STREGA & STEP Surveys

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Introduction and Overview

- STREGA & STEP are surveys in the context of INAF-OACN GTO
- Small and focused surveys

- STREGA
- STEP
- Requirements/Data reduction plans

STREGA@VST

STRructure and Evolution of the GAlaxy

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INAF-OAPadova, INAF-OABologna, University of Pisa,
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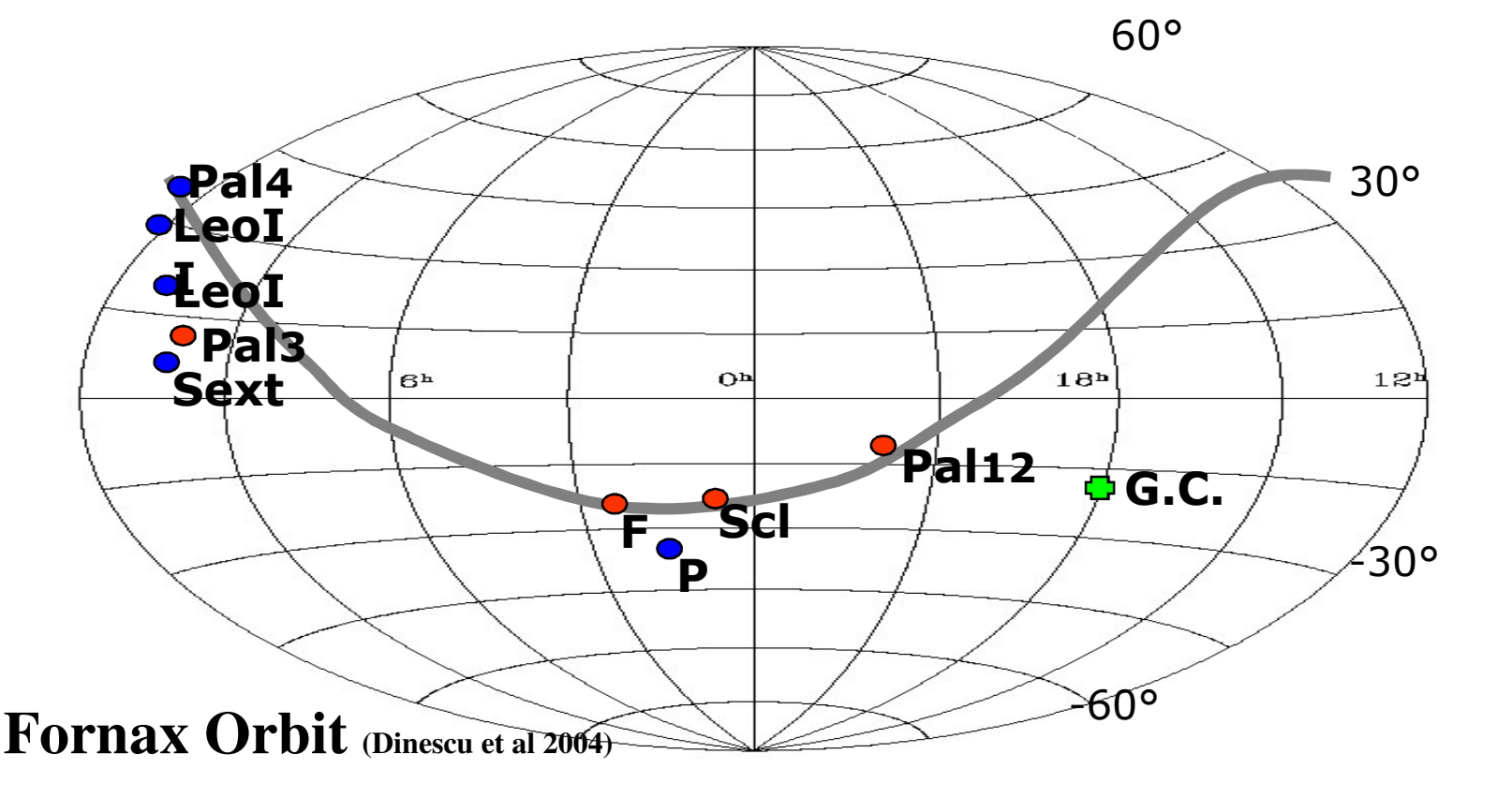
STREGA main aim:

•Contribute to unveil the Halo formation mechanism by investigating the Southern part of the Fornax stream (Lynden-bell 1982, Lynden-bell & Lynden-bell 1995, Dinescu et al. 2004)

•We will use RR Lyrae, LPVs and turn-off stars as tracers to test the presence of extended halos (extra-tidal) around Fornax and Sculptor dSphs.



Fornax Orbit (Dinescu et al 2004)

Additional goals

- Study of the Galactic Warp (CMa overdensity)

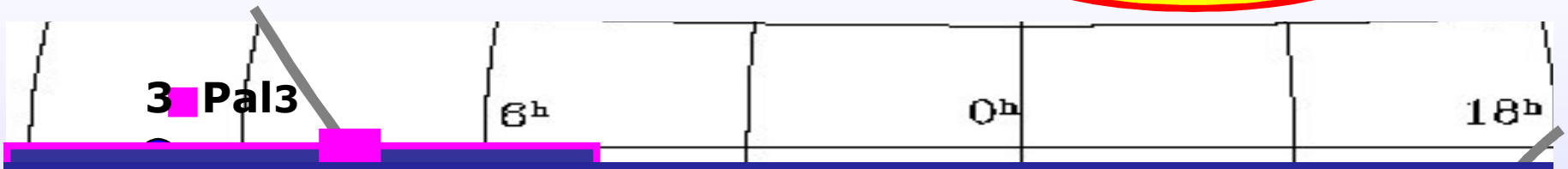
- Disk and Halo White Dwarf Populations: WD LF $\Rightarrow$ age of the Galactic disk, IMF, SFR, Galactic dark matter

- Disk and Halo Populations of Accreting White Dwarfs (CVs) $\Rightarrow$ space density, evolution of low mass close binaries, constraints to the origin of galactic x-ray background.

- Galactic star counts $\Rightarrow$ Galactic structure

Field selection

~150 fields



CORE PROGRAM (first 2 yrs)

- 24 fields around Fornax and Sculptor (up to 10 tidal radii) in three directions to distinguish between tidal tails and halos.
- 3 fields for Pal3.
- 1 field for Pal12.
- 2 strips of 10 adiacent fields in the warp region.

~70 fields	~180 hours
~80 fields	~180 hours

Survey strategy

•RF

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clu

Table 1: Single exposure times for square degree.

filter	limit mag/flux (mag / erg cm^{-2}s^{-1})	airmass	seeing (arcsec)	days from dark moon	S/N	exp. time (min)
g	21.7	1.5	1.0	7	30	1.2
r	21.5	1.5	1.0	7	30	1.2
r	24.0	1.5	1.0	7	10	9.0
i	21.5	1.5	1.0	7	30	2.6
u	23.4	1.5	1.0	3	30	130
vS	23.4	1.5	1.0	3	30	150
Hα	3×10^{-16}	1.5	1.0	10	10	67[a]

- 150 squared deg. at g~22 mag with S/N~30
- 360 hours over 4 years (2 years for the core program)
- Data flow = 0.7 Tb/yr
- VLT spectroscopic follow-up planned
- 6 FTEs per year (3/5 years)

STEP Survey- the SMC in Time: Evolution of a Prototype interacting dwarf galaxy

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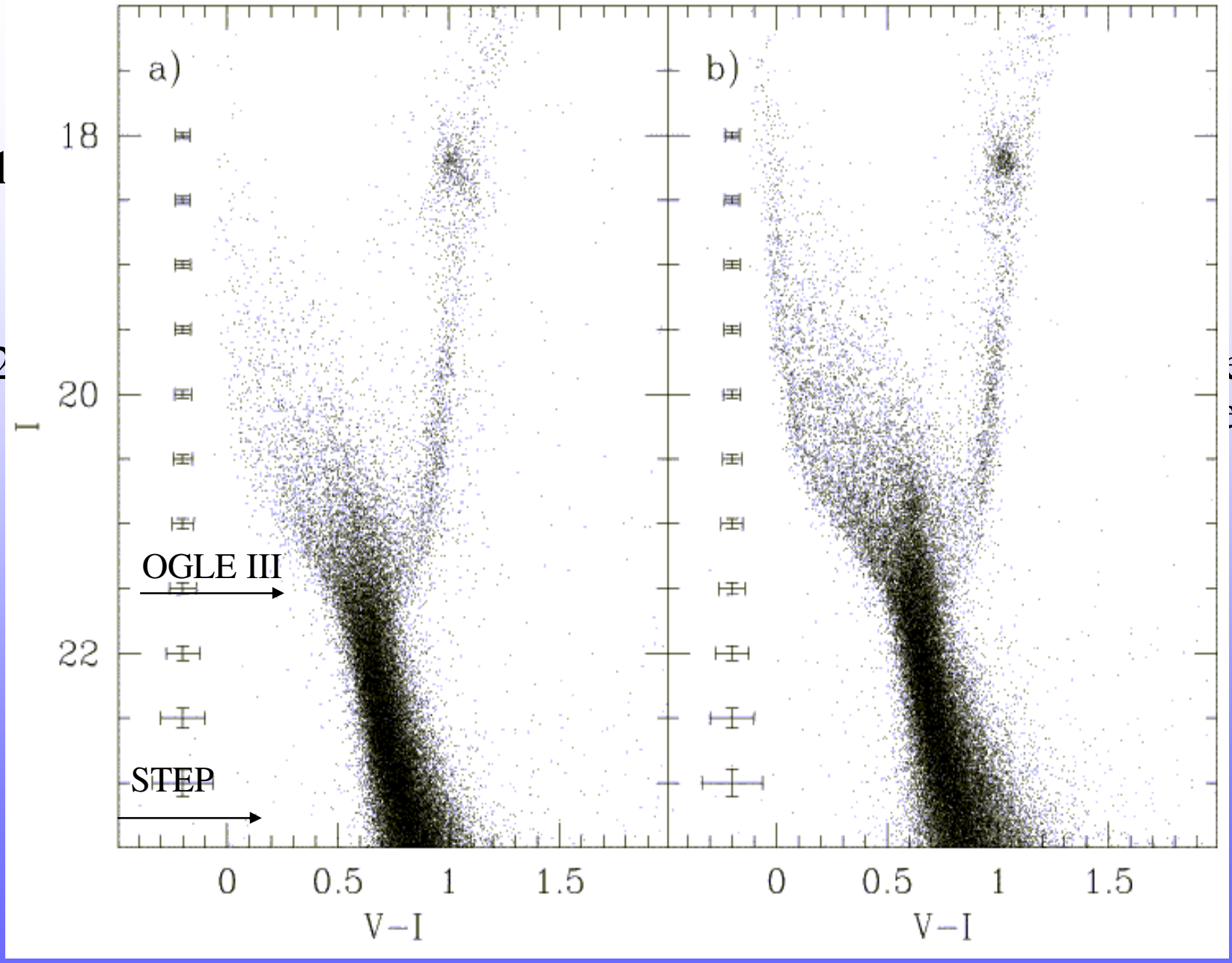
Why SMC

•In hierarchical (CDM) models DGs are possible "building blocks" of larger galaxies (including MW) ⇒ understanding DGs star formation and chemical enrichment histories is fundamental

•Local Group DGs are ideal laboratories for understanding DG properties: we can explore in detail ages, metallicities and spatial distributions of their stellar populations.

•Among LG DGs the Small Magellanic Cloud is the closest late-type dwarf

•tidal interacting with its neighbours: Wing and Bridge towards the LMC ⇒ probe galaxy interaction models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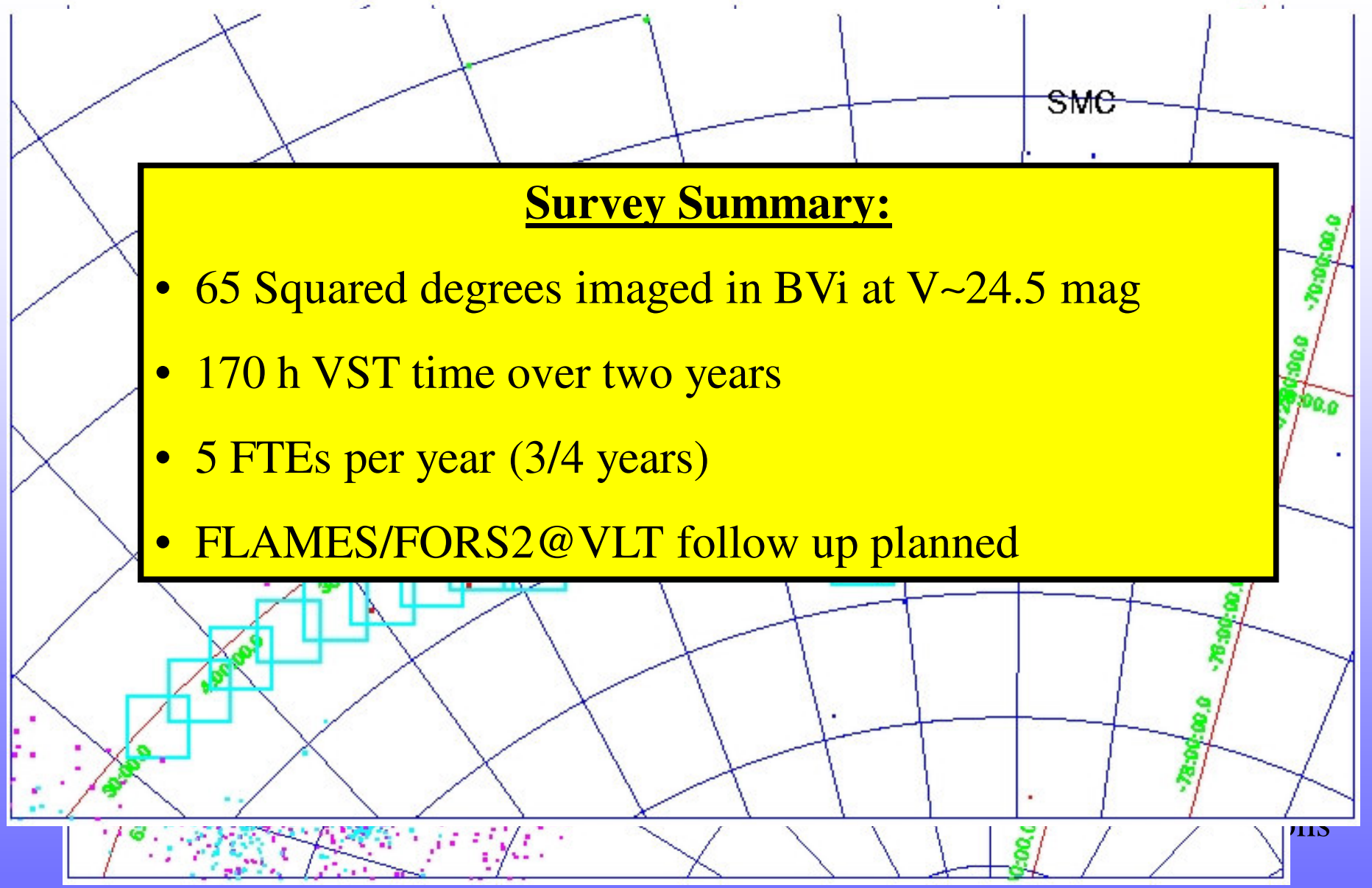
Survey description



Survey Summary:

- 65 Squared degrees imaged in BVi at V~24.5 mag
- 170 h VST time over two years
- 5 FTEs per year (3/4 years)
- FLAMES/FORS2@VLT follow up planned

Other on-going studies on SMC:

• On-going studies on the SMC and/or the Magellanic system are characterized by:

- ➢ very deep photometry and very small FOV (e.g. HST)
- ➢ deep photometry but small/patchy FOV (e.g. IAC group)
- ➢ very shallow photometry and wide FOV (e.g. OGLE)

NO ON-GOING STUDY WILL SECURE DEEP PHOTOMETRY ON A WIDE FOV AS *STEP* WILL.

Complementary observations/surveys

- HST photometry on selected fields, old and young clusters (P.I. J. Ga… …ing.
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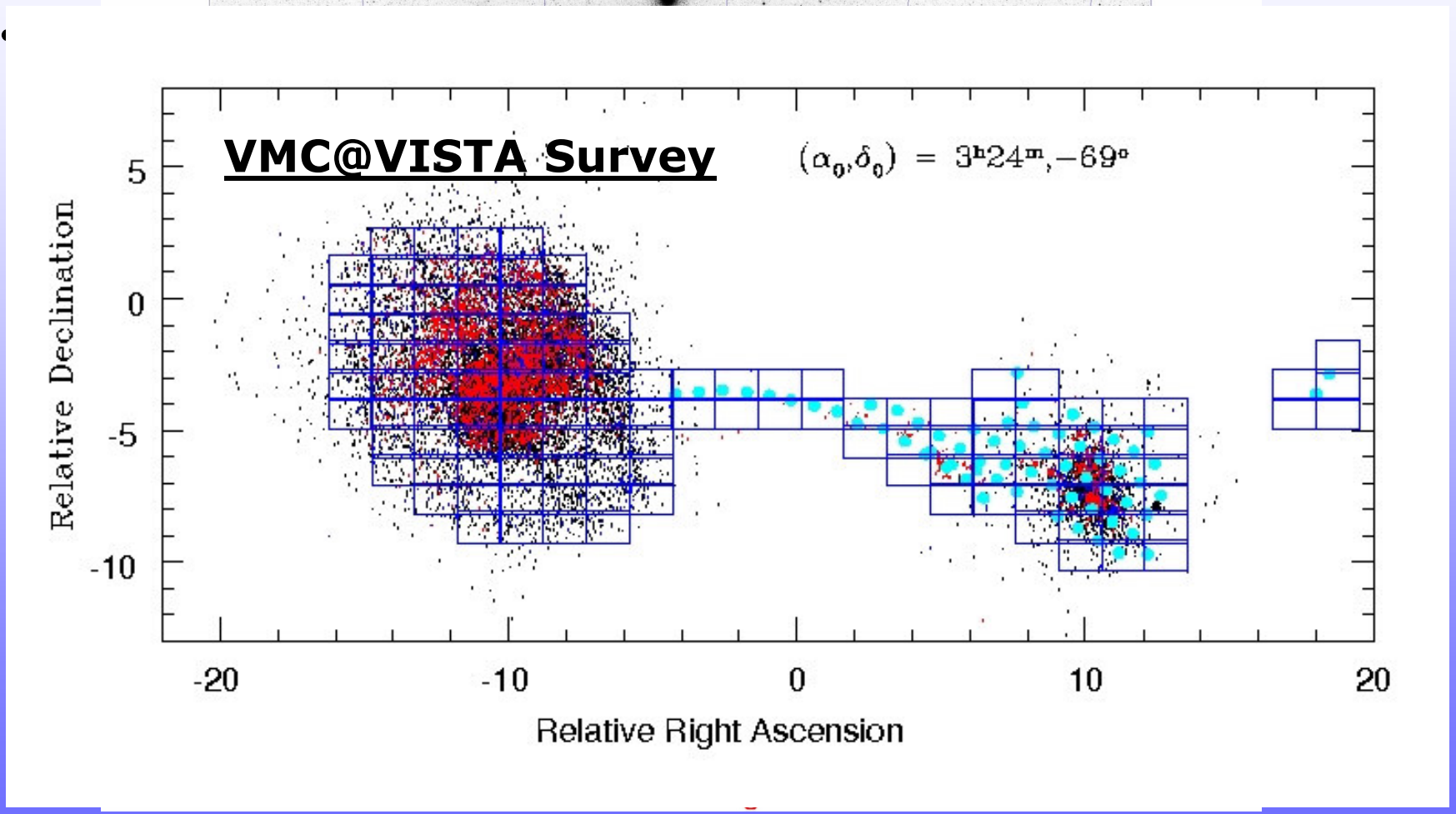

Surveys requiremens

STREGA & STEP have similar requirements:

1. Good pre-reduction (overscan, etc.)
2. Good photometric precision $\Rightarrow$ PSF photometry (especially need for STEP, the SMC body can be really crowded)
3. Good accuracy (i.e.$<$ 0.02 mag) $\Rightarrow$ reliable photometric calibration
4. Efficient variable star finder $\Rightarrow$ image subtraction analysis

Present plans for data reduction

- "Standard" pre-reduction with Astrowise including correction for bias, flat-field……astrometry
- PSF photometry with DAOPHOT/ALLSTAR: custom automatic PSF modeling by using shell scripts. Slow! Looking for better solutions (PSFEx?).
- Standard photometric plan + Astrowise
- Efficient variable star finder: image subtraction analysis with VODIA/MDIA (new comparison tests useful)
- Light curve analysis: custom programs
- We are going to start tests with proprietary WFI data.

Conclusions

•STREGA & STEP are two small and well aimed surveys in the framework of INAF-OACN GTO time.

•STREGA was conceived in 2004. Needed an update at the light of other large surveys ongoing or planned.

•Data reduction with AW, but we need PSF photometry.