The up-date of the Large Quasar Astrometric Catalogue (LQAC)

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Journées « Systèmes de Référence » Paris / September 16-18, 2013

The up-date of the Large Quasar Astrometric Catalogue (LQAC)

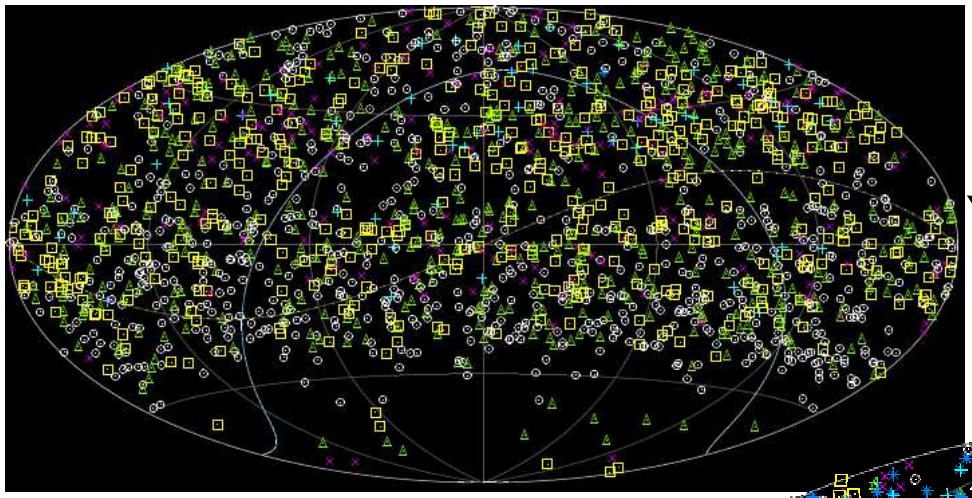
I. Principle of the LQAC
II. Characteristics of the LQAC-2
III. Distribution and « double quasars »
IV. How many quasars detected by GAIA ?
V. Conclusion

Journées « Systèmes de Référence » Paris / September 16-18, 2013

I. Principle of the LQAC

IAU Resolution B3, August 13th. 2009, Rio

The ICRF2 is the fundamental celestial reference frame from 2010, January 1st.

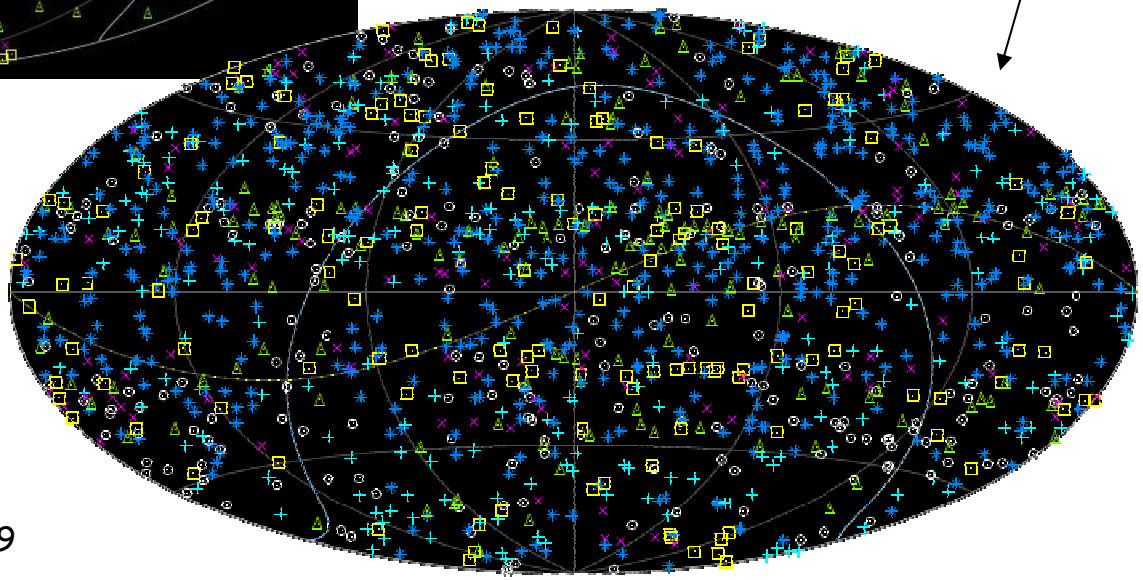


3414 sources

(1 source per 12.3 sq. deg)

2197 sources VCS, $\sigma_{médian}$ = 0.75 mas

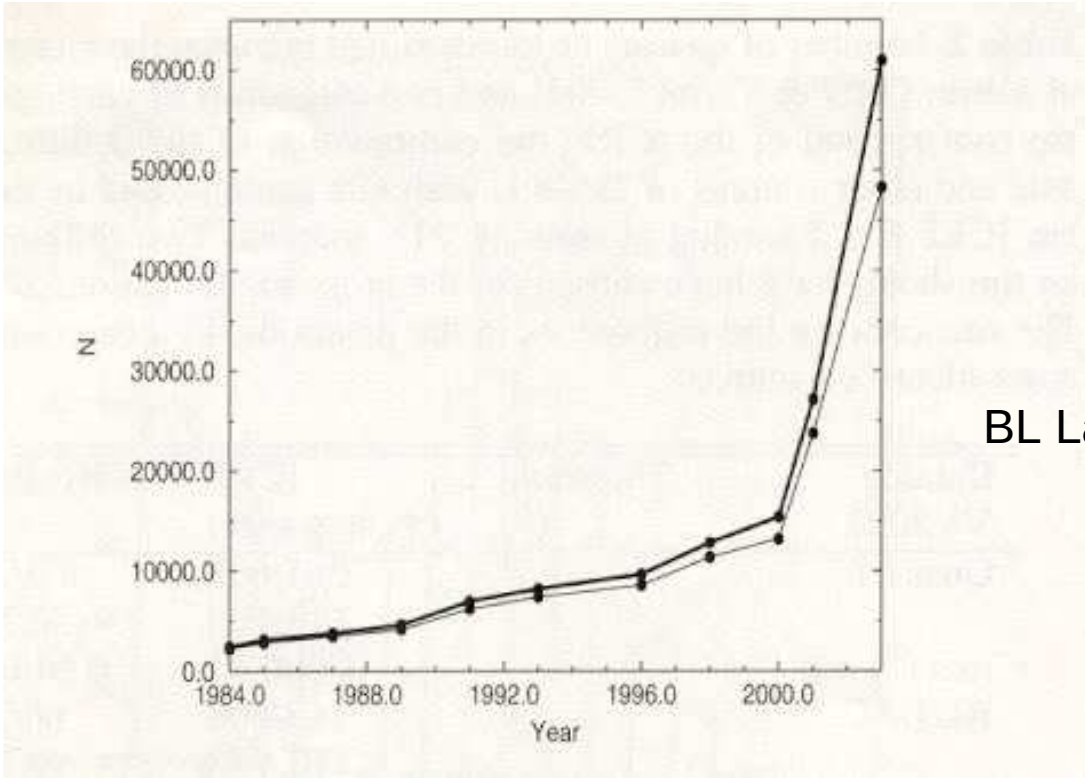
1217 sources non VCS, $\sigma_{médian}$ = 0.17 mas



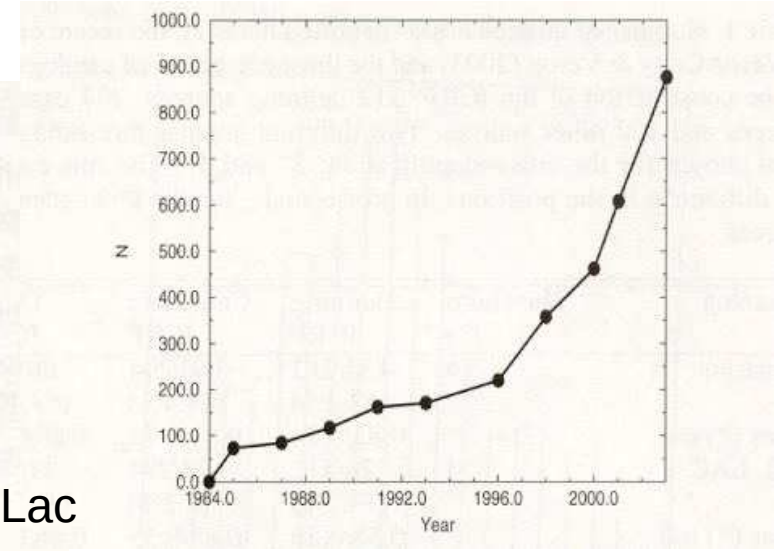
IERS TN 35/Jacobs 2009/Ma et al. 2009

Densification of the ICRS : quasars catalogues & compilations

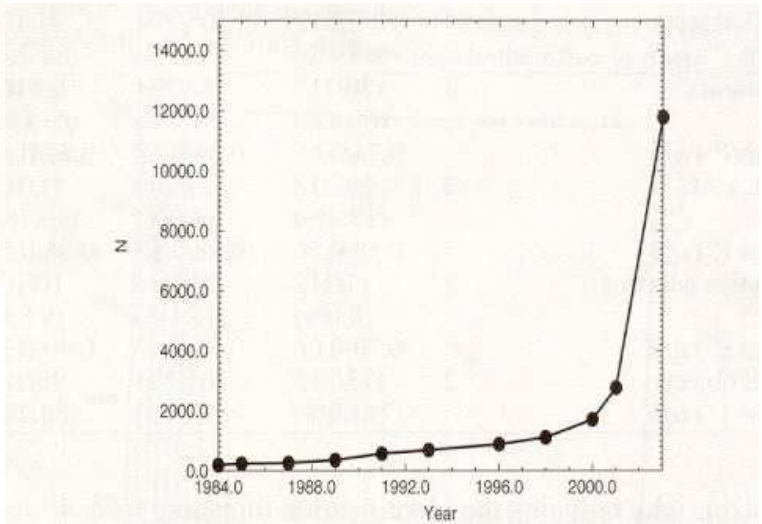
A drastic increase of recorded quasars



QSO's



BL Lac

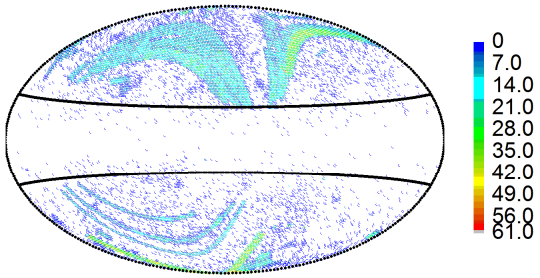


AGN

Véron-Cetty & Véron (2003)

Quasars' sky distribution – 1deg^2 cells count

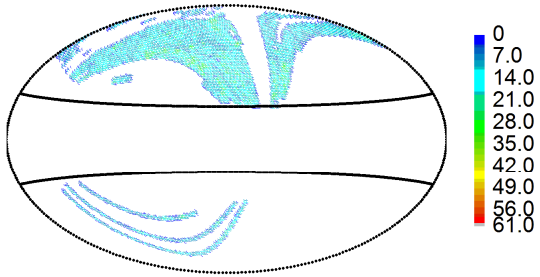
(courtesy : A.H. Andrei)



V&V

2006 / 85,221 QSO's

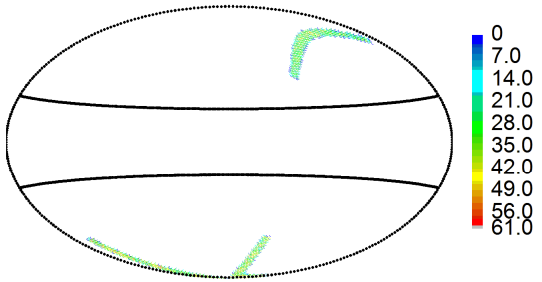
2010 / 133,336 QSO's



SDSS

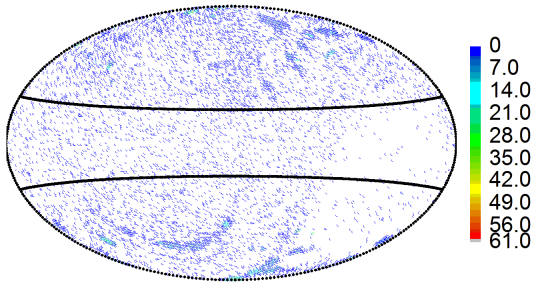
2007 (DR5) / 74,869 QSO's

2010 (DR8) / 126,577 QSO's



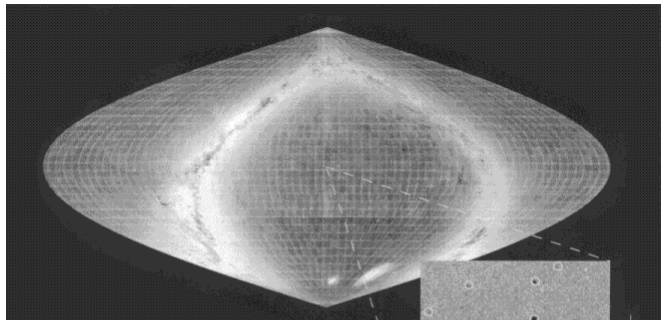
2dF – QSO (2QZ)

23,803 sources



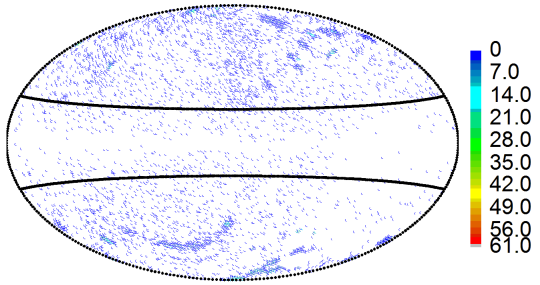
All Radio QSOs

2009 / 11,781 sources



B1.0

All sky up to V=21



Radio QSOs found in B1.0

2009 / 6,941 sources

Construction of the **LQAC** (Large Quasars Astrometric Catalogue)

Objectives

- Compilation of all the recorded quasars
- Strategy insisting on astrometric quality
- Catalogue flag (A=>M) for cross-identifications
- Extended photometry & redshift
- Calculation of absolute magnitudes M_I & M_B
- Basis for regular up-dates (=> GAIA)
- Final ASCII file with V.O. tools in parallel
- Comparisons / statistics / coherence

PRESENT QSO'S CATALOGUES

Radio

- **ICRF 2** (Ma, et al., 2009)
  3,414 radio-loud QSOs and AGNs.
- **VLBA Calibrators** (Beasley, et al., 2007)
  accurate VLBI position for **5,198 radio-stable QSOs and AGNs**.
- **VLA Calibrators** (Benson et al., 2006; www.vla.nrao.edu/astro/calib/)

  radio interferometry astrometry and map information for **1860 QSOs and AGNs**.
- **JVAS Calibrators** (Patnaik et al.,1992; Wilkinson et al., 1998

  radio interferometry astrometry for **2,118 compact QSOs and AGNs**.

  Etc …….

PRESENT QSO'S CATALOGUES

Optical / Infrared

- **Véron-Cetty & Véron 13th ed.** (Véron-Cetty, M.-P. & Véron, P.; 2010)

  133,336 QSOs with measured redshift

- **SDSS DR8** (Adelman-McCarthy et al.2007)

  126,577 QSOs, with measured readshift and *u,g,r,i,z* magnitudes.

- **2dF + 6qZ** (Croom et al. 2004)

  23,803 QSOs, with measured redshift.and *u,b,r* magnitudes

- **FIRST QSO** (White R.L., 2001)

  optical match and redhift information for radio selected **972 bright QSOs**.

- **Hewitt & Burbidge revised edition** (Hewitt A. & Burbidge G.; 1993)

  reference astrometry and magnitude, and redshift information for **7,222** radio-loud QSOs.

- **USNO B1.0** (Monet et al.,2003) , **GSC2.3** (Lasker et al.2003)

- **2MASS** (Cutri et al.,2003) Infrared

II. Characteristics of the LQAC-2

(Souchay et al., 2012)

Improvements of the LQAC-2 (2012) % LQAC (2009)

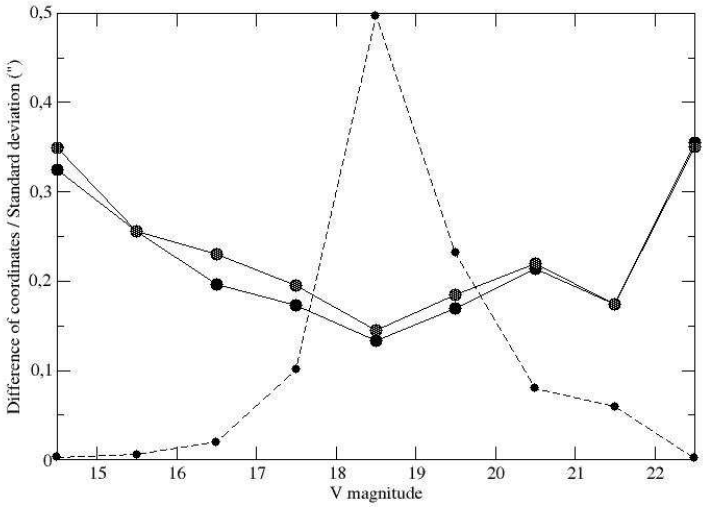
- More quasars 187,504 vs. 113,666 (+64%)
- More cross-identifications
- LQAC identification number for each QSO
- New astrometry => LQRF coordinates

  (Andrei et al.,2009)
- Addition of morphological indexes
  - normalness
  - skewness
  - roundness

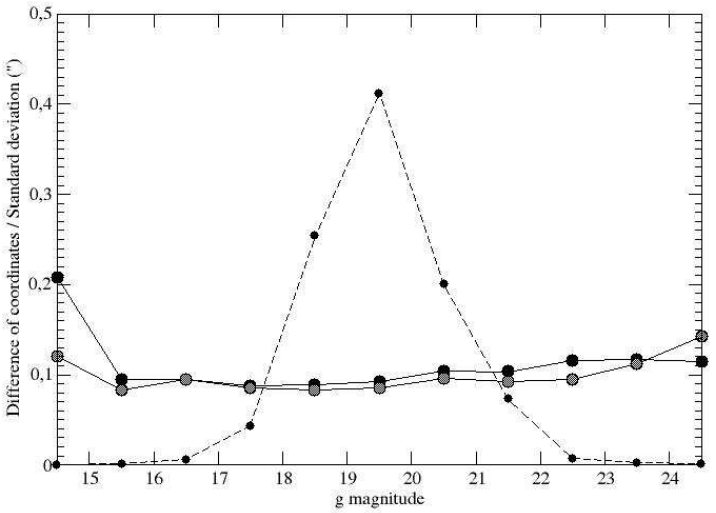
Optimized astrometry

- **LQRF coordinates (Andrei et al.,2009)**
  - Identification in very large surveys (B1.0,GSC2.3,SDSS)
  - Astrometric reduction w.r.t. the UCAC-2
  - Use of spherical harmonics to fit with the ICRF2

(α,δ) off-set w.r.t. V magnitude



(α,δ) off-set w.r.t. g magnitude



Characteristics of the catalogs quasars both for the LQAC-2 and the LQAC.

Catalog Name	Flag	Nature	Nb. QSO's (LQAC2)	Nb. QSO's (LQAC)
ICRF	A	radio	3 414	717
VLBA	B	radio	5 198	3 357
357VLA	C	radio	1 858	1 857
JVAS	D	radio	2 118	2 118
SDSS	E	optical	126 577	74 868
2QZ	F	optical	23 660	22 971
2df-SDSS LRG	G	optical	9 058	0
FIRST	H	radio	969	969
HB	I	opt. & radio	6 721	7 245
2MASS	J	infrared	25 252	
GSC2.3	K	optical	154 900	
B1.0	L	optical	148 894	
V&V	M	opt. & radio	80 667	

LQAC-2 Catalogue (39 parameters)

LQAC Nb.	Original coord.		LQRF coord.		cat. flags	u	B	V	g	r	i	z	J	K	……
LQAC_000-000_001	0.000000000	-0.032800000	359.9998660	-0.0328680	----------M -	0	0.00	19.40	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
LQAC_000-000_002	0.001996551	-0.451102400	0.0020170	-0.4510710	----E-----KLM -	0	21.69	21.08	20.09	21.19	20.50	20.14	19.85	0.00	0.00	0.0
LQAC_000-002_001	0.005187500	-2.033383330	0.0053030	-2.0332680	-------H--KLM -	0	0.00	19.64	0.00	0.00	18.31	18.59	0.00	0.00	0.00	0.0
LQAC_000-030_001	0.005750000	-30.607472222	0.0056940	-30.6074290	-----F----KLM -	0	19.30	20.10	0.00	0.00	19.50	0.00	0.00	0.00	0.00	0.0
LQAC_000-031_001	0.007333333	-31.373833333	0.0072330	-31.3736930	-----F----K-M -	0	19.70	20.69	0.00	0.00	19.86	0.00	0.00	0.00	0.00	0.0
LQAC_000+014_001	0.007748564	14.024511000			----E-----KL- -	0	24.71	21.64	0.00	22.47	20.99	20.23	19.52	0.00	0.00	0.0
LQAC_000-025_001	0.011200000	-25.193600000	0.0111330	-25.1935080	----------M -	0	0.00	0.00	0.00	0.00	21.00	0.00	0.00	0.00	0.00	0.0
LQAC_000-035_001	0.011700000	-35.059200000			----------M -	0	0.00	16.89	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
LQAC_000-027_001	0.022875000	-27.419555555	0.0227550	-27.4195250	-----F----KLM -	0	18.35	19.43	0.00	0.00	19.14	18.69	0.00	0.00	0.00	0.0
LQAC_000+000_001	0.027230760	0.515331640	0.0272260	0.5153110	----E-----KL- -	0	20.58	20.42	0.00	20.59	20.49	20.17	20.19	0.00	0.00	0.0
LQAC_000-063_001	0.033300000	-63.593300000			----------M -	0	0.00	17.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
LQAC_000+000_002	0.033946060	0.276291600	0.0339460	0.2762820	----E-----KL- -	0	20.30	20.41	0.00	20.36	20.02	19.53	19.31	0.00	0.00	0.0
LQAC_000+015_001	0.038609500	15.298489000	0.0386040	15.2984570	----E-----KL- -	0	19.90	19.87	0.00	19.77	19.38	19.15	19.31	0.00	0.00	0.0
LQAC_000+013_001	0.039099260	13.938458000	0.0390840	13.9384300	----E-----KL- -	0	19.25	18.74	18.49	18.89	18.43	18.30	18.08	0.00	0.00	0.0
LQAC_000+023_001	0.039200000	23.954400000			----------M -	0	0.00	0.00	0.00	0.00	18.93	0.00	0.00	0.00	0.00	0.0
LQAC_000-010_001	0.039264450	-10.464410000	0.0392580	-10.4643970	----E-----KL- -	0	19.21	19.67	0.00	19.00	18.97	18.78	18.70	0.00	0.00	0.0
LQAC_000-031_002	0.040375000	-31.279972222	0.0403780	-31.2799450	-----F----KLM -	0	18.40	19.05	0.00	0.00	18.65	18.10	0.00	0.00	0.00	0.0
LQAC_000-030_002	0.041250000	-30.924944444	0.0412790	-30.9248570	-----F----KLM -	0	17.93	19.12	0.00	0.00	18.37	18.30	0.00	0.00	0.00	0.0
LQAC_000+030_001	0.042100000	30.933300000	0.0420760	30.9331550	----------M -	0	0.00	0.00	0.00	0.00	0.00	19.30	0.00	0.00	0.00	0.0
LQAC_000-031_003	0.042375000	-31.997222222	0.0423410	-31.9971400	-----F----KLM -	0	20.28	20.44	0.00	0.00	20.78	0.00	0.00	0.00	0.00	0.0
LQAC_000+014_002	0.047551210	14.929367000	0.0475600	14.9293430	----E-----KLM -	0	19.64	19.80	19.03	19.47	19.36	19.18	19.02	0.00	0.00	0.0
LQAC_000-008_001	0.048196750	-8.835659400			----E-----KL- -	0	19.46	19.17	0.00	19.12	19.06	19.13	19.32	0.00	0.00	0.0
LQAC_000+001_001	0.048300000	1.030600000	0.0483680	1.0307250	----------M -	0	20.43	0.00	19.37	0.00	0.00	0.00	0.00	0.00	0.00	0.0
LQAC_000-031_004	0.048583333	-31.644416666	0.0485590	-31.6443790	-----F----KLM -	0	19.66	20.27	0.00	0.00	19.38	0.00	0.00	0.00	0.00	0.0
LQAC_000+005_001	0.048700000	5.388100000	0.0488640	5.3881690	----------M -	0	0.00	16.40	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
LQAC_000+000_003	0.049839430	0.040358720	0.0498430	0.0403840	----E---IJKLM -	0	17.99	17.60	17.80	17.78	17.85	17.79	17.71	16.65	14.82	0.0
LQAC_000-000_003	0.051083480	-0.539051090	0.0510860	-0.5390290	----E-----K-- -	0	20.69	20.99	0.00	20.61	20.33	20.19	20.26	0.00	0.00	0.0
LQAC_000+014_003	0.054787210	14.176304000	0.0547890	14.1763000	----E-----KL- -	0	19.53	18.94	18.86	19.30	19.12	19.15	19.08	0.00	0.00	0.0
LQAC_000-002_002	0.056700000	-2.172200000	0.0568390	-2.1720740	----------M -	0	0.00	19.40	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
LQAC_000-000_004	0.057513340	-0.913001400	0.0575340	-0.9129930	----E-----KL- -	0	20.50	20.13	0.00	20.22	20.06	19.59	19.45	0.00	0.00	0.0
LQAC_000-001_001	0.061780730	-1.175212200	0.0617870	-1.1752070	----E-----KL- -	0	19.48	19.49	0.00	19.42	19.42	19.21	19.13	0.00	0.00	0.0
LQAC_000+000_004	0.064516770	0.879696740	0.0645210	0.8796560	----E-----KL- -	0	19.60	20.30	0.00	19.41	19.33	19.03	19.14	0.00	0.00	0.0
LQAC_000-027_002	0.066375000	-27.649083333	0.0663900	-27.6490020	-----F----KLM -	0	17.92	18.38	0.00	0.00	17.69	17.21	0.00	0.00	0.00	0.0
LQAC_000-031_005	0.068041667	-31.743861111	0.0680360	-31.7438690	-----F----KLM -	0	17.99	19.08	0.00	0.00	18.16	17.79	0.00	0.00	0.00	0.0
LQAC_000-000_005	0.068473000	-0.309276000	0.0684900	-0.3092950	----E----JKL- -	0	18.70	18.63	0.00	18.12	17.89	17.76	17.68	16.55	15.09	0.0
LQAC_000-008_002	0.072430900	-8.856605600	0.0724170	-8.8566180	----E--H--KLM -	0	19.21	18.93	18.63	18.75	18.27	18.27	18.26	0.00	0.00	0.0
LQAC_000+000_005	0.074540060	0.436830590	0.0745500	0.4368380	----E-----KLM -	0	20.28	20.47	19.85	20.08	19.98	19.74	19.56	0.00	0.00	0.0
LQAC_000-032_001	0.084999781	-32.350342643	0.0850110	-32.3503360	AB------I-KLM *	0	0.00	18.57	17.00	0.00	17.99	17.86	0.00	0.00	0.00	0.5
LQAC_000-025_002	0.088300000	-25.136700000	0.0881390	-25.1368820	----------M -	0	0.00	0.00	0.00	0.00	20.90	0.00	0.00	0.00	0.00	0.0
LQAC_000-002_003	0.095400000	-2.454200000			----------M -	0	0.00	18.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
LQAC_000-025_003	0.095400000	-25.206100000			----------M -	0	0.00	0.00	0.00	0.00	19.70	0.00	0.00	0.00	0.00	0.0
LQAC_000+002_001	0.098700000	2.211400000			----------M -	0	0.00	17.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
LQAC_000+015_002	0.100117290	15.334846000	0.1001140	15.3348460	----E-----KLM -	0	19.38	19.91	19.15	19.21	18.97	19.05	19.13	0.00	0.00	0.0

LQAC-2 => Cross-identifications

Table 2. Number of cross identified objects between the catalogs belonging to the LQAC.

Catalog name	A	B	C	D	E	F	G	H	I	J	K	L	M
A (ICRF2)	**3414**	3414	1595	1569	423	35	0	70	619	1193	2553	2398	1827
B (VLBA)	–	**5198**	1674	1752	528	39	2	96	678	1598	3362	3144	2163
C (VLA)	–	–	**1858**	1271	301	10	0	54	467	752	1385	1326	1182
D (JVAS)	–	–	–	**2118**	384	6	1	53	317	681	1558	1496	1067
E(SDSS)	–	–	–	–	**126 577**	2140	736	773	1877	13 442	102 866	10 1322	23 494
F (2QZ)	–	–	–	–	–	**23 660**	765	0	501	722	22 283	21 255	22 883
G(FIRST)	–	–	–	–	–	–	**9058**	3	58	37	7152	4892	8550
H(2dF-SDSS LRG)	–	–	–	–	–	–	–	**969**	134	628	941	944	958
I(HB)	–	–	–	–	–	–	–	–	**6721**	2411	6654	6480	6299
J(2MASS)	–	–	–	–	-	–	–	–	–	**25 252**	24 731	24 571	14 226
K(GSC23)	–	–	–	–	–	–	–	–	–	–	**154 900**	145 755	54 278
L(B1.0)	–	–	–	–	–	–	–	–	–	–	–	**148 894**	50 633
M(VV2009)	–	–	–	–	–	–	–	–	–	–	–	–	**80 667**

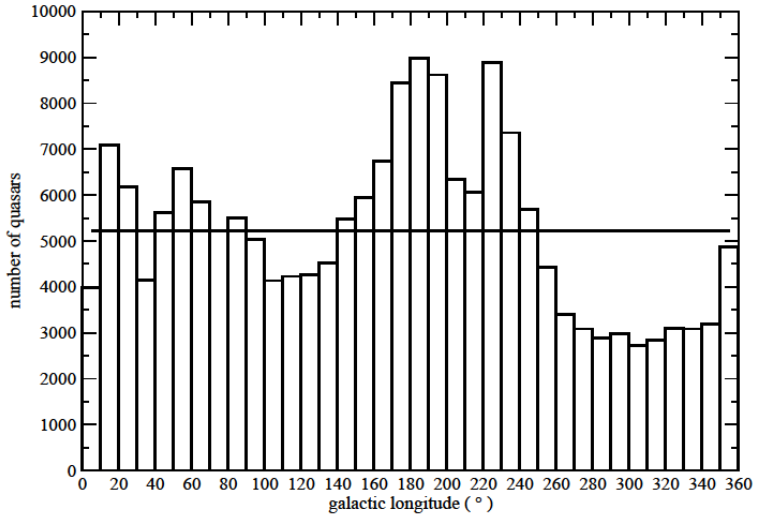
LQAC => items completness

Table 5. Comparison of the number of entries for each data item between the VV2010 catalog, the compilation of the catalogs A–L and the final LQAC-2 catalog.

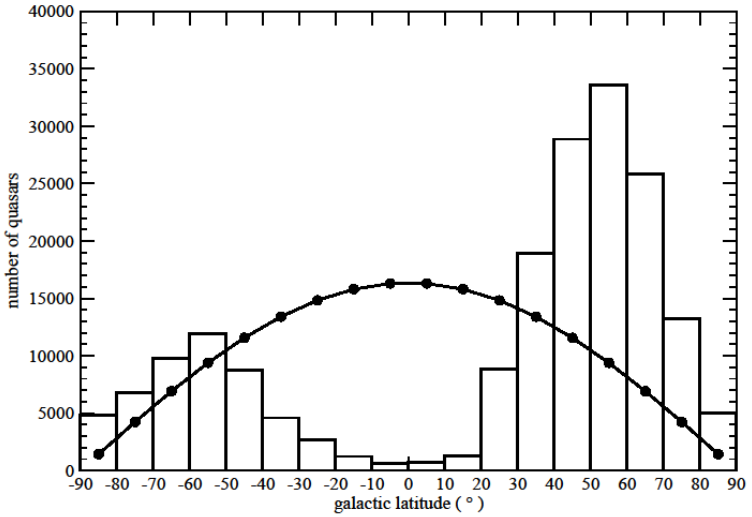
	VV2010	A-L	LQAC-2	%
QSOs	168941	165065	187 504	100.00
z	168 324	160 399	183 652	97.94
u	152 624	156 178	167 983	89.58
b	32 085	156 799	164 721	87.84
v	131 934	75 713	102 774	54.81
g	0	134 881	134 881	71.93
r	3939	162 910	166 033	88.54
i	551	149 735	150 278	80.15
z	0	134 884	134 884	71.93
J	0	25 252	25 252	13.46
K	0	25 252	25 252	13.46
1.4 Ghz	18 111	1814	11797	6.29
2.3 Ghz	0	3482	3482	1.85
5.0 Ghz	5809	863	5358	2.86
8.4 Ghz	0	4551	4551	2.43
24 Ghz	0	61	61	0.03

III. Distribution and « double quasars »

Distribution w.r.t. galactic coordinates

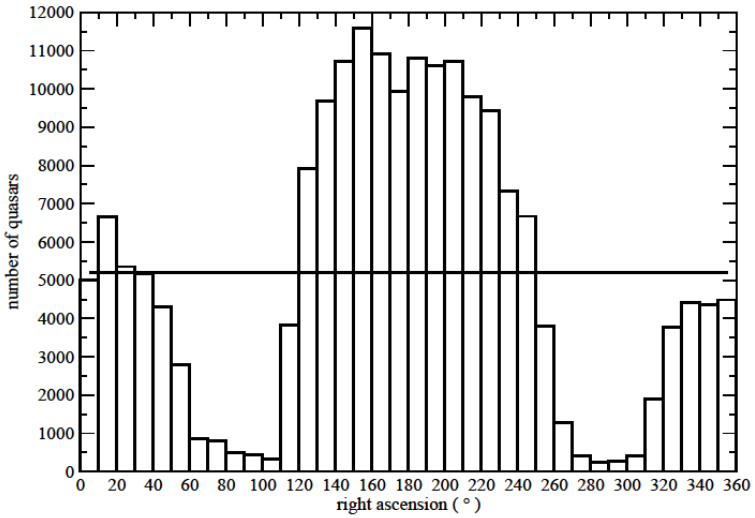


Galactic longitude

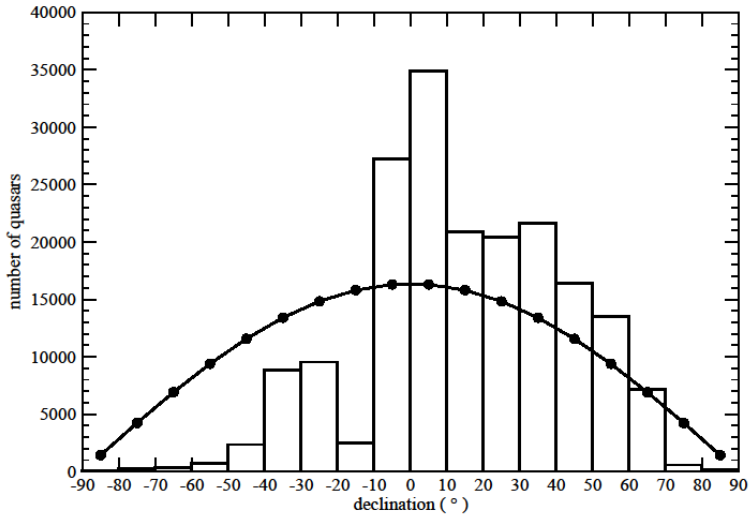


Galactic latitude

Distribution w.r.t. equatorial coordinates



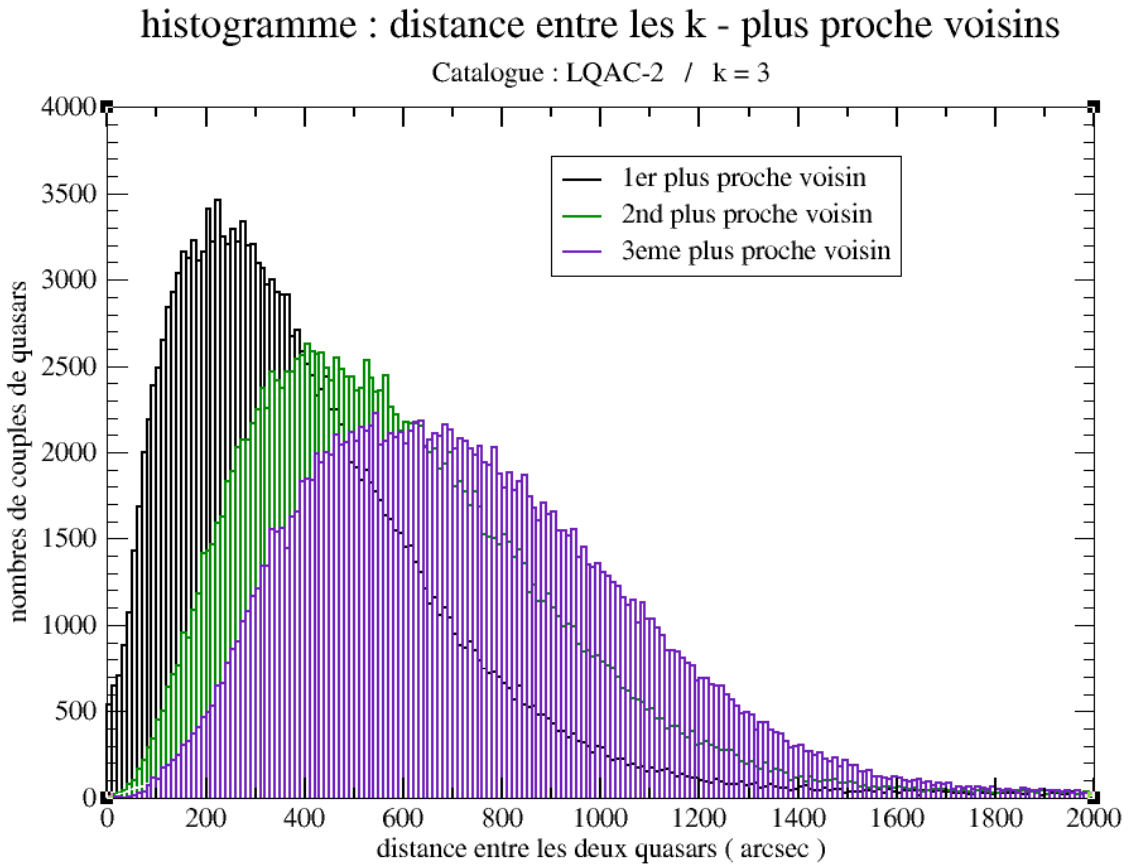
Right ascension



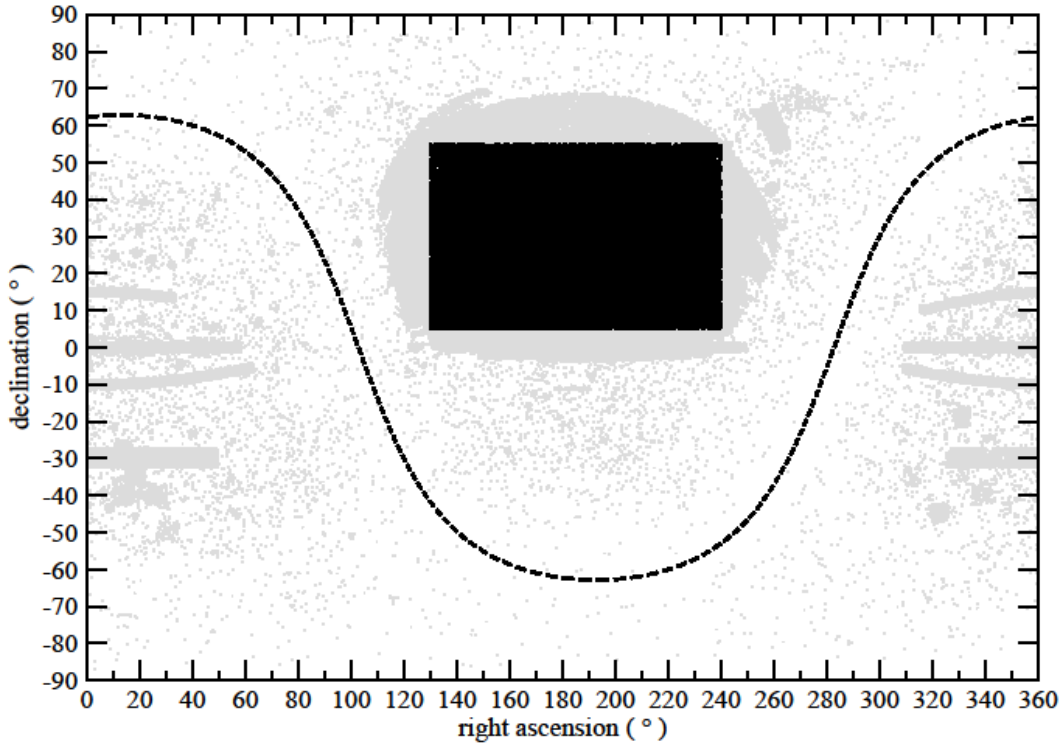
Declination

Statistics of k th- nearest encounter

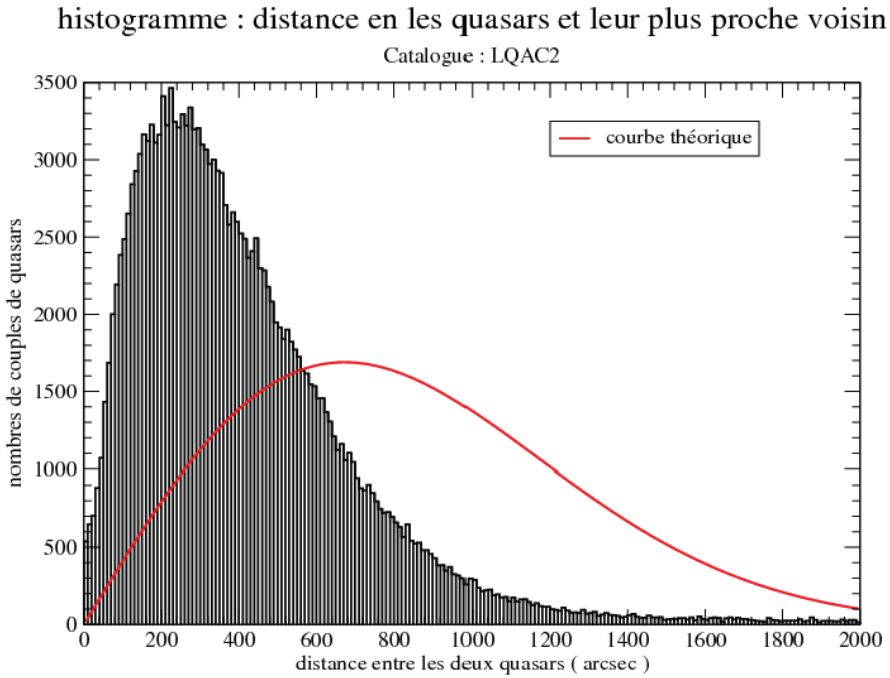
$$f_k(r) = [\ 1 / 2^{k-1}\ (k-1)!\ \sigma\ ]\ \ (r/\sigma)^{2k-1}\ x\ \ \exp(-r^2 / 2\sigma^2)$$ (Mignard,2004)



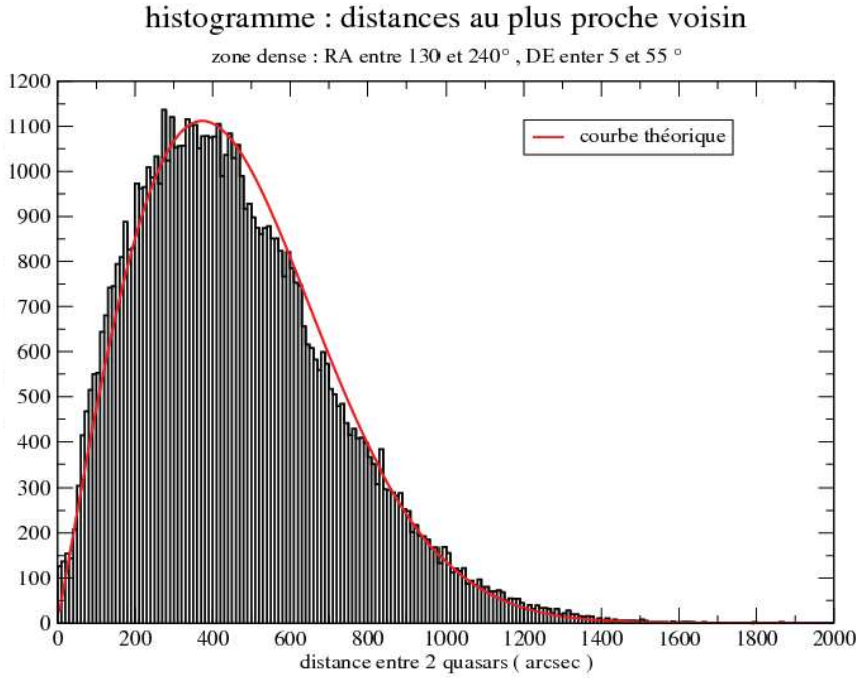
Statistics of nearest encounter



Statistics of nearest encounter

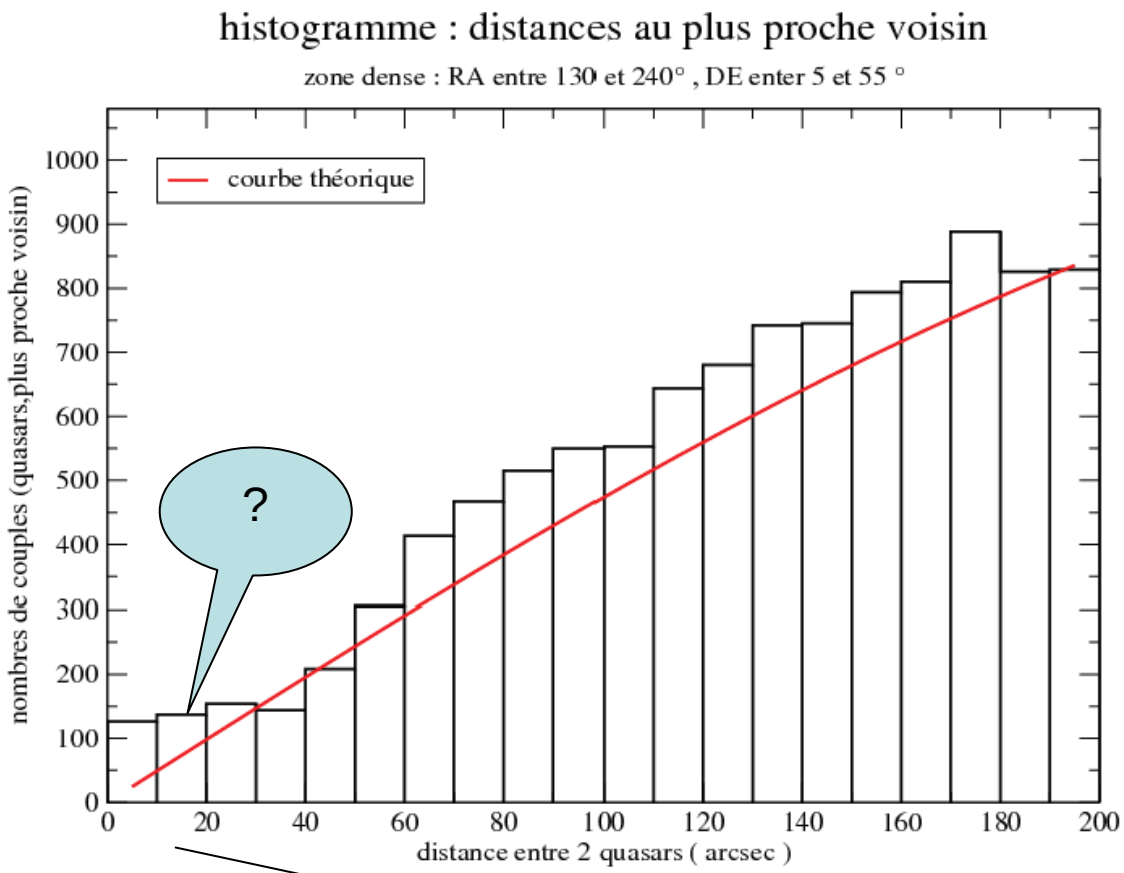


Whole LQAC-2



Dense & homogeneous zone

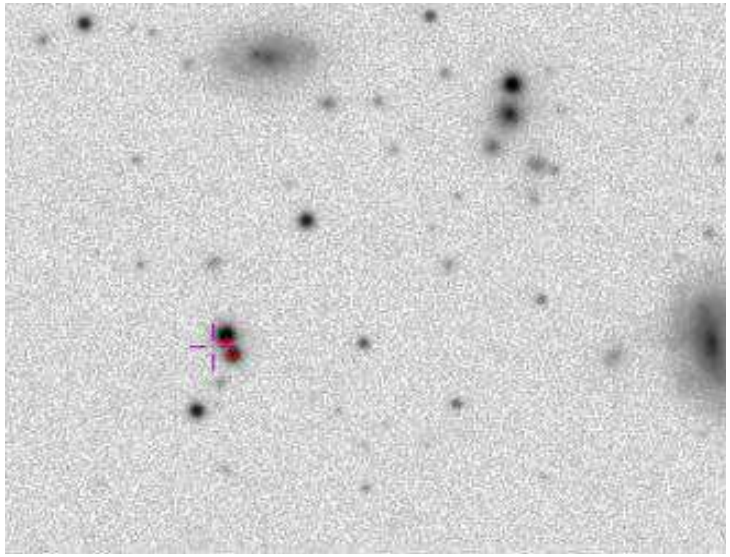
Statistics of nearest encounter



- hazardous coïncident quasars ?
- false double identification ?
- true double quasars ?

DSS images

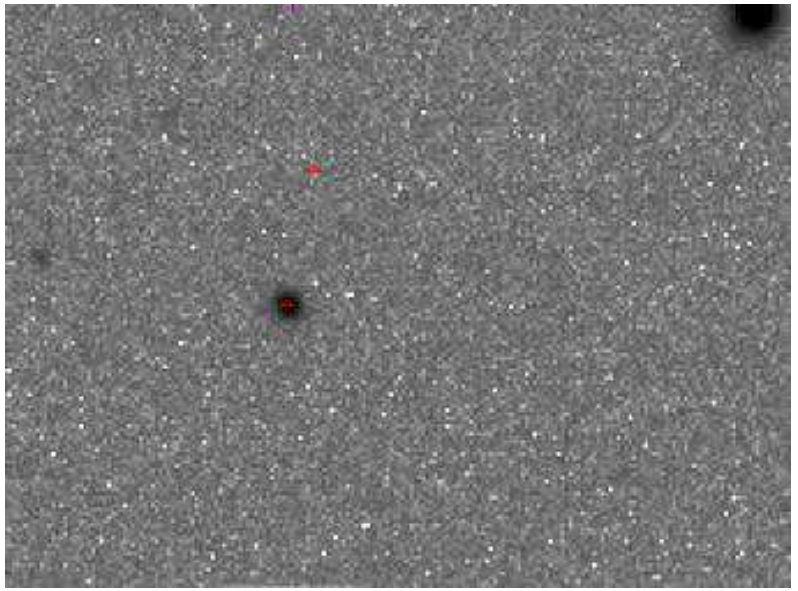
Statistics of nearest encounter



true double quasars ($z_1 = z_2$)

159

coincident quasars (z1 // z2)



false double identification

35

IV. How many quasars detected by GAIA ?

How many quasars detected by GAIA ?

Methodology

(1) Isolate a sky zone *Z* of surface *S* already surveyed with the highest density

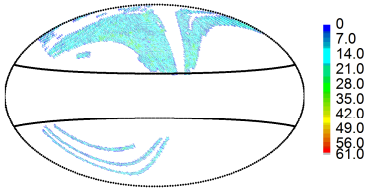
(2) Estimate inside *Z* the number of quasars with GAIA threshold (V < 20)

(3) Extrapolate the number of quasars for the whole sky

(4) Take into account a ratio for galactic extinction

The SDSS quasar catalog

(Schneider et al, A.J. 130, 2005)

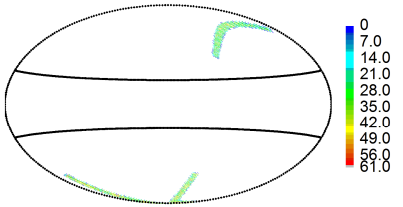


- Dedicated telescope (2.5 m) at Apache Point
- CCD camera
- => u,b,v,g,r,i,z images over 10 000 deg^2
- Properties of each detected object in the 5 bands
- Photometric and astrometric calibration
- Pre-selection of quasars in multidimensional color space
- Quasar catalog constructed on
    - creation of a quasar candidate database
    - visual examination of the candidates'spectra
    - application of luminosity and emission line velocity
- Luminosity limit of M_i=-22, photometry ~0.03 mag.
- Automated line measuring-routine
- 27 entries for each quasar !

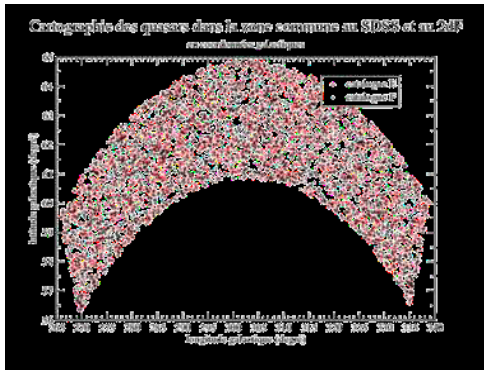
The 2df QSO Redshift Survey

(Croom et al.,MNRAS 349,2004)

- Pre-selection of QSO candidates on broadband ub_Jr from UK Schmidt Telescope photographic plates
- 30 UKST fields, arranged in two 75°x5° declination str ips
- Spectroscopic observations at the AAT (Anglo Australian Telescope)
- Multifibre spectrograph
- => simultaneous spectra
- for 400 objects / 2° field of view
- 44 756 initial objects => spectra classified using automated routines to fit each spectrum to QSO's (stellar, galaxy)
- QSO's selected on broad emission lines (> 1000 kms^{-1})
- Quality flag



How many quasars detected by GAIA ?



Methodology

(1) Isolate a sky zone *Z* of surface *S* already surveyed with the highest density

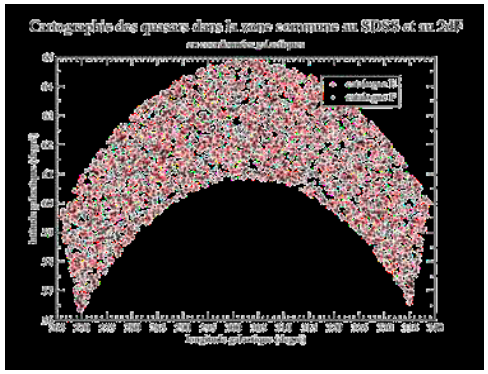
Common SDSS-2QZ zone $11^h40^{mn} < \alpha < 14^h$ $-2° < \delta < +2°$

(2) Estimate inside *Z* the number of quasars N_Z with GAIA threshold (V < 20)

(3) Extrapolate the number of quasars for the whole sky $N_{Total} = Nz * [S_{Total} / S]$

(4) Take into account a ratio ρ for galactic extinction

How many quasars detected by GAIA ?



Methodology

(1) Isolate a sky zone *Z* of surface *S* already surveyed with the highest density

Common SDSS-2QZ zone $11^h40^{mn} < \alpha < 14^h$ $-2° < \delta < +2°$

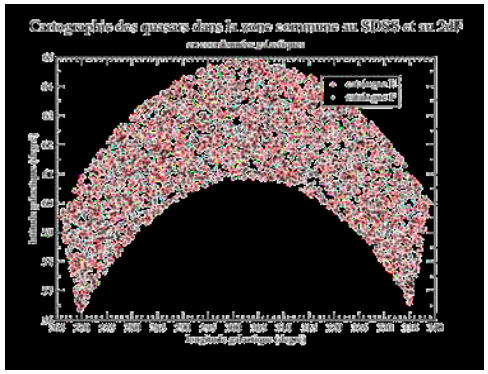
(2) Estimate inside *Z* the number of quasars N_Z with GAIA threshold **(V < 20)**

Problem : V data uncomplete => use of V vs. u relationship

(3) Extrapolate the number of quasars for the whole sky

(4) Take into account a ratio ρ for galactic extinction

How many quasars detected by GAIA ?



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Common SDSS-2QZ zone $11^h40^{mn} < \alpha < 14^h$ $-2° < \delta < +2°$

(2) Estimate inside *Z* the number of quasars N_Z with GAIA threshold (V < 20)

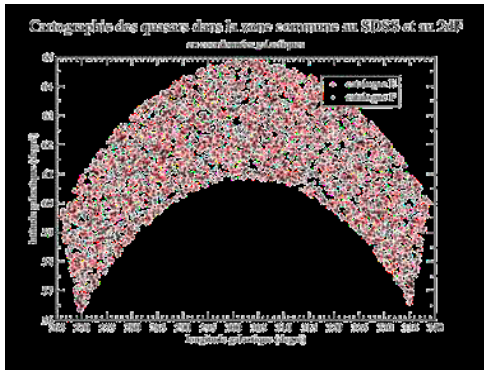
Problem : V data uncomplete => use of V vs. u relationship

(3) Extrapolate the number of quasars for the whole sky

$$N_{Total} = Nz * [S_{Total} / S]$$

(4) Take into account a ratio ρ for galactic extinction

How many quasars detected by GAIA ?



Methodology

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Common SDSS-2QZ zone $11^h40^{mn} < \alpha < 14^h$ $-2° < \delta < +2°$

(2) Estimate inside *Z* the number of quasars N_Z with GAIA threshold (V < 20)

Problem : V uncomplete => use of V vs. u relationship

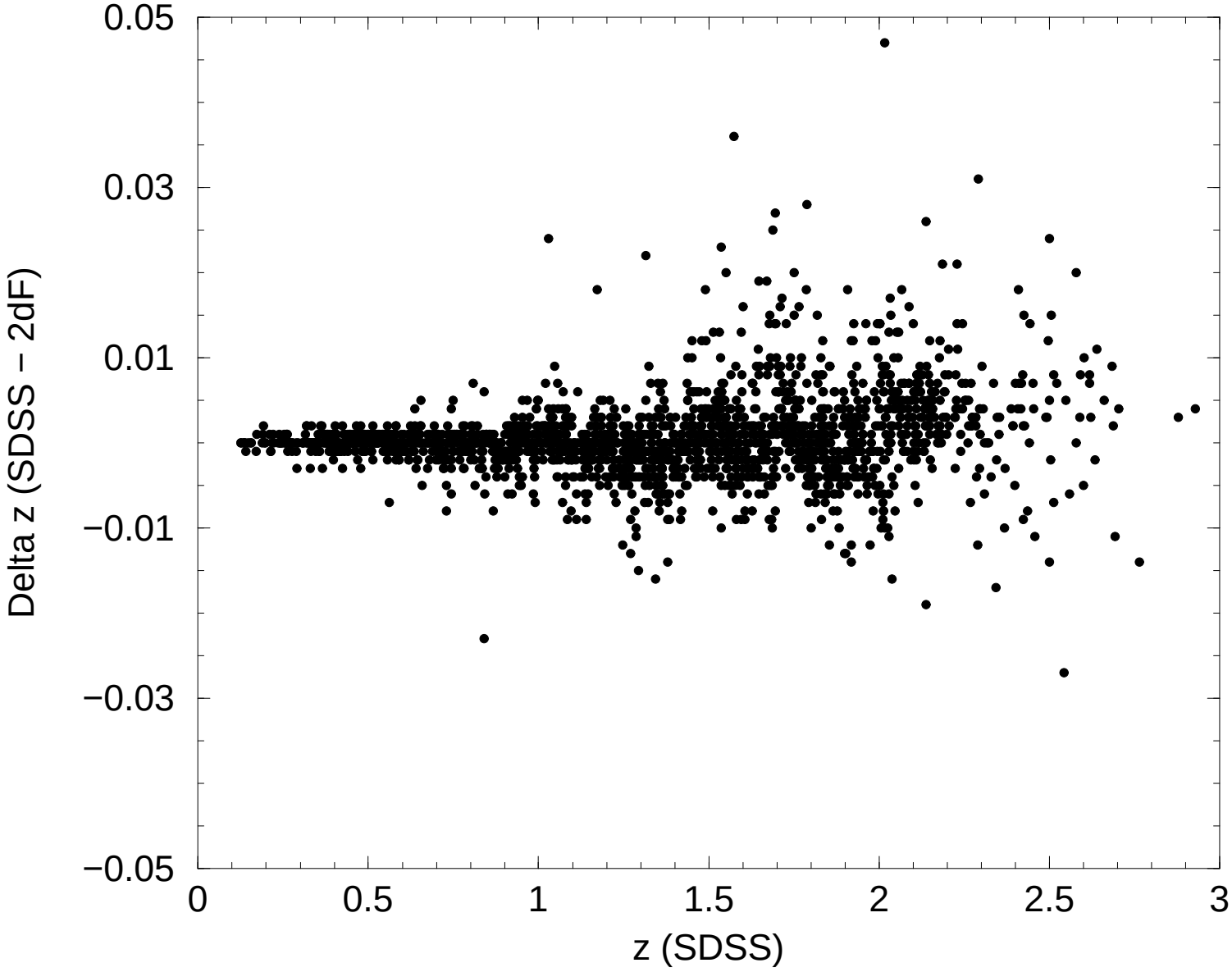
(3) Extrapolate the number of quasars for the whole sky $N_{Total} = Nz * [S_{Total} / S]$

(4) Take into account a ratio ρ for galactic extinction

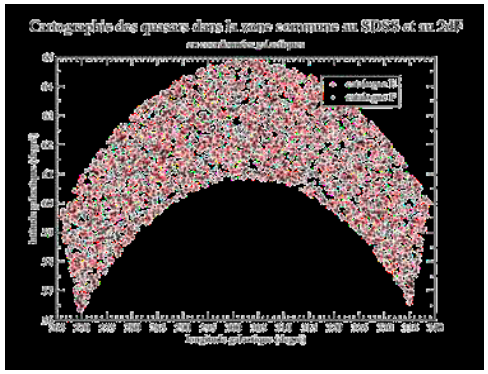
Problem : ρ unknown (or evaluated through deep investigation)

$N_{Gaia} = Nt * \rho = Nz * \rho * [S_{Total} / S]$ ratio = 90%, 80%, 70% ?

Redshift accuracy



How many quasars detected by GAIA ?



Methodology

(1) Isolate a sky zone *Z* of surface *S* already surveyed with the highest density

Common SDSS-2QZ zone $11^h40^{mn} < \alpha < 14^h$ $-2° < \delta < +2°$

=> ~ 140 square deg. (% 42 150)

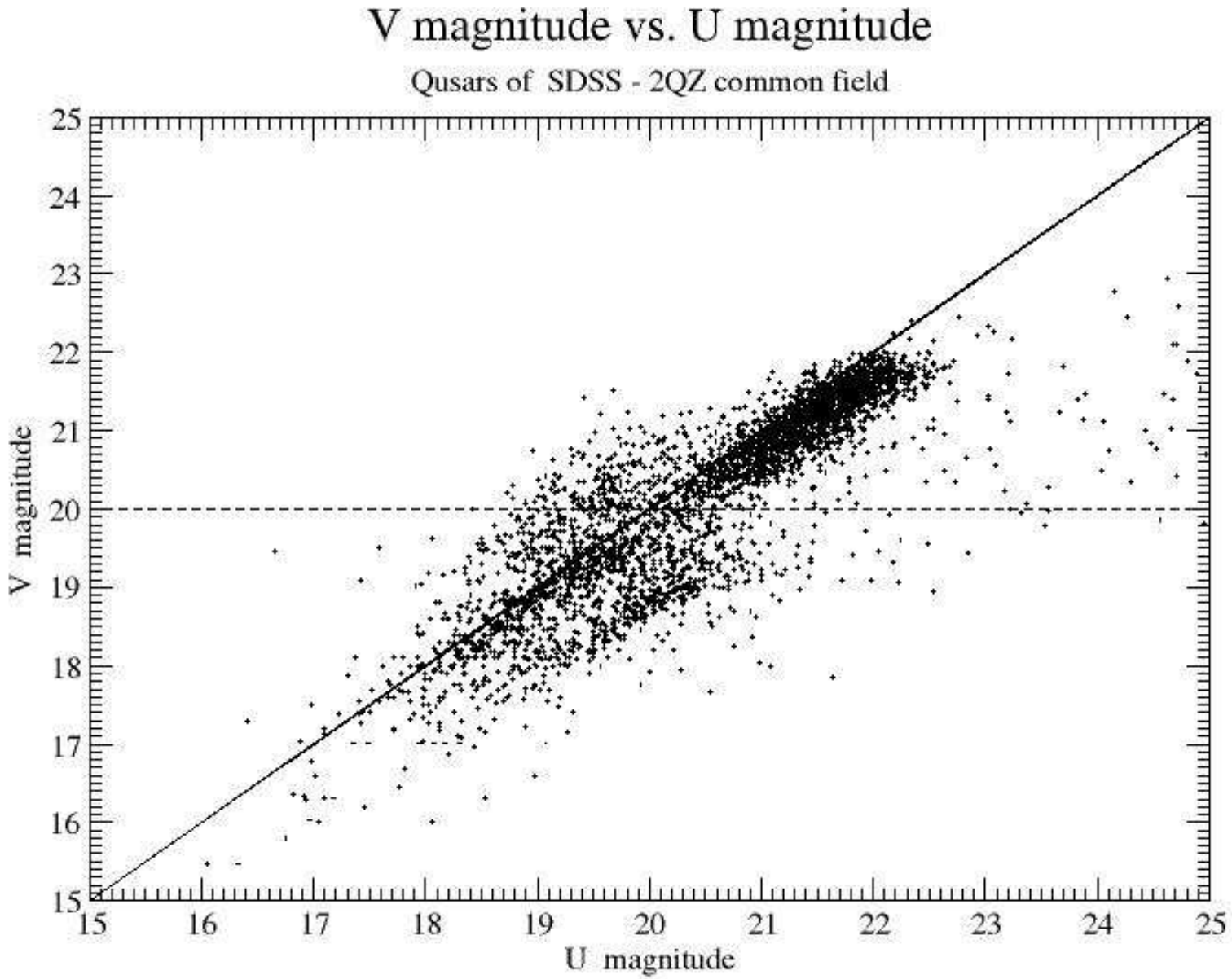
Surprise !!!! **5 127 quasars SDSS - 2QZ**

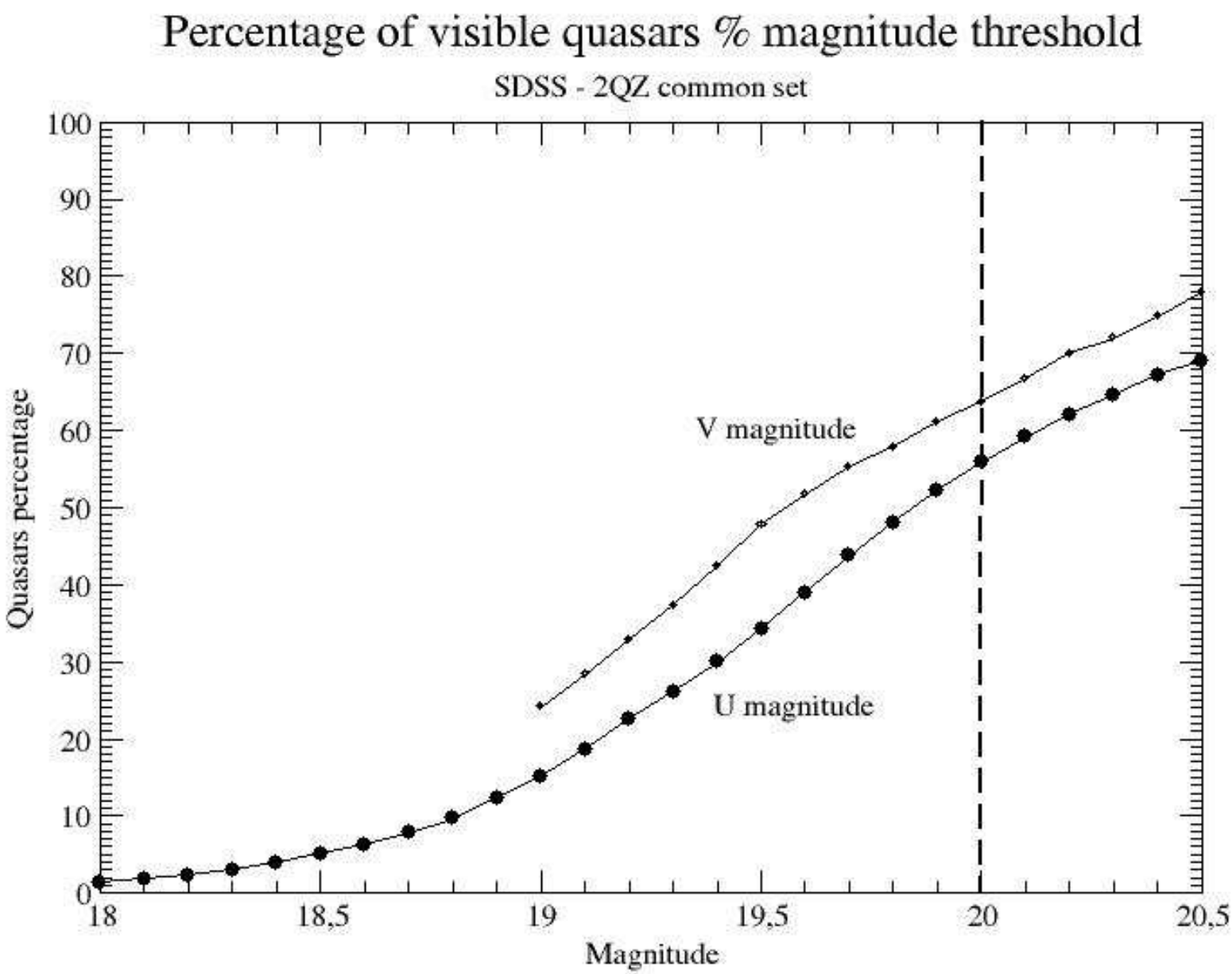
- 900 in common
- 831 in SDSS not in 2QZ
- 3426 in 2QZ not in SDSS

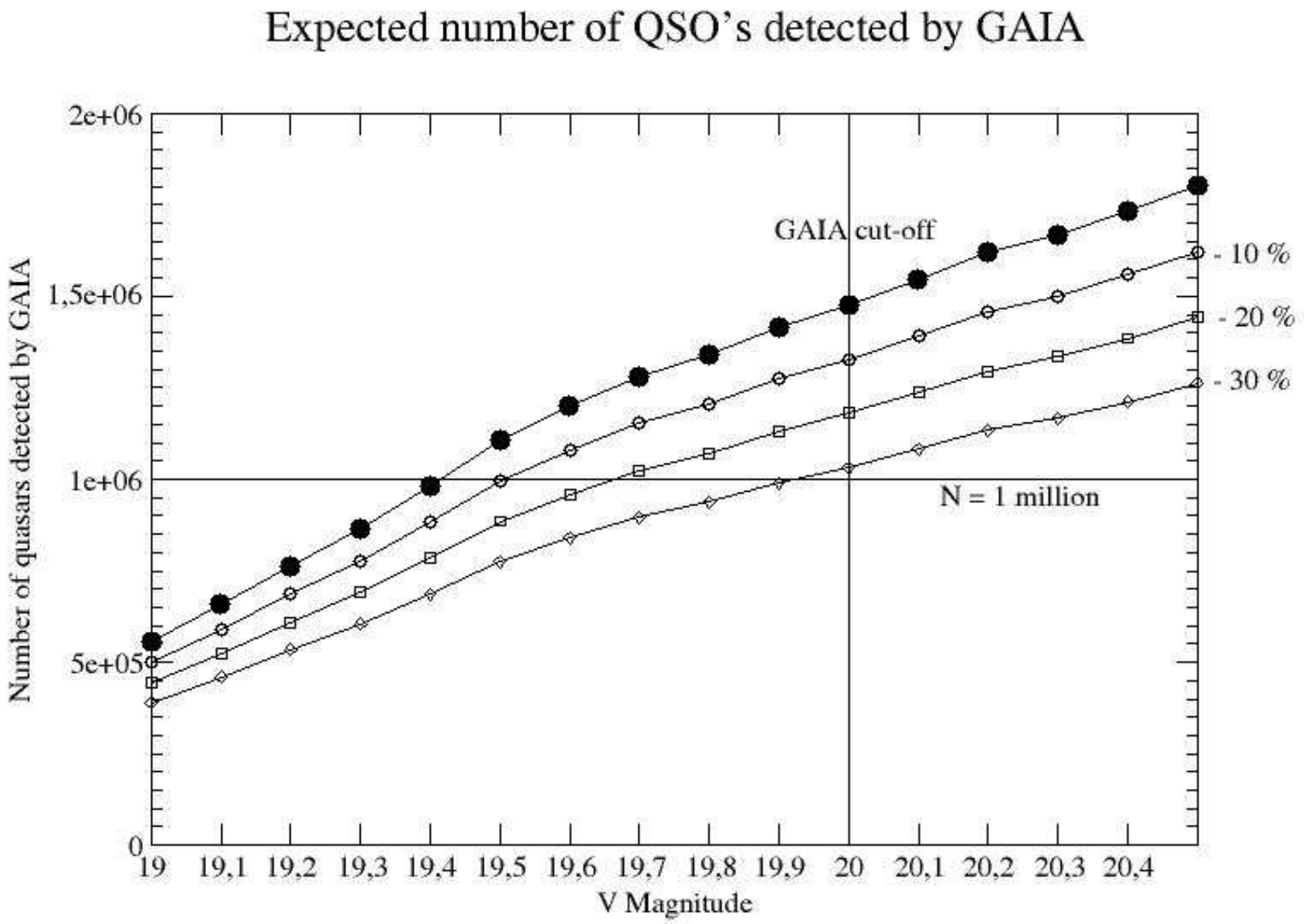
\+ **2 563 quasars not in SDSS – 2QZ**

---

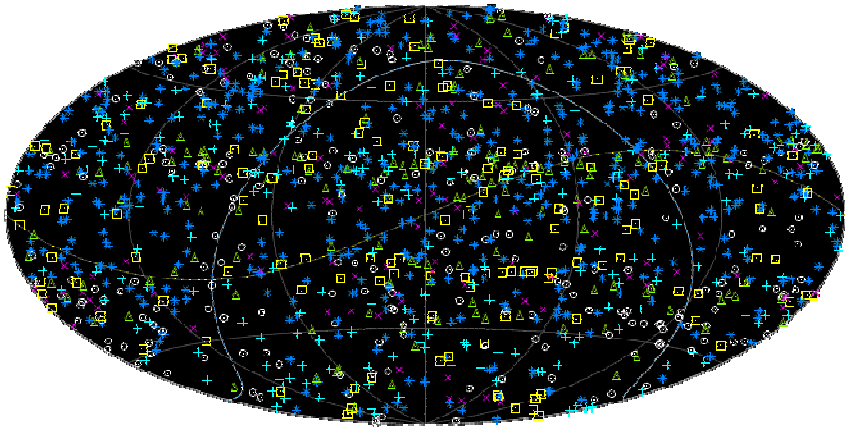
7 690 quasars at all.

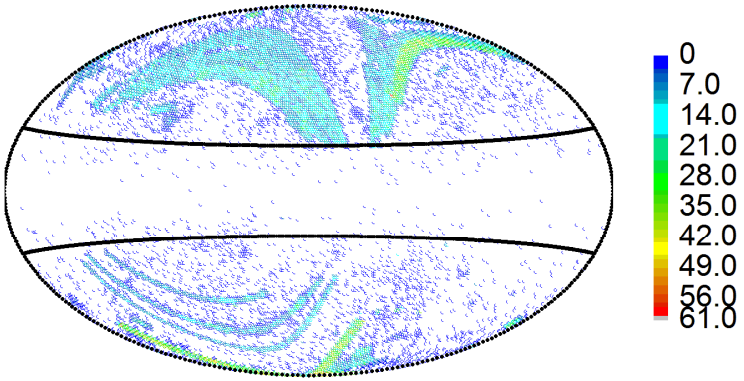

V magnitude vs. U magnitude
Qusars of SDSS - 2QZ common field
V magnitude
U magnitude
15
16
17
18
19
20
21
22
23
24
25


Percentage of visible quasars % magnitude threshold
SDSS - 2QZ common set
Quasars percentage
Magnitude
V magnitude
U magnitude
100
90
80
70
60
50
40
30
20
10
0
18
18,5
19
19,5
20
20,5



=> More than 1 million quasars should be expected from GAIA !!!





V. Conclusion

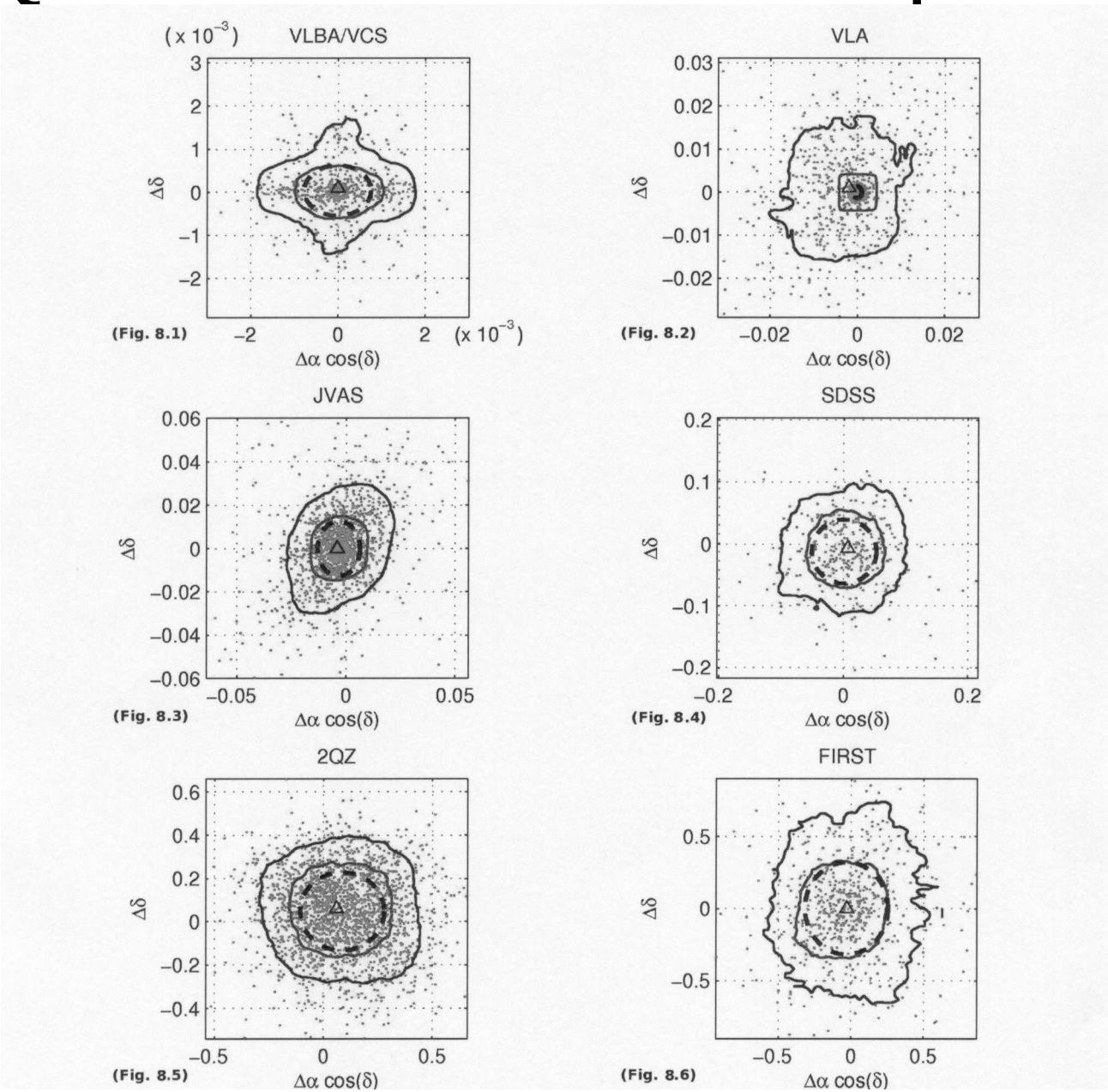
Atelier **EGSG** (**E**xtra**g**alactic **S**cience with **G**AIA)

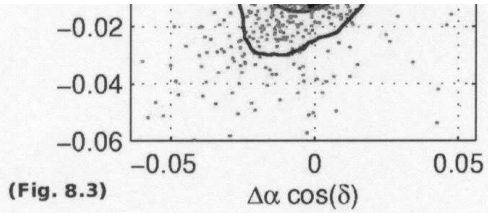
Meudon , December 2-4, 2013

Org.J.Souchay, B.Rocca,E.Slezak

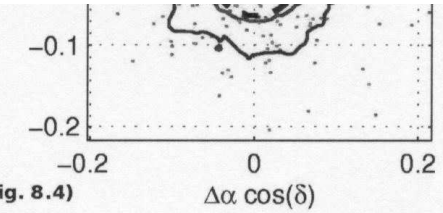
http://cias.obspm.fr/fr/activities/details.php?id=97

LQAC : astrometric comparisons

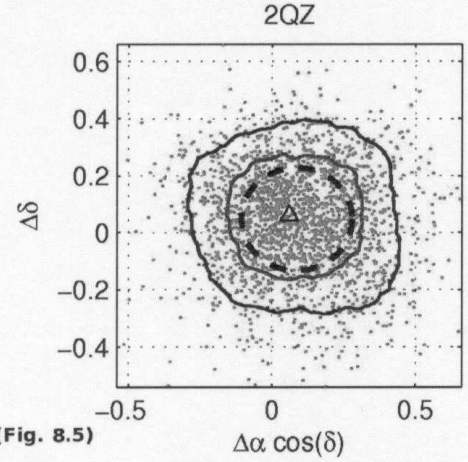




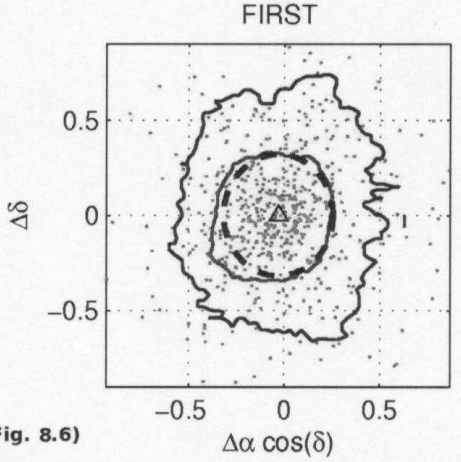
(Fig. 8.3)



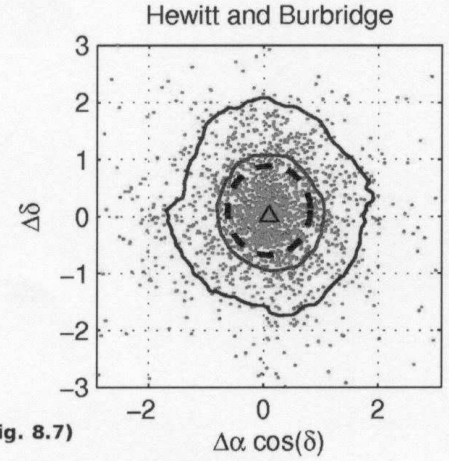
(Fig. 8.4)



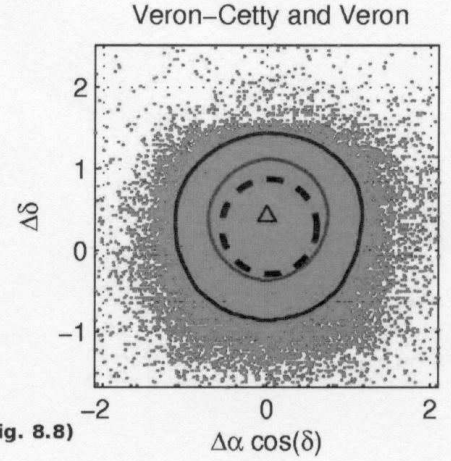
(Fig. 8.5)



(Fig. 8.6)



(Fig. 8.7)



(Fig. 8.8)

Fig. 8. Equatorial coordinate differences between the values in a given catalogue and the preceding compilation phase of the LQAC. The standard deviations are shown by the dash contours. The external continuous contours are lines of equiprobability.

Absolute magnitudes

Cosmological parameters and hypothesis

Friedmann-Lemaître-Robertson-Walker metrics

Ω_k=0, q_0=-0.58, H_0=72 km/s/Mpc

Use of HST and WMAP experiments for constraints

Ad hoc expression for
the luminosity distance $D_L(z)$

$$D_L = \frac{(1+z)\,c}{H_0} \int_1^{1+z} \frac{du}{\sqrt{\frac{1}{3}(1-2q_0) + \frac{2}{3}(1+q_0)\,u^3}},$$

$M - m = 5 - 5 \log D_L - A - K$

A => galactic extinction

K => K- term related to the effect of redshift at given bandwidth

Luminosity distance & K-correction

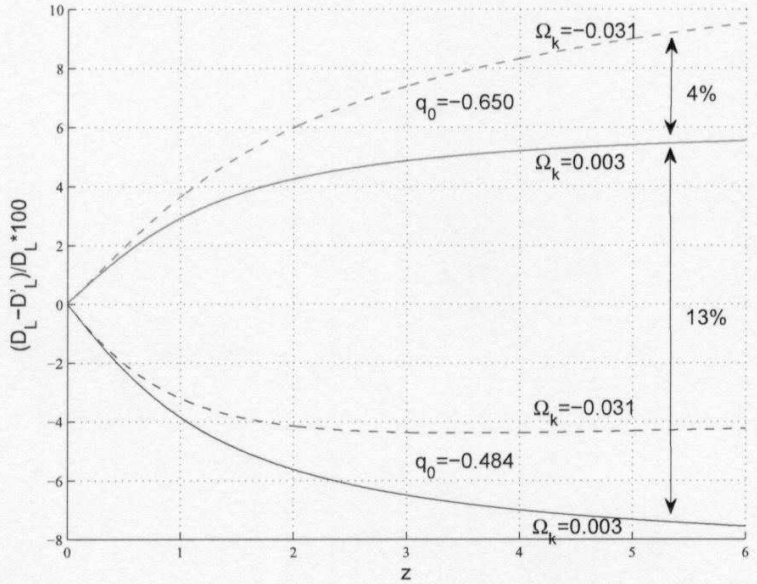


Fig. 16. Relative difference between the luminosity distance D_L computed with the nominal values $q_0 = -0.58$ and $\Omega_k = 0$ and the luminosity distance D'_L computed with the limits values of the same parameters, vs. the redshift z of the sources. Dashed lines for $\Omega_k = -0.031$, solid lines for $\Omega_k = 0.003$ green lines (upper lines) for $q_0 = -0.650$ and black lines (lower lines) for $q_0 = -0.484$.

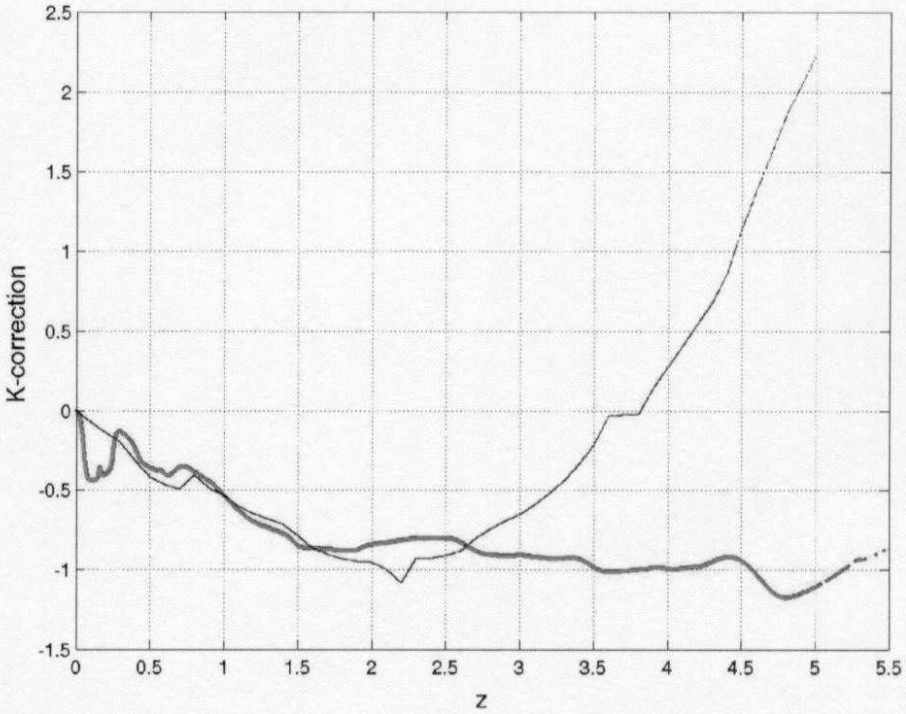


Fig. 17. The K-correction in infrared bandpass K_i (bold line) and in blue bandpass K_B (thin line) vs. the redshift.

Absolute magnitudes

M_i and M_b

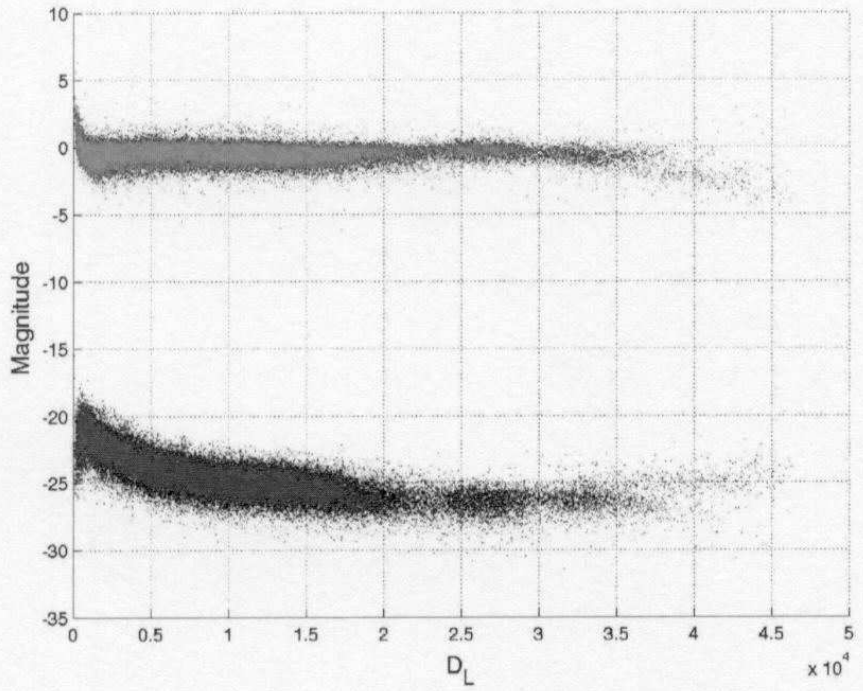
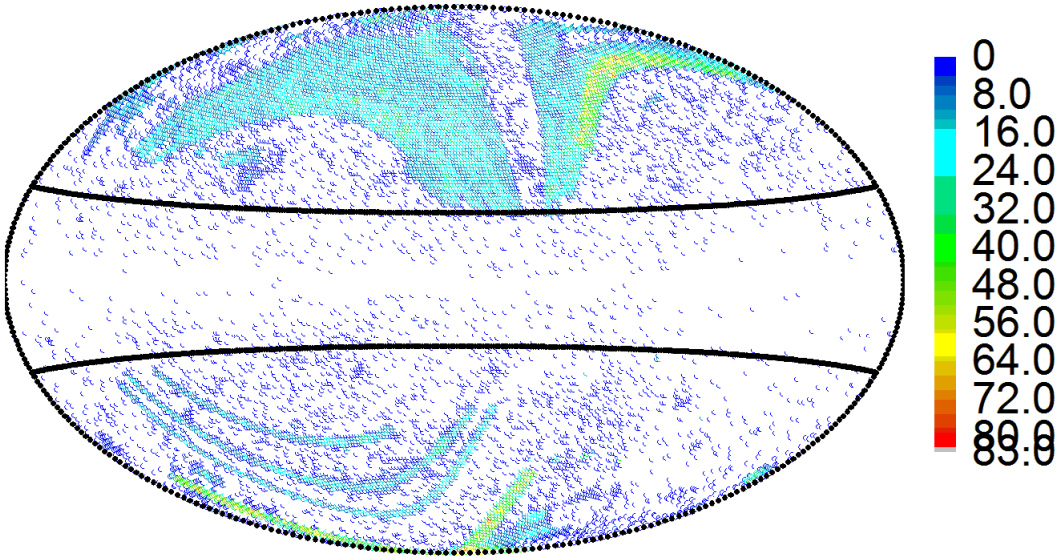


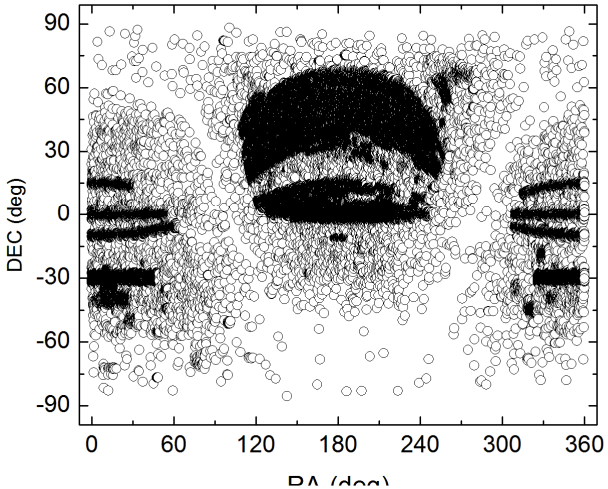
Fig. 18. The blue absolute magnitude M_B (lower line) and the difference between the absolute magnitude in infrared and blue bandpass $(M_i - M_B)$ (the upper line) for the LQAC sources, vs. their luminosity distance.

The L.Q.A.C (Large Quasar Astrometric Catalogue)

Souchay et al., A&A submitted

- **113 653 quasars**
- **Positions α,δ, optimized**
- ***u,b,v,g,r,i,z* photometry**
- **Redshift z**
- **5 radio flux**
- **Catalogue flag A-M**
- **Absolute Magnitudes**





Improvements w.r.t. VV2006

Table 8. Number of entries per item for the following catalogues: VV06, A–L, and final LQAC.

	VV06	A–L	LQAC	% of completness
u	74 367	96 343	**99 665**	87.8
b	79 488	96 253	**106 801**	93.9
v	54 542	48 466	**75 396**	66.3
g	0	74 862	**74 862**	65.9
r	1 540	99 537	**100 811**	88.7
i	101	86 143	**86 238**	75.9
z	0	74 861	**74 861**	65.9
redshift	85 182	101 535	**110 745**	97.4
J	9	13 647	**13 656**	12.0
K	3	13 647	**13 650**	12.0
1.4 GHz	8 405	1 811	**8 934**	7.8
2.3 GHz	0	3 234	**3 234**	2.8
5.0 GHz	3 585	862	**3 951**	3.4
8.4 GHz	0	3 858	**3 858**	3.3
24 GHz	0	61	**61**	0.0

The difference between the 4th. and of the 3rd. column gives the contribution of VV06 to the LQAC.

The LQAC-2
(A&A, in prep.)

- **Nomenclature**

  ex. α = +124,567894°, δ = +56,785643°=> 124+56 xx

- **~ 60% more quasars** (DR7) (187 504 instead of 113 653)
- **Improved celestial coordinates**

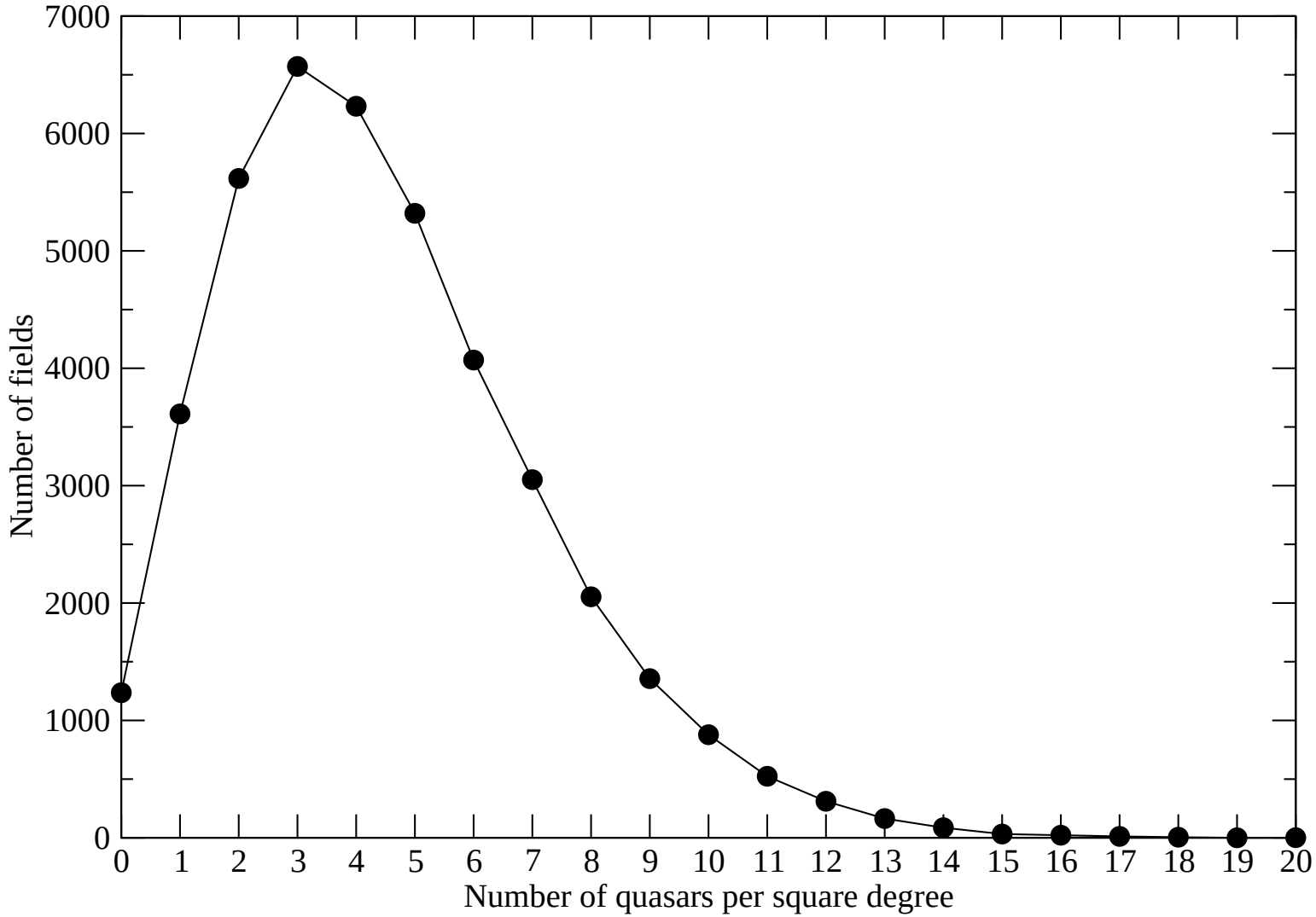
  (LQRF, Andrei et al.,2010)

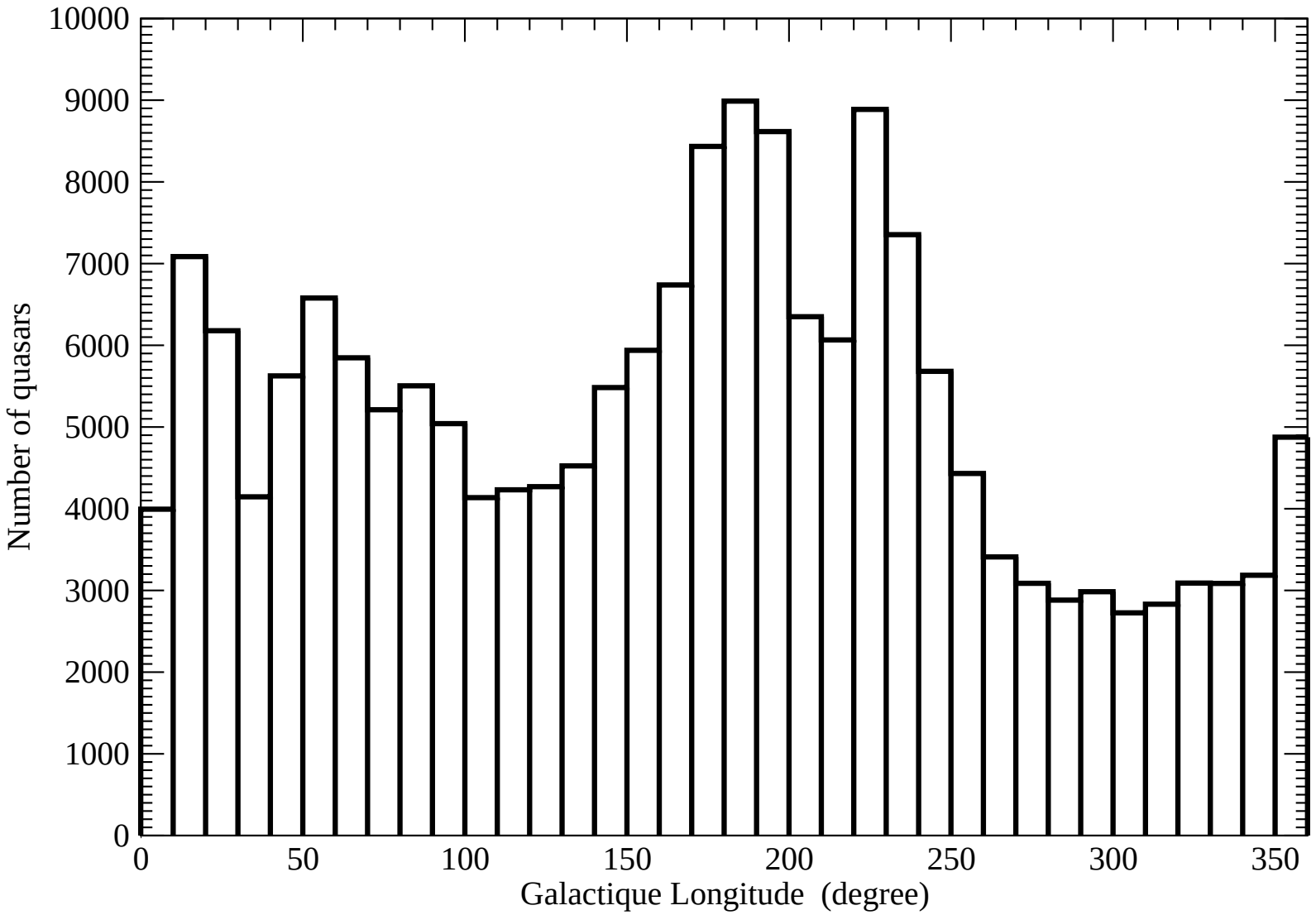
- **Compacity and morphological indexes**

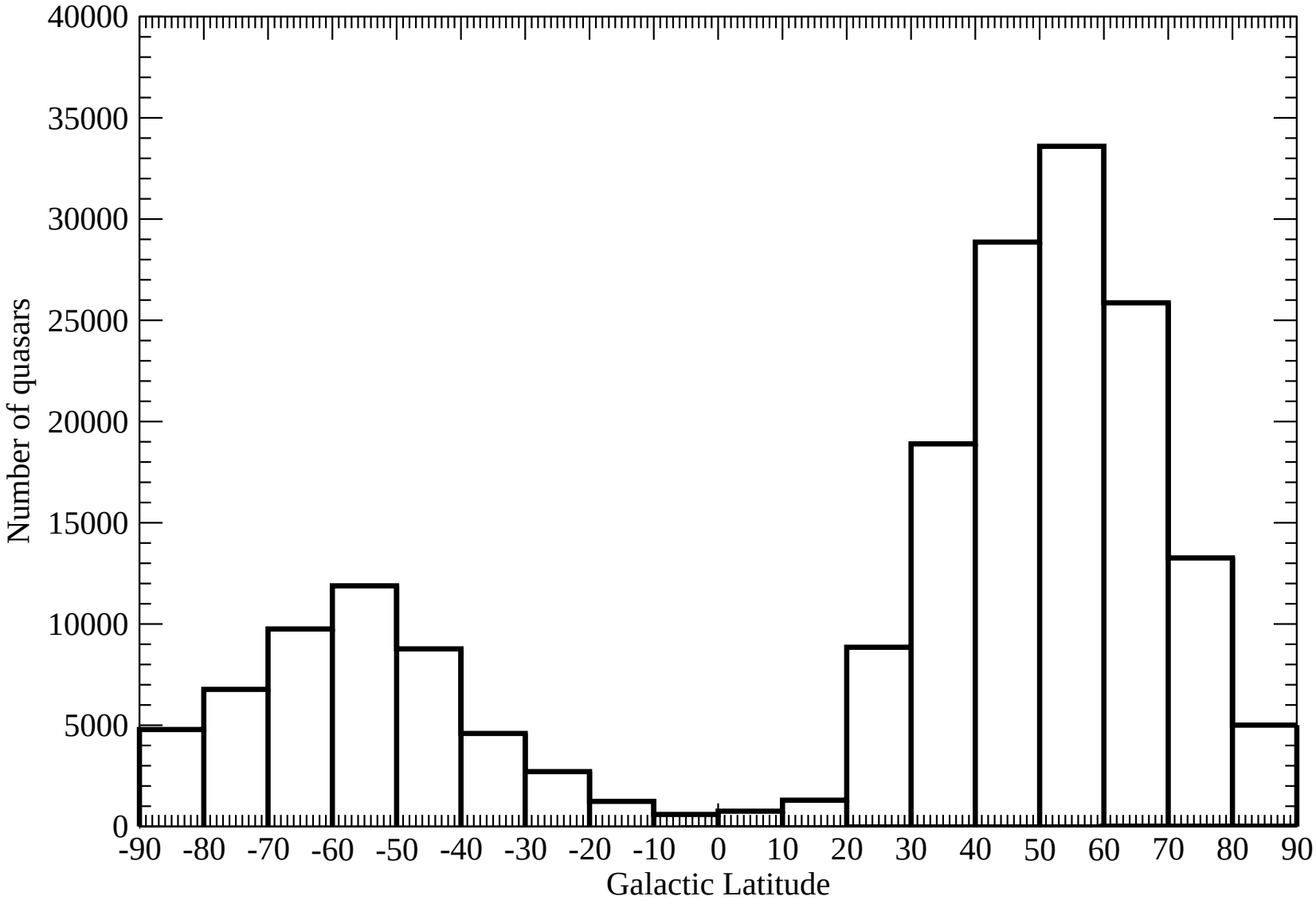
  (point-like or extended, ellipse, gaussian profile …)

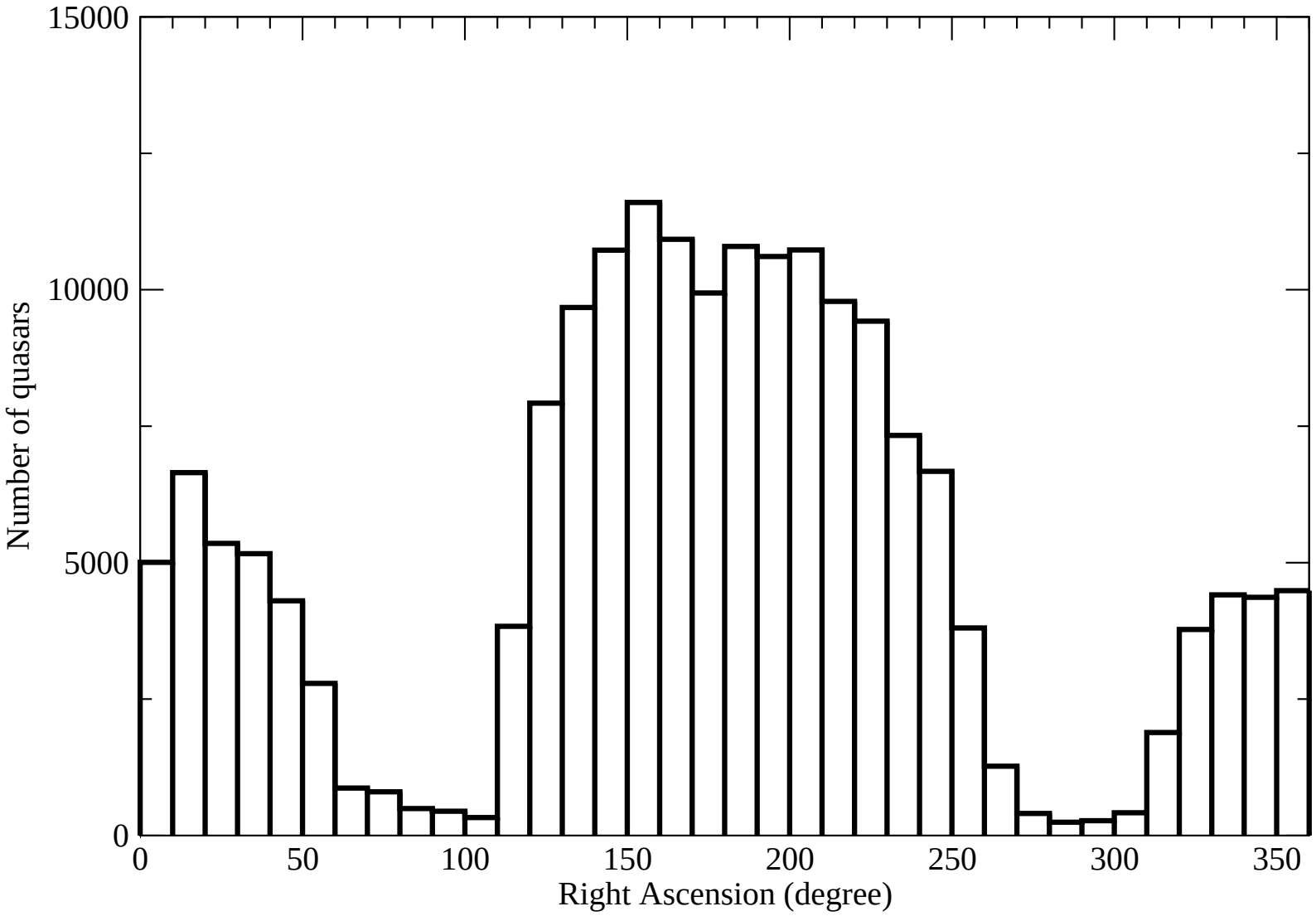
- **Statistical tests** (density, nearest neighbour etc…)

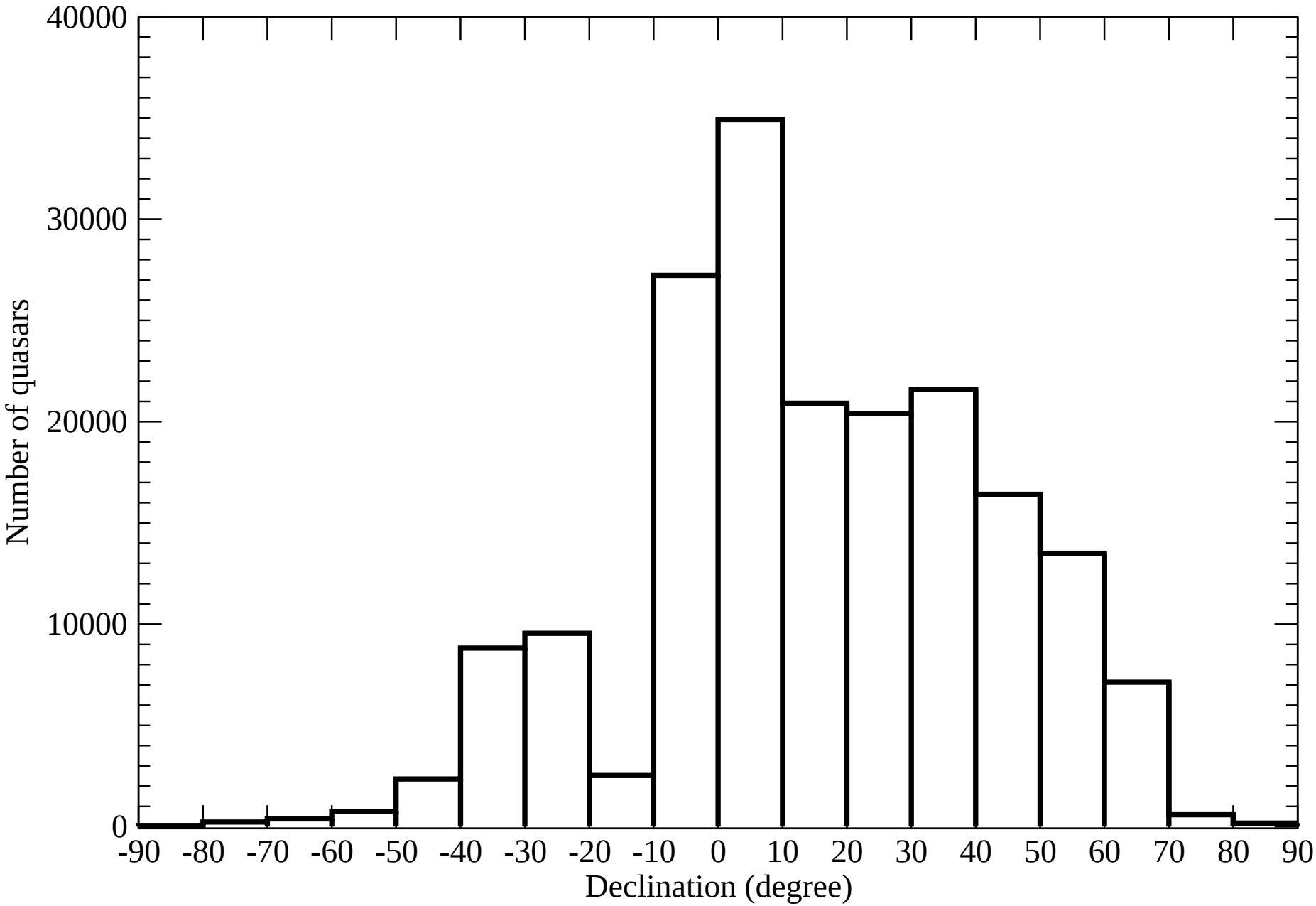
Density % square degree



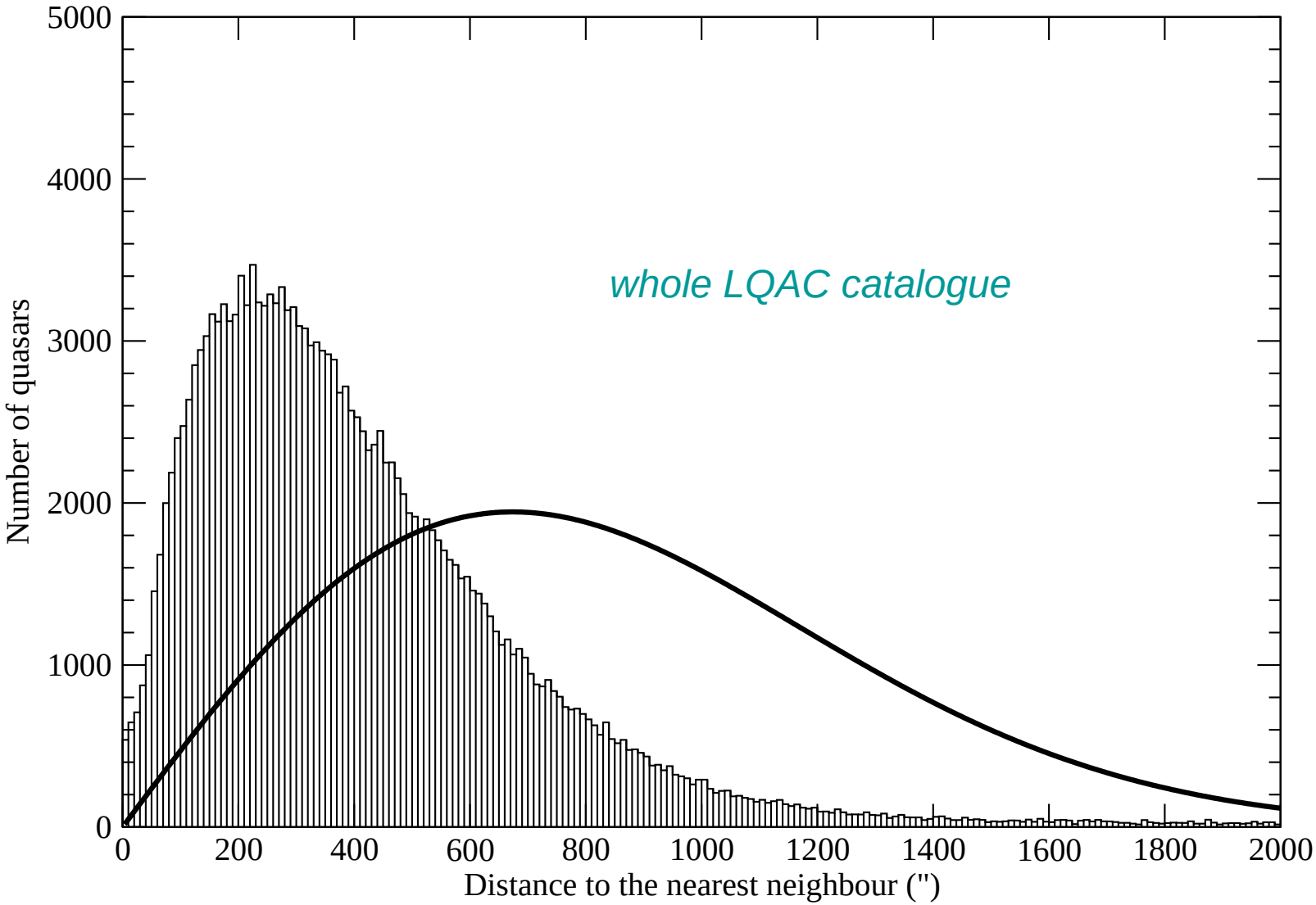

10000
9000
8000
7000
6000
5000
4000
3000
2000
1000
0
Number of quasars
0
50
100
150
200
250
300
350
Galactique Longitude (degree)

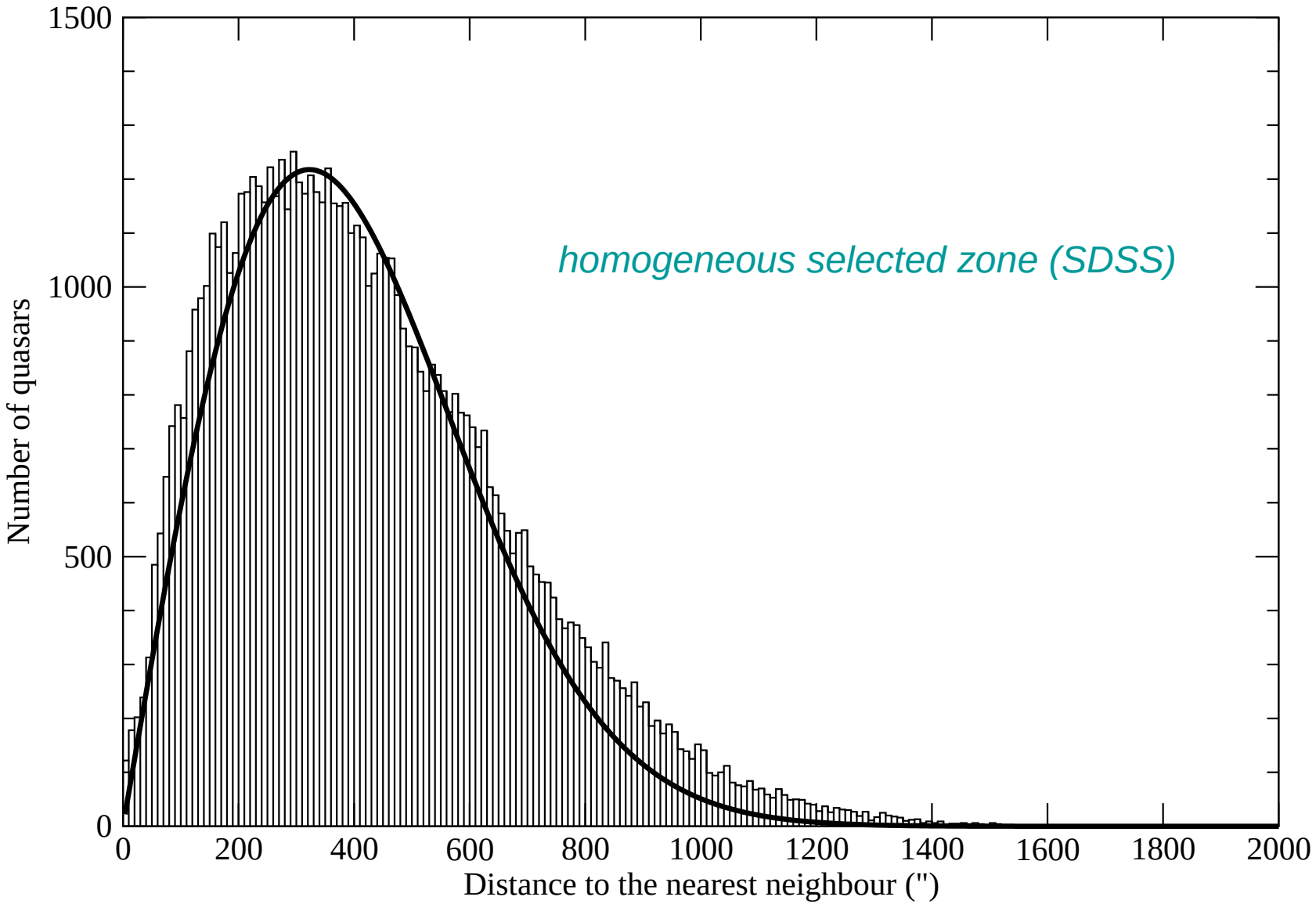

40000
35000
30000
25000
20000
15000
10000
5000
0
Number of quasars
-90 -80 -70 -60 -50 -40 -30 -20 -10 0 10 20 30 40 50 60 70 80 90
Galactic Latitude


15000
10000
5000
0
Number of quasars
0
50
100
150
200
250
300
350
Right Ascension (degree)


40000
30000
20000
10000
0
Number of quasars
-90 -80 -70 -60 -50 -40 -30 -20 -10 0 10 20 30 40 50 60 70 80 90
Declination (degree)

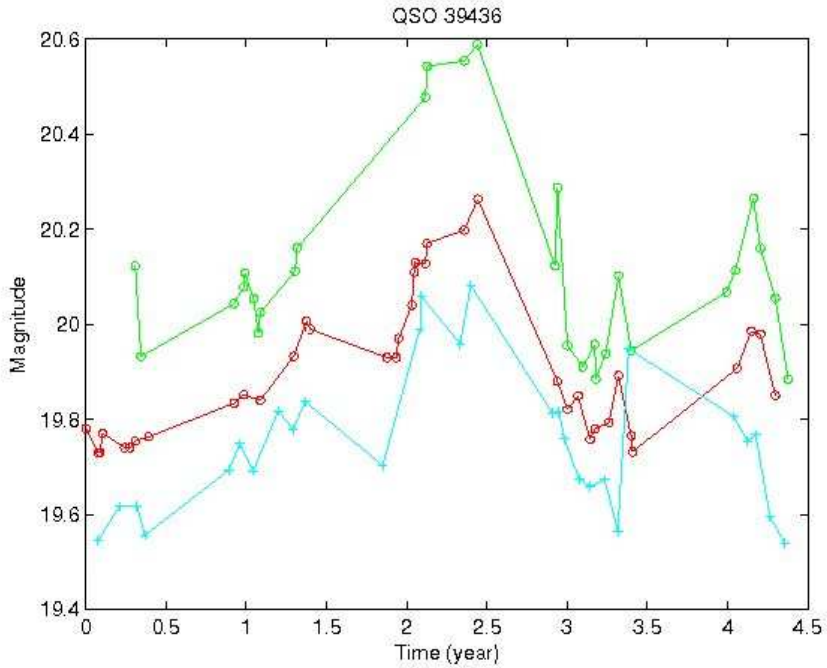
Distance to the nearest neighbour

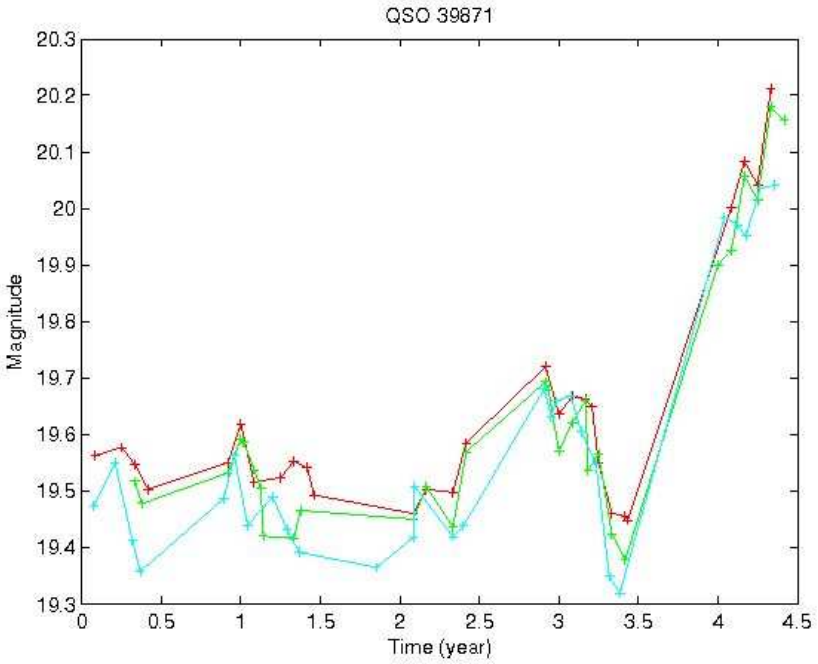



1500
1000
500
0
Number of quasars
0
200
400
600
800
1000
1200
1400
1600
1800
2000
Distance to the nearest neighbour (")
homogeneous selected zone (SDSS)

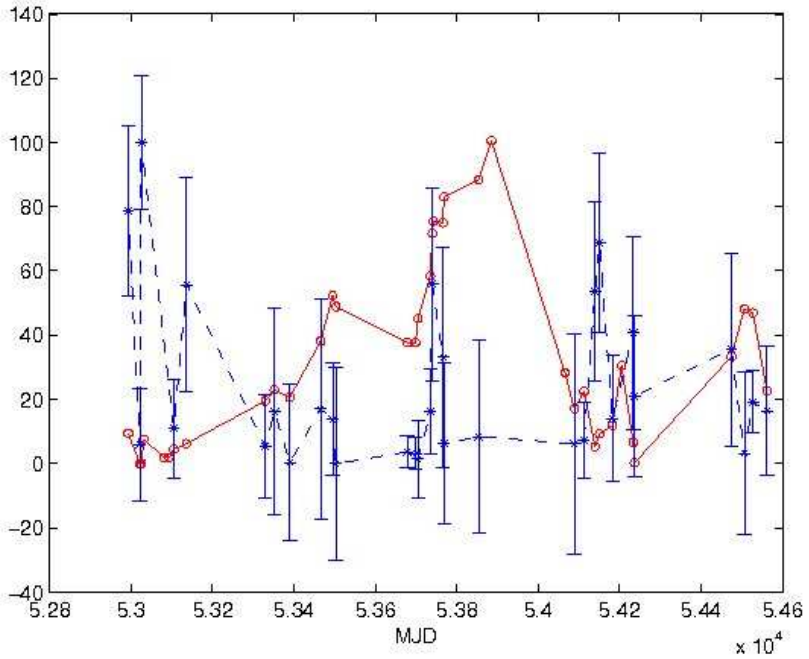
Astro – photometric variations of QSO's (**Taris et al, A&A, 2011**)

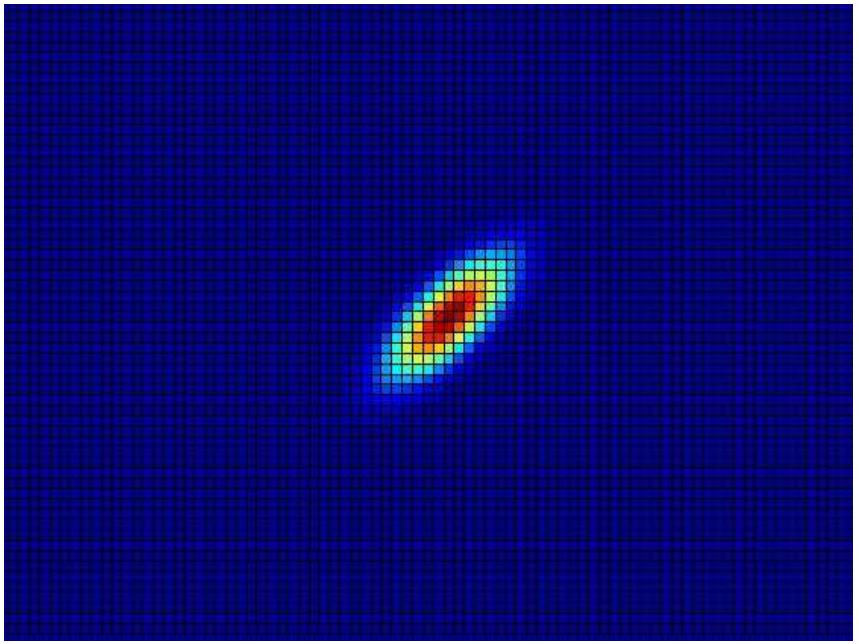
- ~ 40 quasars from the Deep -2 field of the CFHT
- Light curves of quasars (~ years)
- Search of a correlation between the variation magnitude variation and astrometry





Variations astro-photométriques des QSO's (suite)





Taris et al., A&A, 2011

- Chercher une corrélation pour d'autres QSOs du Deep2
- Idem pour les champs Deep3/Deep4
- Statistique sur un grand nombre de QSOs

Search for rapid optical variability in RQQSO's

- *Rabbett et al. (1998)* 23 objects
  => no evidence for short term variability

- *Webb et al. (2000)* 23 QSO's and Seyfert 1 galaxies in various timescales (mn, hr, day, week,month)

  => No evidence for significant optical variablity
  (> 0.03 mag) for the 77 intranight comparisons
  => fastest significant variations (~ days) consistent with dynamical timescales of black hole accretiion disk

- *Gupta and Joshi (2005)* 7 RQQSO's => 3 INOV , 1 doubtful

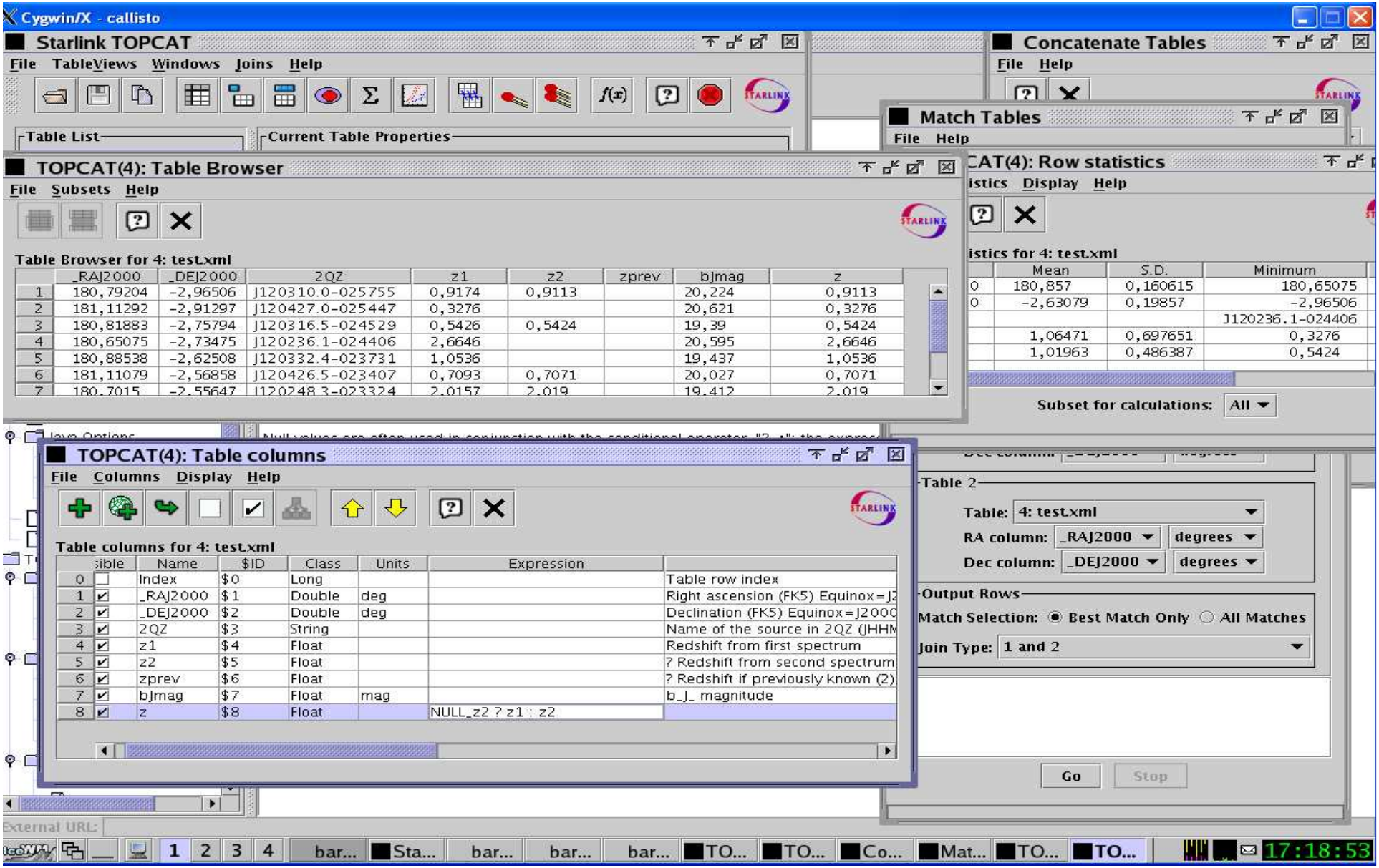
  => some RQAGN's INOV ~ 10%
  => blazars INOV 100%

- *Gayal et al. (2007)* 11 RQQSO's / 19 nights => 2 clear INOV, 2 possible

- *Etc….*

OV Tools (Topcat)

C.Barache



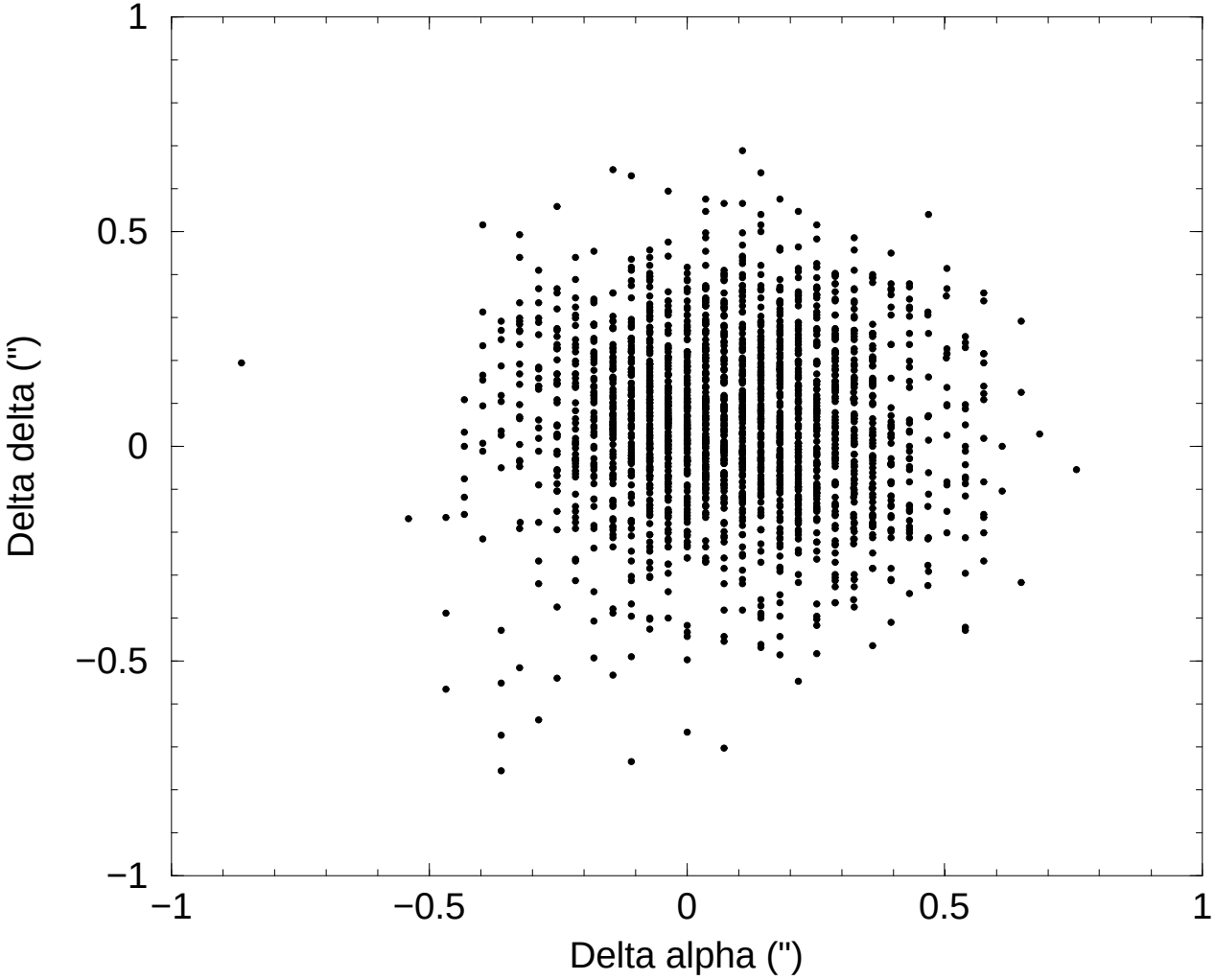
Cross-identification of SDSS/2dF

$\Rightarrow$ Comparison of common data
(astrometry, redshifts, photometry)

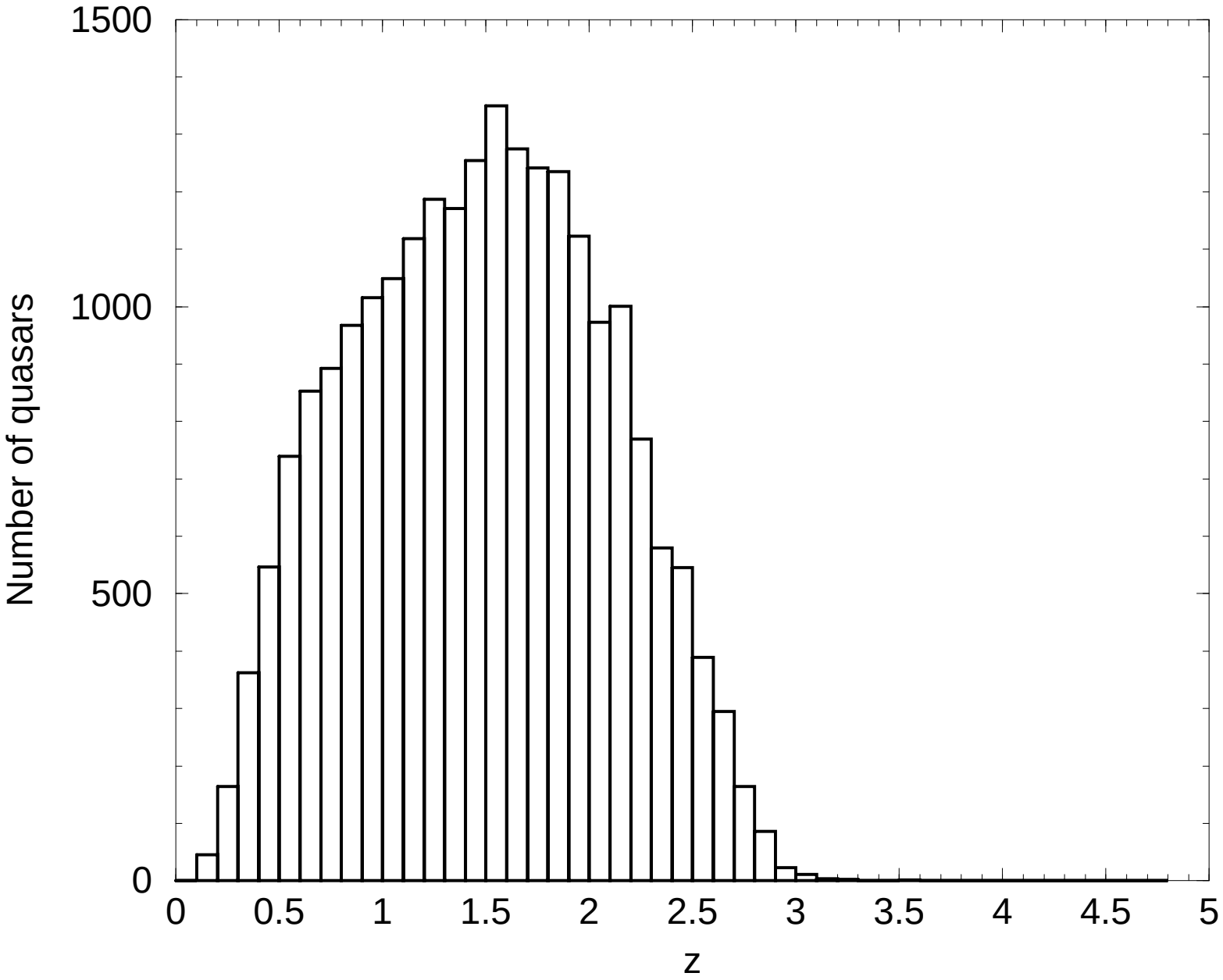
$\Rightarrow$ Complementarity (photometry)

Astrometric differences SDSS%2dF

(Souchay et al.,A&A,2007)



Histogram of redshifts /2QZ (2dF)



Histogram of redshifts /SDSS-DR5