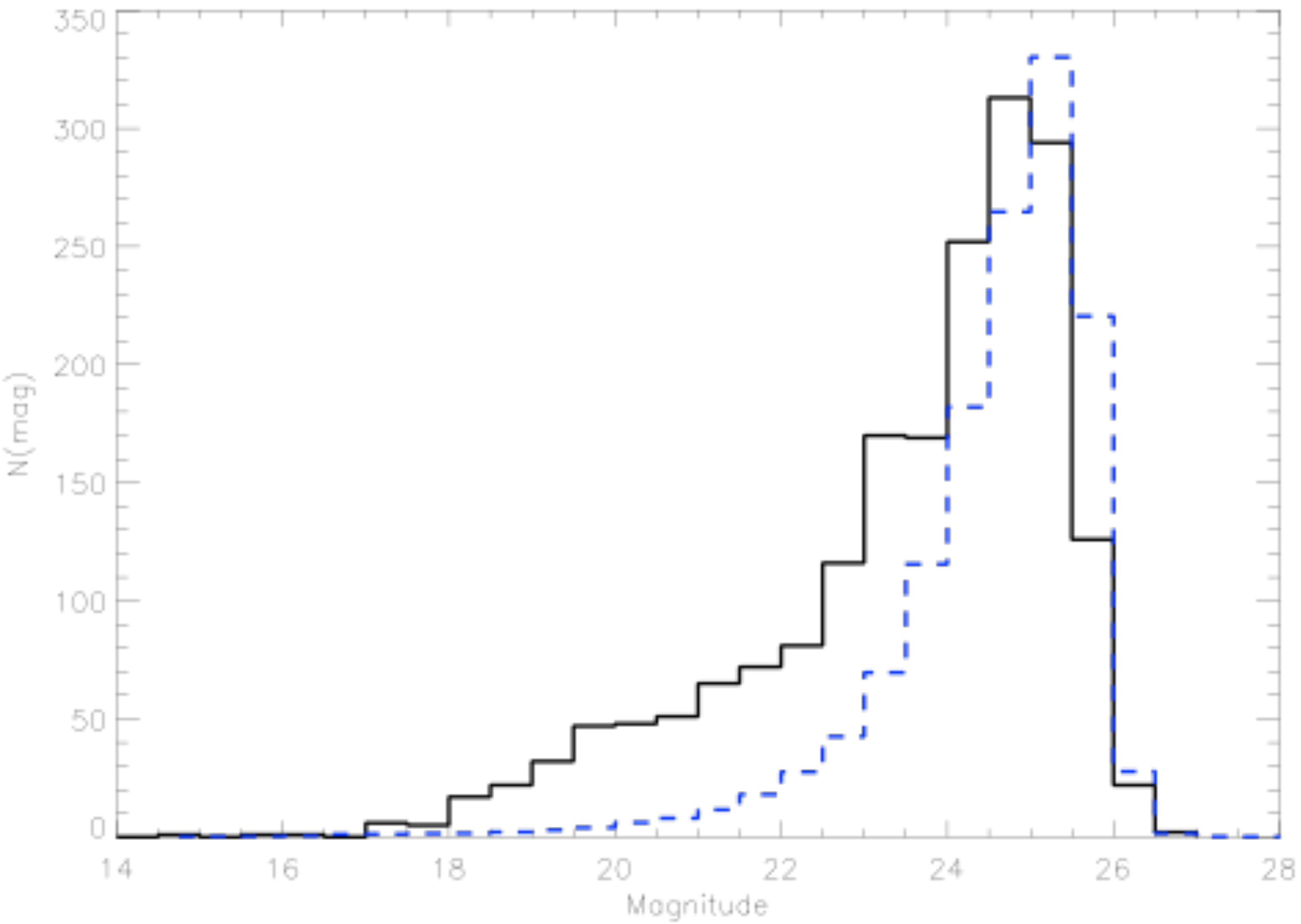
f(r) is the probability distribution function of the positional errors

n(m) is the surface density of background objects with magnitude m

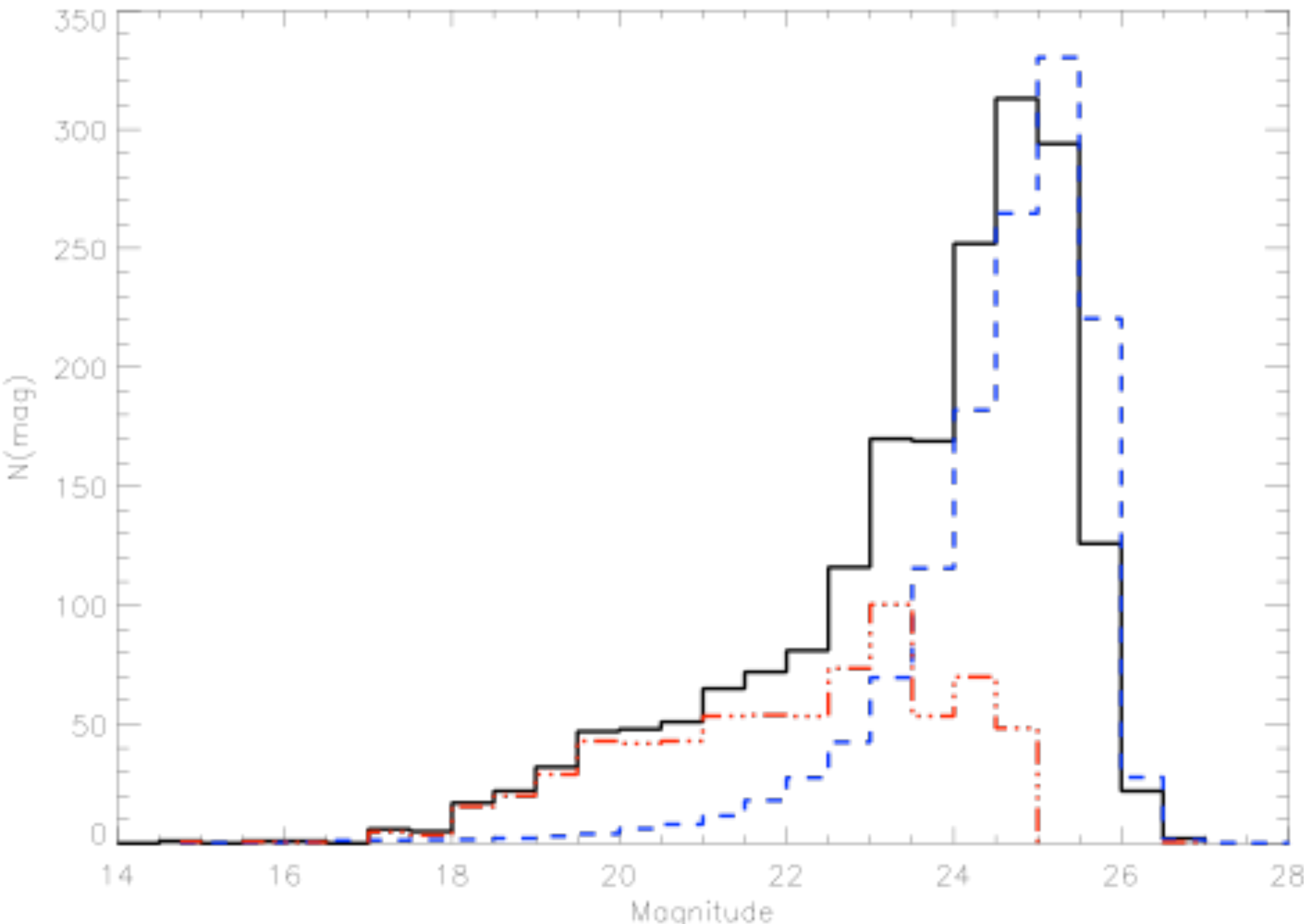
Building q(m) all the optical sources around the radio positions



Building q(m) The background sources



q(m) is the expected probability distribution

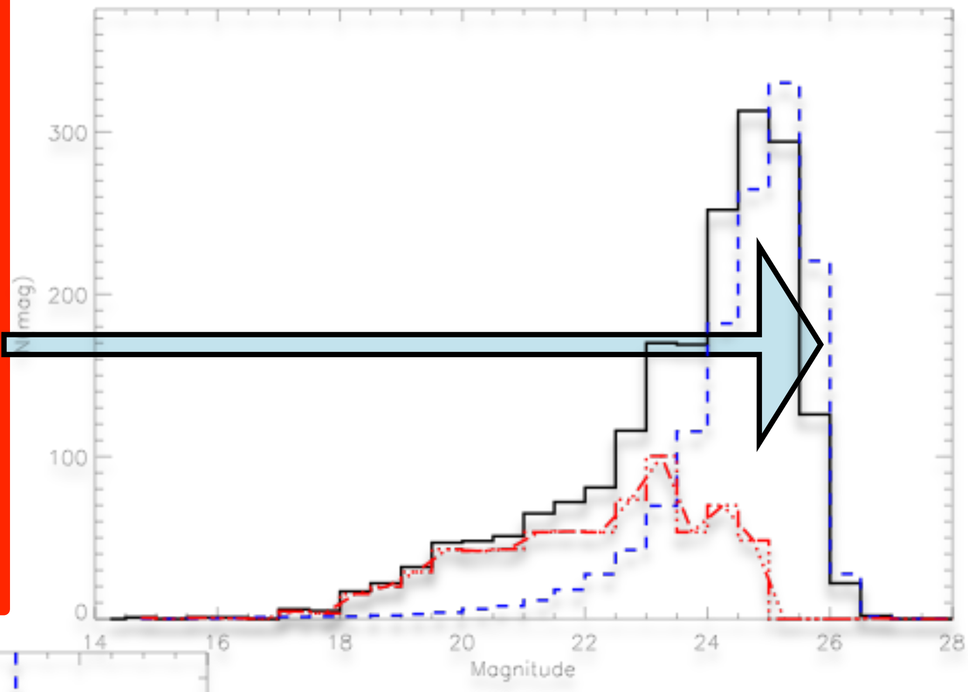


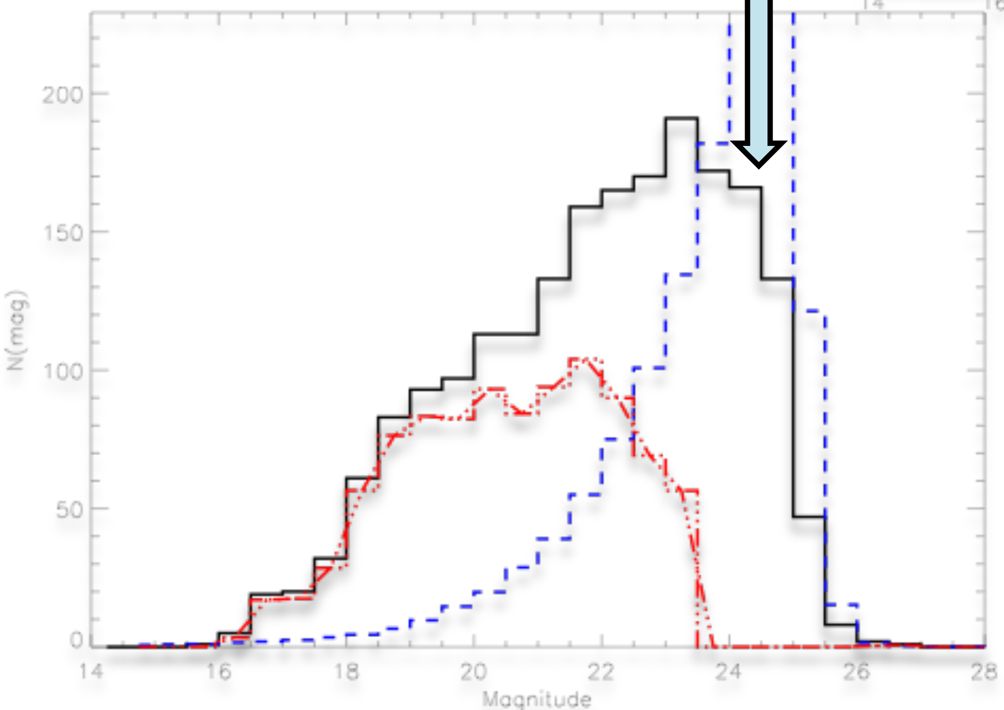
With this technique we have :

1389 radio sources

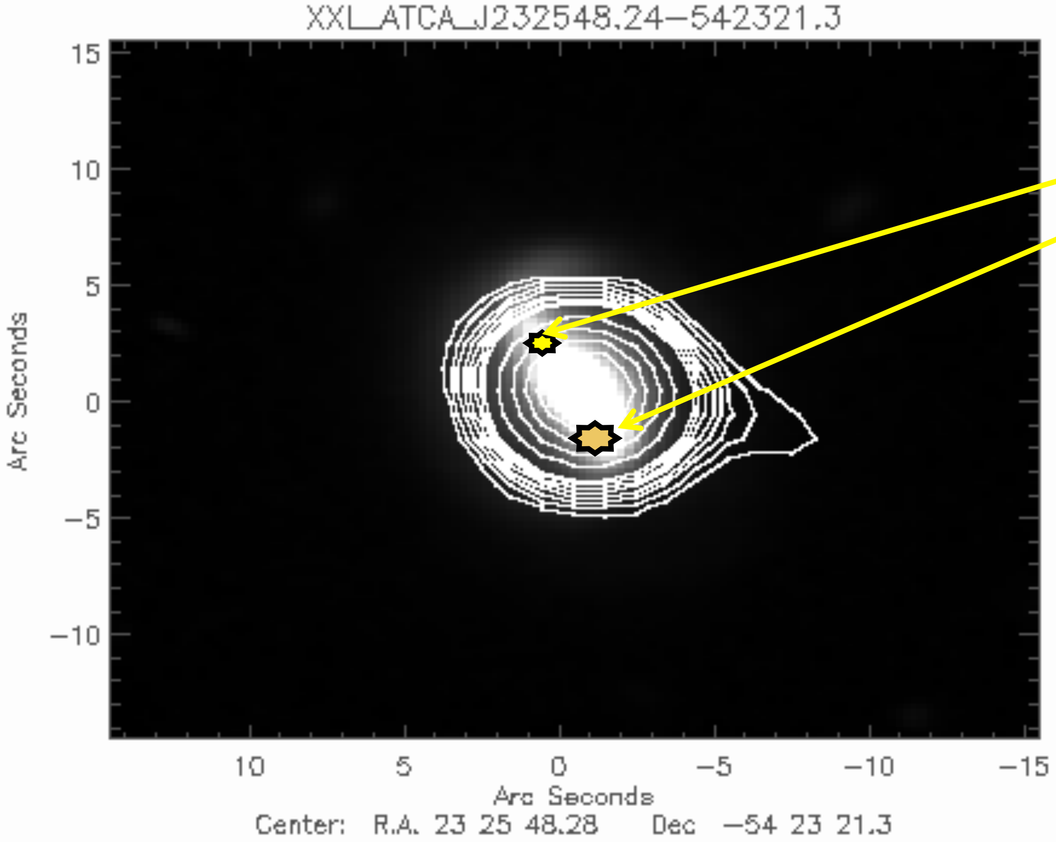
DECam g band	736	(53 %)
DECam z band	900	(65 %)
VISTA K band	827	(60 %)

At fainter magnitudes, the number of objects in the error boxes around the radio sources turns out to be smaller than that expected from the field global counts n(m).





The reason for this effect is the presence of a large number of relatively bright optical counterparts close to the radio position. These objects, which occupy a non negligible fraction of the total area of the radio error boxes, make it difficult to detect fainter background objects in the same area.



Faint object in these positions are not detected

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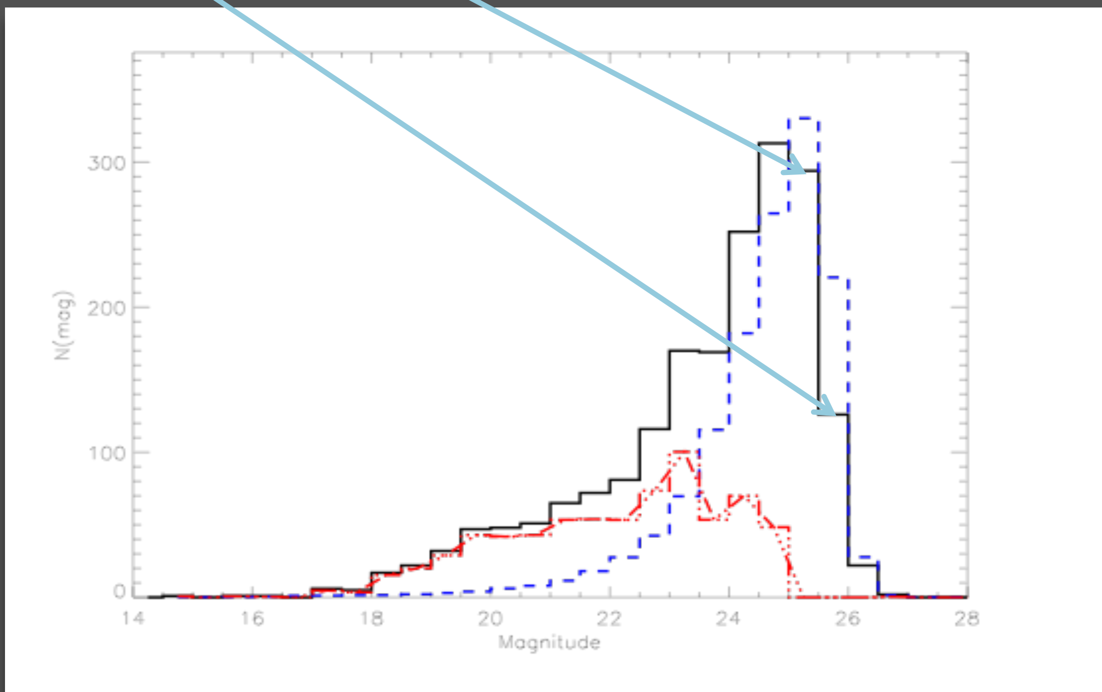
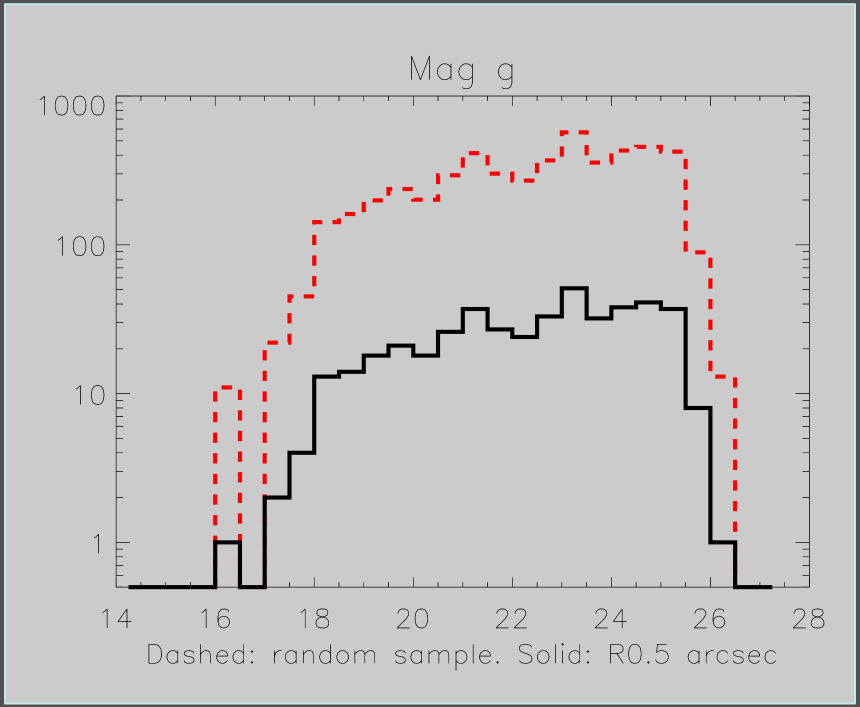
As a consequence, the distribution of sources estimated around radio sources is underestimated in comparison to the global field.



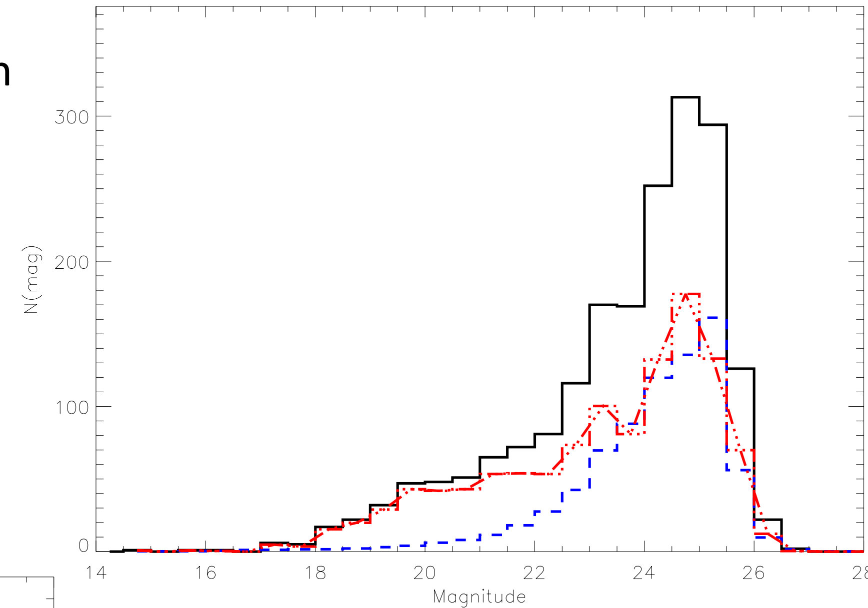
...since it is impossible to modify the optical distribution around the radio sources

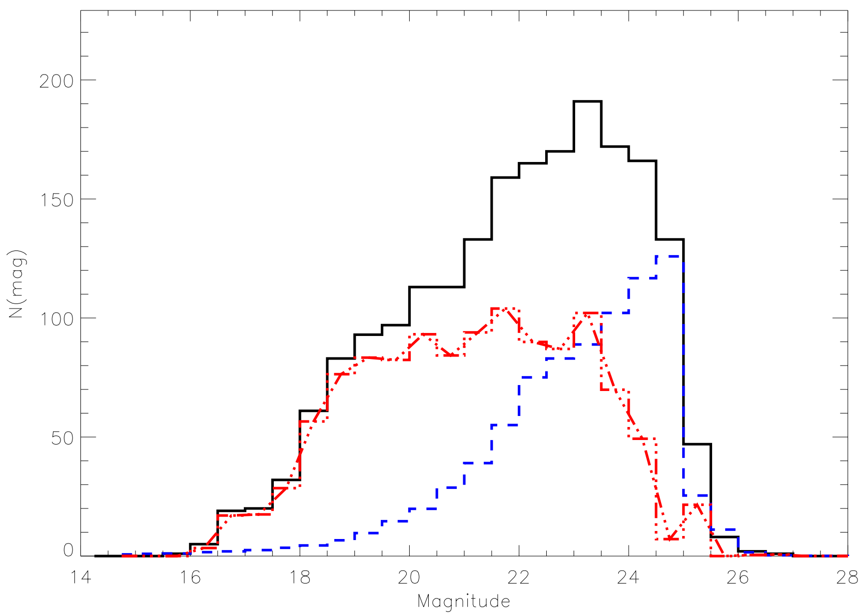
we must modify the global background distribution

In order to estimate the correct source distribution to be used at faint magnitudes in the likelihood calculation, we have randomly extracted from the optical catalog 5000 optical sources with the same expected magnitude distribution of the radio sources, and we computed the background surface density around these objects.



As expected, we found that at fainter magnitude the background distribution is smaller than the observed counts around radio sources



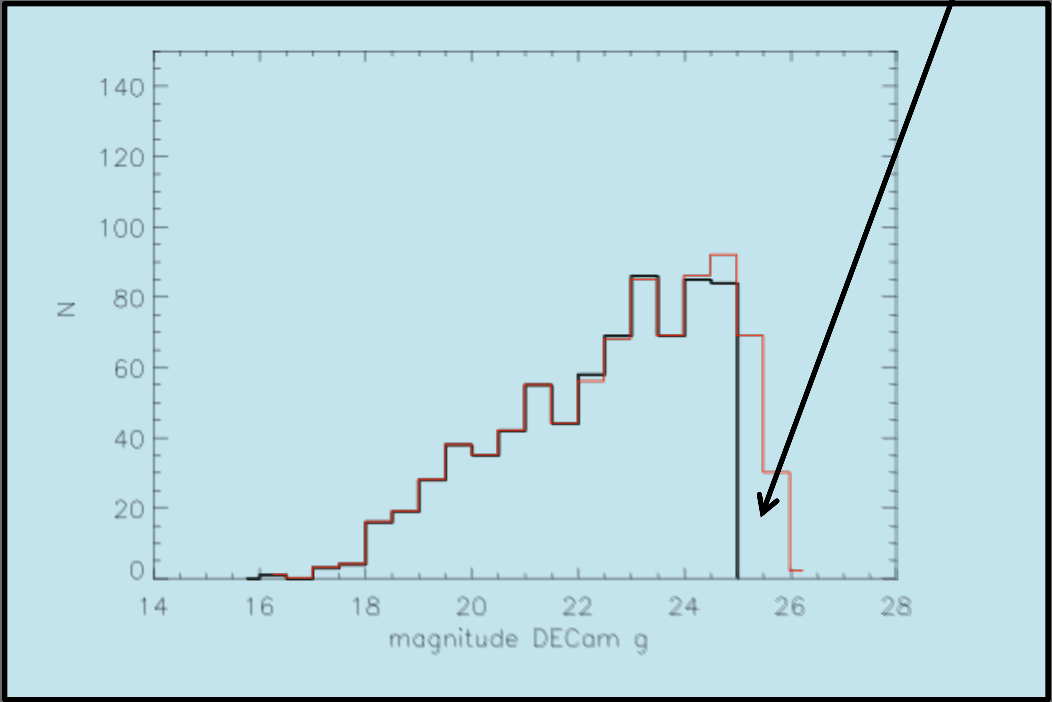


Identification SUMMARY

1389 radio sources

DECam g band 736 (53 %) ⇨ 842 (61 %)

DECam z band 900 (65 %) ⇨ 1008 (73 %)



Conclusion

1. We are using DECam BCS and VISTA data for the identification of the XXL Radio sources

2. We are using this process as workbench to test and improve techniques for the optical identification of radio sources in view of the next generation of radio surveys

3. Using traditional Likelihood Ratio Technique we identified about 65 % of the XXL-S Radio sources in g , z and K bands .

4. With a new technique for the background calculation in the LR process we increased our identification of about 10%.

5. These are hundreds of XXL sources …. But hundreds of thousands in next generation radio surveys