OMEGACAM GTO
Italian share

Enrico Cappellaro

Istituto Nazionale di Astrofisica - Osservatorio Astronomico di Padova

OMEGACAM GTO - Italian share

Enrico Cappellaro

Hripsime Navasardyan

Andrea Baruffolo

Paolo Bagnara

Alessandro Bortolussi

Carlo Magagna

Luigi De Pizzol

Laura Greggio

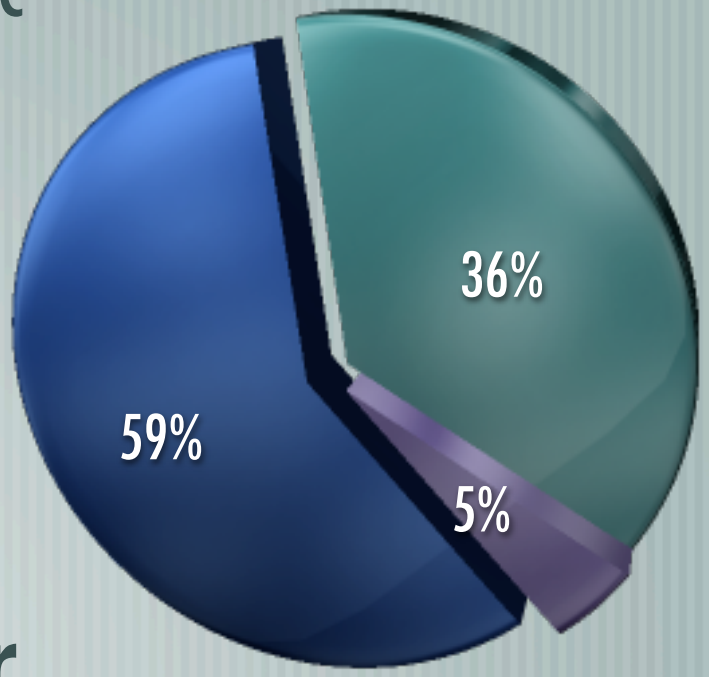
Enrico Cascone

CNAA+INAF

OAPD

OAC

1.2 Meuro



12 nights/yr

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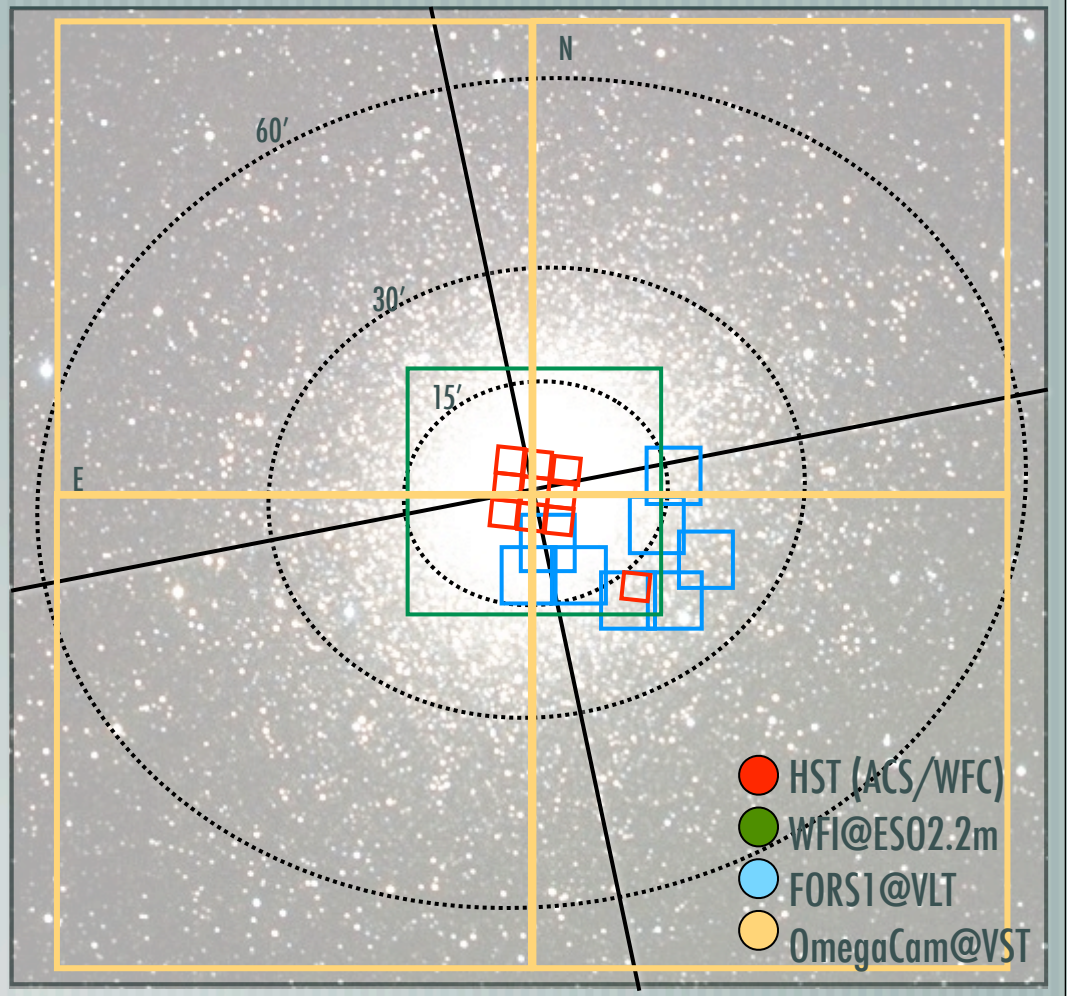
Target	P.I.	Technique	length [yr]	time [h]	1°yr	2°yr	VST
GC ω Centauri	Piotto	Accurate Astrometry and stellar photometry	5	46	23	-	-
Galaxy Structure	Momany	Stellar photometry	2	35		35	-
Local Dwarf Galaxies	Held	Stellar photometry in crowded fields	4	128	32	32	135
OmegaWINGS	Poggianti (D'Onofrio)	Surface brightness and morphology	2	60	30	30	90
SuDaRE	Cappellaro	Transient search	4	128	32	32	128

Photometry and Astrometry of the Galactic GC ωCen

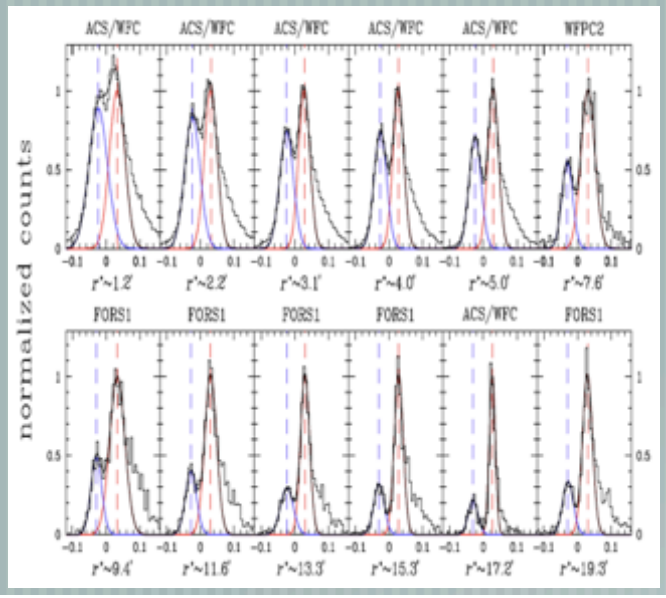
Piotto G. (PI), Ortolani S. , Momany Y., Cassisi S., Anderson Y, Bedin L. R., Bellini A., Milone A.P., Marino A. F.

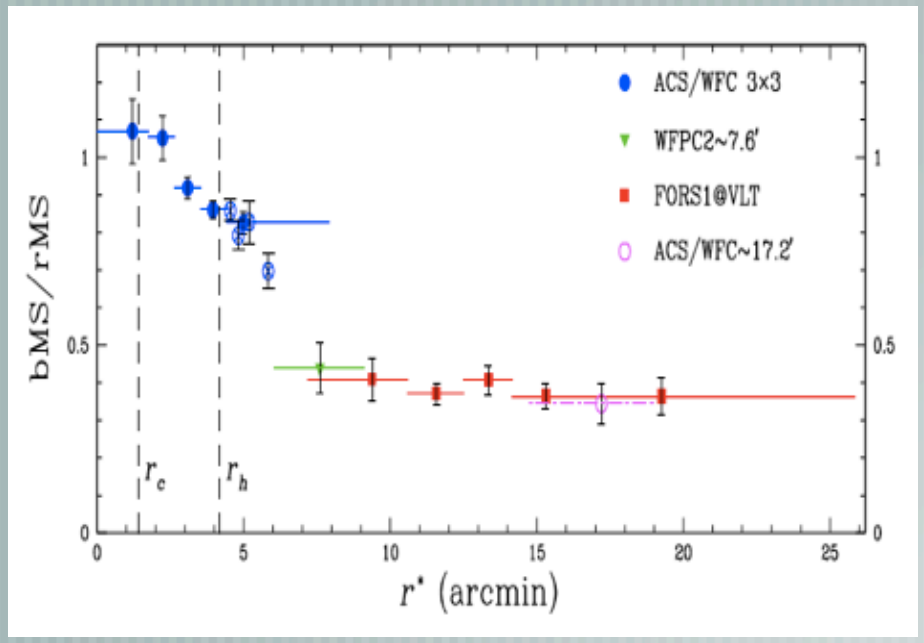
A complete photometric and astrometric investigation of ωCen up to its tidal radius and beyond

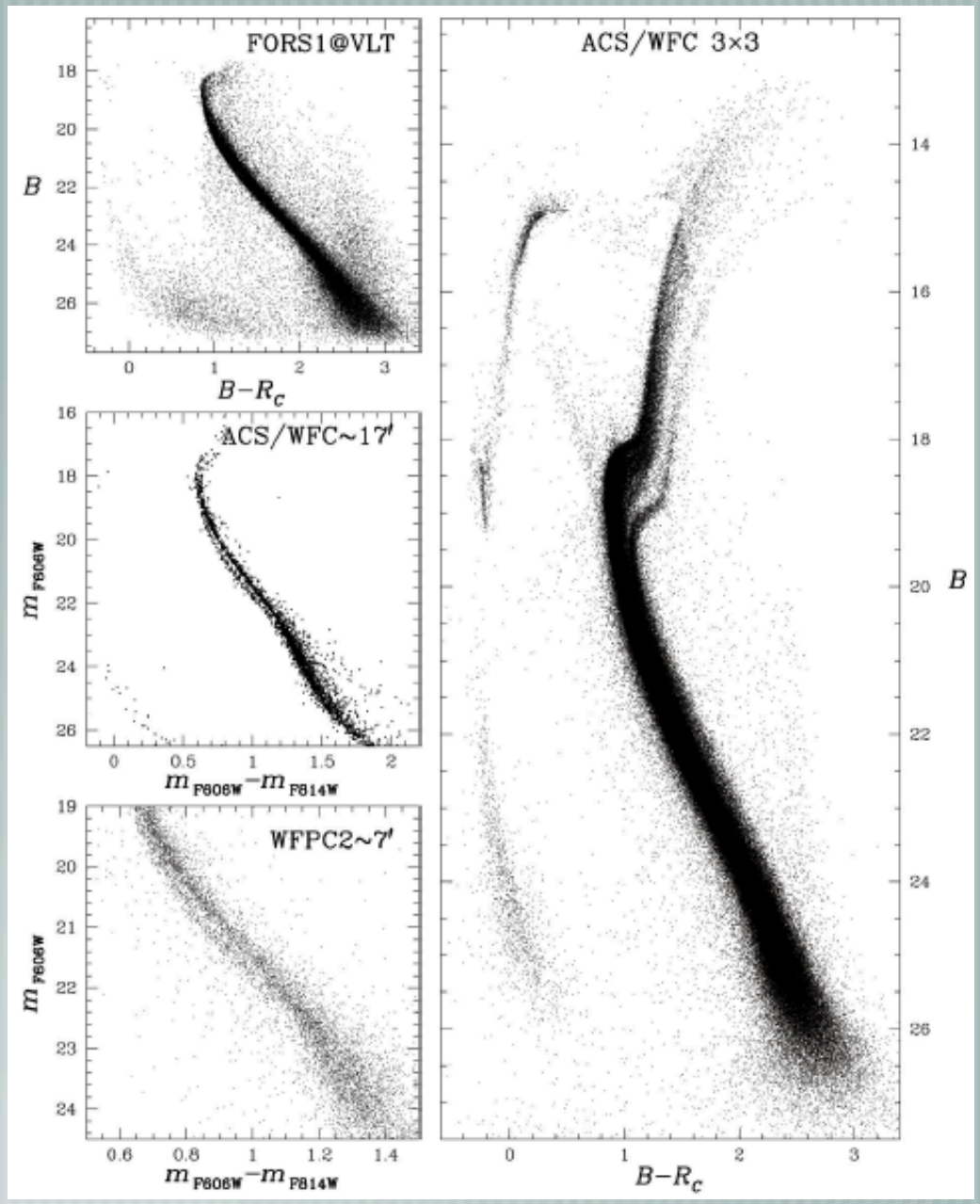
- Map of ω Cen stellar content from the RGB tip to 3 mag below the TO
- Radial distribution of multiple populations
- Proper motions (CMD cleaning, stellar/ population kinematics, cluster rotation field)
- Stellar variability



Main-Sequence radial distribution







Fill the gap between r=6′-8′ and extend the analysis up to the tidal radius

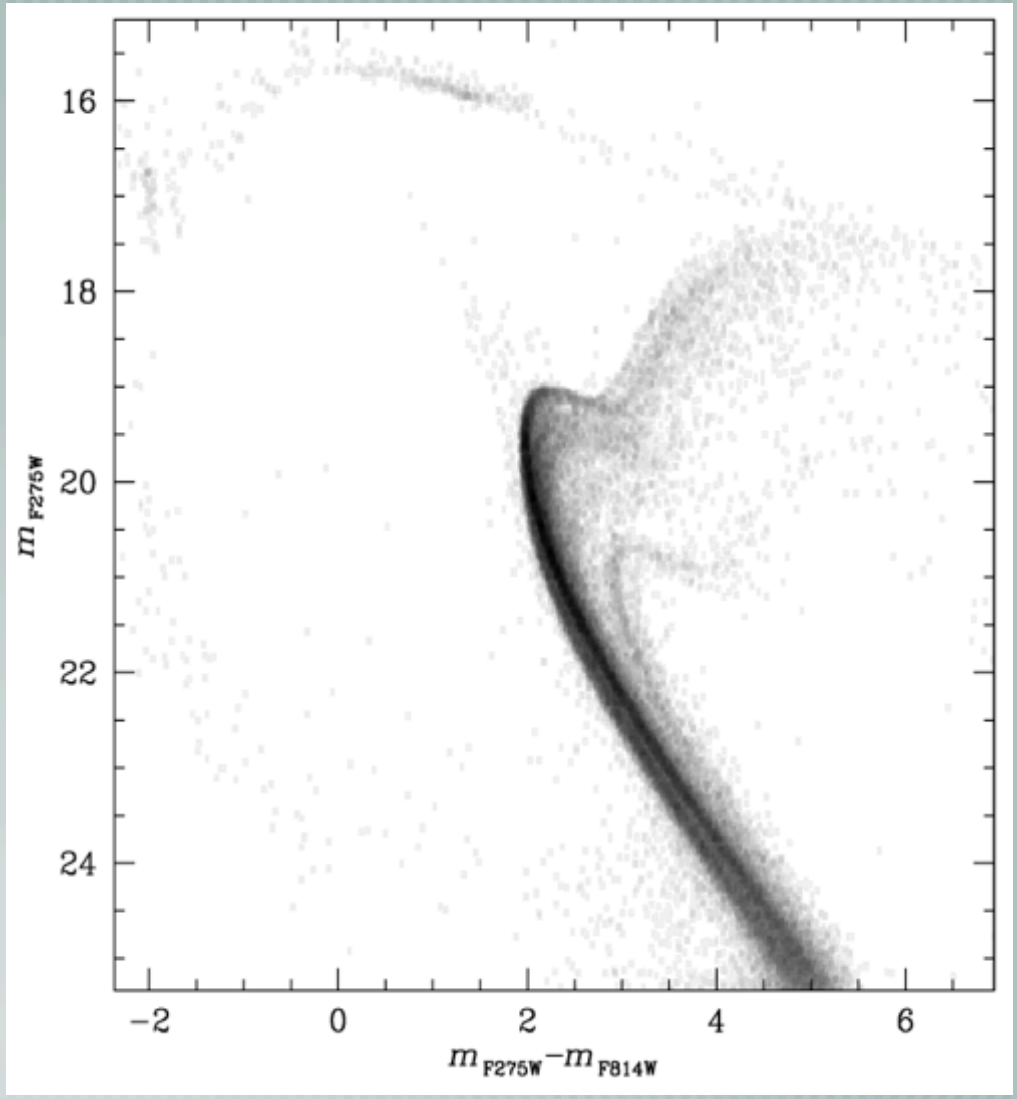
Photometry and Astrometry of the Galactic GC ωCen

Observing strategy

- 2 epochs - 5 years apart
- 2 filters (B,V TBD)
- 4 VST fields (2°x 2° FoV)
- 100 dithered exposures per field, filter, epoch
- Total time: 23h x 2 epochs

expected proper-motion error:

σ_{pm}=0.15 mas yr^{-1}



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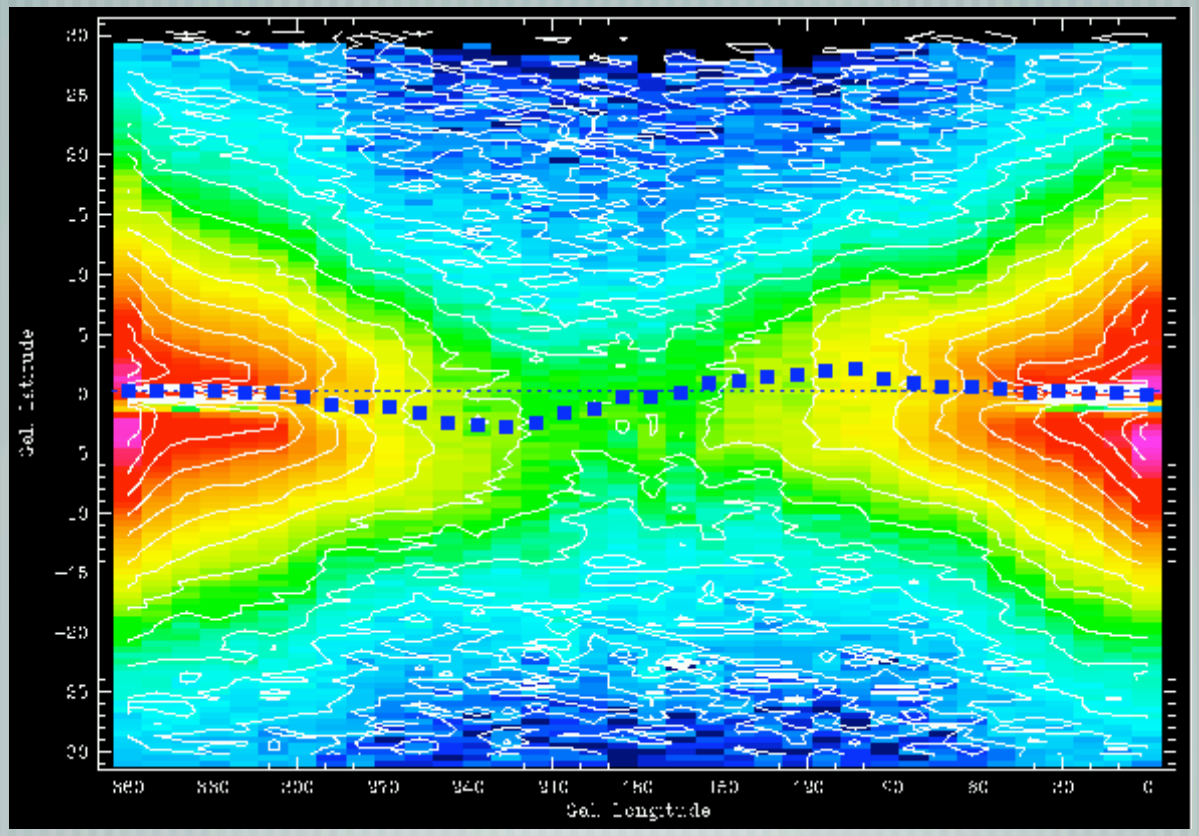
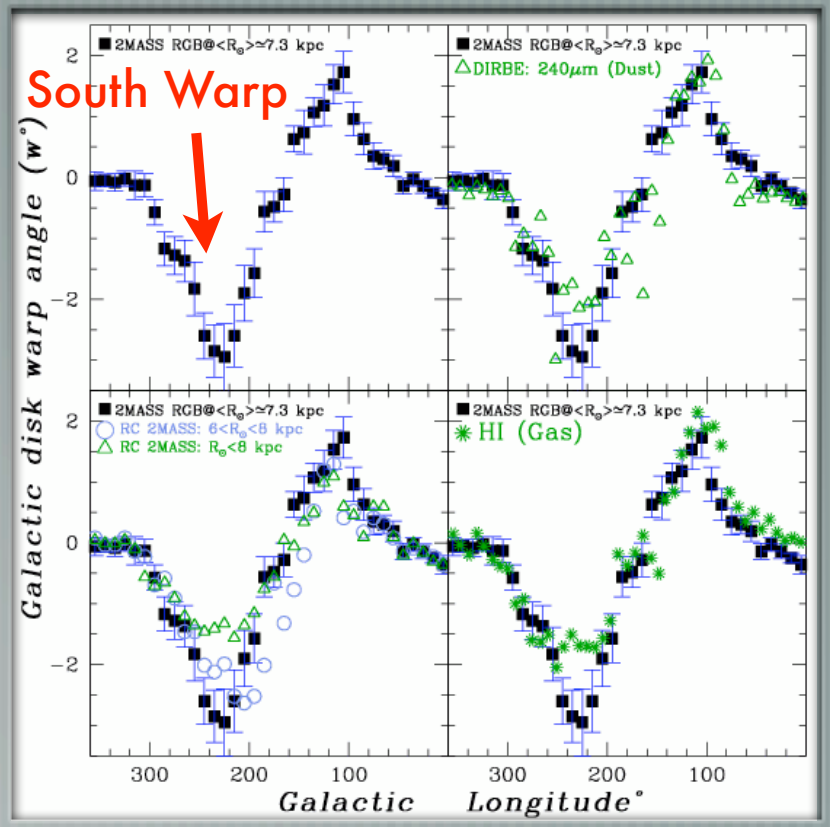
OMEGA-WARP

Momany Y., Zaggia S. - INAF-OA Padova
Piotto G., Ortolani S., Carraro G. - Dip. Astro. UNIV. Padova
Bedin R. - STScI Baltimore

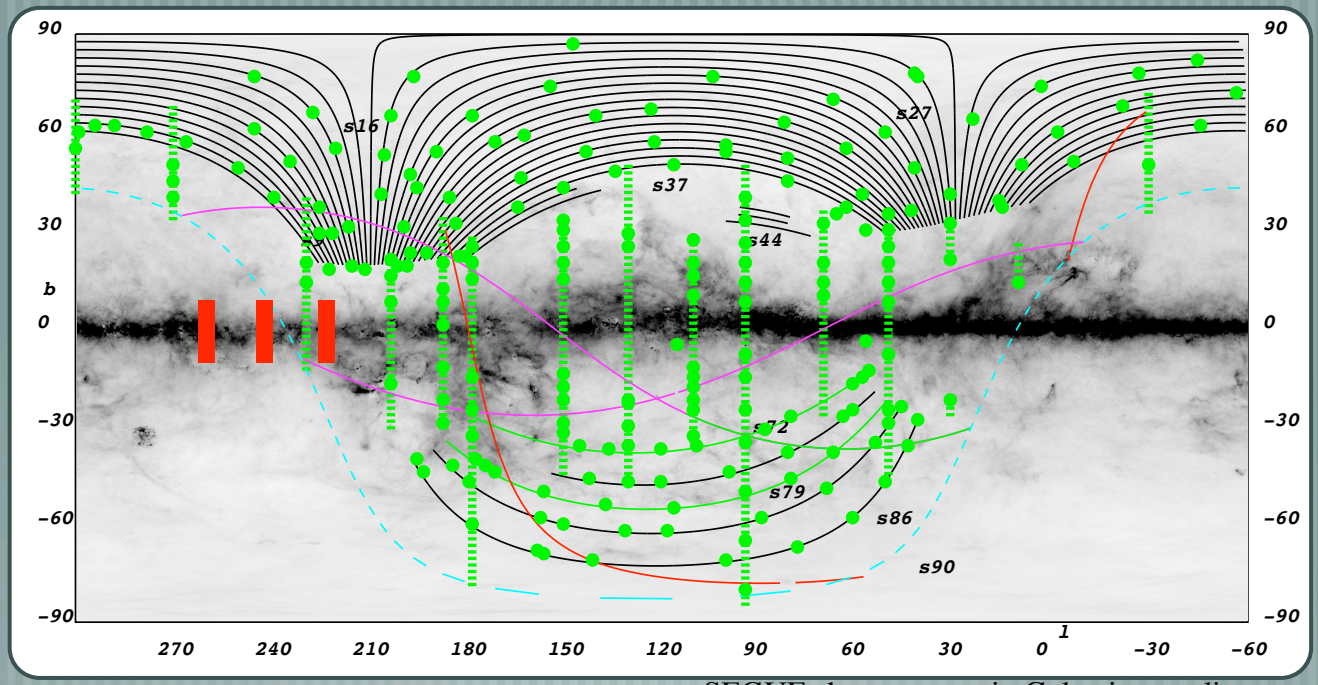


The Galactic Warp

- The Southern part of the Warp is seen as an overdensity in the Canis Maior region, 210<l<260.
- Origin and extent of the Warp and associated Flare are still unknown
- Traced already in gas and dust the stellar counterpart is still lacking a complete mapping with good tracers (Red Clump, HB) at low latitudes



A survey centered on the Southern Warp



SEGUE sky coverage in Galactic coordinates

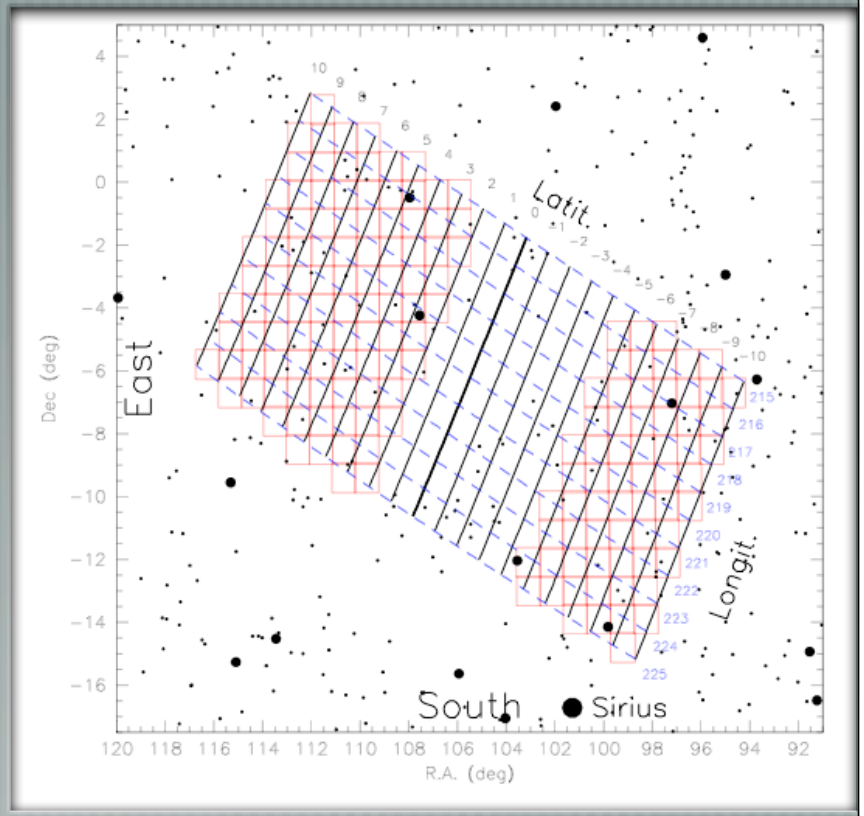
The goals of the survey are:

- extend the knowledge of the stellar population and star formation history of the disk out to its outer edge, 20kpc in the direction of the south warp
- have a clear view of the vertical structure of the outer disk
- understand the origin of the warp: accretion of satellite; cosmic infall; spontaneous disk bending.

OMEGA-WARP

Survey specs

- 3 stripes 2^ox20^o long across the disk, centered at l=220°, 240°, 260°
- along the path of the Carina orbit.
- 2 colors g,i down to g=23.5, i=23.0, S/N=10
- easily performed in <u>bright time</u>
- 28 min per pointing
- Time request: 65 hours



Exploiting available WFI partial coverage of the stripes to obtain 5 mas precision proper motions.

Synergies with VISTA Hemisphere Survey, VST STREGA (Carina Stream), VST VPHAS+

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Scientific Background:
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Observationg Techniques:
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Zaggia S., Grado A., Limatola L., Capaccioli M. 2010, "The tidal tailof the Globular Cluster NGC2808", A&A, submitted

Omegacam survey of Local Group dwarf galaxies

P.I.s: E. V. Held (Padova), E. Tolstoy (Groningen)

Institutes:

Italy: Osservatorio Astronomico di Padova, INAF
Netherlands: University of Groningen
USA: Joint Astronomical Center
ESO: ESO Garching and Santiago

Targets: 10 dwarf galaxies of the Local Group

Science Aims

- accurate determination of spatially resolved star-formation histories of dwarf galaxies of the Local Group over their full extension
- study of extra-tidal stellar structures using different tracers, in particular horizontal branch stars (NB. large-scale tidal streams will be followed up by dedicated GTO proposals).

Survey specs

BVi (or gri) mapping beyond the nominal tidal radius: 1, 9, or 16 sq. deg. around each galaxy depending on the galaxy size.
Target S/N ratio is 15 at B=24.4, V=23.5 and i=22.6.

Time request

128h (32h x 4) over the first 4 yr; dark (70%) + grey (30%) time;
(comparable contribution from the Dutch partner).

Local Group dwarf galaxies
VST-GTO extension

Science goals

A) characterize the physics of young/massive stars in star-forming dwarfs; young stars, HB and blue stragglers in dwarf spheroidals.

B) accurate and timely determination of the basic properties (structure, distance, metallicity) of newly discovered dwarf galaxies

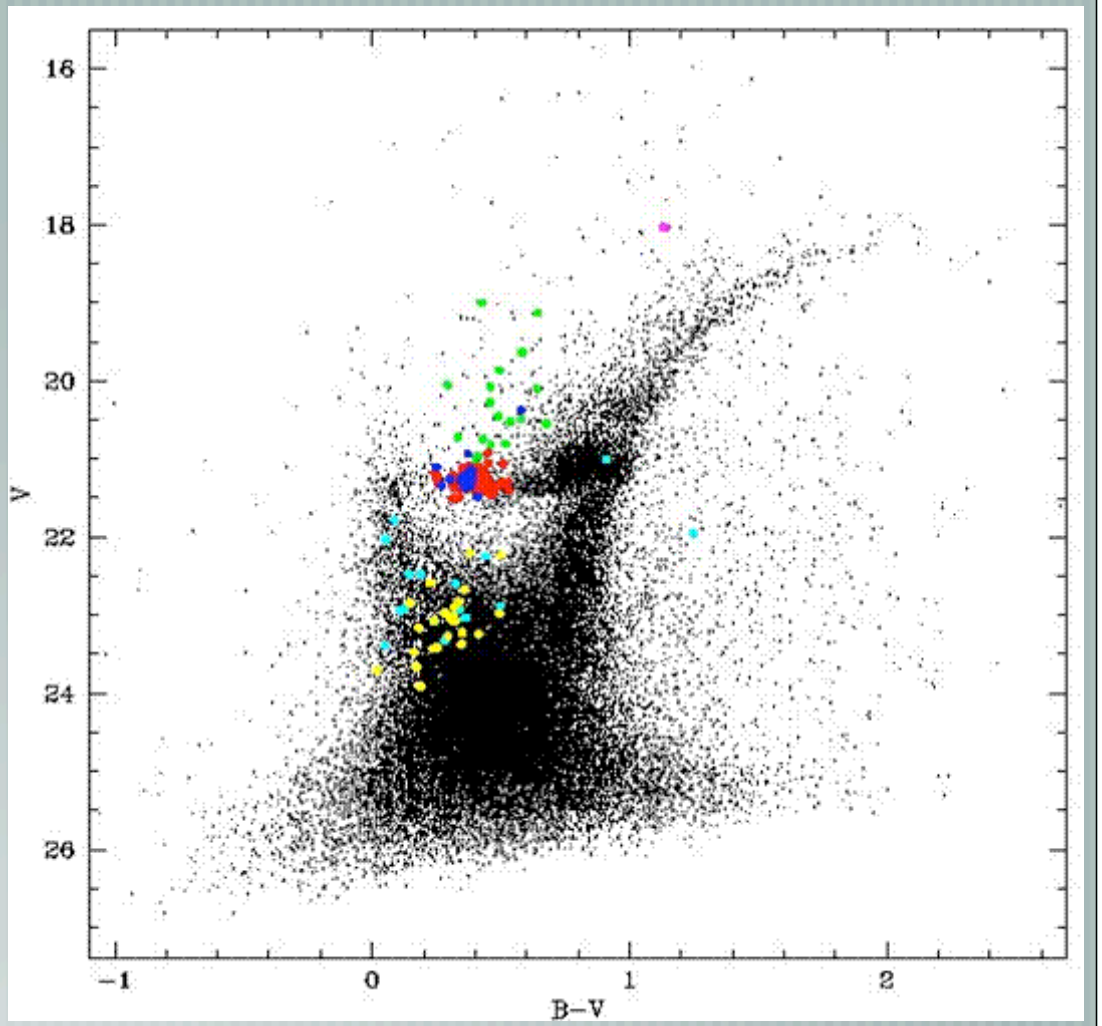
Survey specs

A) U-band coverage. The targeted S/N is 15 at u_{AB} = 24.1 (U =23.3)

B) ugri follow-up observations of newly discovered dwarf galaxies (e.g. by Skymapper)

Previous results based on WFI data related to this project

- Poretti, E., Clementini, G., Held, E.V., et al. 2008. Variable Stars in the Fornax dSph Galaxy. II. Pulsating Stars below the Horizontal Branch. ApJ 685, 947
- Rizzi, L., Held, E.V., Saviane, I., Tully, R.B., Gullieuszik, M. 2007. The distance to the Fornax dwarf spheroidal galaxy. MNRAS 380, 1255
- Rizzi, L., Held, E.V., Bertelli, G., Saviane, I. 2003. Clues to the Evolution of the Carina Dwarf Spheroidal Galaxy from the Color Distribution of its Red Giant Stars. ApJ 589, L85
- Held, E.V., Clementini, G., Rizzi, L., Momany, Y., Saviane, I., Di Fabrizio, L. 2001. RR Lyrae Variable Stars in the Dwarf Spheroidal Galaxy Leo I. ApJ 562, L39



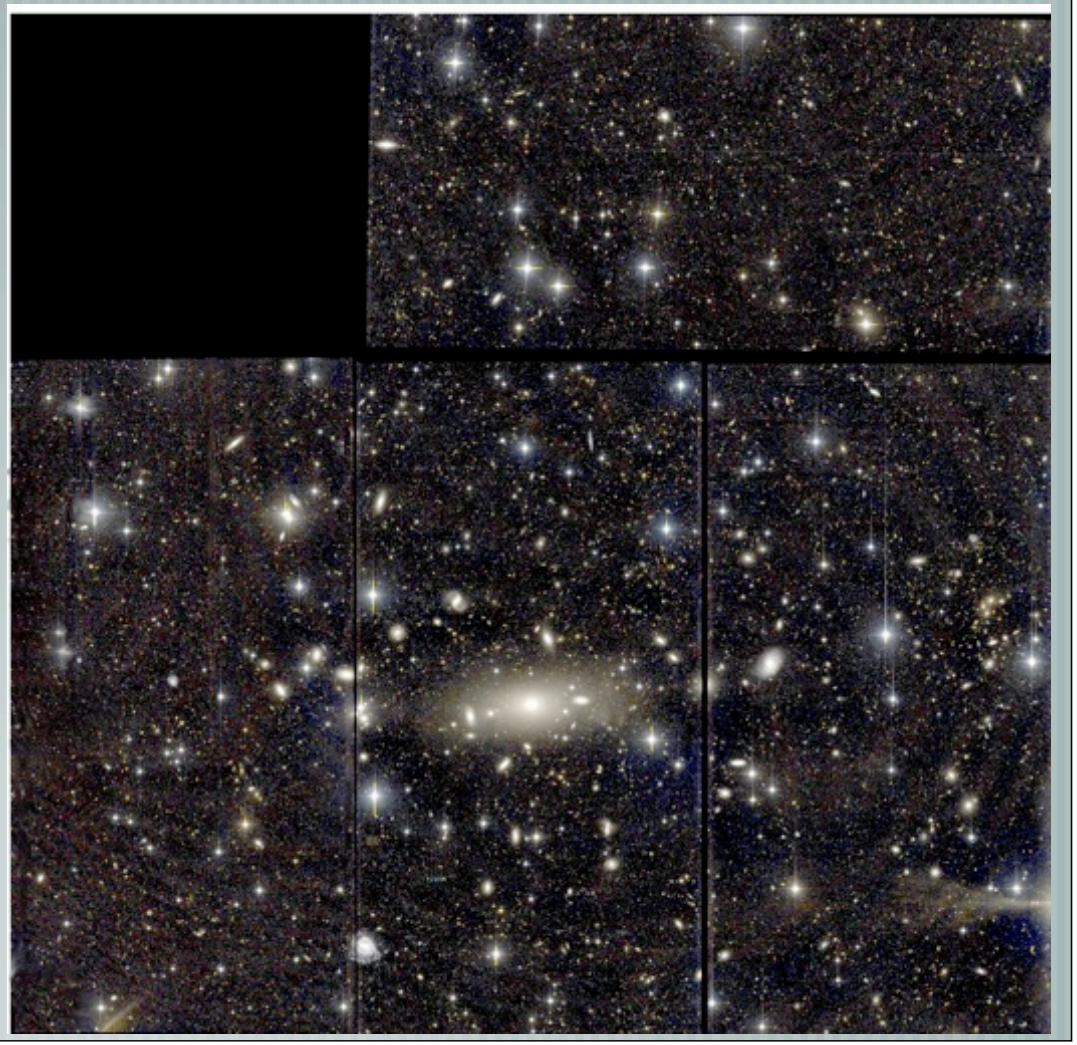
WIde-field Nearby Galaxy-cluster Survey

Daniela Bettoni
Mauro D'Onofrio
Bianca M. Poggianti (co-PI)
Giovanni Fasano (co-PI)
Alessandro Omizzolo

Antonio Cava
Tiziano Valentinuzzi
Benedetta Vulcani
Jacopo Fritz
Jesus Varela

+ Alan Dressler
Per Kjaergaard
David Woods
Warrick Couch
Mariano Moles

+ external collaborators at Trieste, Granada, Tenerife



WIde-field Nearby Galaxy-cluster Survey

A multi-wavelenght wide-field survey of 77 X-ray selected clusters at z=0.04-0.07

- Wide range of L_X, optical richness, substructure
- Wide range of galaxy luminosities and masses
- Legacy value

GOALS

- study cluster and cluster galaxy properties in local Universe
- detailed stellar populations and morphologies
- provide an adequate local reference sample for high-z studies

The existing WINGS dataset

B and V deep photometry (34′ x 34′)

77 clusters, FOV 1.2-2.7Mpc, res. 0.7-1.6kpc, $M_V \simeq -13$

400.000 gal phot., 40.000 surf.phot + morph

Optical fibre spectroscopy

48 clusters, 100-200 galaxies/cluster, down to $M_V \simeq -17$

Near-IR deep photometry (0.8 sq.deg.)

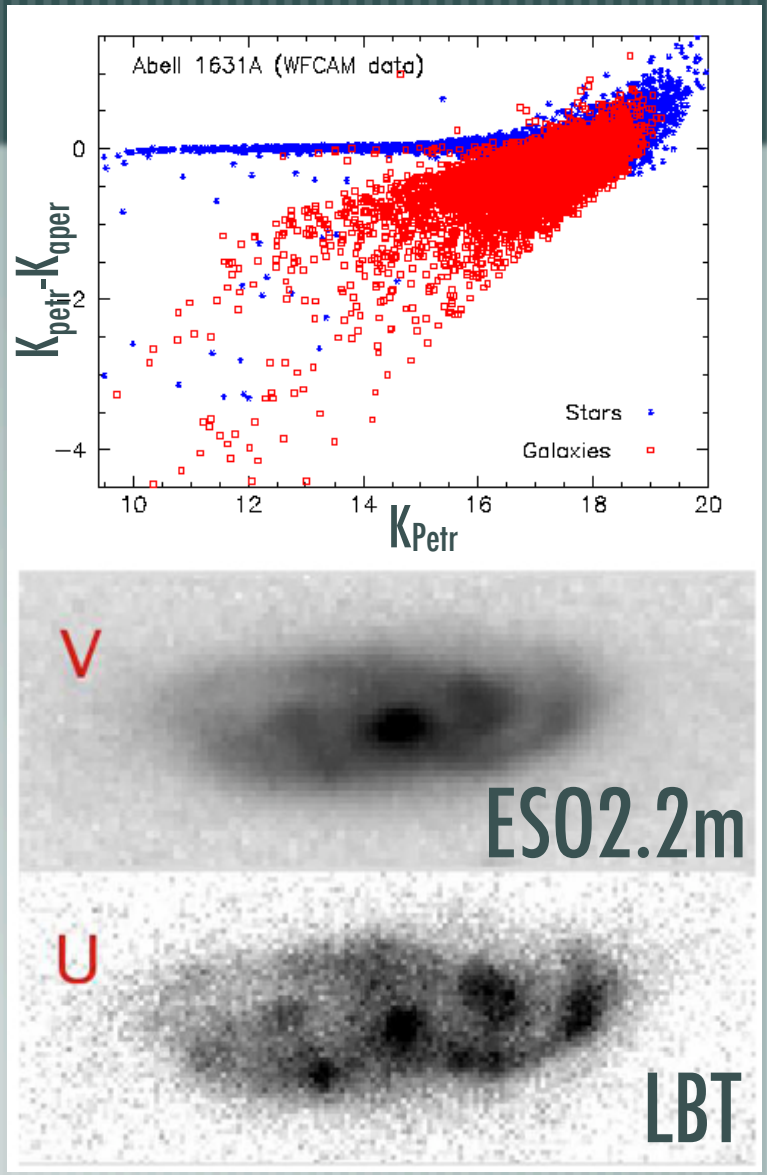
28 clusters, J and K – galaxy masses, SED + struct.props

Halpha narrow-band imaging

20 clusters, ongoing

U-band (limited in number of clusters and quality)

Only 5 clusters with good photometric quality - integrated and spatially res. SF



Obtained with WFC/INT, WFC/ESO2.2, WYFFOS/WHT, 2dF/AAT, WFCAM/UKIRT, 90prime/Bok, LBC/LBT

OMEGAWINGS

The existing optical WINGS dataset covers 35x35 arcmin, that corresponds to about
½ the cluster virial radius for most clusters
A larger field of view is needed to reach the cluster virial radius, the cluster outskirts and infall regions, where most of the galaxy transformations are thought to occur

OMEGAWINGS will get B and V imaging of 59 WINGS clusters
30 hr/yr during the first two years of VST operations
30/40min exposure per band in dark/grey time
For 20 clusters, will complement existing near-IR WFCAM/UKIRT data with similar FoV

Aimed to measure galaxy colors, masses, morphologies, structural parameters
reaching out 1 to 5 virial radii depending on cluster mass and distance

OMEGAWINGS U extension

Get U-band for 54 clusters to the same surface brightness limits covered in B,V,J,K, obtaining spectral energy distributions

Scientific goals

- Study the ongoing and recent star formation activity as a function of galaxy mass, morphology and environment (position in the cluster core and outskirts, cluster-centric distance, local density)
- Map the spatial distribution of the ongoing and recent star formation **within** galaxies: the distribution of the star-forming regions will tell us about the processes that act enhancing/quenching the star formation activity

Time request (VST GTO)

1.5hrs exposure per cluster (S/N ~ 1.0/pix to mAB=26.3 mag/arcsec2)

90 hr including overheads

SOME WINGS HIGHLIGHTS

Catalogs released:

Optical photometric catalogs (Fasano et al. 2006, Varela et al. 2009

Near-IR catalog (Valentinuzzi et al. 2009)

Spectroscopic catalog (Cava et al. 2009)

Line measurements and star formation histories (Fritz et al. 2010a, b in press)

Cluster properties:

substructure (Ramella et al. 2007)

velocity dispersions + dynamical analysis and 3D substructuring (Cava et al. 2009,+ in prep.)

Galaxy properties:

fundamental plane (D'Onofrio et al. 2008,2010 subm.)

morphologies (Poggianti et al. 2009)

superdense galaxies (Valentinuzzi et al. 2010a, 2010b)

Brightest Cluster Galaxies (Fasano et al. 2010)

evolution of the galaxy stellar mass function (Vulcani et al. 2010a in press)

evolution of ellipticities of early-type galaxies (Vulcani et al. 2010b subm.)

Color-magnitude diagrams, Lick indices analysis, star formation analysis... (subm.)

Supernova diversity and rate evolution SUDARE

Cappellaro E., Benetti S., Greggio L. , Turatto M. , Zampieri L. , Bufano F.
Miluzio M. , Botticella M., Pastorello M. , Valenti S., Patat F.

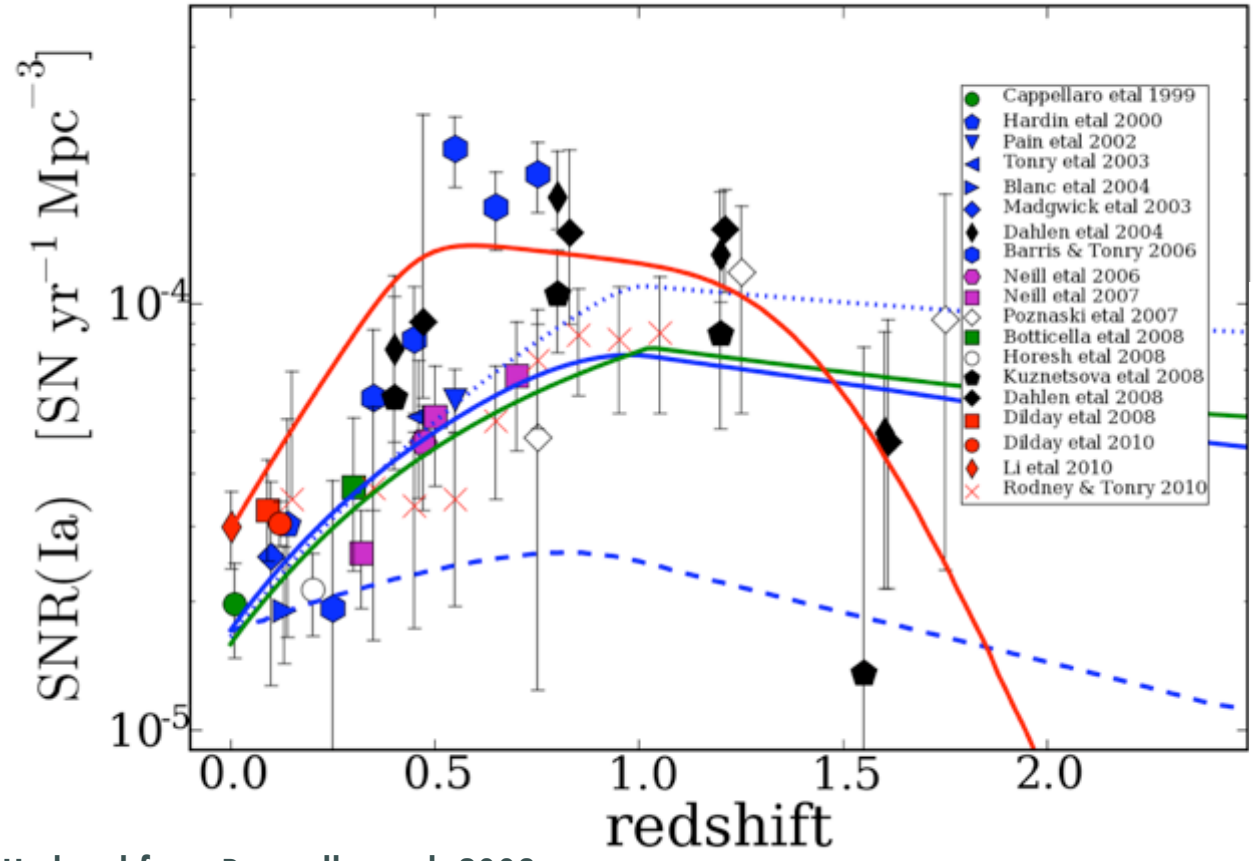
Why SN rates

- Link progenitor and stellar evolution scenarios
- Probe star formation history and nucleo-synthesis
- Test scenarios for compact objects formation (NS and BH) or extreme events (GRB)
- Support search programs for neutrinos, GW

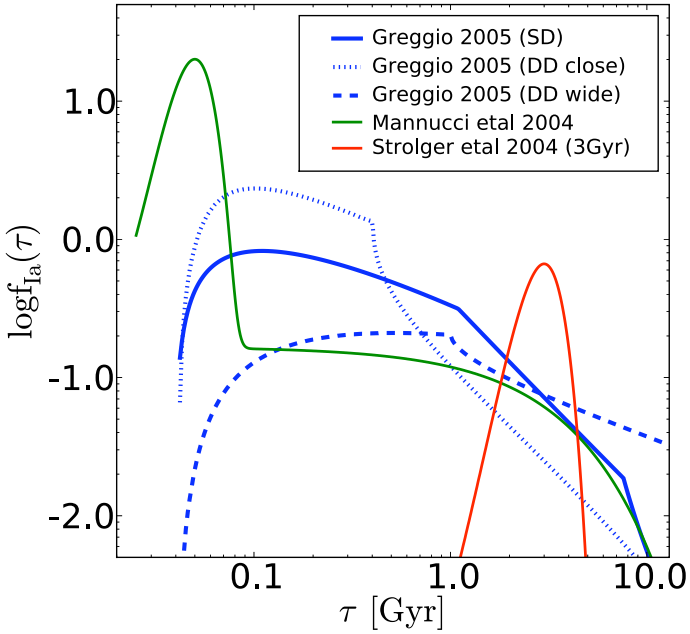
SN searches

- Local, targeted searches
  - Photographic and visual (Cappellaro et al 1999 [CET99])
  - CCD (LOSS, Filippenko,Weidong-Li in press ....)
  - CHASE, ..., Amateurs (!)
- Low redshift panoramic searches
  - Sloan SN search, PTF, ROTSE, Catalina Sky Survey, Pan-starrs .....
- Pencil-beam deep searches
  - WFI@ESO2.2, CFHT Legacy survey, ESSENCE, GOODS .....
  - Omegacam@VST, LBC@LBT, ... DES, LSST, SNAP/JDEM

SNIa's rate evolution



Updated from Botticella et al. 2009



SNIa diversity

sub-Chandarsekhar model

Sim etal (2010)

SNe 1991bg - 2004eo

Detonation of He in an accreted shell ignites detonation of a CO WD

1.5 mag fainter than average → Ni mass 0.2-0.4 $M_\odot$

WD mass 0.9-1.1 $M_\odot$

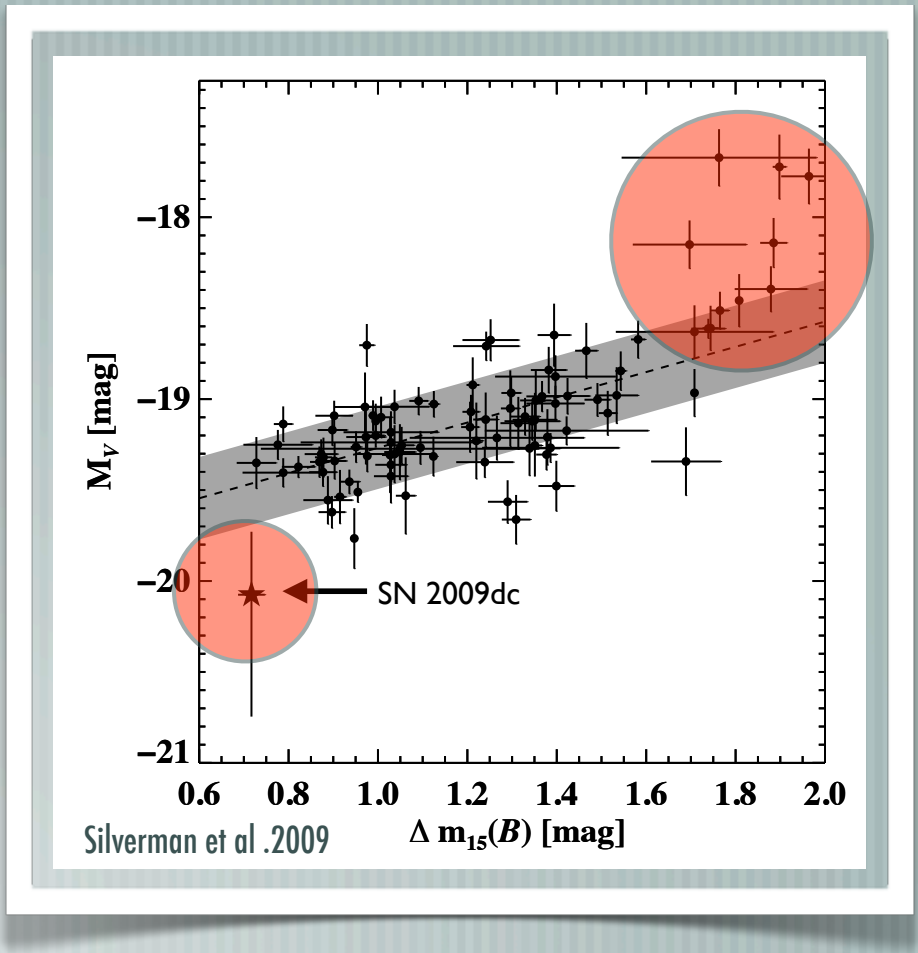
super-Chandrasekhar model

Silverman etal (2010)

SN 2009dc

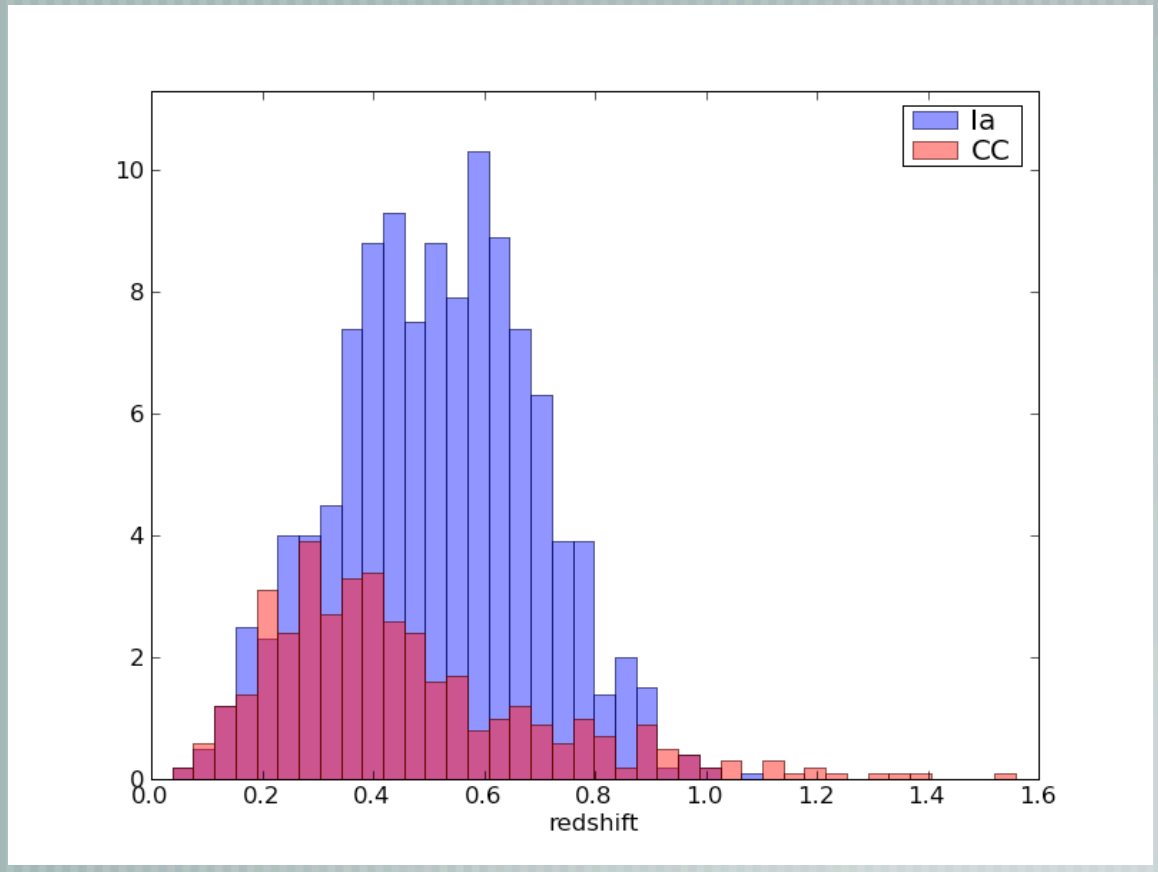
1 mag brighter then average → Ni mass= 1.7 $M_\odot$

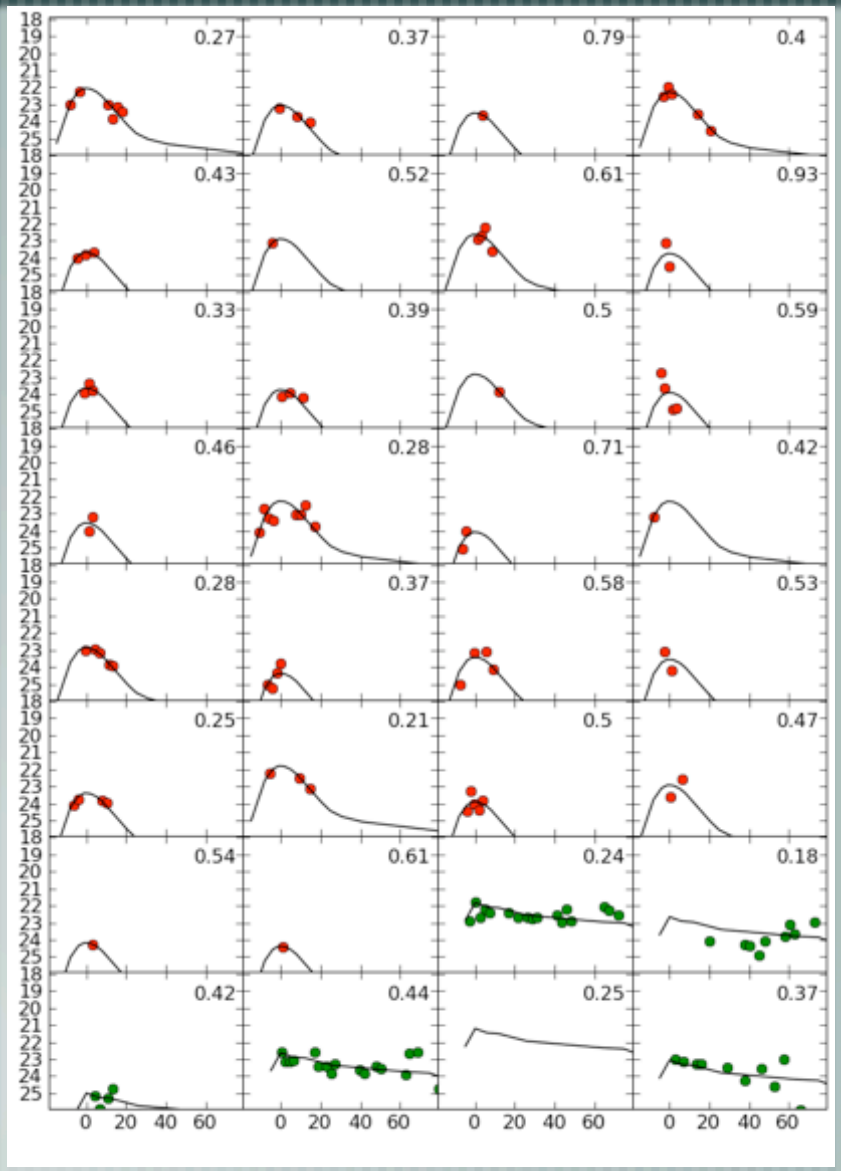
WD mass > 2 $M_\odot$



Search simulation

Expected detection 50 SNe / field / season
(200 in 4 years)





Supernova diversity and rate evolution
SUDARE

Field: CDFS 03 32 13 -27 50 00

r-band exposure every 3 day

g,i band colors once 10 days

Sinergy with VOICE by Covone etal.

Observing season: Aug 1 - Jan 31 (2h at AM<1.5)

	x season	
Search run	45	exposure 30-45 min
Color photometry	25	

Time request: 65-70h / yr

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Benetti S., Cappellaro E., Mazzali P. et al ApJ 623, 1011: The Diversity of Type Ia Supernovae: Evidence for Systematics?

Maeda K., Benetti S., Stritzinger T.et al 2010 Nature 466, 82: An asymmetric explosion as the origin of spectral evolution diversity in type Ia supernovae

OMEGACAM GTO - Italian share

Target	P.I.	Technique	length [yr]	time [h]	1°yr	2°yr	VST
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