# The VST GTO programs

## Overview

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# Outline

1) The current GTO program proposals
2) Highlights of the VST/GTO projects
3) Statistics of the GTO requests over years
4) Strategies to optimize the GTO programs' execution

Original VST GTO-based surveys (LoIs submitted in 2005)

VST GTO surveys first revision (2008)

VST GTO after LoIs solicited by INAF (October 2009)

# VST GTO (September 2010)

1. SUDaRE: SUpernova Diversity and Rate Evolution
2. STREGA: STRucture and Evolution of the GAlaxy
3. STEP: The Small Magellanic Cloud in time: evolution of a prototype interacting late-type dwarf galaxy
4. U – WINGS: U' follow-up of the multi-filter survey WINGS
5. VST – ACCESS (A Complete CEnsus of Star formation in the Shapley supercluster)
6. VOICE: VST Optical Imaging of the CDFS and ES1 areas
7. VEGAS: VST survey of Elliptical GAlaxies in the South hemisphere
8. VST - Local Group: A VST-Omegacam survey of Local Group dwarf galaxies

## *STEP: SMC in Time-Evolution of a Prototype interacting late-type dwarf galaxy*

Use the wide field of view and good resolution of VST to carry out the first deep and homogeneous photometric survey of the entire SMC body as well as time-series photometry of the Bridge to test against the current galaxy formation scenario.

**PI: Ripepi (INAF-Napoli)**

**Partners**

**Italy:** INAF (Napoli, Bologna, Padova, Teramo, Arcetri), Univ. Napoli

**UK:** M.R. Cioni (Univ. Hertfordshire) ← VMC@VISTA

**Germany:** E. Grebel (ZAH) ) ← VLT

**USA:** A. Nota, E. Sabbi (STSCI), J.S. Gallagher (Univ. Wisconsin) ) ← HST

**Staff involved: 3.7 FTE/yr**

**Post-docs: 1.3 FTE/yr**

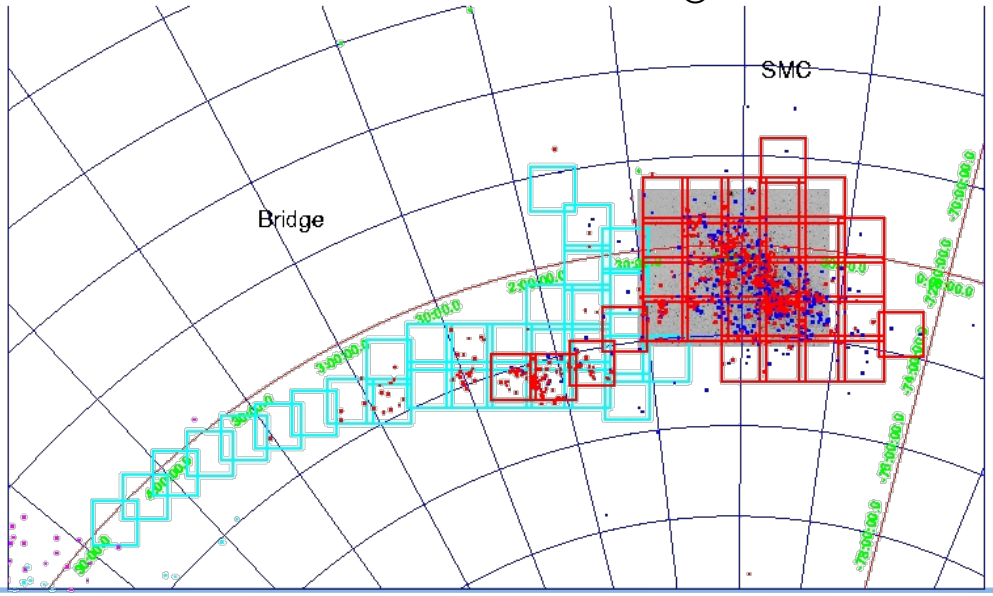
# *STEP: SMC in Time-Evolution of a Prototype interacting late-type dwarf galaxy*

## Science Aims

• To study in detail the SFH of SMC and of its stellar cluster component through deep (1-2 mag fainter than the TO of the oldest population) CMD over the whole SMC body.

• To study systematically for the first time the Wing and Bridge populations both on the basis of CMDs and of variable stars as tracers.

• To identify the PMS objects with mass down to 1.0 $M_{\odot}$ we have to reach r′ 22.5 with S/N=5.



# *STEP: SMC in Time-Evolution of a Prototype interacting late-type dwarf galaxy*

## Survey specs:

65 Squared degrees imaged in BVi at V~24.5 mag around the **SMC and Bridge**

DEEP SURVEY: BVi photometry of 35 sq. deg at V~24.5 mag with S/N=10

SHALLOW SURVEY: BVi Time series photometry on 30 sq. deg along the Wing and the Bridge: at V~19.5 mag (~magnitude of RR Lyrae stars) with S/N=100 (V~24.5 mag with S/N=10 on summed images).

r'Halpha imaging of the SMC body and Bridge

## Complementary data/programs:

- HST/VLT photometry/spectroscopy of selected fields/clusters.
- VMC@VISTA survey (P.I: M.R. Cioni): YHKs photometry of the Magellanic System (LMC, SMC, Bridge, Stream): 184 sq. deg. at Ks=20.3 mag in five years.
- FLAMES/FORS2@VST follow up planned

# *STEP: SMC in Time-Evolution of a Prototype interacting late-type dwarf galaxy*

## Timing

No other survey on nearby galaxies as deep, wide and panchromatic as STEP.

- OGLE III shallower, does not cover the Bridge.
- OGLE IV covers a wider area including the Bridge, but shallower and limited to BV I (results expected in 2016-2017 - OGLE III lasted 8years).
- Sky Mapper: covers the area but shallower, worse spatial resolution, too few epochs for variability purposes.

**Compelling to exploit VST advantage as soon as possible (i.e. during the first 2 years of VST operations) to guarantee international leadership to our project and meet the commitment with VISTA public survey**

## Strategy/Synergies

VMC@VISTA survey (P.I: M.R. Cioni) already started: postponed the **Bridge observations** to the start of STEP observations

***STEP: SMC in Time-Evolution of a Prototype interacting late-type dwarf galaxy***

## Time Request

(i) BV i′ deep imaging of the SMC body:

- 30 pointings in B 25 mag, V 24.5 mag and i′ 23.8 mag with S/N=10
- 80 m, 40 m, and 25 m in BV I′ including all the overheads.
- the target 35 sq. deg. will need about 85 h (D=50%; G=50%)

(ii) BV i′ time-series photometry of the Bridge:

- 30 phase points in V , 12 in B and 10 in i′ on 30 sq. deg.
- RR Lyrae stars, B~20 mag, V~19.5 mag, I~18.5 mag, with S/N=100
- 6 m, 4 m and 3 m in BV i′
- 30 degrees covering the Bridge, we need about 111 h (G=50%; B=50%)

(iii) r′H imaging of the SMC body and Bridge:

4m and 35 m in r′ and H, respectively (including all the overheads)
For SMC body and Bridge (65 sq. deg.) about 42 h (B=100%) are needed

## *STREGA@VST: Structure and evolution of the Galaxy*

This survey aims at investigating the Galactic Halo formation by:
i) tracing tidal tails and halos around stellar clusters and galaxies;
ii) mapping extended regions of the southern portion of Fornax orbit
iii)searching for new very faint stellar systems ← successful SDSS experience
The adopted stellar tracers will be Variable (RR Lyrae and Long Period Variables), Turn-off (TO) and Main Sequence (MS) stars.

**PI: Marconi (INAF-Napoli)**

**Partners**

**Italy:** INAF (Napoli, Roma, Teramo, Torino, Padova , Bologna), Univ. Tor Vergata – Roma, Univ. Naples, Univ. Pisa, Univ. Padua

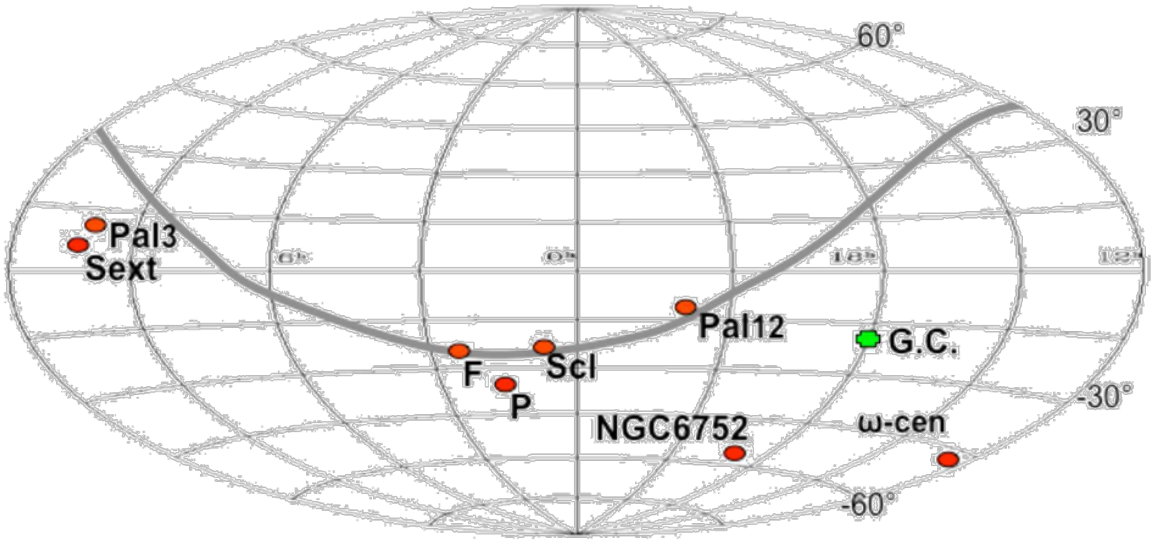
**UK:** M.R. Cioni (Univ. Hertfordshire)

**Staff involved: 4.7 FTE/yr**
**Post-docs: 2.2 FTE/yr**

## *STREGA@VST: Structure and evolution of the Galaxy*

### Science Aims

- To study the formation of the Galactic halo and the interaction of the Milky Way with the satellite systems
- To derive constraints on the formation history of Galactic globular clusters and on the nature of the satellite dwarf spheroidal galaxies.
- To characterize the properties of variable stars, White Dwarfs and Interacting Binaries as a function of the Galactic latitude.



## *STREGA@VST: Structure and evolution of the Galaxy*

### Survey specs:

CORE PROGRAM (first 2 yrs: ~75 fields):
study of surrounding regions (up to at least 3 tidal radii in 3 directions) of selected crucial dwarf spheroidal galaxies and globular clusters, in particular along Fornax orbit.

SECOND PART (second 2-3 yrs: ~90 fields):
- strips of adjacent fields distributed transversally to Fornax orbit
- extension to 10 tidal radii when needed on the basis of core program results.

### Foreseen spectroscopic follow-up:

10 nights VLT spectroscopy follow-up:
i) kinematical (VIMOS@VLT) and chemical (FORS@VLT) properties of Fornax Stream tracers and of extra-tidal stars around galaxies and stellar clusters;
ii) accurate spectra (FORS@VLT) for the brightest objects among cool and ultra-cool WDs;
iii) spectra (FORS@VLT) to study the SED of faint objects for classification purposes and time resolved spectroscopy to provide binary parameters of IBs.

## *STREGA@VST: Structure and evolution of the Galaxy*

### Timing

*VST with its large F.O.V., high image quality and spatial resolution is an ideal instrument to accomplish the scientific goals of a wide and deep photometric survey like STREGA:*
→First mapping of the entire structure of the Fornax stream in the Southern hemisphere.
→First sample of variable sources in the investigated fields up to 140 kpc, legacy for time variability investigations.

• SkyMapper shallower by about 1 mag, even co-adding the planned six epochs
• Pan-STARRS → northern portion of Fornax orbit → competitiveness/complementarity with STREGA, crucial to start the core program observations as soon as possible.

### Strategy/Synergies

Partial area overlap with the three approved ESO public survey for VST KIDS, ATLAS and VPHAS+.
KIDS reaches limit magnitudes deep enough to detect TO stars overdensities → synergy between STREGA and KIDS is under definition.
ATLAS and VPHAS+ too shallow for our purposes, useful for the calibration phase in the common filters.

## *STREGA@VST: Structure and evolution of the Galaxy*

# Time Request

**(5 years program)**

CORE PROGRAM
89.6 h/year x 2 years
G=98% B=2%

| filter | n. fields | n. phase points | single exp. time (min) | single exp. overheads (min) | Total exp. time (hours) |
|---|---|---|---|---|---|
| g | 75 | 20 | 1.2 | 1 | 55.0 |
| r | 50 | 10 | 1.2 | 1 | 18.4 |
| r | 25 | 1 | 9.0 | 1 | 4.1 |
| i | 75 | 10 | 2.6 | 1 | 45.0 |
| u | 10 | 1 | 130 | 14 | 24.0 |
| $vS$ | 10 | 1 | 150 | 16 | 27.7 |
| H$\alpha_{AB}$ | 15 | 1 | 16 | 4 | 5.0 |

SECOND PART
64h/year x 3 years
G=98% B=2%

| filter | n. fields | n. phase points | single exp. time (min) | single exp. overheads (min) | Total exp. time (hours) |
|---|---|---|---|---|---|
| g | 90 | 20 | 1.2 | 1 | 66.0 |
| r | 90 | 1 | 9.0 | 1 | 15.0 |
| i | 90 | 10 | 2.6 | 1 | 54.0 |
| u | 10 | 1 | 130 | 14 | 24.0 |
| $vS$ | 10 | 1 | 150 | 16 | 27.7 |
| H$\alpha_{AB}$ | 15 | 1 | 16 | 4 | 5.0 |

# *VST-ACCESS (A Complete CEnsus of Star formation in the Shapley supercluster)*

Survey of a wide area around Shapley supercluster (z ~ 0.05) to study of the cluster assembly processes in driving the evolution of galaxies as a function of galaxy mass and environment **from the field, through filaments and groups, to the cluster cores**. The VST survey will be the essential foundation of a multi-wavelength survey already available for the Shapley supercluster core.

**PI: P. Merluzzi (INAF-Capodimonte)**

**Partners**

**Italy -** INAF (INAF-Napoli, Brera-Milano)

**UK -** C. P. Haines, S. Raychaudhury, G. P. Smith (University of Birmingham); R. J. Smith, J. R. Lucey (University of Durham)

**Australia -** M. Dopita, C. Farage (Australian National University). K. Pimbblet (Monash University)

**Staff involved: 5 FTE/yr**

**Post-docs: 3 FTE/yr**

# *VST-ACCESS*

## Science Aims

**The VST survey complemented with spectroscopic data, NIR, FIR and HI imaging will constitute a unique data-set to investigate the relative importance of nature and nurture on galaxy evolution as a function of environment and galaxy mass.**

- obtaining a statistical census of obscured star-formation in supercluster galaxies;
- correlating obscured star formation with hierarchical cluster assembly;
- searching for the ram pressure effects and galaxy “suffocation”;
- comparing IR and optical star-formation indicators;
- investigating the environmental dependence of the stellar mass function.

**The VST survey will provide the fundamental reference for the multi-band survey and will effectively contribute to detect some important signatures of galaxy evolution by means of:** photo-*z* - local galaxy density - internal colour gradients - morphological classification - separating dusty and passive red sequence galaxies - *u’*-band SFR indicator - detailed weak-lensing mass maps.

## *VST-ACCESS*

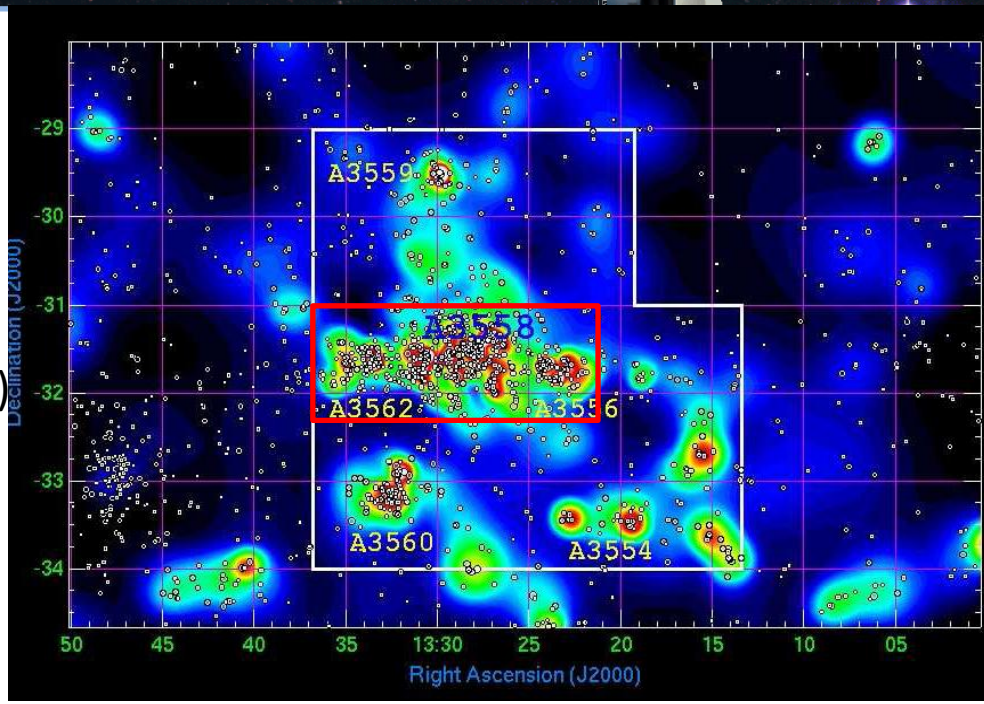
**Survey specs:**

**Bands**: *u', g', r', i', z'* .

**Area**: 23deg$^2$ centred in the Shapley core.

**Limiting magnitude**: $r'_{AB}$ = 25mag *(S/N=5*; 3" ap.)
= $M_r^*$+8 at *z*~0.05

→galaxy properties to $r'_{AB}$ = 23.5mag (*S/N*~20)
= $M_r^*$+6 at *z*~0.05




## Complementary data/programs I

**Data already available (SSC~3deg$^2$):**

• Optical, NIR, FUV/NUV, MIR/FIR imaging (ESO/WFI, UKIRT/WFCAM, GALEX, Spitzer/MIPS) • X-ray spectro-imaging (XMM mosaic) • radio (VLA 1.4GHz radio continuum).

• Spectroscopy (AAOmega, 6dF) 1200 galaxies – 90% complete to *r'*<16.5 in the 23deg$^2$

## *VST-ACCESS*

### Complementary data/programs II

**Already requested (~3deg$^2$):**

• HI imaging (MeerKAT SKA) • FIR imaging (Herschel PACS/SPIRE) • Optical spectroscopy (AAOmega) for a mass selected galaxy sample down to *R*=18.7mag (M*+4).

**VST → survey follow-ups in the 23deg$^2$ area:**

- Herschel PACS/SPIRE survey;
- HI imaging with MeerKAT;
- NIR survey with VISTA;
- AAOmega spectroscopic survey complete at *r'*=18mag.
- VLT/MUSE (~80hr) to witness the impact of processes such as pre-processing/harassment/ram-pressure stripping on both the star-formation and dynamical properties of galaxies in groups and filaments falling into the cluster.

# *VST-ACCESS*

## Timing

**The evolution of star-formation and galaxy morphologies with redshift** has been studied in 1) field environment (e.g. Z-COSMOS, VIRMOS) and 2) massive clusters (e.g. LoCuSS and STAGES at z~0.2, MACS/EdiSCs at 0.4<z<1.0).

**One key missing ingredient** to understand the morphology-density and SF-density relations, is a panoramic dataset of high-quality optical imaging of nearby galaxy clusters. **from the core to outside the virial radius (≥ 5Mpc) [galaxy infall along filaments, within groups, or directly from the field** (e.g. Balogh et al. 2009)].

**SDSS provides coverage of many rich local clusters,** but it image quality limits robust morphological classifications to massive galaxies (>~L*).

**VST-ACCESS will fill this gap** → a local counterpart to the 0.2<z<1.5, surveys.
High-quality optical imaging: FWHM~0.7" at z~0.05 corresponding to 0.7 kpc comparable to HST imaging at z~0.7 (FWHM~0.1") for galaxy clusters at intermediate redshifts.

<u>The scientific goals of VST-ACCESS cannot be pursued with data from shallower and wider survey (e.g. SkyMapper, VST-ATLAS, KIDS) or studying less wide and complex structure (e.g. Coma 3-degree Survey)</u>

# VST-ACCESS

## Time Request and strategy

The total time requested at VST amounts at about 100h included overheads (D=40%, G=30%, B=30%).
We plan to carry out the survey in three years starting as soon as the VST will operate in order to apply for Herschel time and to start the spectroscopic survey. The proposed survey schedule is:

- first year: ~31 hr (13 dark, 9 gray, 9 bright)
  10deg$^2$ covered in *i'* band, SSC in all bands and contiguous fields in four bands.
- second year: ~35 hr (15 dark, 10 gray, 10 bright)
  13deg$^2$ covered in *i'* band, 8deg$^2$ along a filament covered in at least four bands.
- third year: ~35 hr (15 dark, 10 gray, 10 bright)
  completion of the survey.

| Band | Seeing (arcsec) | Moon phase | Exposure time per pointing (hr) | AB mag. | S/N* within a 3arcsec aperture |
|---|---|---|---|---|---|
| *u'* | 1.0 | dark | 1 | 25 (23.3) | 5 (22) |
| *g'* | 1.0 | dark | 0.5 | 25 (22.9) | 5 (39) |
| *r'* | 0.7 | dark/gray | 1 | 25 (21) | 5 (150) |
| *i'* | 1.0 | bright | 0.5 | 23.8 (20.7) | 5 (86) |
| *z'* | 1.0 | bright | 0.5 | 23.0 (20.5) | 5 (51) |

* S/N>20 is the requirement for reliable colours, S/N>100 is the limit for surface photometry.

# *VOICE: VST Optical Imaging of the CDFS and ES1 fields*

VST u; g; r; i optical survey of the central regions of the CDFS and ES1, for a total of 8.0 square degrees for which deep and uniform optical data are still missing.
These areas are of paramount interest for the community as they have been surveyed by Spitzer (SWIRE) and are also the target of deep NIR (**VISTA-VIDEO**), MIR (**Spitzer-SERVS**) and FIR (**Herschel-HerMES**) observations. GALEX (UV) and **ATLAS** (radio) data are also available, while a deep MeerKAT 1.4 GHz survey has been just proposed on the same fields.

**PI: Covone (University of Naples)** co-PI: Mattia Vaccari (University of Padua)

**Partners**

**Italy:** INAF (Napoli, Padova, Catania, Trieste), Un. Napoli, Un. Padova

**UK:** **Seb Oliver**, **Duncan Farrah** (Univ. of Sussex), **Matt Jarvis** (Univ. of Hertfordshire), Eduardo A. Gonzalez-Solares (CASU - Univ. of Cambridge), Claudia Maraston (Univ. of Portsmouth)

**USA:** **Jamie Bock** (Jet Propulsion Laboratory), **Mark Lacy**, Maurilio Pannella (NRAO), Jiasheng Huang (CfA, Harvard)

**Australia:** **Ray Norris** (CSIRO); **China:** Chenggang Shu (Shanghai Normal University );

**Germany:** Mara Salvato (Max Planck IPP); **Chile:** Alessio Romeo (Universidad A. Bello Santiago)

**Staff involved: 5 FTE/yr**

**Post-docs: 1.5 FTE/yr (+1 TBH)**

# *VOICE: VST Optical Imaging of the CDFS and ES1 fields*

## Science Aims

z<0.4

- morphological mix as a function of
  - stellar mass
  - star-formation rate and
  - local environment
- constrain the mass assembly history of galaxies and their SFR (**synergy with SUDARE**)

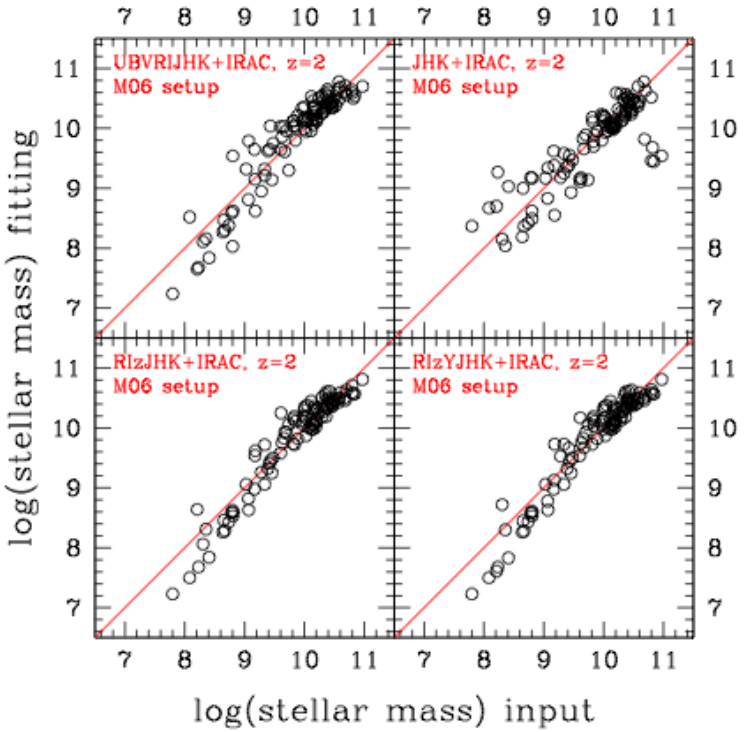
z~0.5

weak lensing to detect massive clusters ($10^{14}$Msun) and determine their 2D total mass distribution.

z~1

*(with the NIR, MIR, FIR and radio)* large sample of ~M* galaxies enabling to study the cosmic history of star-formation

Time domain: AGN variability.




Recovered stellar mass with different datasets (Maraston et al.).

## *VOICE: VST Optical Imaging of the CDFS and ES1 fields*

### Survey specs:

Multiband (u g r i) optical survey of the regions around the CDFS and Elais S1 (4 + 4 sq deg, RA 03hr and 00hr, respectively)

### Complementary data/programs:

- GALEX (FUV & NUV)
- Spitzer IRAC & MIPS 3.6-160 micron 7-band (SWIRE)
- NIR (VISTA-VIDEO ZYJHK)
- MIR (Spitzer-SERVS IRAC 3.6 and 4.5 micron)
- FIR (Herschel-HerMES 100/160/250/350/500 micron)
- ATCA (ATLAS) 1.4 GHz data
- MeerKAT (MIGHTEE, proposed 1.4 GHz deep survey, PI : van der Heyden & Jarvis)

- z-phot available on much smaller area (Cardamone et al. 2010; 0.25 sq. deg) or based on less deep data (Rowan-Robinson et al. 2008)

# *VOICE: VST Optical Imaging of the CDFS and ES1 fields*

## Strategy/Synergies

The present survey has a strong synergy with **SUDARE (PI: Cappellaro),** on the region centered on the CDFS (4 sq. deg).
We will perform u band observations (10 hr + overheads per sq deg), while SUDARE will provide data in *g,r,i* bands.

The synergy will have much impact on the scientific goals, as we will aim at improving the knowledge on the correlation between SNIa rate and the stellar population of the host galaxy and constraining the SFR at intermediate redshift.

The CDFS will also be covered by the KIlo Degree Survey (KIDS). However, KIDS has a shallower depth (exposure time 1800s in r-band) therefore being a complementary project rather than a competitor.

# *VOICE: VST Optical Imaging of the CDFS and ES1 fields*

## Timing

A number of observational projects have allowed a huge step forward in the understanding of galaxy evolution at low ($z < 0.2$) and high redshift ($z > 0.7$), thanks to very wide, shallow surveys on one hand (SDSS) and deep field survey (e.g., GOODS, AEGIS, UDS, COSMOS) on the other.

At intermediate-z, these observational projects cannot detect faint galaxies or cannot explore a representative volume. A survey on a larger volume at intermediate redshift ($0.3 < z < 1$) is therefore complementary in order to study a more representative galaxy population.

The two selected regions have been the target of a large number of multi-wavelength surveys. However, **the lack of an uniform and deep optical coverage does not allow the full scientific exploitation of such a wealth of data.**
**VST is the ideal instrument to complete the optical survey, which we think is still competitive if the two regions can be completed within 4 years.**

## Time Request

•reach a S=N ~ 100 down to r =21 for robust determination of structural parameters;
•detect a large fraction of the optical counterparts of Spitzer sources (more than 80% of the sources brighter than 2 microJy at 3.6 micron will be detected in the r and i bands).

| filter | $u$ | $g$ | $r$ | $i$ |
|---|---|---|---|---|
| $t_{\rm exp}$/hr | 4 | 3 | 2 | 2 |
| $m_{\rm AB}$ | 26.0 | 26.5 | 25.8 | 25.1 |

# *VEGAS: VST survey of Elliptical GAlaxies in the South hemisphere*

**Structure and formation of early-type galaxies (ETGs)**. Multi-band characterization of the light distribution of ETG out to 20% of their virial radius. Colour and stellar population gradients, surface brigthnes fluctuation and GCs census. The survey it will provide the best dataset for extension of the program aimed at the study of the galaxy dynamics (high resolution long slit and 2D spectroscopy) and dark matter (PN and GCs kinematics, X-ray follow-up).

## PI: Capaccioli (University of Naples)

## Partners

**Italy:** INAF (Napoli, Teramo), Un. Napoli, Un. Padova

**USA:** Pannella (NRAO-Socorro), Romanowsky (Univ. of California, Lick Obs.)

**Australia:** D. Forbes (Swinburne Univ.)

**Staff involved: 4 FTE/yr**
**Post-docs: 2 FTE/yr**

# *VEGAS: VST survey of Elliptical GAlaxies in the South hemisphere*

## Science Aims

The large field-of-view (FOV) of the OmegaCam mounted at the VST together with its high efficiency and spatial resolution will allow to map the galaxy surface brightness from their core to the regions where about 90% of their total light is enclosed with reasonable integration time.

**1) SB out to 8-10 Re**: physical correlations among structural parameters (total luminosity, Sersic index, *Re, ellipticity,* boxiness/diskiness);

2) ***g-r, g-i colour gradients*** and the connection with galaxy formation theories*;*

3) **GC color and density distribution**; GC **luminosity function**; comparison of GCs' integrated colors to the theoretical models (multiple episodes of formation of globular clusters);

4) **SBF fluctuations**: for distance and chemical characterization of the stellar population out to 2-3 *Re;*

5) **Stellar M/L**: stellar masses, M/L gradients;

6) Study of **the long-lived external structure and the diffuse component** of the galaxies and their connection with the environment.

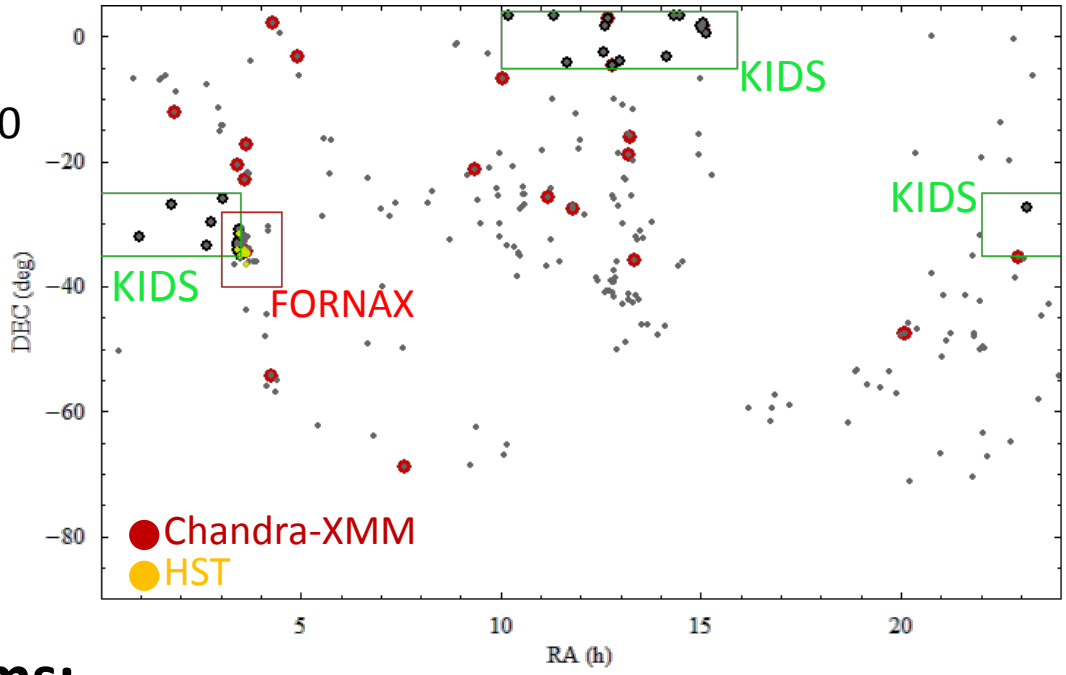
# *VEGAS: VST survey of Elliptical GAlaxies in the South hemisphere*

## Survey specs:

Multiband (u g r i ) optical survey of ~110 of galaxies with Vrad<4000 km/s in all environments (field to clusters).

## Expected SB limits:

27.5 *g* , 27.0 *r* and 26.2 *i* mag arcsec$^{-2}$ (S/N=10 per arcsec$^{-2}$).




## Complementary data/programs:

**The main aims of the survey are conceived to be fulfilled with optical bands only**.
But, LR spectroscopic follow-up would allow to improve the reliability of the achieved results (e.g., stellar population chemical analysis).
**Synergistic opportunities**: galaxy dynamics (high resolution long slit snd 2D spectroscopy) and dark matter (PN and GCs kinematics, X-ray follow-up)

# *VEGAS: VST survey of Elliptical GAlaxies in the South hemisphere*

## Timing

Next generation Virgo Cluster Survey (NGVS) in the North hemisphere (~140 nights of CFHT time: 2009-2012) in five filters (*u,g',r',I',z', e.g. 27.2 AB mag* arcsec-2 in *r' band).*
*The NGVS will be the state-of-the-art optical survey of a low-redshift cluster environment for* years to come in the North hemisphere => VEGAS a complementary survey in the South with no environmental restrictions (from field to cluster).

The OBEY survey, a complete sample of elliptical galaxies (MB< -20) at distances 15-50 Mpc down to 27.7 mag arcsec-2 in (only) V band. The sample includes 54 giant ellipticals in four nearby clusters (Virgo, Fornax, Centaurus and Antlia). FOV of 20' and the typical seeing of the survey (1.7'').

SkyMapper shallower than VEGAS and with a poorer image quality.

## Strategy/Synergies

HST surveys local Universe: 1) The ACS Virgo and 2) Fornax Cluster Survey and 3) the ACS Coma Cluster survey (g' = 27.6 mag arcsec-2 and Ic= 26.8 mag arcsec-2). We will take advantage from the overlap with the South targets.

**KIDS: ~40 galaxies included in KIDS. We need to double the KIDS exposures to reach the required depth in the three bands.**

# *VEGAS: VST survey of Elliptical GAlaxies in the South hemisphere*

## Time Request

Total exposure time per pointing in the three filters ~3h (**~4h** included overheads) **for 70 gals**.
For the targets observed with KIDS (**~40**) **1.8h** are needed (g = 900s; r = 1800s; i = 1200s already available).
SAMPLE: ~110 galaxies. TOTAL: ~350h over 5 years.

<u>30 h per year in the first 2 years and ~100 h in the following three years</u>

| Band | Moon | Exp. Time (hr) | SB (mag arcsec$^2$) | S/N/arcsec$^2$ |
|---|---|---|---|---|
| g | d | 1.6 (0.25) | 27.5 | 10 |
| r | d | 1.3 (0.5) | 27 | 10 |
| i | g/b | 1.0 (0.3) | 26.2 | 10 |

GTO=15%

44 nights / year

X

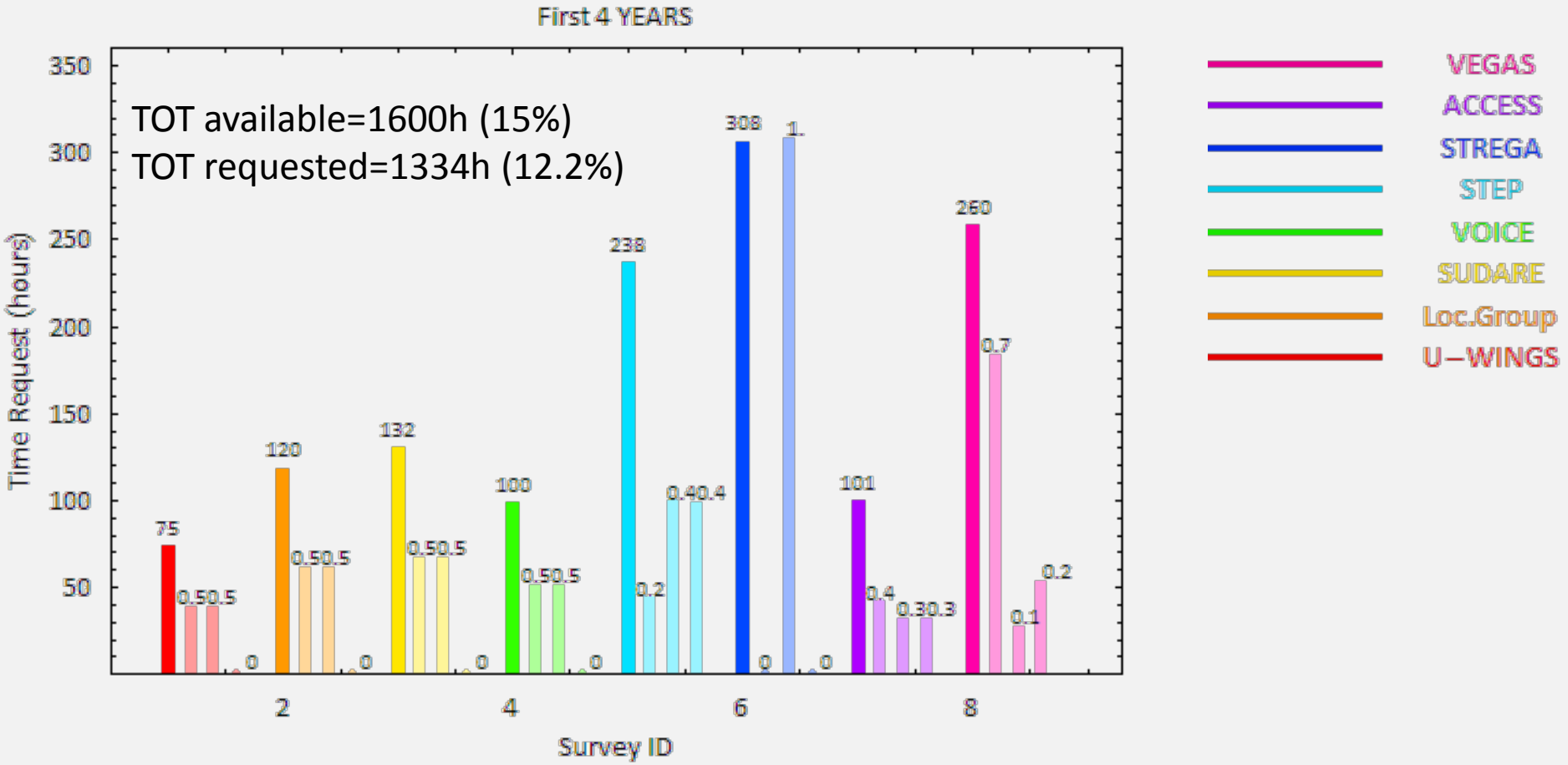
9h / night

=

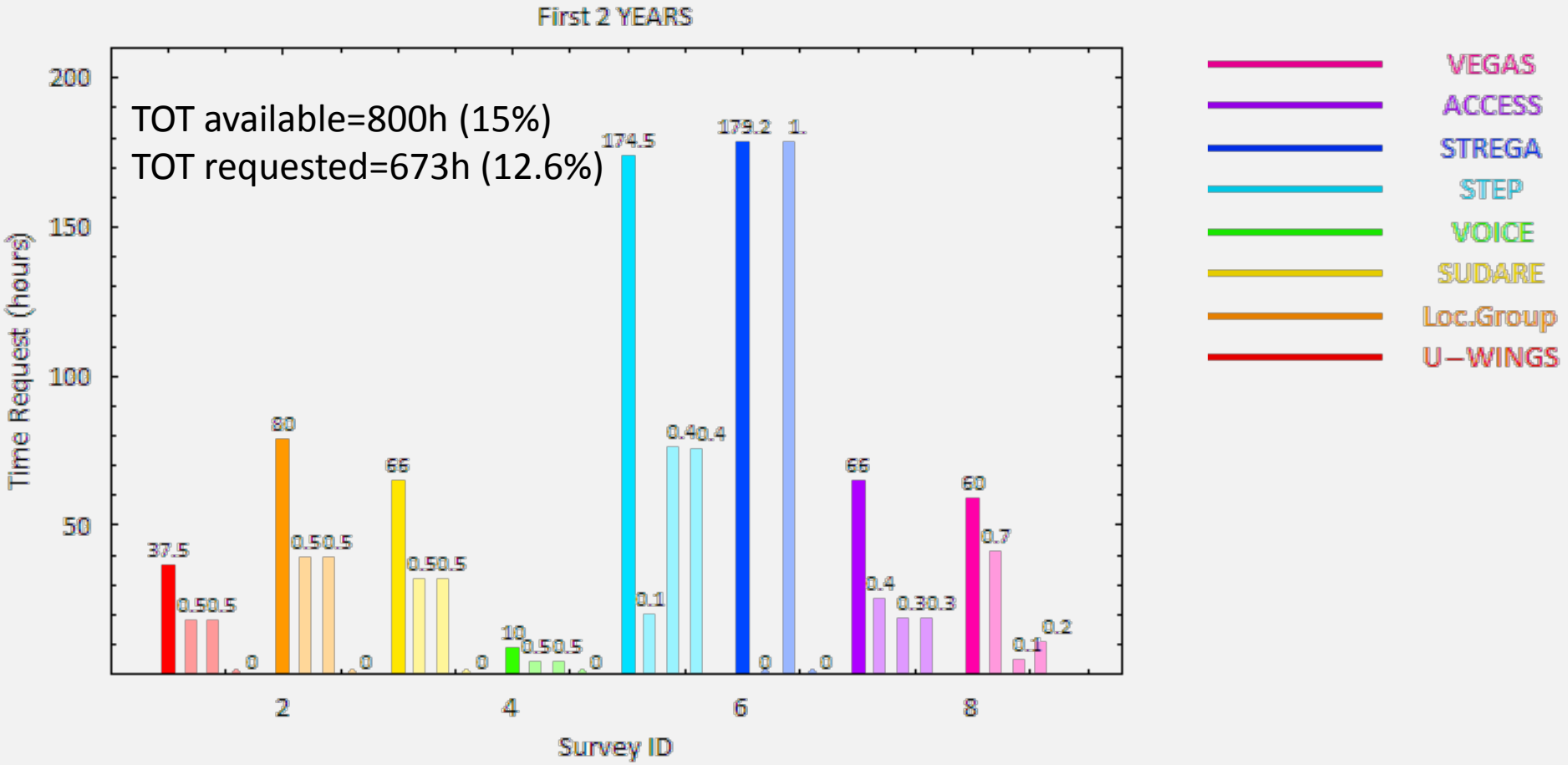
**~400h/year**

# Situation after strategy revision and synergy exploitation

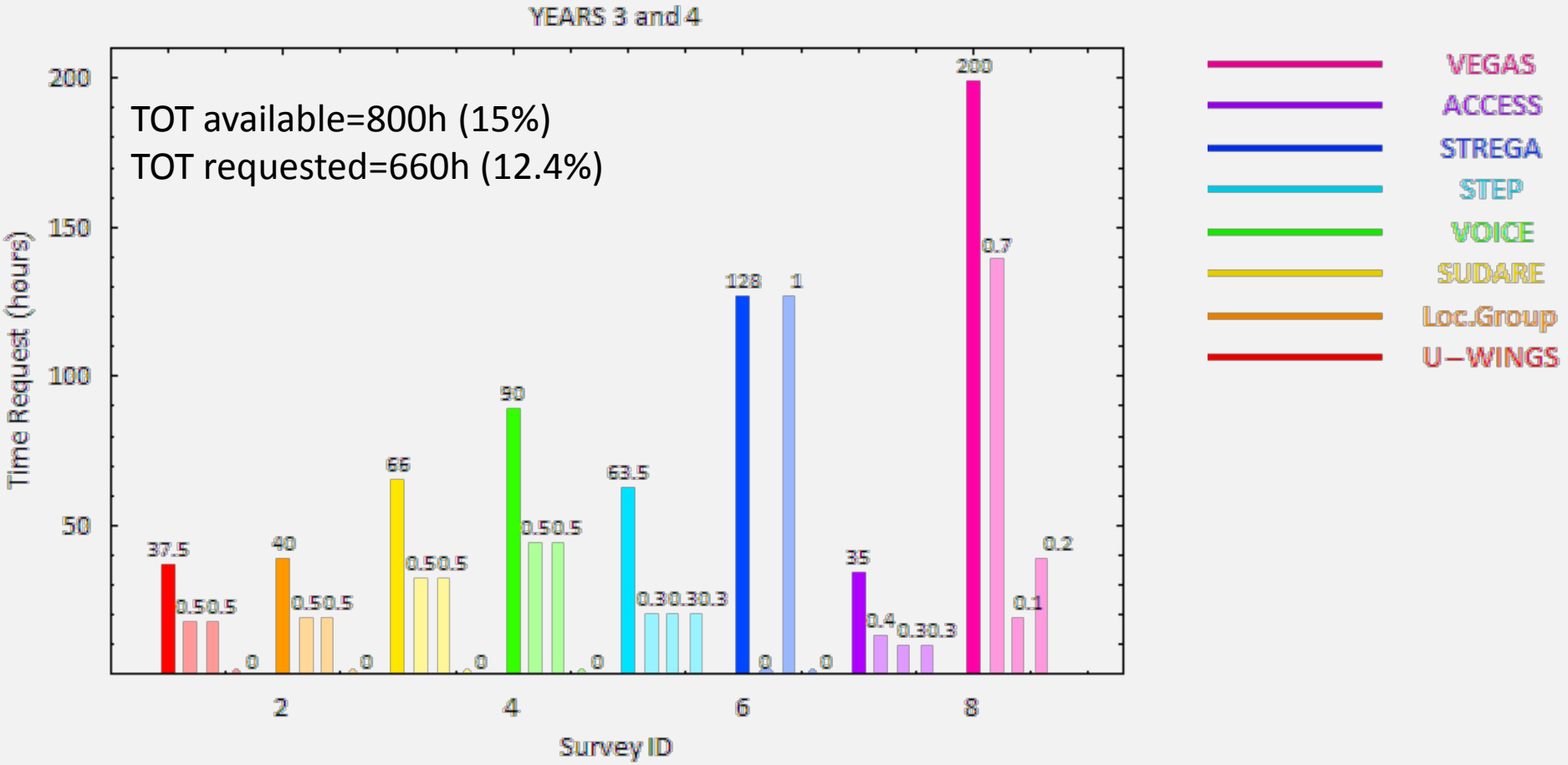
First 4 Years: Time Request per Survey and fractions of D/G/B



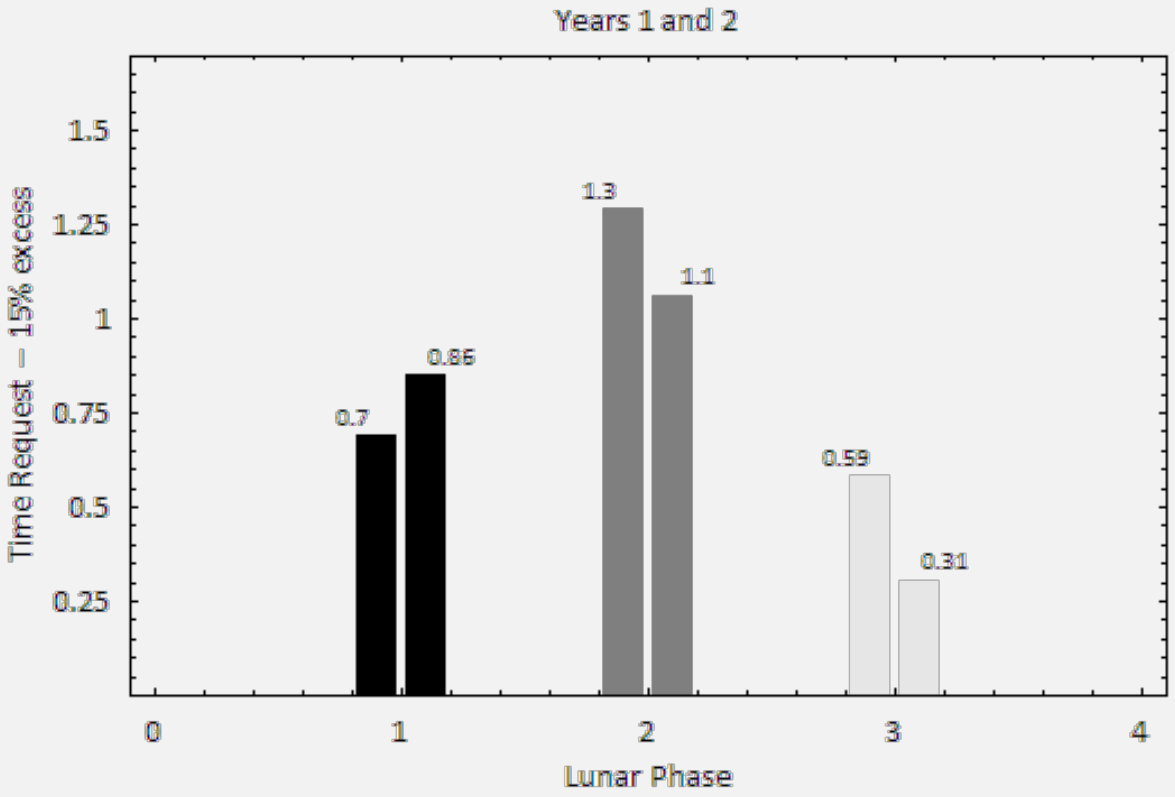
First 2 Years: Time Request per Survey and fractions of D/G/B



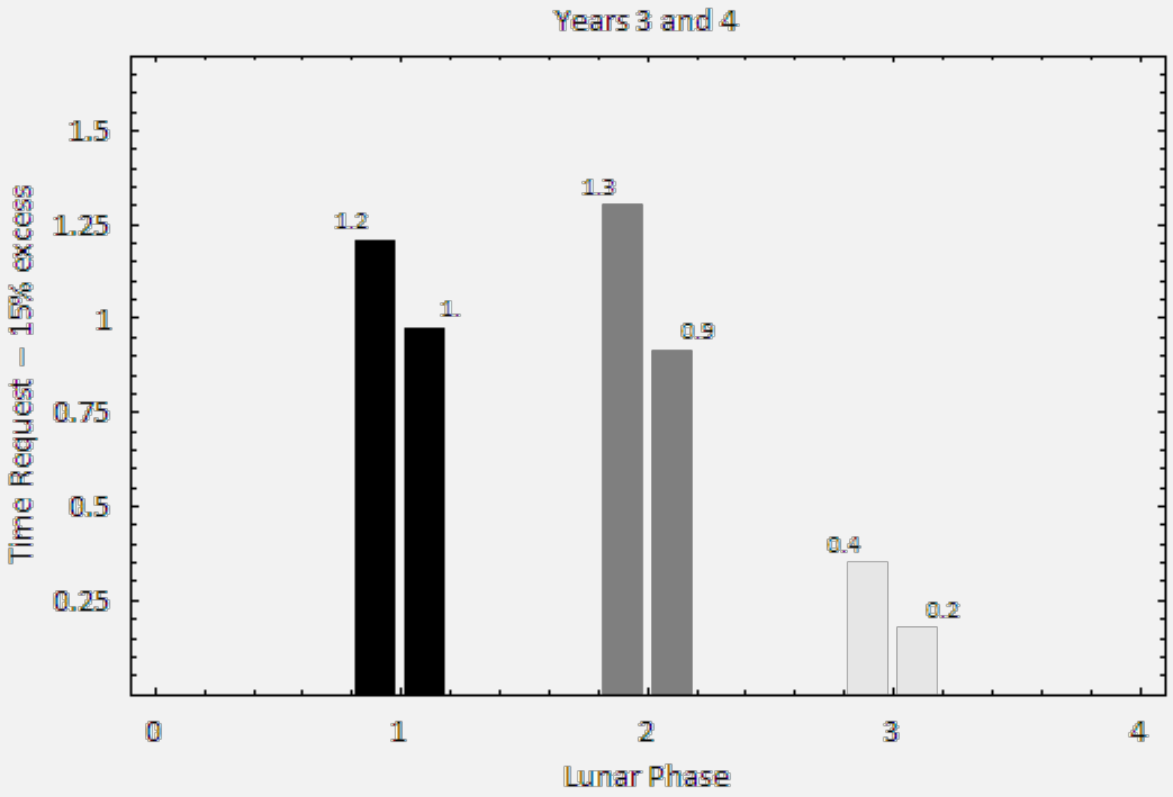
Years 3rd and 4th: Time Request per Survey and fractions of D/G/B



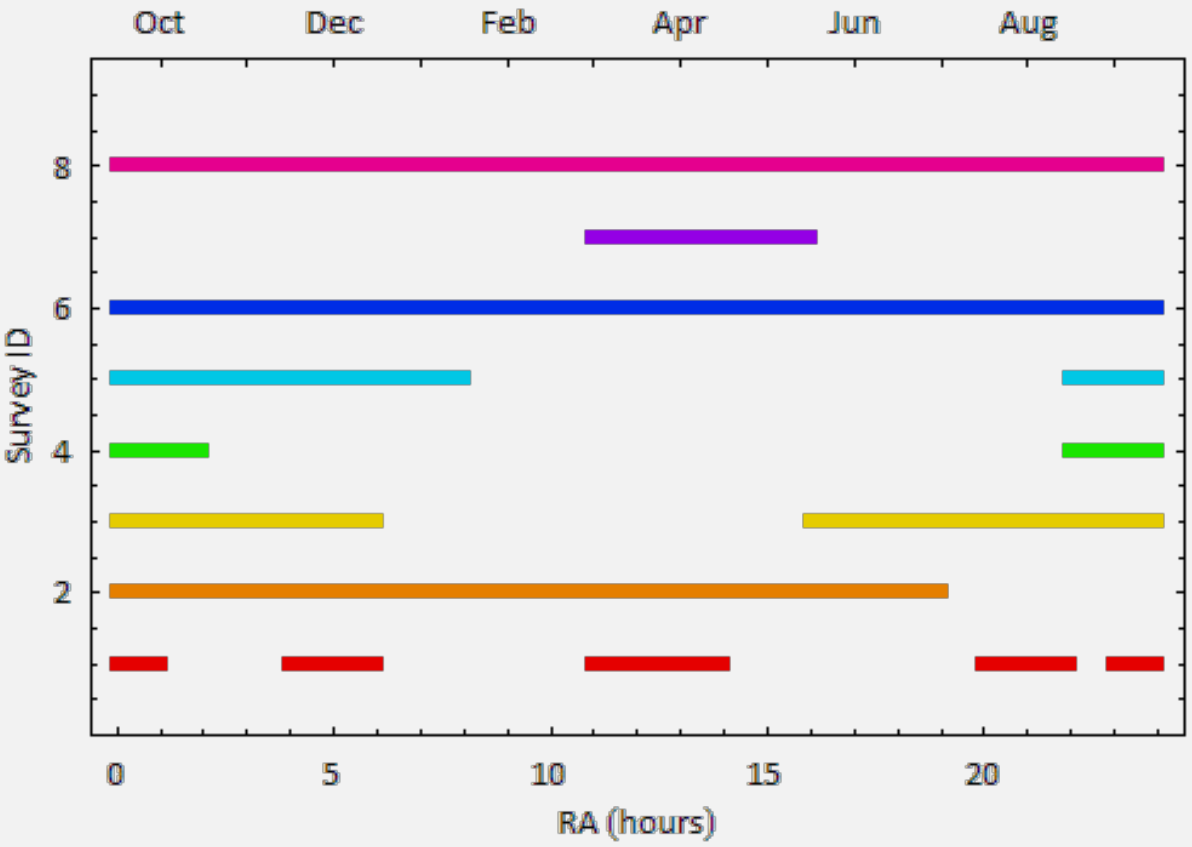
Years 1st and 2nd: excess fraction of D/G/B over 15% GTO per lunar phase
(D/G/B=120h/160h/120h)



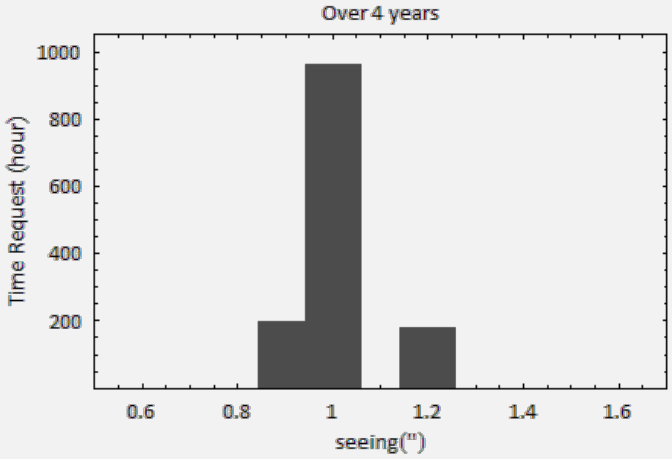
Years 3rd and 4th : excess fraction of D/G/B over 15% GTO per lunar phase
(D/G/B=120h/160h/120h)



## RA Distribution of Surveys







# SURVEY MILESTONES and EXPECTED RESULTS

| Survey | 2011-2nd | 2012 | 2013 | 2014 |
|---|---|---|---|---|
| STEP | Bridge var. meet VMC@VISTA | SMC body deep (SFH results+IB) → | → | |
| STREGA | Fornax Stream (Pal12,ScI,F,P,Pal3 ,Sext) – first results | Fornax Stream +N6752, ωCen – final results on the Stream → | completion+2nd phase on the basis of the 1st phase results → | → |
| ACCESS | | 10sqdeg i'band + 3sqdeg CORE in all other bands (science/calibration + follow-ups) | 13sqdeg i'band + 8sqdeg FILAMENTS (SFH+galaxy structure along filam.ents + follow-ups) → | completion of the survey → |
| VOICE (SUDARE) | 1st sqdeg CDFS | 2nd sqdeg CDFS | 3rd sqdeg CDFS + 2sqdeg ES1 DATA REL. 1 | 4th sqdeg CDFS+ 2sqdeg ES1 DATA REL. 2 |
| | SFH, structural parameters, stellar masse (z<0.4) - WL (z~0.5) - M* galaxies at z~1 → | | | |
| VEGAS | | Follow-up of 15 KIDS-N +… ↔ | …+ other 8 Southern systems | ~90 galaxies (Fornax …) → |

## *Serendipity*

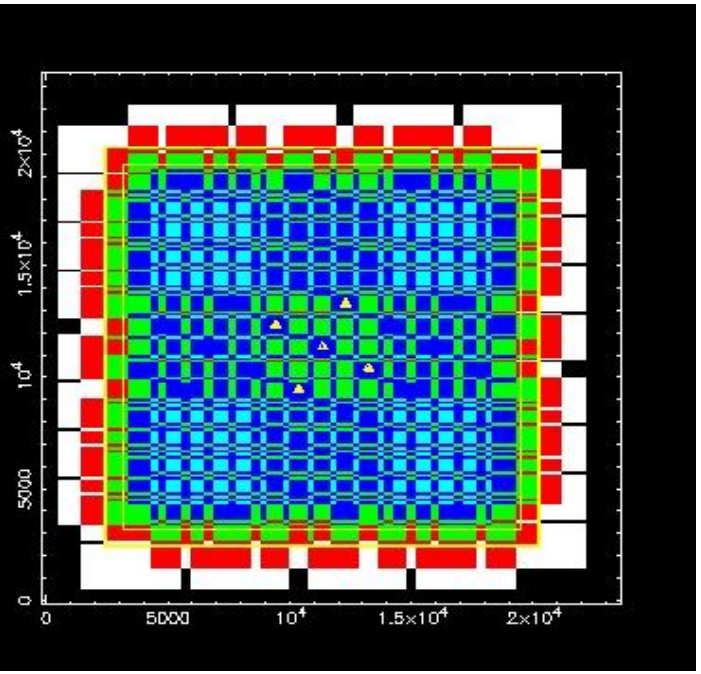
This project contemplates the use of all the GTO images.
While assessing the quality, transient objects/phenomena can be found directly (dithers) and/or by comparing each field with masters (when available) to search for photometric (color excess, variability, etc.) and/or astrometric (fast motions etc.) peculiarities.

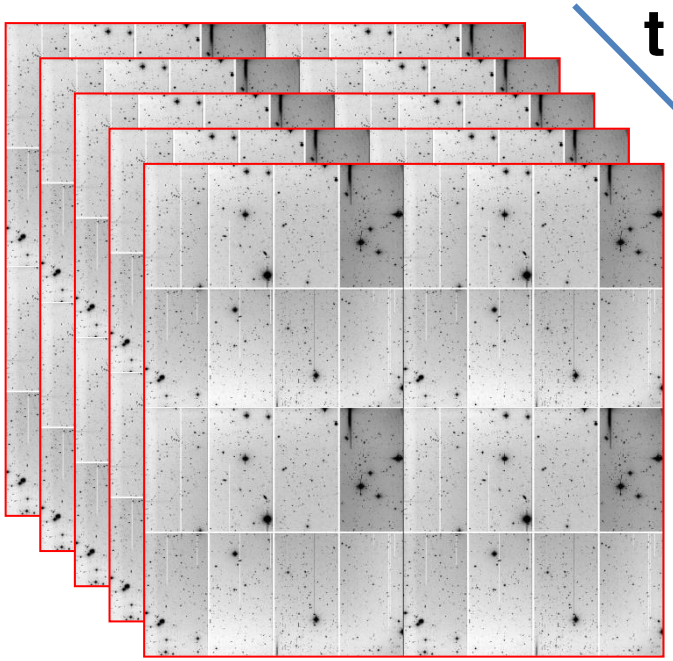
The discoveries, if not related to the scientific subject of the proposal which the image belongs to, shall be property of the VST Science Team, who will decide how to use them.

**PI: M. Capaccioli (University of Naples)**

**Partners**

G. Longo (University of Naples), A. Grado (INAF – Naples) and VST team.




**variability**

- ❑ **positional**
- ❑ **photometric**

- Homogeneous data processing
- *ad-hoc* detection software (Data Mining)

# Conclusions I

• The italian community has continuously monitored the competitive status of the VST-GTO programs. Some of the original proposals have been dropped out because obsolete. In 2009 INAF opened a new call for proposals to match the fast-growing interest of the Italian community towards the VST project. The response has been ample.

• The proposed programs presently involve a few dozens of Italian scientist and a dozen of Italian Observatories/Universities and a similar amount of foreigner collaborators.

# VLT Survey Telescope Center at Naples

# Conclusions II

• The telescope time request was particularly high in the first 2 years (~980h), corresponding to about 18% of the total VST operations, still in the range of the 15-20% foreseen in the MOU. In the first 4 years, though, the total amount of requested time is 1414 h which corresponds to about the 13% of the total VST observing time.

• An intense work on the survey coordination/synergy/strategies has been carried on which allowed to dramatically reduce the Time Request on the first two years. The surveys have been spread over 5 years, and the time request per lunar phase is ≤15% almost everywhere with a significant vacancy of **Dark Time** in the first two years, and of **Bright Time** in the all 4 years. This could be allocated to the Public Surveys without significantly impacting the achievement of the proposed Science Aims.

# Conclusions III

Any other significant GTO reduction below the numbers showed here would negatively impact the timing of the results expected for the GTO surveys and the related impact on the community.