A Complete Bank of Optical Images of the ICRF

(and others)

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THE GAIA INITIAL QSO CATALOGUE – GIQC_5 IN THE MDB

What it is

♦ It is a compilation of QSOs from the literature. And in the literature under QSO are included active galactic nuclei objects (AGN) at large, that is radio loud quasars, Blazars, radio quiet quasars, BL LACs, Seyfert galaxies, LINERS. Thus, in the GIQC a QSO is an object which can be seen as an extragalactic quasi stellar source from a certain point of view and a given set of parameters.

♦ It aims to completeness. Objects were excluded if the redshift was unknown (except for quasars) or unreliable; or if the magnitude was quoted brighter than 10; or if the astrometric accuracy was worse than 1 arcsec.

♦ The precisions on position and on magnitude are modest, just to suffice to unmistakable match to the actual Gaia observation.

♦ The redshifts are useless for the main purpose of matching but are invaluable to feed the supervised Artificial Neural Networks (ANN) at the basis of the Gaia autonomous QSO detection.

♦ The morphology and variability indexes are merely indicative, in the statistical meaning, but this knowledge is required to understand and model the astrometric error budget, and to accept an object to form the core GCRF.

Where it is

http://gaia.esac.esa.int/maindb/mdbtools/

The tables are below MDB/CU3/AuxData/InitialQso

GAIA-C3-TN-GPA-AA-003-01

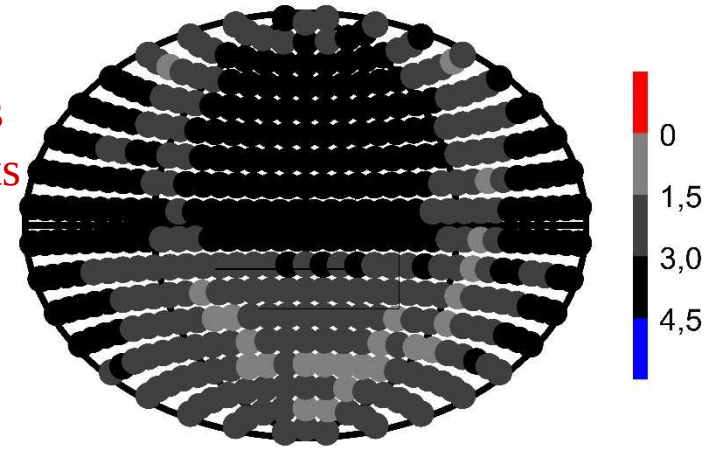
THE GAIA INITIAL QSO CATALOGUE – GIQC_5 IN THE MDB

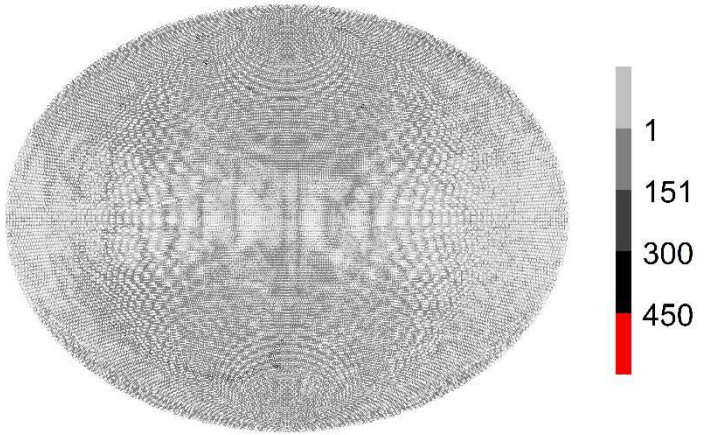
The GIQC_5 in a nutshell

Number of sources	1,248,372
Sources with magnitude	1,246,512
Sources with redshift	1,157,285
Astrometry precision	1 arcsec
Magnitude precision	0.5
Redshift precision	0.01
Average density	30.3 sources/deg^2
Average neighbor distance	3.7 arcmin (σ 4.9 arcmin)
Maximum distance to neighbor	5.2 deg
Maximum distance to neighbor (average of 100 larger values)	3.0 deg (σ 0.6 deg)

Sky density distribution

10 deg cells
log10 counts
equatorial





1 deg cells, linear counts, galactic

Abstract:

We have been developing a systematic effort to collect good quality images of the optical counterpart of radio loud QSOs – ***in particular the ICRF sources***, with special effort towards those that have been regularly radio surveyed either for future implementation at high frequencies and/or those that will be the ***link sources between the ICRF and the Gaia CRF***. Observations have been taken at the LNA/Brazil, CASLEO/Argentina, NOT/Spain, LFOA/Austria, Rozhen/Bulgária, and ASV/Serbia. In complement images were collected from the SDSS and from the DSS.

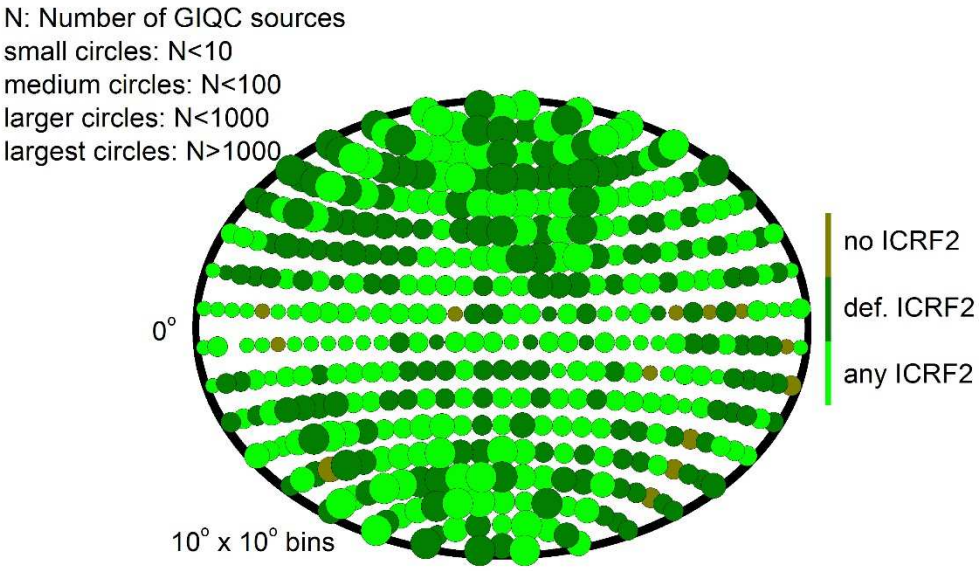
As a step to implement such image data bank and make it publicly available through the IERS service we present its description, that comprises for each source ***the number of measurements, filter, pixel scale, size of field, and seeing*** at each observation. The ***photometry analysis is centred on the morphology***, since there remain still cases in which the host galaxy is overwhelming, and many cases in which the host asks for a non-stellar PSF modelling. On basis of the neighbour stars we assign magnitudes and variability whenever possible. Finally, assisted by previous literature, the redshift and luminosity are used to derive astrophysical quantities, in special the absolute magnitude, SED and spectral index.

Moreover, since ***Gaia will not obtain direct images of the observed sources, the morphology and magnitude becomes useful as templates*** onto which assembling and interpreting the one-dimensional and uncontinuous line spread function samplings that will be delivered by Gaia for each QSO.

DSS – Digitized Sky Survey

The Digitized Sky Surveys were produced at the Space Telescope Science Institute under U.S. Government grant NAG W-2166.

The term Digitized Sky Survey originally referred to the publication in 1994 of a digital version of an all-sky photographic atlas. For the northern sky, the National Geographic Society - Palomar Observatory Sky Survey provided almost all of the source data. For the southern sky, the Southern Sky Atlas and its Equatorial Extension (together known as the SERC-J) and the southern Galactic Plane survey (SERC-V), from the UK Schmidt Telescope at Anglo-Australian Observatory, were used. The Second Generation DSS includes thePalomar Observatory Sky Survey II, made with the Oschin Schmidt Telescope at Palomar Observatory for the northern sky. Sources for the southern sky included the 'Galactic Red' survey, the Equatorial Red Survey, and the Second Epoch Survey, all made with the UK Schmidt Telescope at Anglo-Australian Observatory. The pixel size was 25 or 15micrometres, corresponding to 1.7 or 1.0 arcseconds in the source material. B, R, I Schimdt plates were used.



sources	259387
<obs/source>	2
magnitudes	258662
redshift	254737
GIQC-D	150756
GIQC-C	42906
GIQC-O	65725
GIQC-new	0
ICRF-D	240
ICRF-vcs	1346
ICRF-nonvcs	708
not ICRF	257093

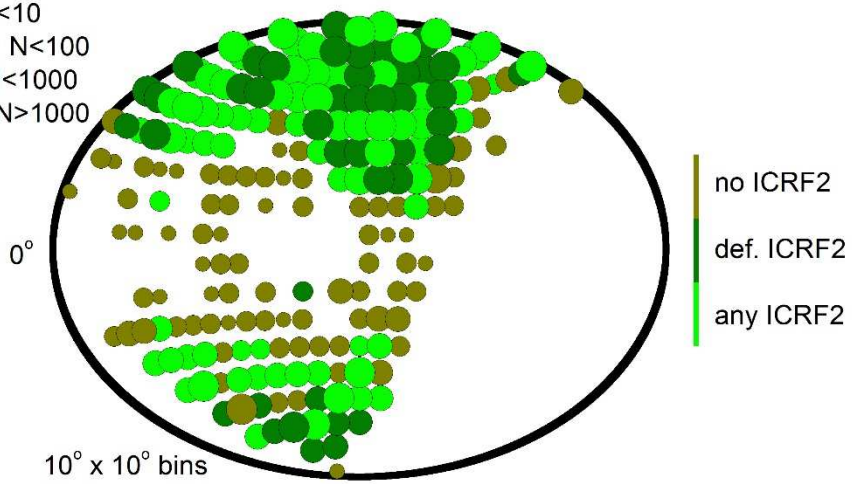
SDSS DR7 – Apache Point Observatory

SDSS is managed by the Astrophysical Research Consortium for the Participating Institutions of the SDSS Collaboration. Funding for SDSS has been provided by the Alfred P. Sloan Foundation, the Participating Institutions, the National Science Foundation, and the U.S. Department of Energy Office of Science. The SDSS web site is http://www.sdss.org/.

Longitude	+105° 49′ 12”
Latitude	+32° 46′ 48”
Altitude	2798m

Diameter	2.5m
Focus	F=12.5m
Scale	3.3”/mm
Field	continuous scan 3′.36 × 3′.36 (0”.05/px)
Filters	*u, g, r, i, z*

N: Number of GIQC sources
small circles: N<10
medium circles: N<100
larger circles: N<1000
largest circles: N>1000



sources	126577
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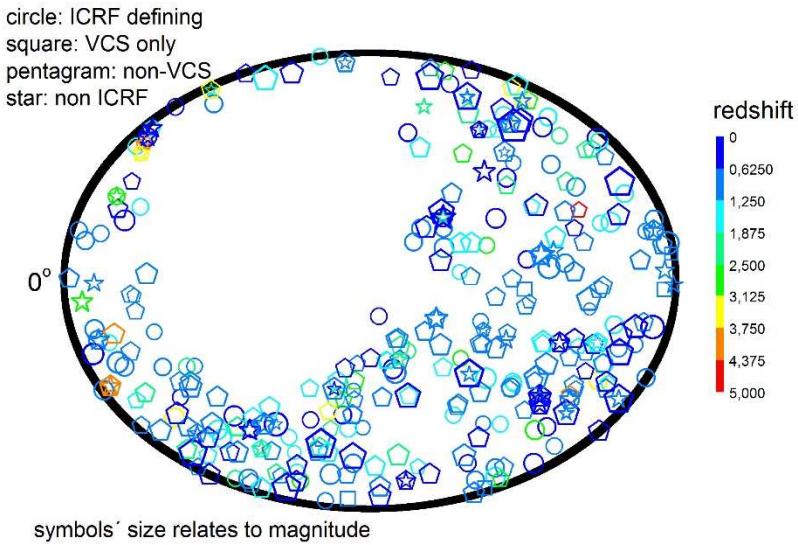
magnitudes	126576
redshift	126481
GIQC-D	119348
GIQC-C	7229
GIQC-O	0
GIQC-new	0
ICRF-D	**63**
ICRF-vcs	365
ICRF-nonvcs	174
not ICRF	**125975**

LNA/Brasil – Perkin-Elmer

Laboratório Nacional de Astrofísica/MCT, Itajubá-MG

Longitude	+45° 34′ 57”
Latitude	-22° 32′ 04”
Altitude	1864m

Diameter	1.60m
Focus	F=16m
Scale	13”/mm
Field	5′× 5′ (0”.3/px)
Filters	V, C, R, I



sources	350
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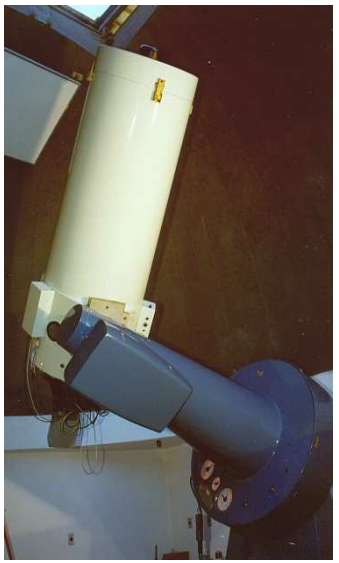
magnitudes	327
redshift	281
GIQC-D	305
GIQC-C	11
GIQC-O	34
GIQC-new	
ICRF-D	107
ICRF-vcs	5
ICRF-nonvcs	185
not ICRF	53

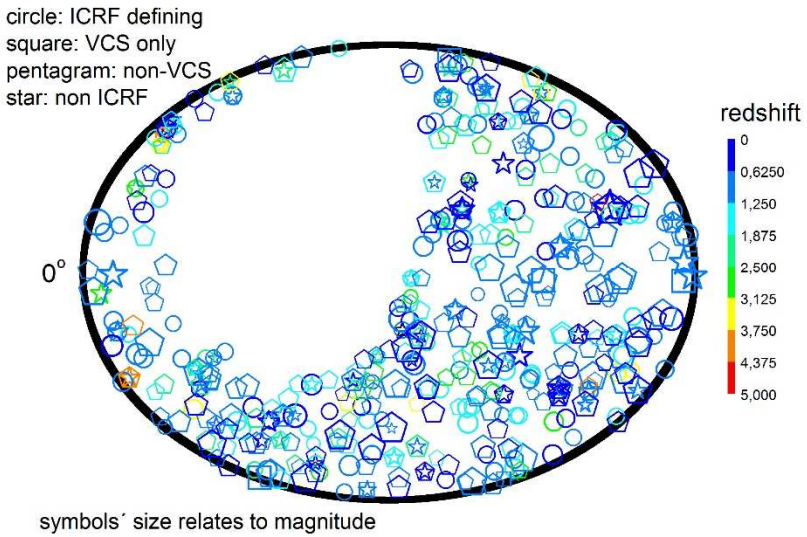
LNA/Brasil – Boller & Chivens

Laboratório Nacional de Astrofísica/MCT, Itajubá-MG

Longitude	+45° 34′ 57”
Latitude	-22° 32′ 04”
Altitude	1864m

Diameter	0.60m
Focus	F=8.1m
Scale	26”/mm
Field	10′× 10′ (0”.6/px)
Filters	B, V, C, R



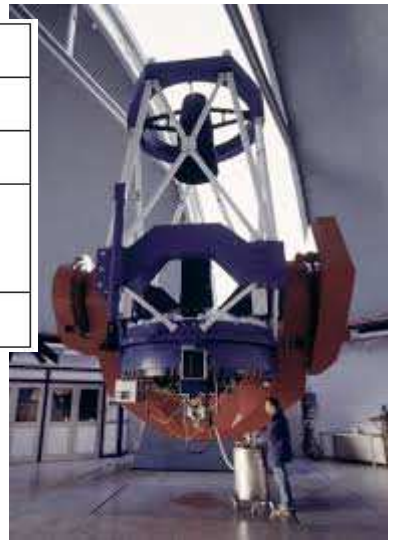


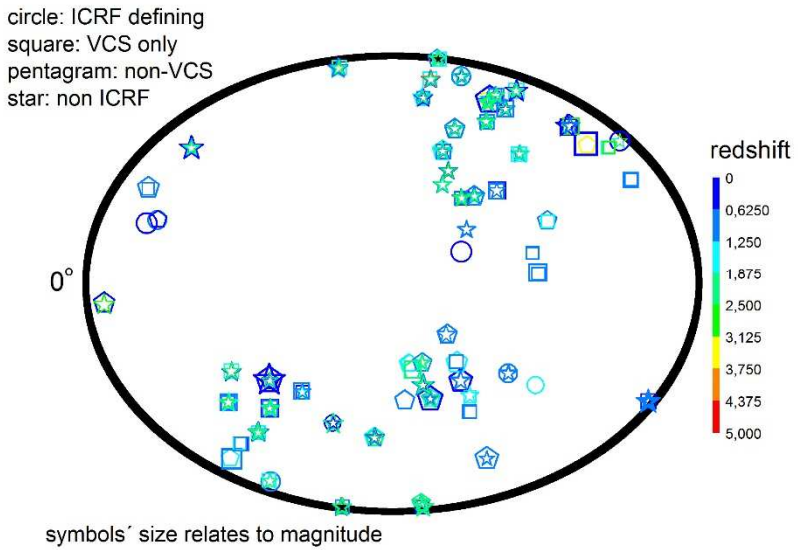
sources	495
<obs/source>	5
magnitudes	462
redshift	403
GIQC-D	412
GIQC-C	15
GIQC-O	68
GIQC-new	
ICRF-D	150
ICRF-vcs	7
ICRF-nonvcs	238
not ICRF	100

MEPG 2.2/Chile – Zeiss - WFI

Longitude	+70° 43′ 08”
Latitude	-29° 15′ 04”
Altitude	2347m

Diameter	2.2m
Focus	F=17.6m
Scale	2.3”/mm
Field	WFI 8 CCDs 30′ × 30′ (0”.24/px)
Filters	B, R





sources	497
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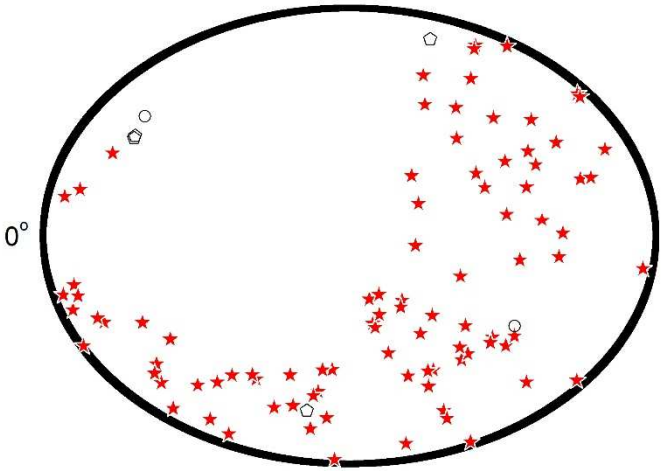
magnitudes	497
redshift	404
GIQC-D	180
GIQC-C	19
GIQC-O	298
GIQC-new	0
ICRF-D	10
ICRF-vcs	52
ICRF-nonvcs	29
not ICRF	406

CASLEO/Argentina – Jorge Sahade Boller & Chivens

Longitude	-69° 18′ 23”
Latitude	-31° 47′ 14”
Altitude	2552m

Diameter	2.15m
Focus	F=5.6m
Scale	11.3”/mm
Field	5′× 5′ (0”.3/px)
Filters	B, R



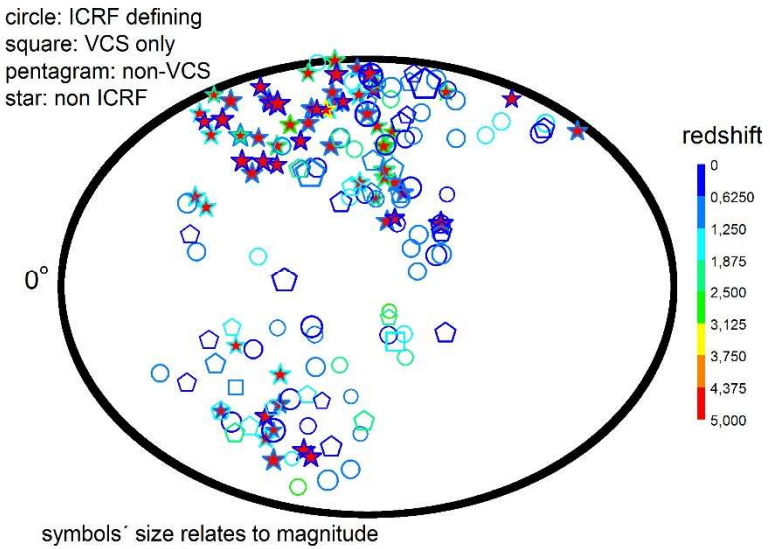
sources	103
<obs/source>	8
magnitudes	6
redshift	6
GIQC-D	2
GIQC-C	0
GIQC-O	4
GIQC-new	**97**
ICRF-D	0
ICRF-vcs	0
ICRF-nonvcs	0
not ICRF	**103**

New Sources – optical counterparts of Bourda et al. (2008, 2010, 2011) on going VLBI observations of optically-bright extragalactic radio sources for the alignment of the radio frame with the future Gaia frame

NOT/Islas Canarias/Spain – Ritchey-Chretien

Longitude	-17° 53′ 06”
Latitude	+28° 45′ 26”
Altitude	2382m

Diameter	2.56m
Focus	F=2.8m
Scale	11.3”/mm
Field	5′× 5′ (0”.19/px)
Filters	B, R



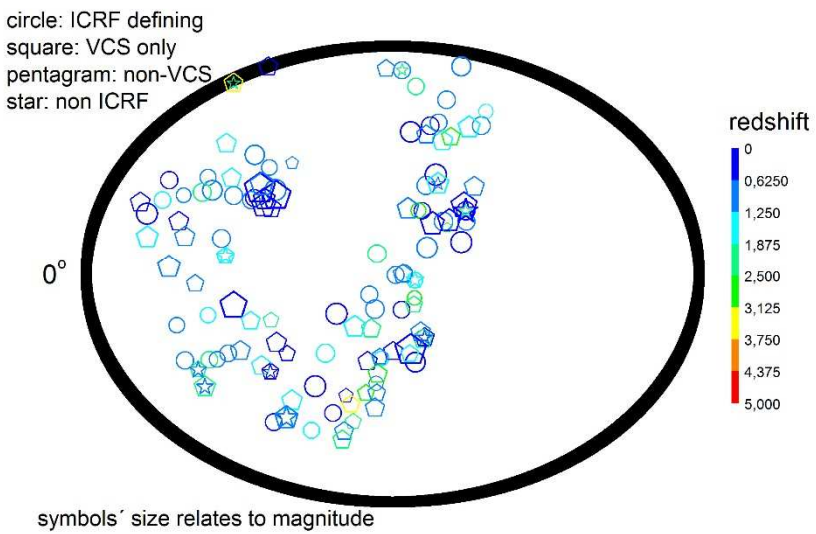
sources	190
<obs/source>	9
magnitudes	190
redshift	179
GIQC-D	160
GIQC-C	2
GIQC-O	28
GIQC-new	0
ICRF-D	62
ICRF-vcs	2
ICRF-nonvcs	34
not ICRF	**92**

Not ICRF and ICRF def – optical counterparts of Bourda et al. (2008, 2010, 2011) on going VLBI observations of optically-bright extragalactic radio sources for the alignment of the radio frame with the future Gaia frame

Rumanian program - Belogradchick/Bulgary – Zeiss

Longitude	+22° 40′ 30”
Latitude	+43° 37′ 22”
Altitude	650

Diameter	0.60m
Focus	F=8.1m
Scale	26”/mm
Field	10′× 10′ (0”.6/px)
Filters	C

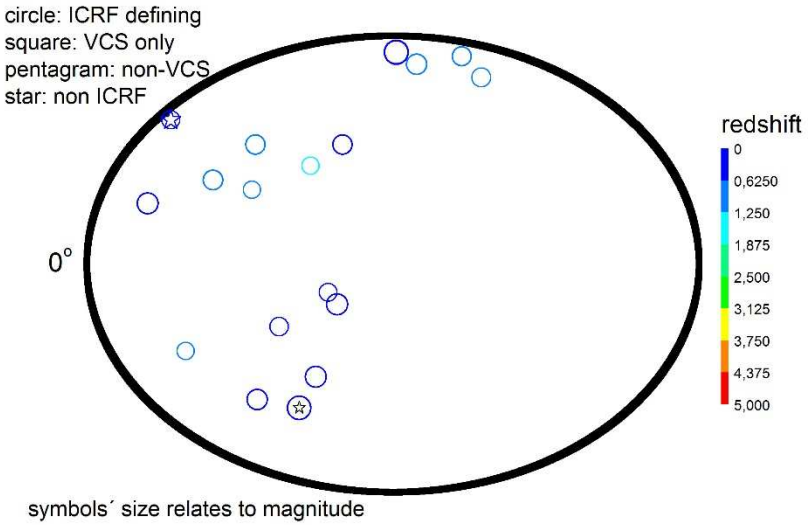


sources	133
<obs/source>	35
magnitudes	128
redshift	123
GIQC-D	121
GIQC-C	1
GIQC-O	11
GIQC-new	
ICRF-D	55
ICRF-vcs	0
ICRF-nonvcs	63
not ICRF	15

Serbian program – Rozhen/Austria – Ritchey-Chretien

Longitude	+24° 45′ 00”
Latitude	+41° 41′ 30”
Altitude	1750m

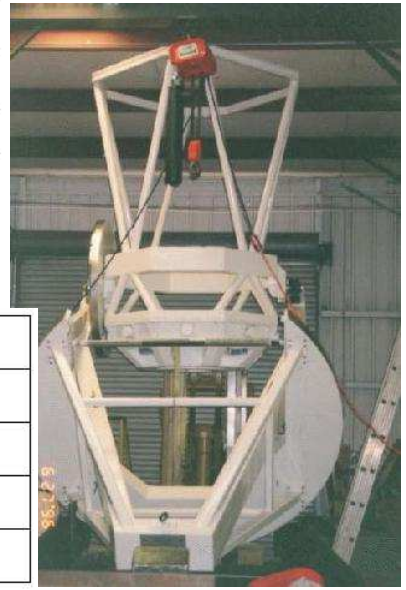
Diameter	2.00m
Focus	F=16m
Scale	12.8”/mm
Field	5.6′× 5.6′ (0”.26/px)
Filters	V, R



sources	20
<obs/source>	7
magnitudes	20
redshift	19
GIQC-D	18
GIQC-C	1
GIQC-O	1
GIQC-new	
ICRF-D	18
ICRF-vcs	0
ICRF-nonvcs	0
not ICRF	2

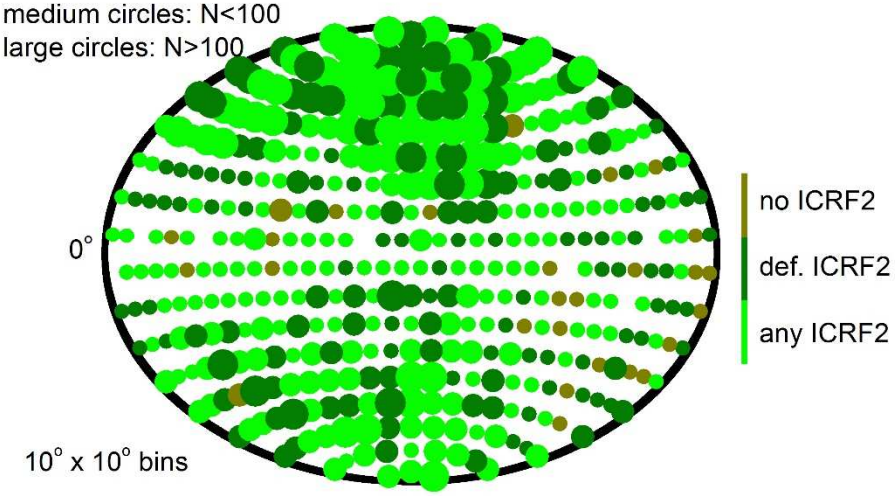
2MASS – Whipple Observatory and CTIO – PAIRITEL/Cassegrain

Longitude	+110° 52′ 39”	+70° 48′ 54”
Latitude	+31° 40′ 51”	-30° 09′ 55”
Altitude	2320m	2215m



Diameter	1.3m
Focus	F=6.6m
Scale	31.5”/mm
Field	(2”.0/px)
Filters	J, H, K

N: Number of GIQC sources
small circles: N<10
medium circles: N<100
large circles: N>100

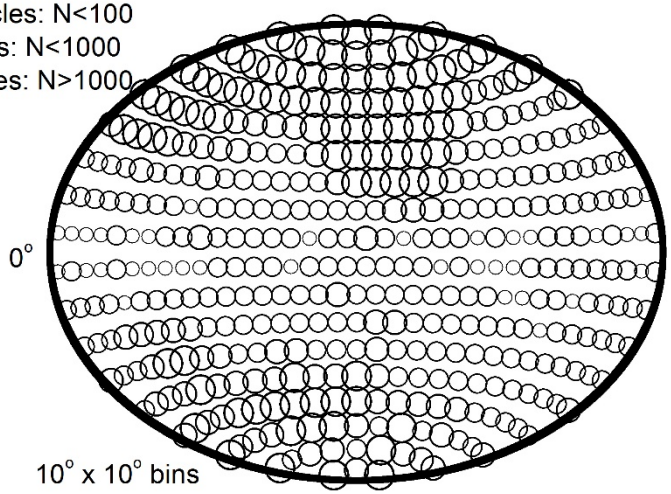


sources	25252
<obs/source>	3
magnitudes	25252
redshift	24656
GIQC-D	24174
GIQC-C	489
GIQC-O	589
GIQC-new	0
ICRF-D	178
ICRF-vcs	626
ICRF-nonvcs	427
not ICRF	24021

Current Numbers

Sample	N	Completeness
ICRF2	2744	0.80
ICRF2 defining	295	1.00
GCRF x ICRF link	558	0.93
GIQC	301524	0.24
GIQC defining	186405	0.97
This work	301524 GIQC sources 97 ICRF3 proposed southern sources	

N: Number of sources with optical images
small circles: N<10
medium circles: N<100
larger circles: N<1000
largest circles: N>1000



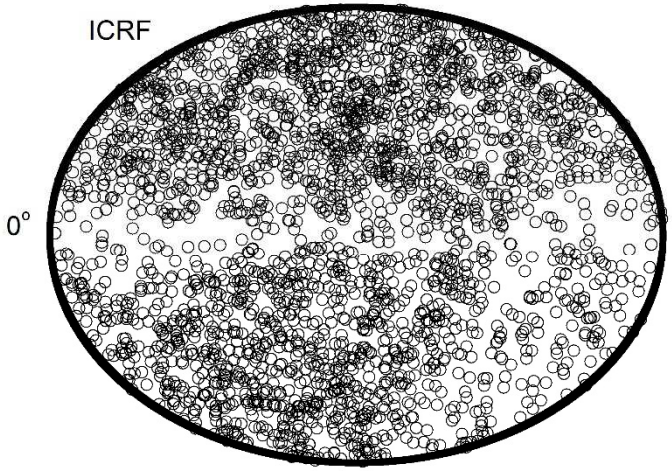
Forthcoming Numbers

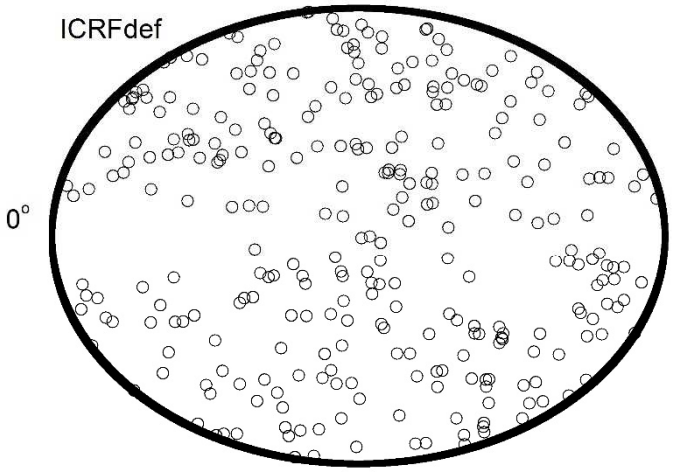
- SDSS later DR releases – about +200,000 sources with *ugriz* images
- BOSS SDSS survey – abolut +1,000,000 sources with *ugriz* images
- Zacharias & Zacharias (2014) – 413 ICRF2 sources taken at the CTIO 0.9m
- Infrared surveys – VISTA and UKIDSS
- CFHT public archives
- Large synoptic surveys – DES, and more

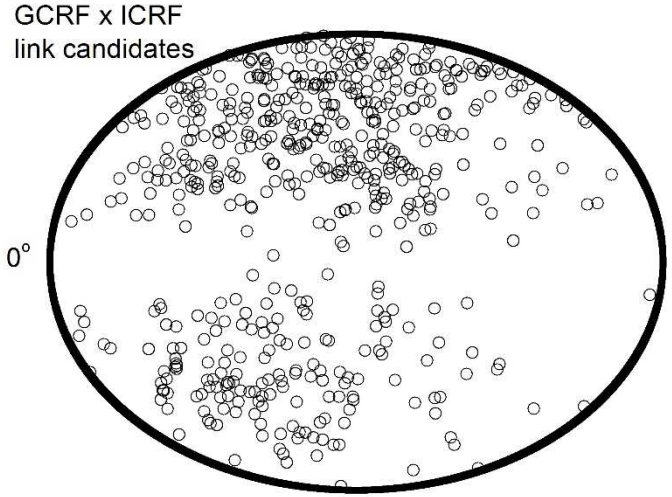
(uneven resolution, it`s true –

but also large wavelength and time length coverage)

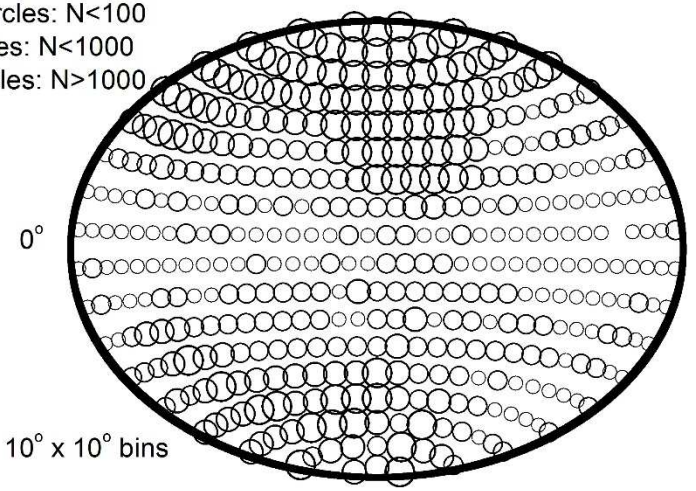
Current Numbers







N: Number of GIQC defining sources
small circles: N<10
medium circles: N<100
larger circles: N<1000
largest circles: N>1000



GAGNES MEETING~ 1670

GAGNES ~ 1670

GAGNES ~ 2070