

WINGS survey of local clusters of galaxies

The database

A. Moretti for the WINGS team
Padova University/INAF-OaPD

Fasano
Poggianti
Bettoni
D'Onofrio
Omizzolo
Gullieuszik
Valentinuzzi
Bindoni

Couch
Dressler
Moles
Kjaergaard
Fritz
Cava
Varela

The survey



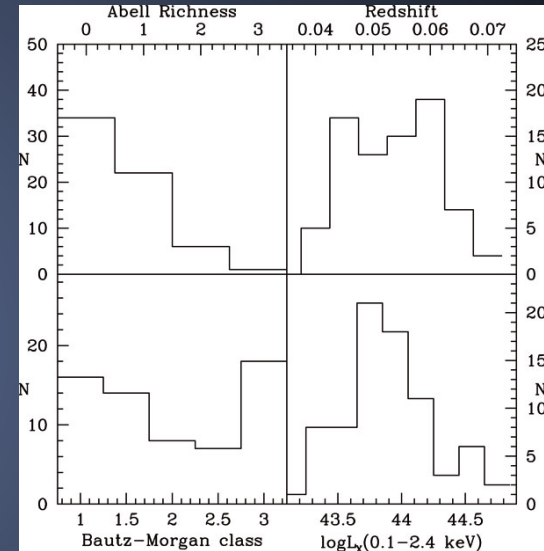
- [Home Page](#)
- [Cluster Sample](#)
- [Optical](#)
- [Near Infrared](#)
- [Spectroscopy](#)
- [People](#)
- [Get Data](#)
- [Contact](#)

Wings Project

WINGS (Wide-field Nearby Galaxy-cluster Survey; Fasano et al. 2002; Fasano et al. 2006) is an all-sky ($|b| > 20$) survey of a complete, X-ray selected sample of galaxy clusters in the redshift range 0.04-0.07. The goal of the WINGS project is the systematic study of the local cosmic variance of the cluster population and of the properties of cluster galaxies as a function of cluster properties and local environment. This data collection allows the definition of a local, 'zero-point' reference against which to gauge the cosmic evolution when compared to more distant clusters.



The core of the WINGS project is the optical (B,V) imaging survey. It provides photometric data for huge samples of galaxies (~550,000) and stars (~190,000) in the inner field (34'x34') of 77 nearby galaxy clusters, as well as structural and morphological information for a sub-sample (~50,000) of relatively bright galaxies. Spectroscopic information for ~6,000 galaxies in 48 WINGS clusters is provided by a follow-up multi-fiber, medium-resolution survey, while additional photometric information comes from follow-up imaging surveys in the NIR (J,K; 28 WINGS clusters) and U-band (18 WINGS clusters). When compared to other literature sky surveys it is clear that WINGS is the only one providing complete and homogeneous data for a huge sample of galaxies in the field of nearby galaxy clusters.



76 clusters
(36 north and 42 south)

$0.04 < z < 0.07$

Fasano et al., 2006



WINGS data (raw)

Photometric

B,V wide field (34'x 34')
(INT, WFI) [WINGS-OPT, 76
clusters]

J, K wide field photometry
(UKIRT) [WINGS-NIR, 28
clusters]

U wide field photometry
(BOK, INT, LBT) [WINGS-U, 9
& 11 clusters]

V,B,u' wide wide field (VST)
[OMEGA-WINGS, 59 clusters]

Spectroscopic

WYFFOS (north) & 2dF
(south) spectra for ~6000
objects [WINGS-SPE, 48
clusters]

WINGS science

B & V photometry

Fasano et al., 2006
Ramella et al., 2007
Fritz et al., 2007
D'Onofrio et al., 2008
Cava et al., 2009
Varela et al., 2009
Valentinuzzi et al., 2009
Poggianti et al., 2009
Fasano et al., 2010

Valentinuzzi et al., 2010
Fritz et al., 2011
Vulcani et al., 2011a
Vulcani et al., 2011b
D'Onofrio et al., 2011
Bettoni et al., 2011
Valentinuzzi et al., 2011
Fasano et al., 2012
Vulcani et al., 2012

V band used for detection/photometry

Big haloes separately analyzed

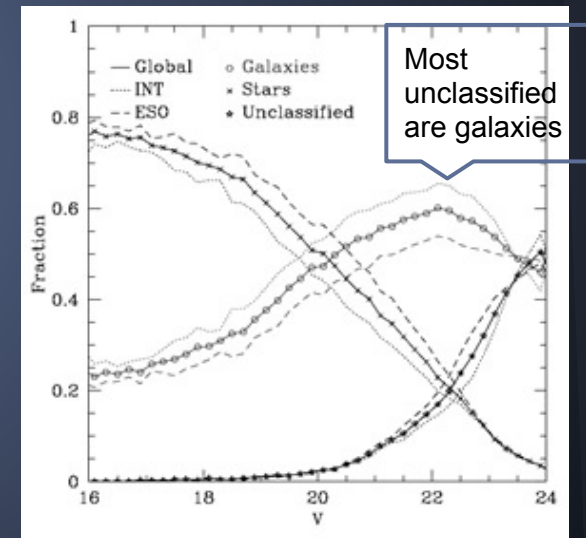
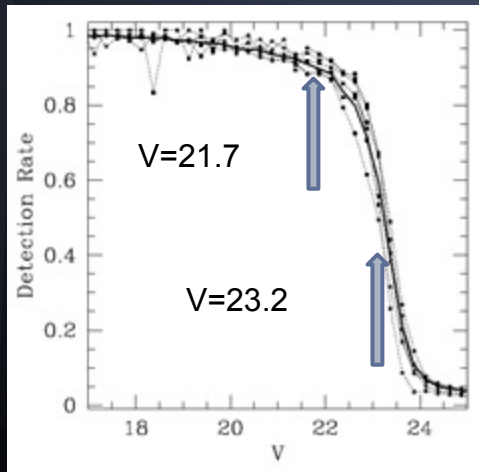
Detection limit at $m_V \sim 25.7$ mag/arcsec² (0.6 deeper than SDSS)

Rejection of detections in only 1 band

Classification using sextractor stellerity

($G_x \leq 0.2$; ~ 400000)

Simulations on each field to compute completeness



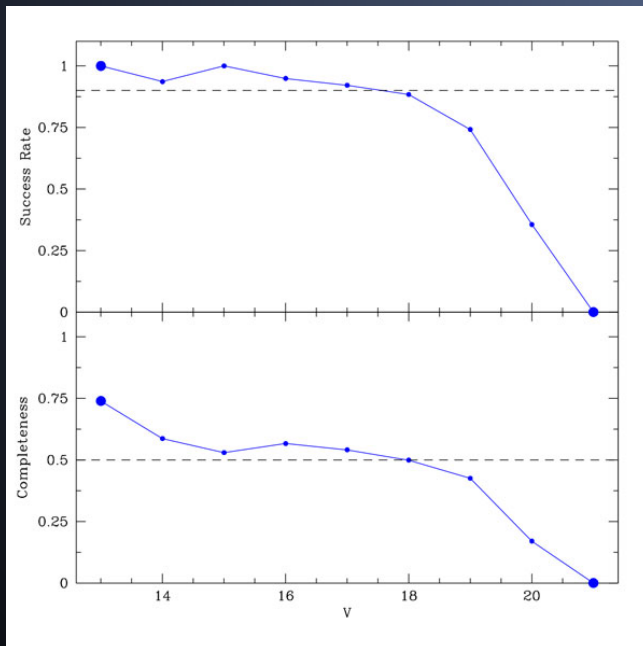
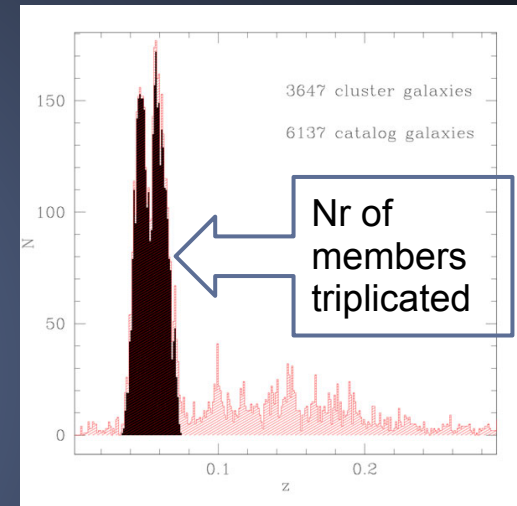
WINGS science

Spectroscopy

Fasano et al., 2006
 Ramella et al., 2007
 Fritz et al., 2007
 D'Onofrio et al., 2008
 Cava et al., 2009
 Varela et al., 2009
 Valentinuzzi et al., 2009
 Poggianti et al., 2009
 Fasano et al., 2010

Valentinuzzi et al., 2010
 Fritz et al., 2011
 Vulcani et al., 2011a
 Vulcani et al., 2011b
 D'Onofrio et al., 2011
 Bettoni et al., 2011
 Valentinuzzi et al., 2011
 Fasano et al., 2012
 Vulcani et al., 2012

48 clusters (26 N, 22 S) - ~6000 galaxies
 (30% of which already in literature)
 WYFFOS@WHT 1.6" 3800-7000 Å
 2dF@AAT 2" 3600-8000 Å



Nr of successful redshift measurement /
 number of spectra
 Nr of spectra / Nr of photometric objects with
 same cuts

SPECTROSCOPIC completeness (to be used
 when studying magnitude limited properties
 (21 clusters have completeness > 50%))

WINGS science

J & K photometry

Fasano et al., 2006
Ramella et al., 2007
Fritz et al., 2007
D'Onofrio et al., 2008
Cava et al., 2009
Varela et al., 2009
Valentinuzzi et al., 2009
Poggianti et al., 2009
Fasano et al., 2010

Valentinuzzi et al., 2010
Fritz et al., 2011
Vulcani et al., 2011a
Vulcani et al., 2011b
D'Onofrio et al., 2011
Bettoni et al., 2011
Valentinuzzi et al., 2011
Fasano et al., 2012
Vulcani et al., 2012

28 clusters (with good sampling of cluster properties)

pixel resolution ~ 0.2 Kpc

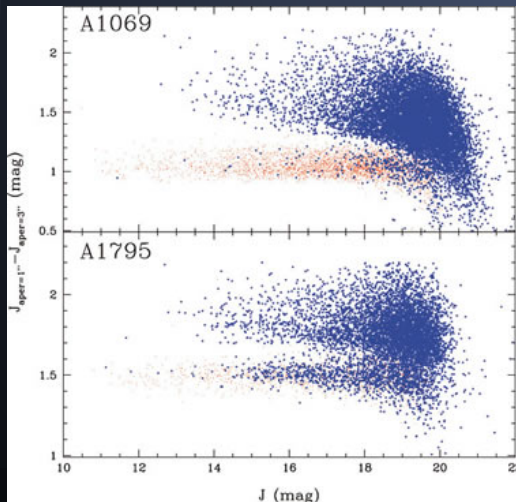
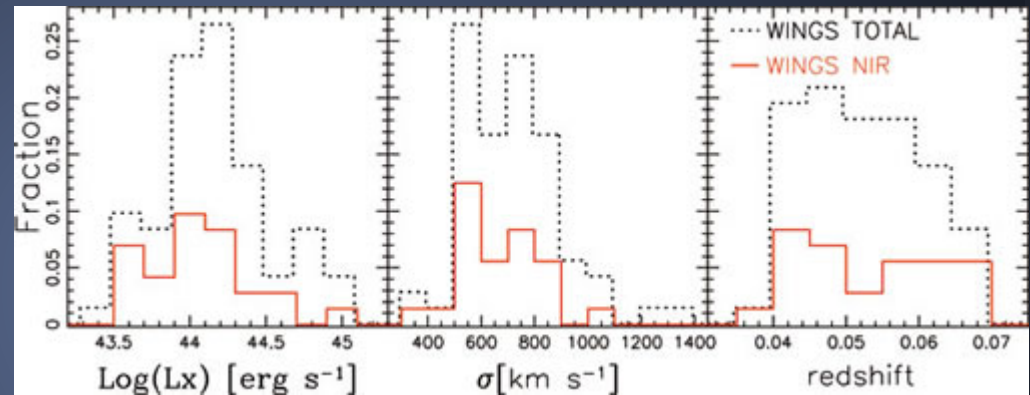
~ 750000 extended sources

90% detection completeness @

J=20.5, K=19.4

90% classification compl. @

J=19.5, K=18.5



Interactive cleaning of galaxy sample (to remove stars)

WINGS science

SED fitting

Fasano et al., 2006
Ramella et al., 2007
Fritz et al., 2007
D'Onofrio et al., 2008
Cava et al., 2009
Varela et al., 2009
Valentinuzzi et al., 2009
Poggianti et al., 2009
Fasano et al., 2010

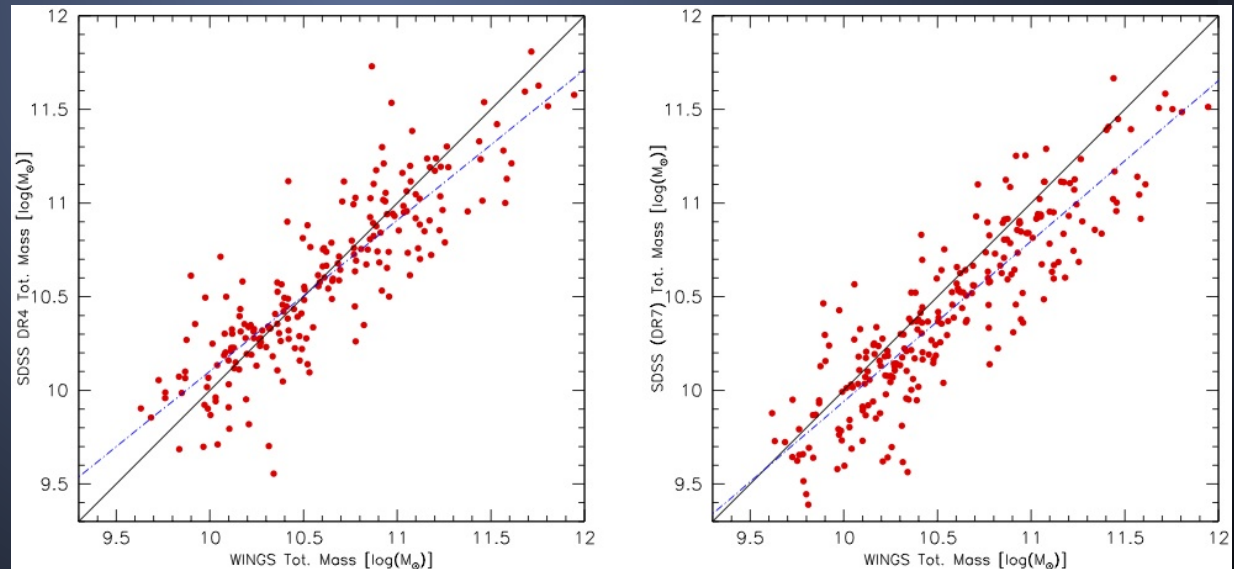
Valentinuzzi et al., 2010
Fritz et al., 2011
Vulcani et al., 2001a
Vulcani et al., 2001b
D'Onofrio et al., 2011
Bettoni et al., 2011
Valentinuzzi et al., 2011
Fasano et al., 2012
Vulcani et al., 2012

SED fit on ~5300 galaxies
(12 ages, 3 metallicities)
70% with chi-sq < 3.0

->Stellar masses

->Star Formation
Histories

->Ages (MW & LW)

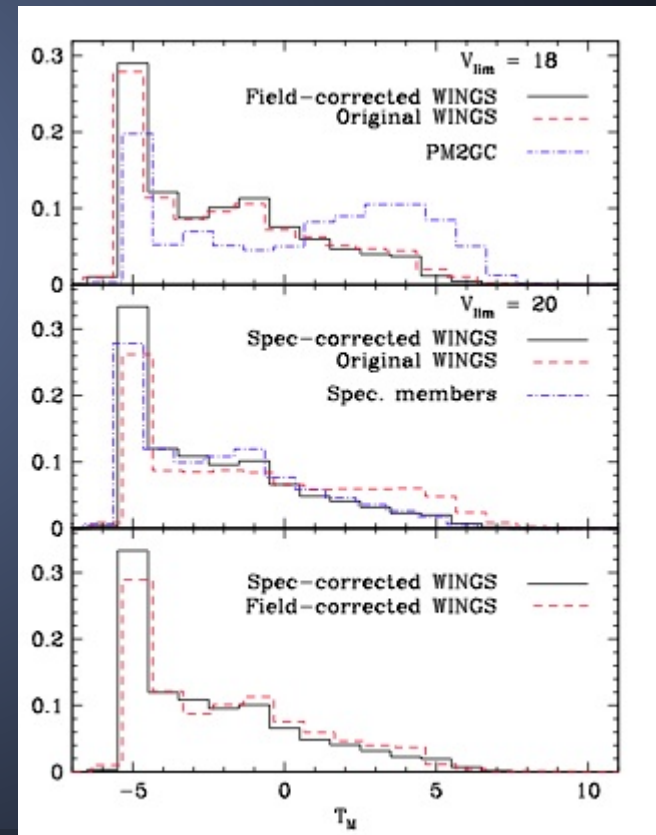
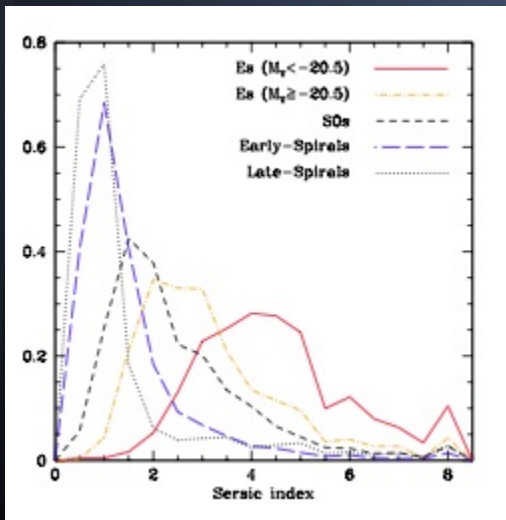


WINGS science

Fasano et al., 2006
 Ramella et al., 2007
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 Cava et al., 2009
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 Poggianti et al., 2009
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 Vulcani et al., 2011b
 D'Onofrio et al., 2011
 Bettoni et al., 2011
 Valentinuzzi et al., 2011
Fasano et al., 2012
 Vulcani et al., 2012

MORPHOT: automatic classification of morphological types based on
 21 diagnostics & ML + NN technique
 Validation using ~ 1000 visually class. galaxies
 [particularly efficient in separating E and S0,
 unlike other automatic tools]

-> M type for ~ 40000 WINGS galaxies



WINGS WiP

Moretti et al. [LF]

Moretti et al. [Database]

Gullieuszik et al. [OmegaWINGS]

Omizzolo et al. [U,B]

Fasano et al. [Morph/Density]

Hanssen et al. [Lick indices]

Marziani et al. [AGN]

Bindoni et al. [Surf. photom.]

OmegaWINGS

Moretti et al. [LF]
Moretti et al. [Database]
Gullieuszik et al. [OmegaWINGS]
Omizzolo et al. [U,B]
Fasano et al. [Morph/Density]
Hanssen et al. [Lick indices]
Marziani et al. [AGN]
Bindoni et al. [Surf. photom.]

Motivations:

study outskirts of clusters and the infalling regions, where clusters accrete new galaxies.
morphologies, sizes, structural parameter in different vs. distance from the center

Data:

u', B- and V- band OmegaCAM imaging for all WINGS clusters
observable from Paranal (59/76)

2 observing programs in GTO time (PI Poggianti [BV] and D'Onofrio [U]). 60+60 hrs

Observations started 1 year ago (ESO P88) [18 clusters already observed]

The two programs will be likely completed in ~1year (end of ESO P92)

Data-reduction:

ESO/MVM or "Alambic" + simple Python scripts.

Completed automated pipeline. From raw telescope frames to stacked mosaics

OmegaWINGS

Moretti et al. [LF]
Moretti et al. [Database]
Gullieuszik et al. [OmegaWINGS]
Omizzolo et al. [U,B]
Fasano et al. [Morph/Density]
Hanssen et al. [Lick indices]
Marziani et al. [AGN]
Bindoni et al. [Surf. photom.]

Photometric calibration:

CCDs gain variation: calculated from background value

Illumination correction: based on dithered observations of SA107

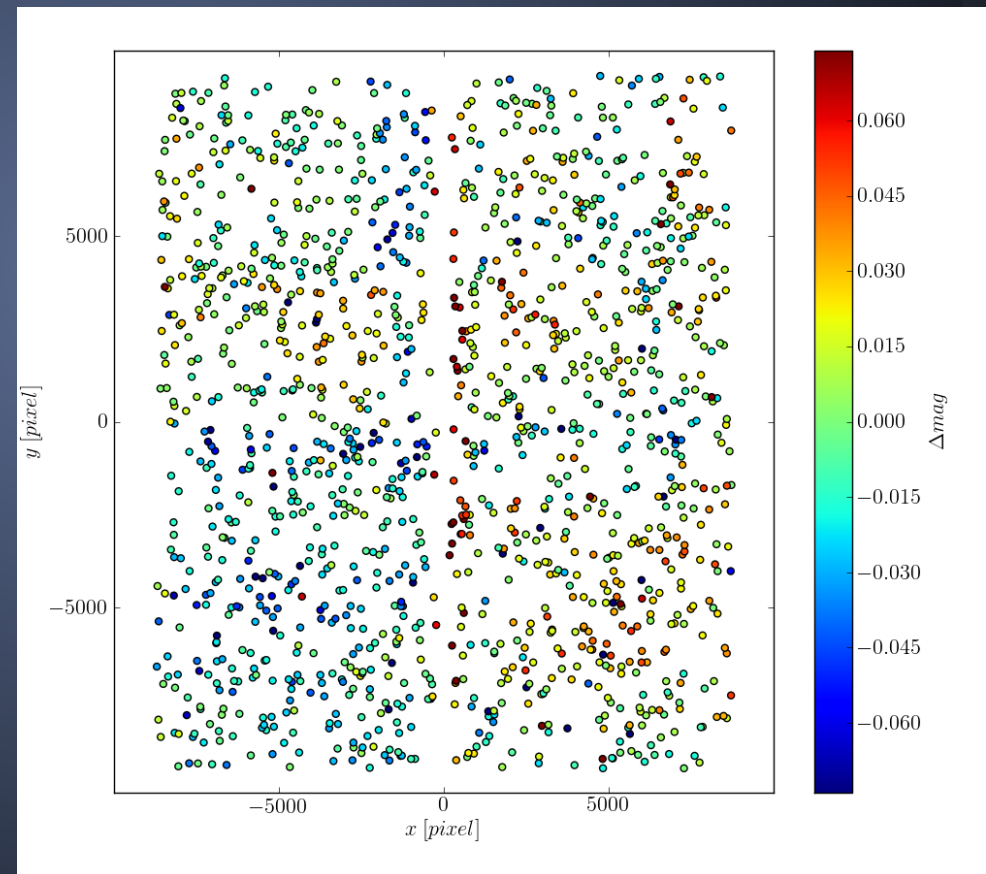
[up to 0.2 mag]

ZP and Colour terms:

by comparison with previous WINGS photometry

Astrometric calibration:

SDSS DR8 (when available) or 2MASS



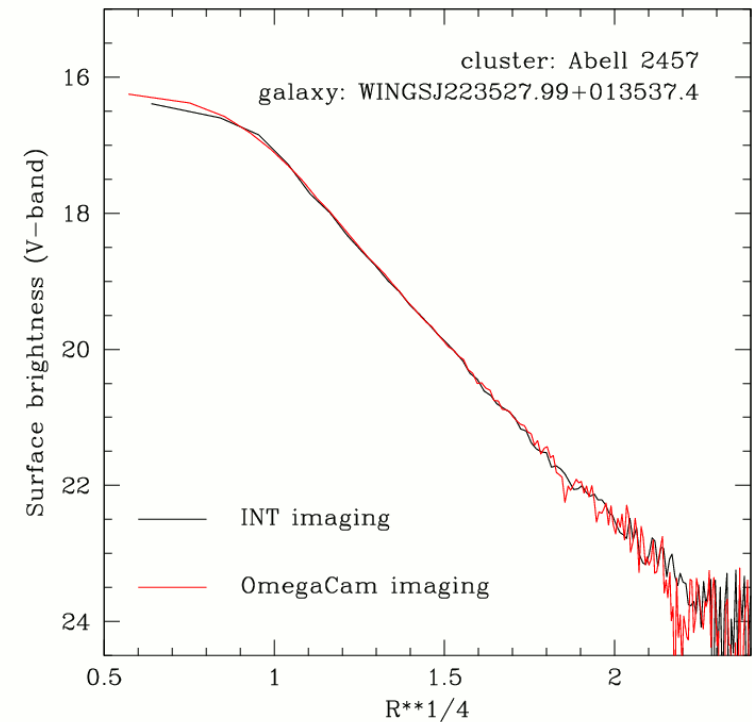
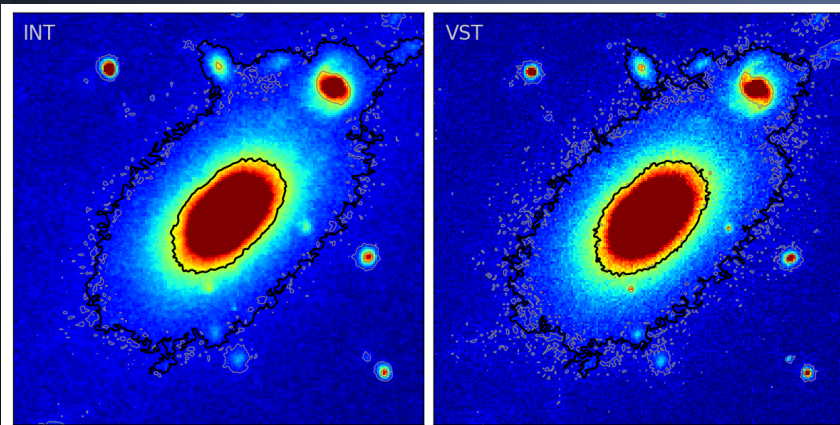
SDSS DR8 -> Johnson (Jordi et al., 2005) [Entire field]

OmegaWINGS

Moretti et al. [LF]
Moretti et al. [Database]
Gullieuszik et al. [OmegaWINGS]
Omizzolo et al. [U,B]
Fasano et al. [Morph/Density]
Hanssen et al. [Lick indices]
Marziani et al. [AGN]
Bindoni et al. [Surf. photom.]

Sky subtraction

2step combination of
dithered images
+ source masking



WINGS data (catalogs)



CDS



VO [NEW]



In publ.

Optical photometry (~759000) and surface photometry (~42000)

NIR photometry (~960000 [k] ~630000[j]) and surface photometry (~72000 [k])

SFH (~5300)

Morphologies (~40000)

EW (~4400)

Local densities (~66000)

Lick indices (~4500)

The VO tools and WINGS

thanks to IA2 team in Trieste

34'x34' B, V images for 76 clusters available (Aladin, TOPCAT)

Mosaic

Fully calibrated (astro+photo)

Ready to download and use

Surface photometry (V, K)
catalogs

Equivalent widths catalogs

Local densities catalogs
[Unpublished yet]



The VO tools and WINGS: how to

SIA query

Registry: euro-vo

Keyword: WINGS

SIA parameters: Optional

Send table to Aladin

Simple Image Access (SIA) Query

Available SIA Services

Registry: <http://registry.euro-vo.org/services/RegistrySearch>

Keywords: wings

Match Fields: Short Name Title Subjects ID Publisher Description

Accept Resource Lists

Short Name	Title	Subjects	Identifier	Publisher	Contact
WINGSOptIma	WINGS Optical wide--field images	imaging survey optical	ivo://ia2.inaf.it/hosted/wings/siap/opt	IA2	Alessia Moretti <alessia.mor...

AccessURL Description Version

SIA Parameters

SIA URL:

Object Name: A1831

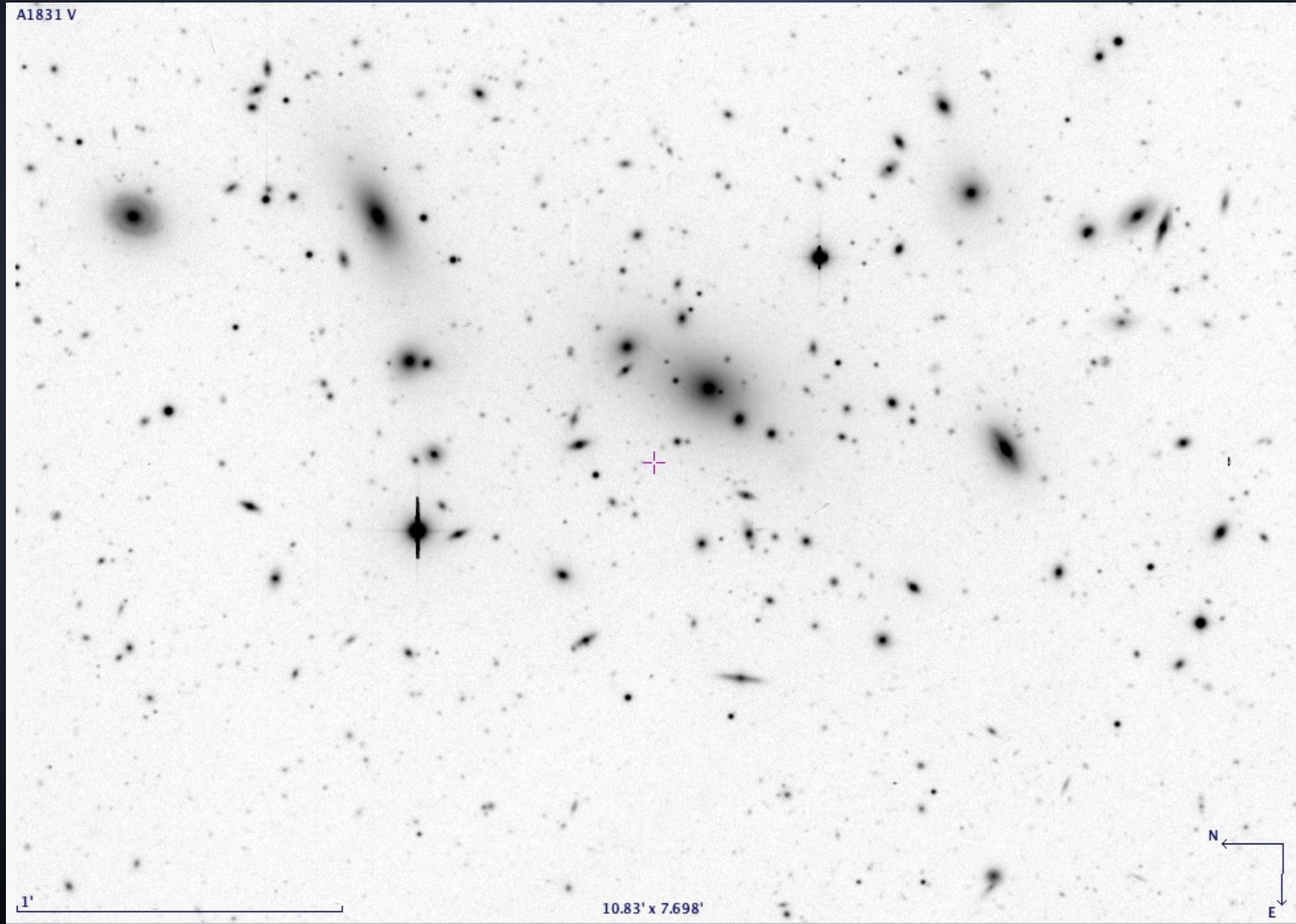
RA: 209.7925 degrees (J2000) Accept Sky Positions

Dec: 27.99111 degrees (J2000)

Angular Size: 1 degrees

Image Format: image/fits

The VO tools and WINGS: how to



The VO tools and WINGS: how to

Cone search

Registry: euro-vo

Keyword: WINGS

cone parameters: Optional

Send table to Aladin

The screenshot shows the 'Cone Search' window with the following details:

- Registry:** `http://registry.euro-vo.org/services/RegistrySearch` (highlighted in red)
- Keywords:** wings
- Match Fields:** Short Name, Title, Subjects, ID, Publisher (checked); Description (unchecked)
- Accept Resource Lists:** checked
- Buttons:** Cancel Query, Submit Query
- Search Results Table:**

Short Name	Title	Subjects	Idc
J/A+A/470/39	Substructures in WINGS clusters (Ramella+, 2007)	Clusters_of_galaxies	ivo
J/A+A/495/707	WINGS spectroscopy of 48 galaxy clusters (Cava+, 2009)	Clusters_of_galaxies, Velocities, Redshifts	ivo
J/A+A/497/667	WINGS: Deep optical phot. of 77 nearby clusters (Varela+, 2009)	Clusters_of_galaxies, Photometry, Galaxies	ivo
J/A+A/501/851	WINGS JK photometry of 28 galaxy clusters (Valentinuzzi+, 2009)	Clusters_of_galaxies, Photometry, Galaxies	ivo
J/A+A/526/A45	WINGS-SPE II catalog (Fritz+, 2011)	Clusters_of_galaxies, Photometry, Galaxies, Photometry:wide-band	ivo
J/ApJS/173/85	HI 21cm forbidden-velocity wings (Kang+, 2007)	Interstellar_Medium	ivo
J/MNRAS/420/926	Morphology of galaxies in WINGS clusters (Fasano+, 2012)	Clusters_of_galaxies, Galaxies	ivo
WINGSwidth	WINGS equivalent widths	optical lines equivalent width catalog	ivo
WINGSGasphotk	WINGS K surface photometry	surface brightness galaxies catalog	ivo
WINGSGasphotv	WINGS V surface photometry	surface brightness galaxies catalog	ivo
WINGSLocDens19.5	WINGS local densities ($M_V < -19.5$)	galaxies local density catalog	ivo

Below the table is a scroll bar and a table with columns: AccessURL, Description, Version.

Cone Parameters

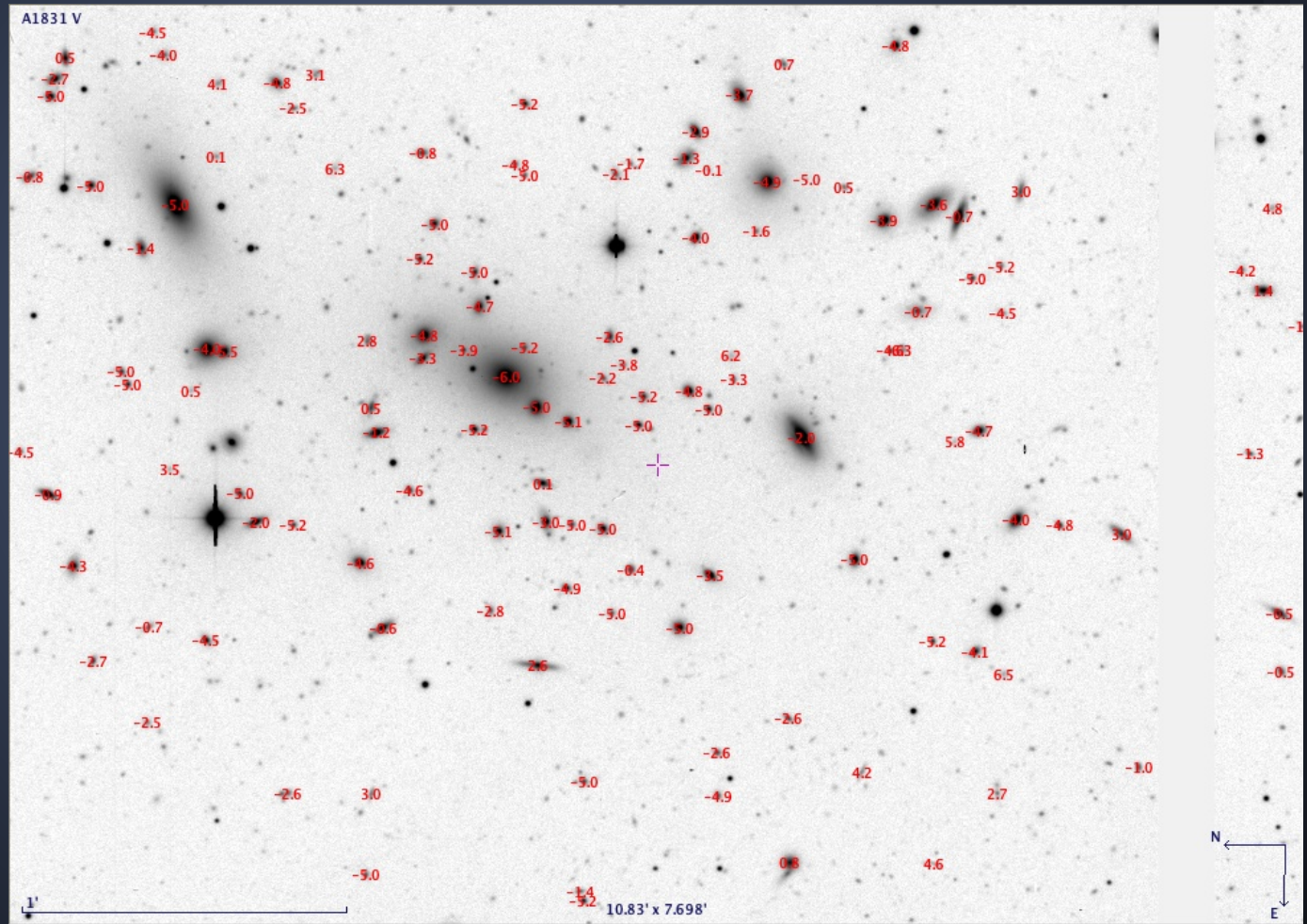
- Cone URL:
- Object Name: **Resolve**
- RA: degrees (J2000)
- Dec: degrees (J2000)
- Radius: degrees
- Accept Sky Positions

OK

The VO tools and WINGS: how to

Morphologies:

derived by
MORPHOT (and
visual, if any)
+ errors



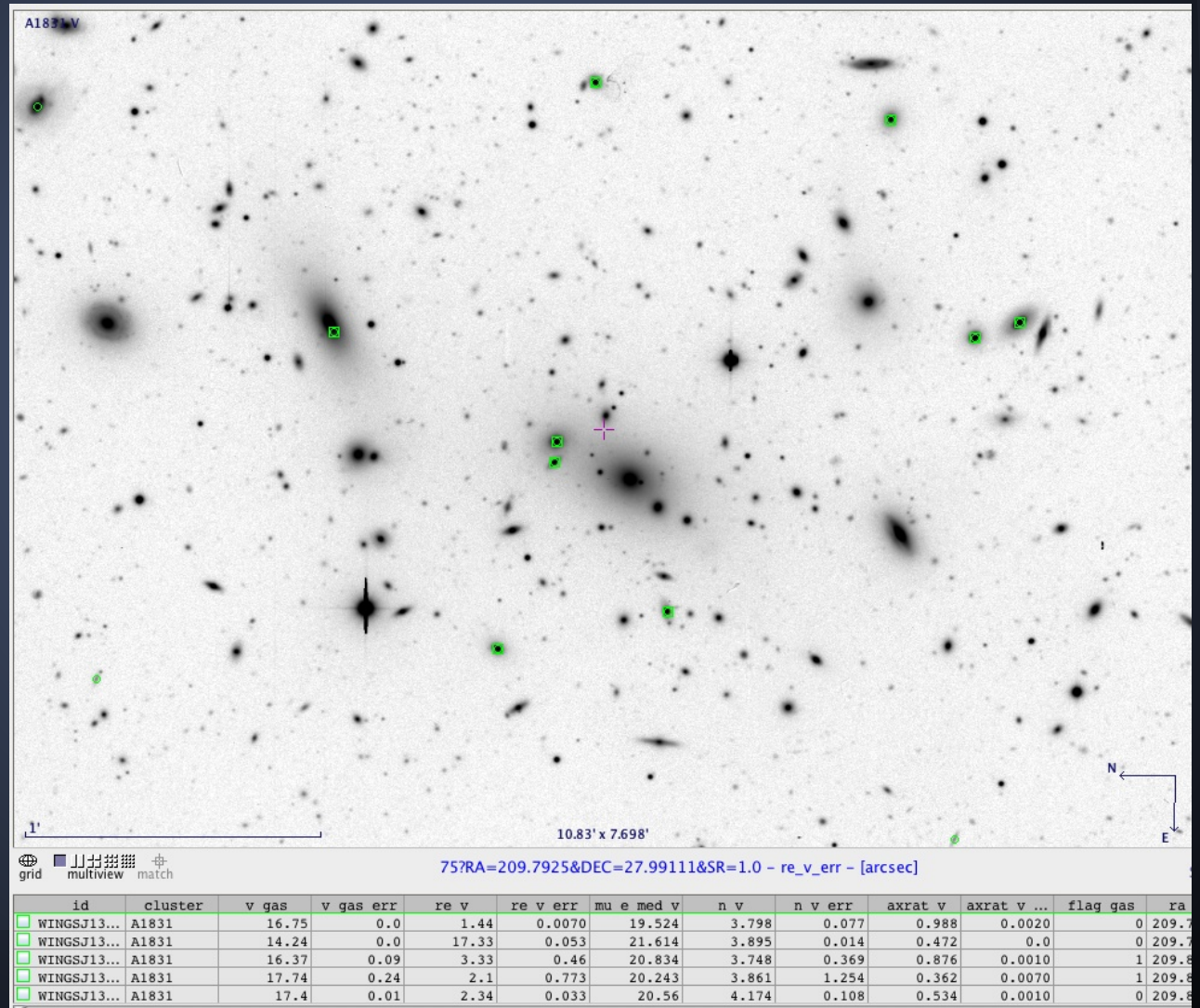
The VO tools and WINGS: how to

Gasphot catalog (V, K)

-> Surf. brightness

-> Sersic index

-> Axial ratio

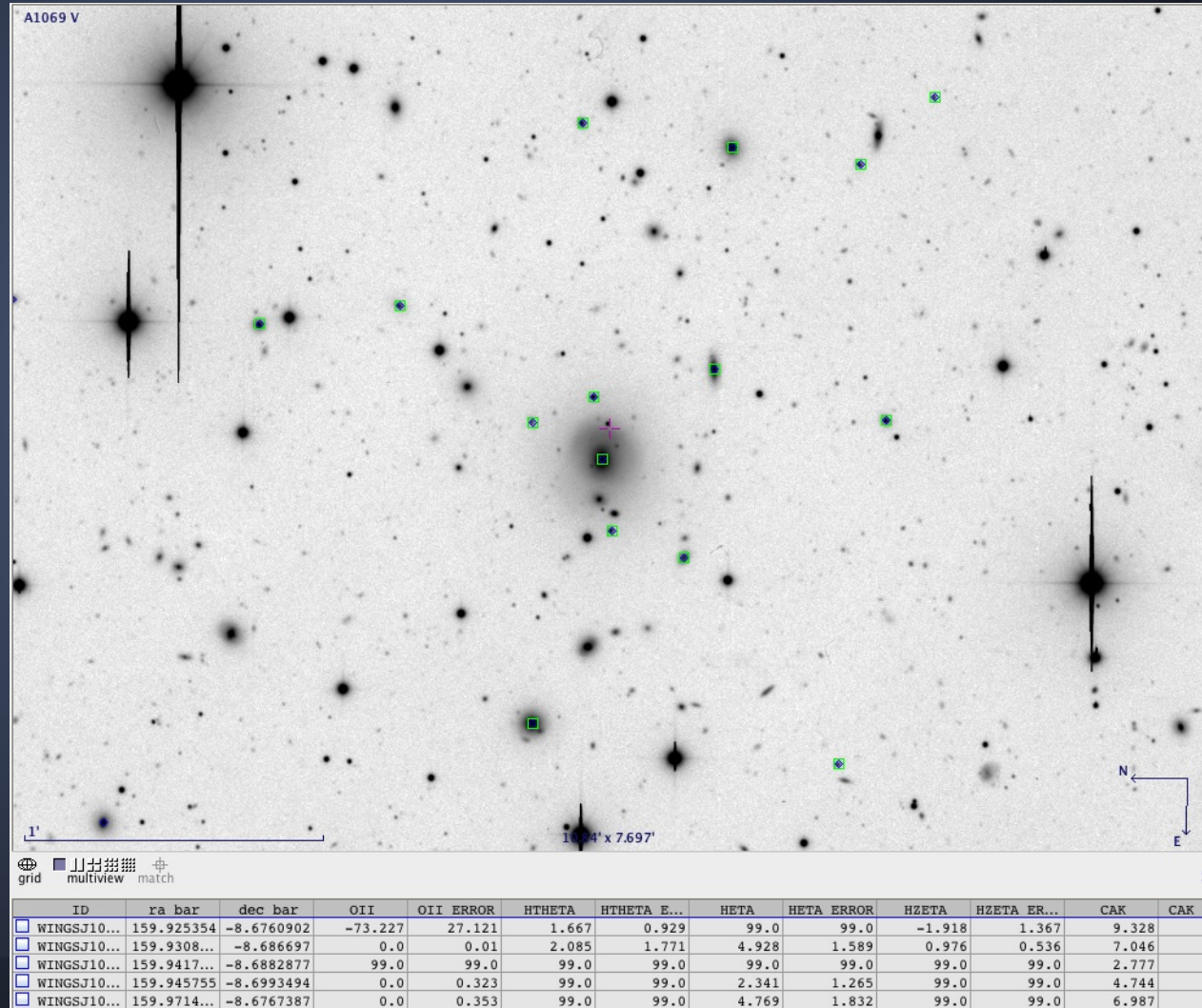


The VO tools and WINGS: how to

Eqwidth catalog:

-> emission and absorption lines

-> spectral type [1=e(a);
2=e(b); 3=e(c); 4=k;
5=k+a; 6=a+k]



Concluding remarks: USE WINGS!

Cone Search

Available Cone Services

Registry: <http://registry.euro-vo.org/services/RegistrySearch>

Keywords: wings And

Match Fields: Short Name Title Subjects ID Publisher Description

Accept Resource Lists Cancel Query Submit Query

Short Name	Title	Subjects	Id
J/A+A/470/39	Substructures in WINGS clusters (Ramella+, 2007)	Clusters_of_galaxies	ivo
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J/ApJ/173/85	HI 21cm forbidden-velocity wings (Kang+, 2007)	Interstellar_Medium	ivo
1/MNRAS/420/926	Morphology of galaxies in WINGS clusters (Fasano+ 2012)	Clusters_of_galaxies, Galaxies	ivo
WINGS _{eqwidth}	WINGS equivalent widths	optical lines equivalent width catalog	ivo
WINGS _{Gasphotk}	WINGS K surface photometry	surface brightness galaxies catalog	ivo
WINGS _{Gasphotv}	WINGS V surface photometry	surface brightness galaxies catalog	ivo
WINGS _{LocDens19.5}	WINGS local densities (M _v <-19.5)	galaxies local density catalog	ivo

AccessURL Description Version

Cone Parameters

Cone URL:

Object Name: Resolve

RA: degrees (J2000) Accept Sky Positions

Dec: degrees (J2000)

Radius: degrees

OK