### FORNAX DEEP SURVEY: the faint stellar halo of the cD galaxy NGC1399

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# **FORNAX DEEP SURVEY** with VLT Survey Telescope

• new survey of the Fornax Cluster to obtain deep imaging in the u, g, r, i bands at VST

• join project based on INAF (**P.I. M. Capaccioli**) & OmegaCam GTO (**P.I. R. Peletier**)



# **FORNAX DEEP SURVEY** with VLT Survey Telescope

• new survey of the Fornax Cluster to obtain deep imaging in the u, g, r, i bands at VST

- join project based on main scientific aims li) & OmegaCam GTO (P.I. R. Peletier)
- SB and color profiles out to 8-10 Re
- GCs and compact galaxies
- satellite galaxies

- Long-lived external structures, ICL, connection with the environment

the up-to-date largest mosaic of the Fornax Cluster  $5 \ge 5$  sq degrees that extends up to the virial radius of the cluster





ON-OFF observing strategy ~50 exp of 150sec

seeing 0.6 - 1.1



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Nov 2013

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Nov 2013 Nov 2014 ON-OFF observing strategy -50 exp of 150sec

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Nov 2014 **ON-OFF** observing strategy ~50 exp of 150sec seeing 0.6 - 1.1 tot exp time for 2014 dataset: 17.8 hrs u band 12.8 hrsg band 12.8 hrs *r* band 7.8 hrs i band

Nov 2013







Credits: A.Grado, L. Limatola

#### NGC1399

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the central dominant galaxy of the Fornax cluster (D=19 Mpc)
previous studies of the optical radial profiles reveals a large halo extending up to 250 kpc (Killeen & Bicknell 1988)
hosts a very populous GC system (Dirsch et al.2003; Bassino et al. 2006), the red GCs are traced out to ~ 40 kpc, while the blue GCs out to ~ 250 kpc
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- X-ray data have shown the presence of an extended hot gaseous halo (Paolillo et al. 2002)

#### Surface Photometry: method

• as a first step, every bright sources on all scales (from stars to galaxies and background objects) were accurately masked, thus excluded from the fit

 $\bullet$  estimate the outer radius  $R_{lim}$  where the galaxy light blends into the sky level

deconvolution with PSF

• the **azimuthally averaged SB profiles**, PA and ellipticity profiles, are obtained by the fit of isophotes in elliptical annuli, up to the  $R_{lim}$ 

### The halo "around" NGC1399



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0.5 1 1.5 2 2.5 3 3.5

4.5

4













"decoupling" between the inner of and outer isophotes"



#### NGCI399 - light distribution



M<sub>g</sub>=-22.78 mag R<sub>e</sub>=251.7 arcsec R<sub>lim</sub>- 33' -182 kpc

 $\mu^{g}_{lim} \sim 30 \text{ mag/arcsec}^{2}$  $\mu^{i}_{lim} \sim 28.7 \text{ mag/arcsec}^{2}$ 

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light profile shows a break at R~16 arcmin

 $28 \leq \mu_g \leq 31 \text{ mag/arcsec}^2$ 











## NGC1399 - light d





### NGC1399 - light d





 $3 R_e \le R \le 8 R_e$ exponential decreasing component which contributes to -15% of the total magnitude

#### NGC1399 - light distribution



B => g band from Fukugita et al. (1996)





#### red tail at R-180 arcsec from the center on the East side



0.34 0.48 0.62 0.76 0.9 1 1.2 1.3 1.5

g-i [mag]





### NGCI399 - fit with Sersic's laws



with B/T>0.9and  $M_{DH}$ - 10<sup>12</sup>  $M_{\odot}$ NGC1399 should have an halo dominated by the accreted material with n-4

#### NGC1399 - fit with Sersic's laws



### NGC1399 - light distribution vs X-ray



### NGC1399 - light distribution vs X-ray



### NGC1399 - light distribution vs X-ray



- emission peaks on NGC1399
- xray halo is not symmetric, but it extends more on the SW side
   many filaments & voids









### NGC1399 - light distribution vs GCs density





# NGC1399 - light distribution vs GCs density





#### Conclusions

#### The large FOV, high efficiency, and spatial resolution of OmegaCAM @VST allow us

• to obtain the largest mosaic of the Fornax Cluster (reduced portion of  $3 \times 2 \deg^2$ )

) to map the surface brightness of galaxies to an unprecedent galactocentric distance, i.e.  $\mu_g^{lim} \sim 28-32$  mag/arcsec<sup>2</sup> at R~15 R<sub>e</sub> and the g-i color profiles up to 6-10 R<sub>e</sub>

### Conclusions for NGC1399

2D light & color distributions are asymmetric, more emission is detected on the West side

**b light profiles** (in the g and i bands) extend up to ~ 170 kpc from the center

well fitted by a **double sersic laws**, for **R<15 arcsec** with **n=2** and for **15<R<951 arcsec** with **n=3.9** 

▶ for R>951 arcsec -88 kpc, i.e. R-5R<sub>e</sub>, and 28  $\leq \mu_g \leq 31 \text{ mag/arcsec}^2$ , a break in the slope is observed

such outer component of the halo has a more steeper light profile and bluer colors than the inner regions

• in the same range of radii

- the X-Ray density profile shows an additional component, named "cluster component"
- the density distribution of the **blue GCs differs** from that of **red GCs**, which follow that of the stars in the galaxy

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• the X-Ray density profile s "cluster component" Truncated halo

#### or

• the density distribution of the "re-shape" by a merger event ? GCs, which follow that of the stars in the galaxy