VLT Public Spectroscopic Survey
- Survey Strategy -

Carine Babusiaux

l'Observatoire de Paris — GEPI

Summary of various inputs received,

in particular from the VLT Public Survey Planning Group:

P. Bonifacio, B. Famaey, S. Feltzing, G. Gilmore, E. Grebel, D. Kawata,

A. Korn, S. Randich, N. Walton

- In one pointing :

UVES → Chemical Tagging (R = 40 000, 7 stars) (abundances, Vr)

GIRAFFE HR high SNR → Chemical Labelling (R = 20 000) (α, r-s, Vr)

GIRAFFE HR low SNR → Chemo-dynamics (Fe, α?, Vr)

- Large and homogenous sample needed:
  - Same set-up, same data reduction analysis
  - all stellar populations (thin disk, thick disk, halo, bulge, clusters)

- Size:
  - 300 nights over 5 years
  - 2 settings , 45 minutes (1 OB per setting) → 5 fields/night

    → 1500 fields, 165 000 stars + 10 500 UVES stars

Survey size optimisation

- In some regions of specific dynamical interest in the disk:

only one setting (HR21) for Vr only.

- At high latitude (|b|>20°):

  bright (V<16): observed in the two settings

  faint (16<V<19.5): two target list for the two settings

Two sub-integrations for cosmic rays removal

Binaries

The two settings will be observed at 2 different epochs

⇒ binaries detection:

→ binary studies

→ abundances determination :

1% flux contamination can produce a 0.1+dex bias (Erspamer & North 2003)

→ Vr dispersion:

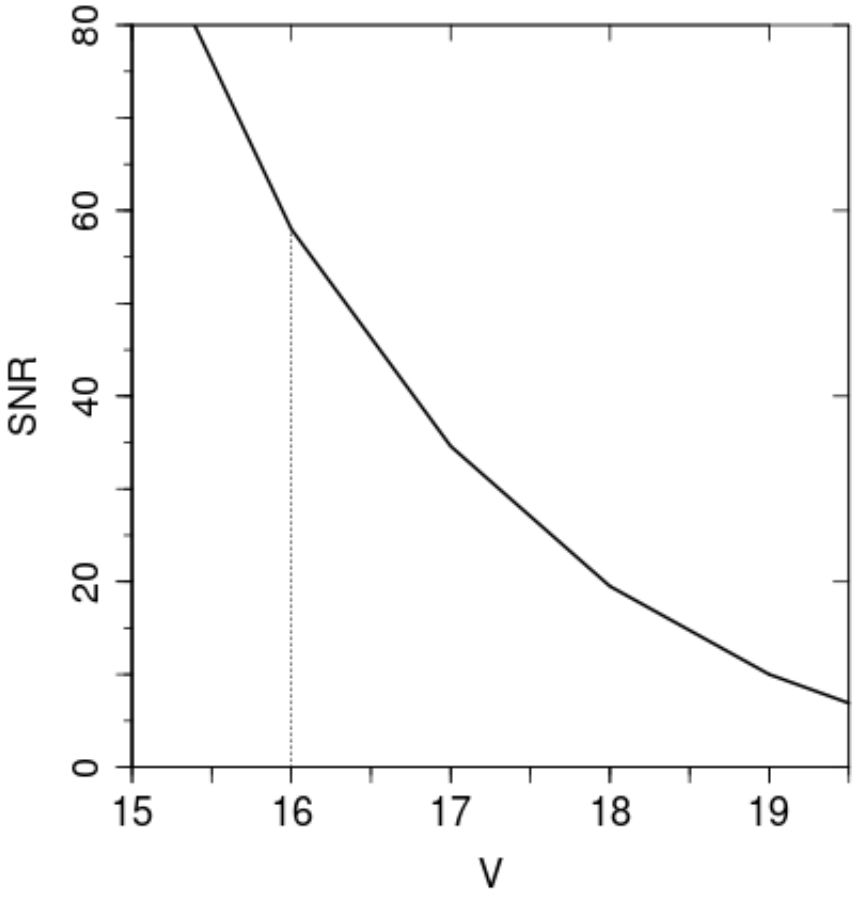
Extra Vr dispersion due to un-detected binaries on solar type stars = 8 km/s

With 2 epochs this is reduced to 4 km/s

HR21

R = 16 200

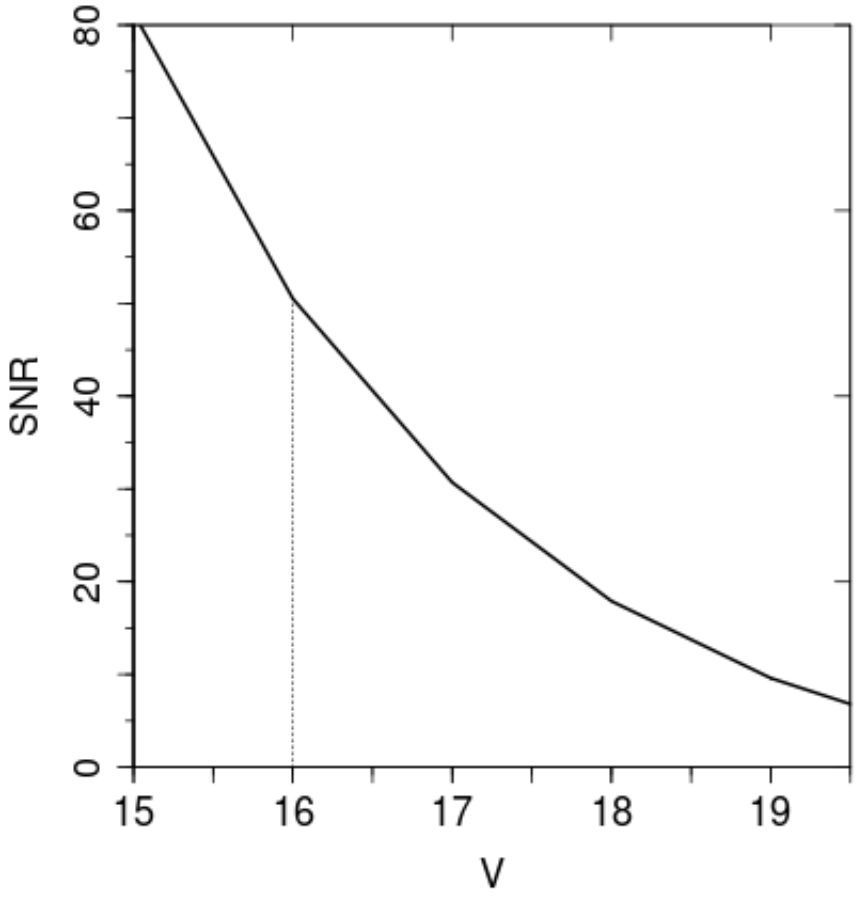
848.4 < λ < 900.1



HR12

R = 18 700

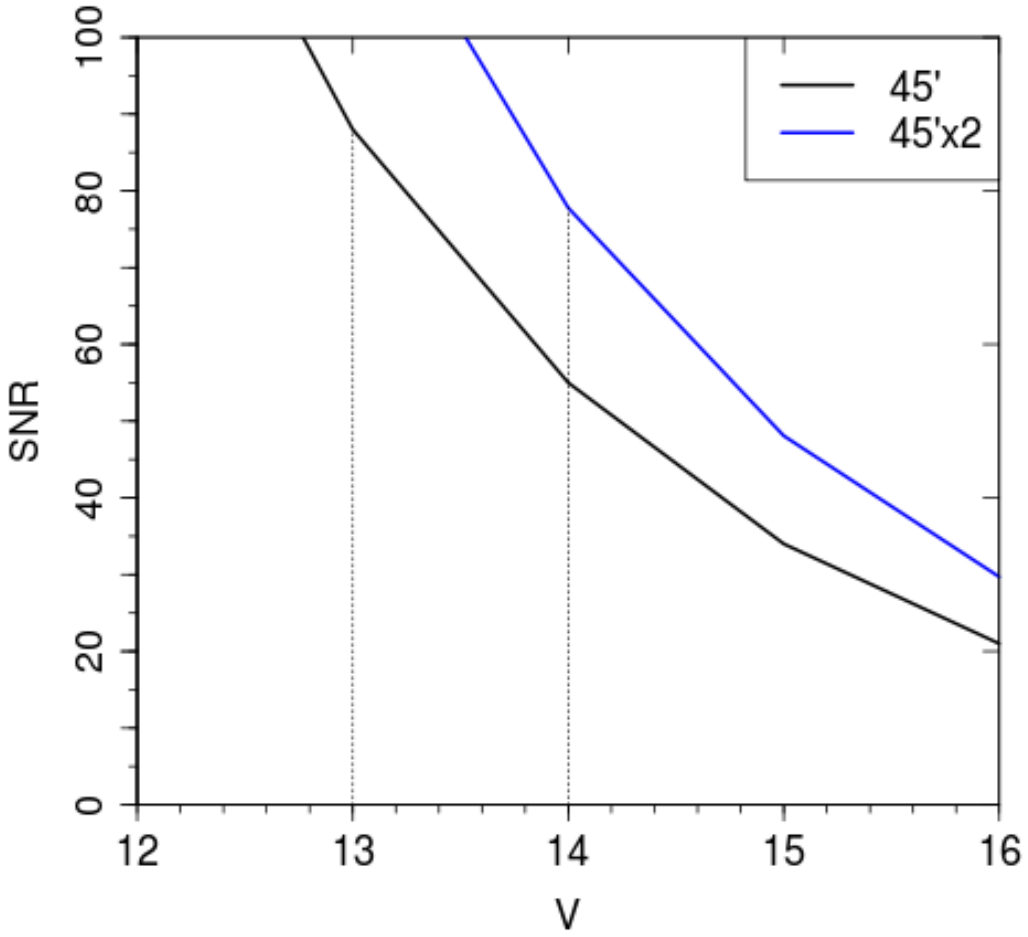
582.1 < λ < 614.6



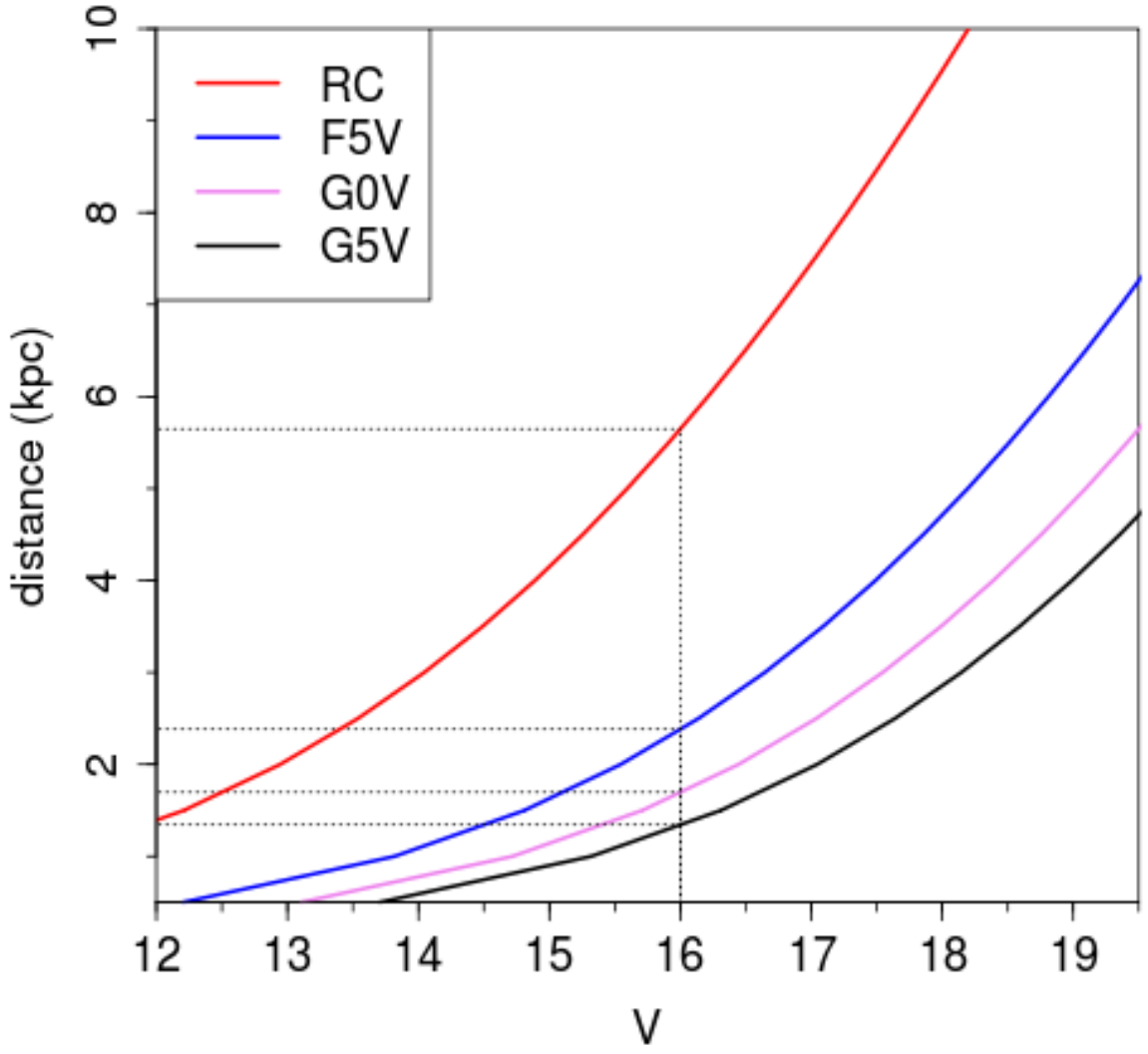
UVES 580

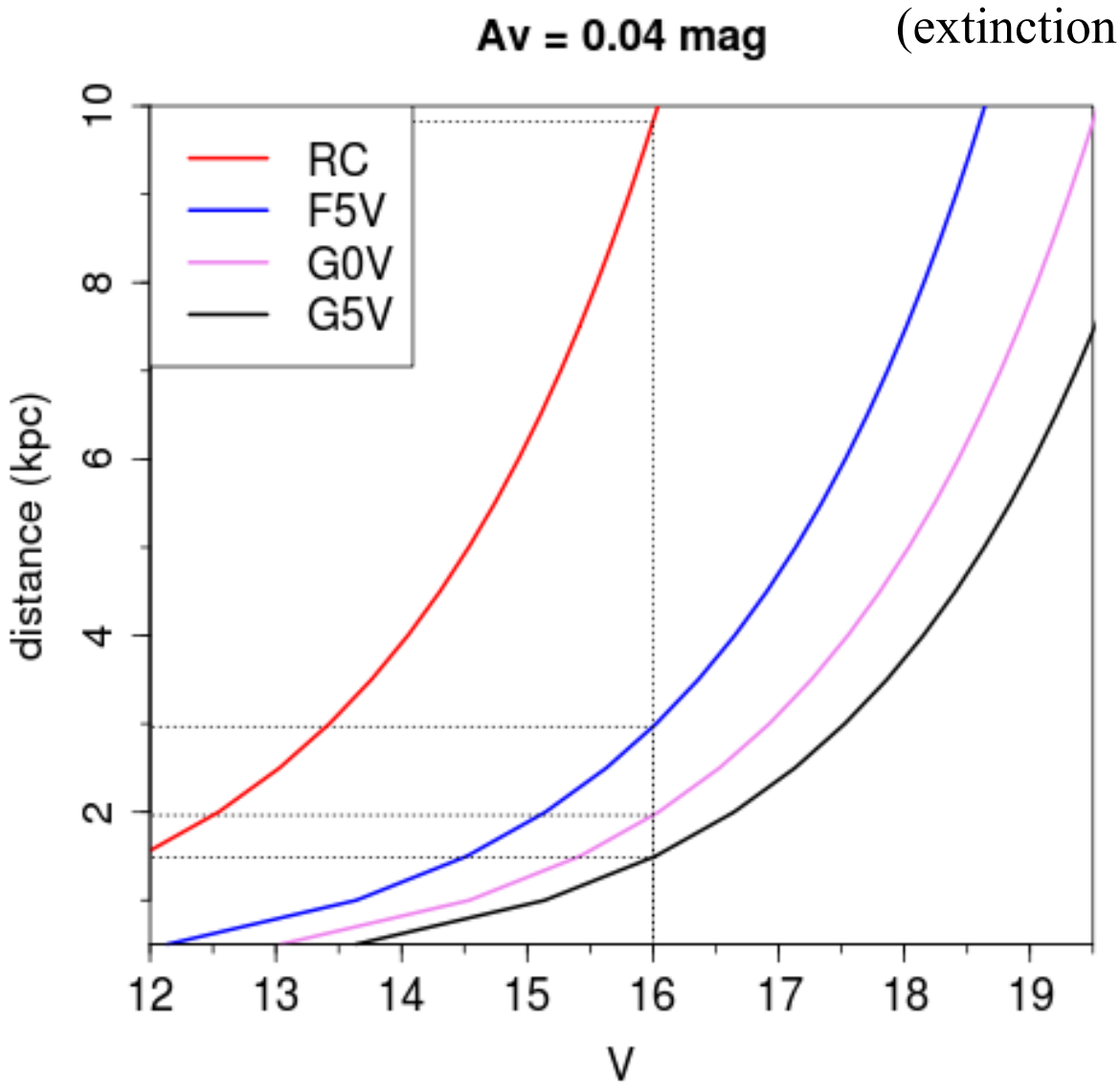
R = 47 000

$473 < \lambda < 580$ & $582 < \lambda < 683$



Av = 0.22 mag/kpc (Typical extinction at b=20°)



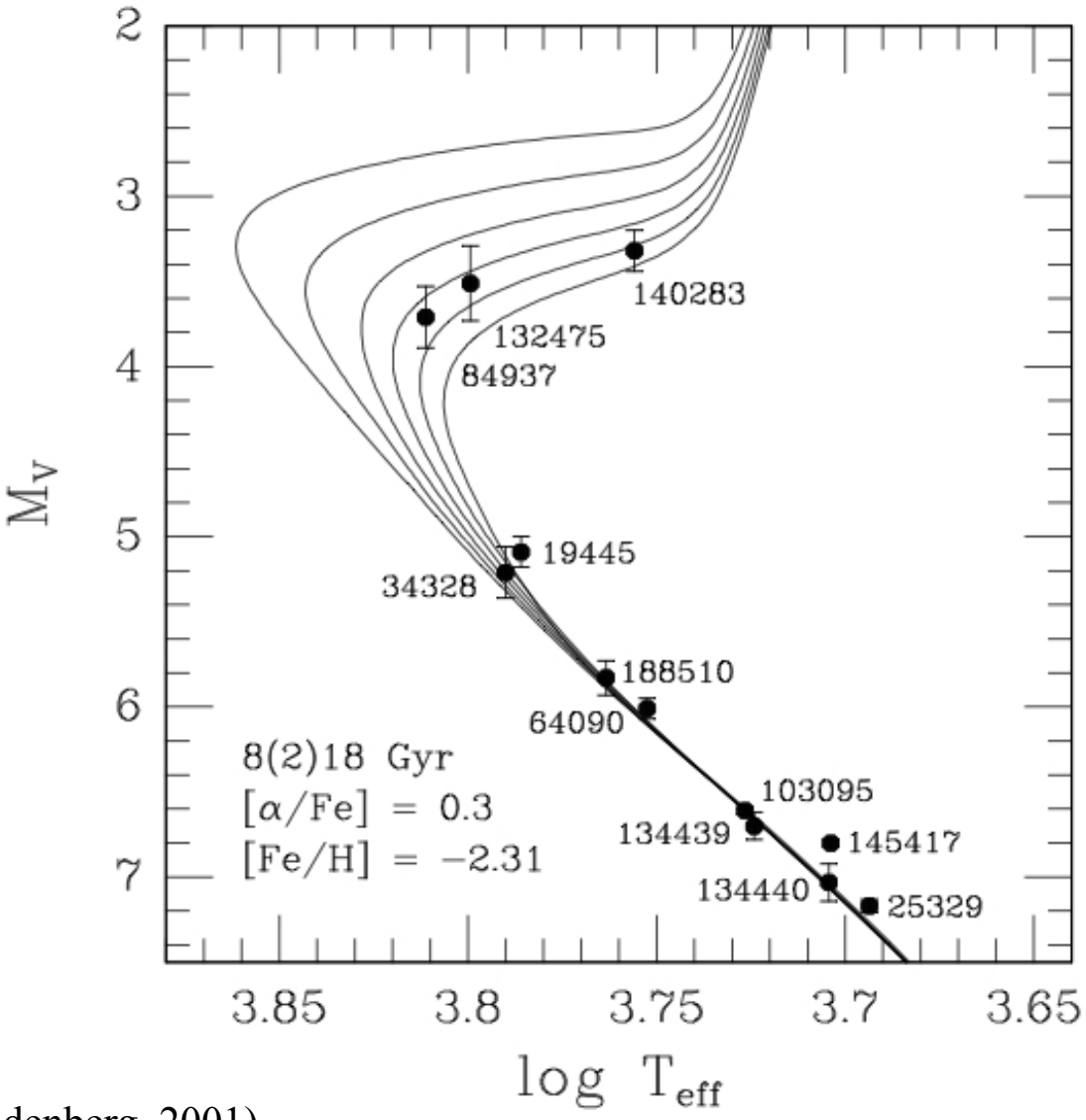


(extinction at the SGP)

- Gaia Parallaxes:

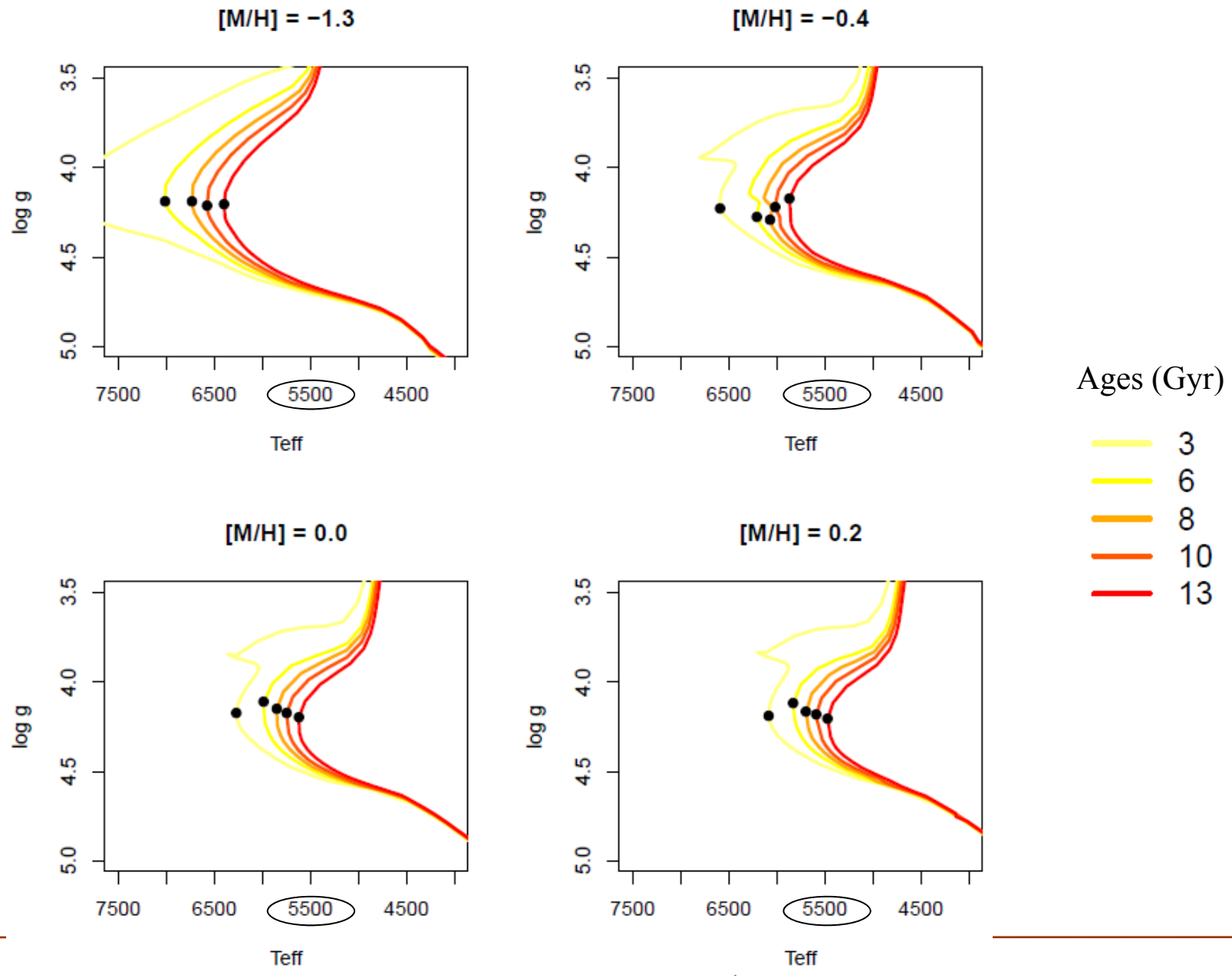
  at V=16: σ_π= 0.035 mas, at 8kpc σ_π/π = 28%

  at V=19: σ_π= 0.15 mas, at 4kpc σ_π/π = 64%



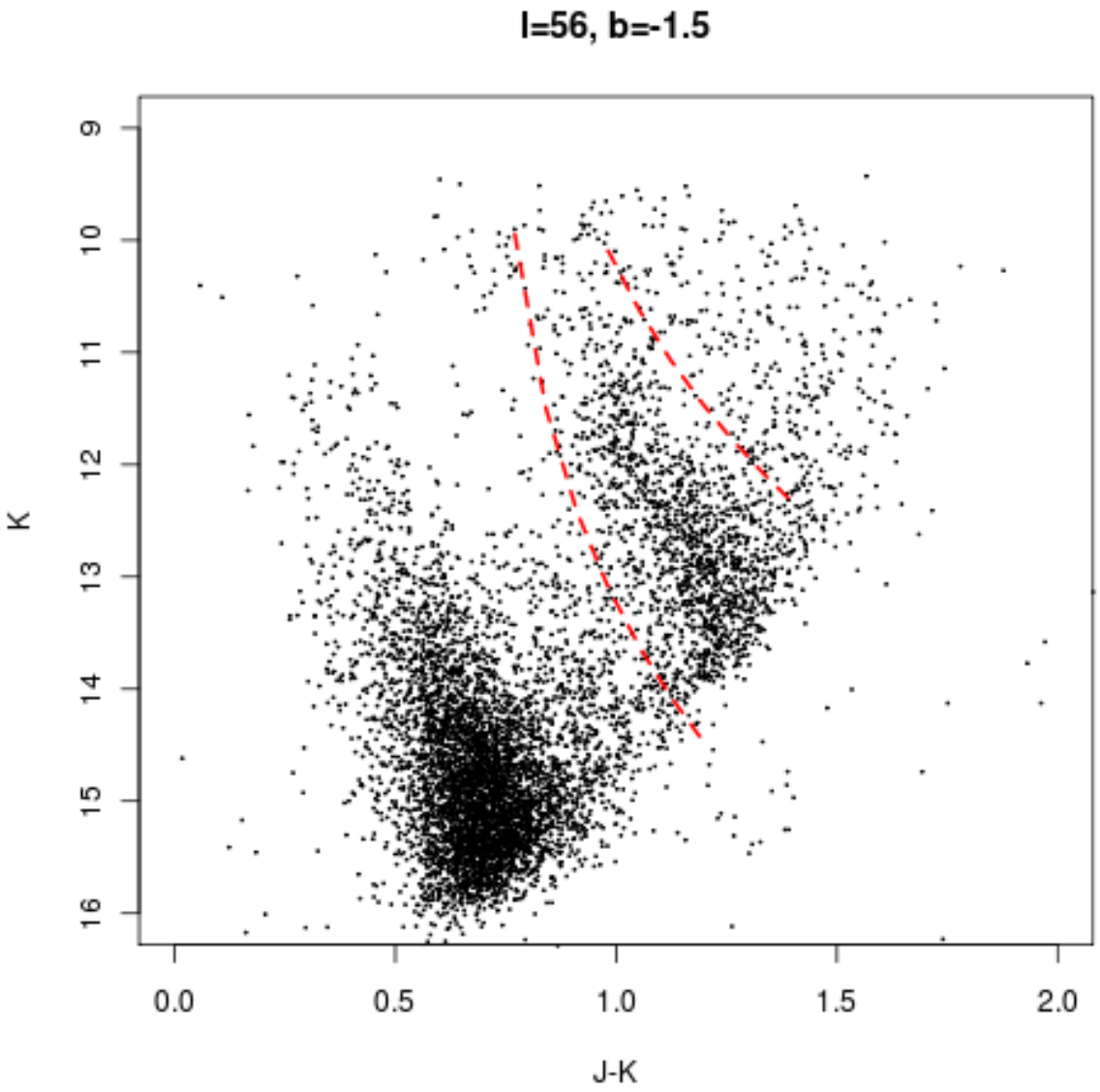
(Bergbush & Vandenberg, 2001)

G5V targets → MDF



(Padova)

RC targets → probe large distances



CaII triplet region:

- strong triplet for all stars
- well studied (RAVE, Gaia, Giraffe Archive...)

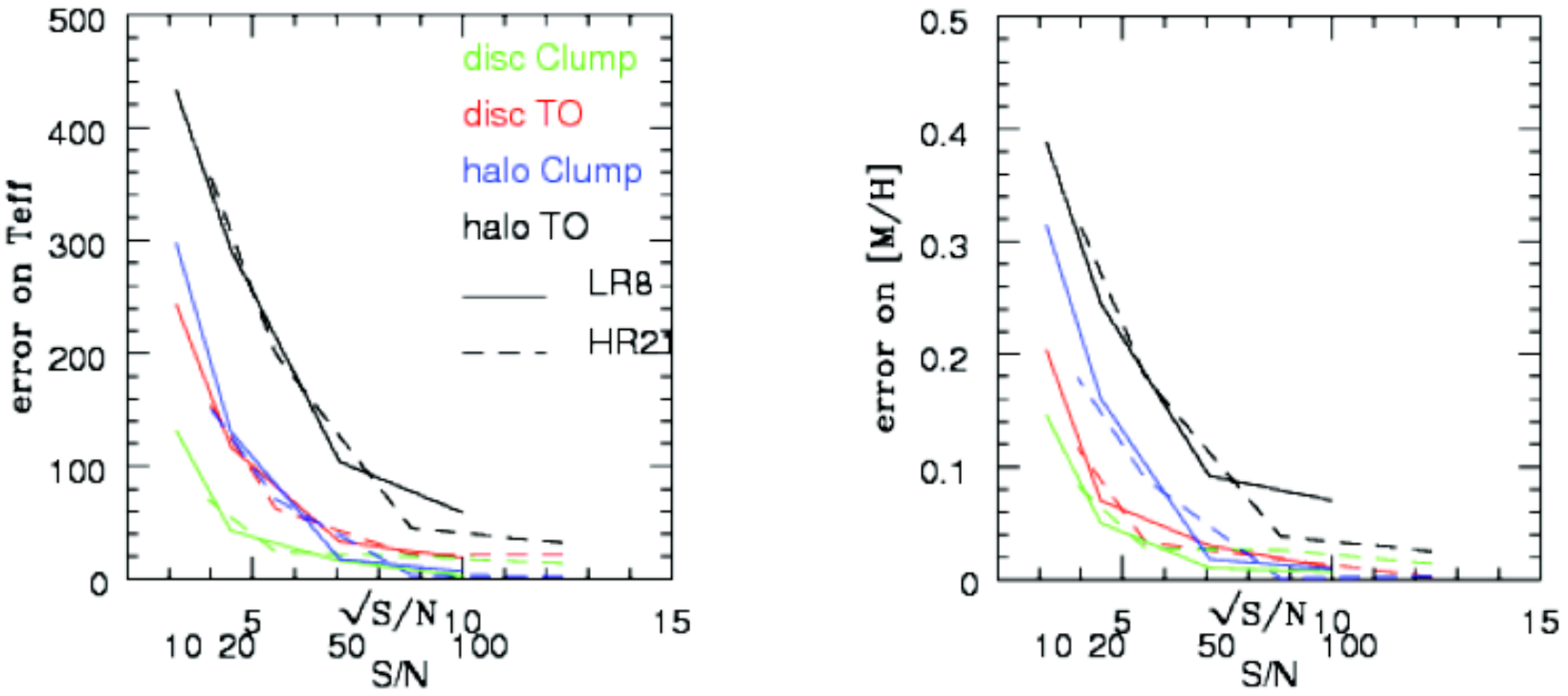
→ LR08 versus HR21 for low SNR?

Piercarlo Bonifacio simulation:

for a K2 star with V=19 in 45 minutes:

Rv error:	LR08	3.4 km/s
	HR21	2.2 km/s

LR08 / HR21



LR8 SNR, same exposure time

- **HR12** / HR15n / HR13 / HR14:
  - HR12 and HR15n have the highest efficiencies

(Note that HR15n has been chosen by the OC LoI)

  - HR12 has the NaID line, still visible in metal-poor stars at low SNR
  - for a K2 star with V=19 in 45 minutes Rv error = 1.3 km/s
  - NaI is also an ISM line

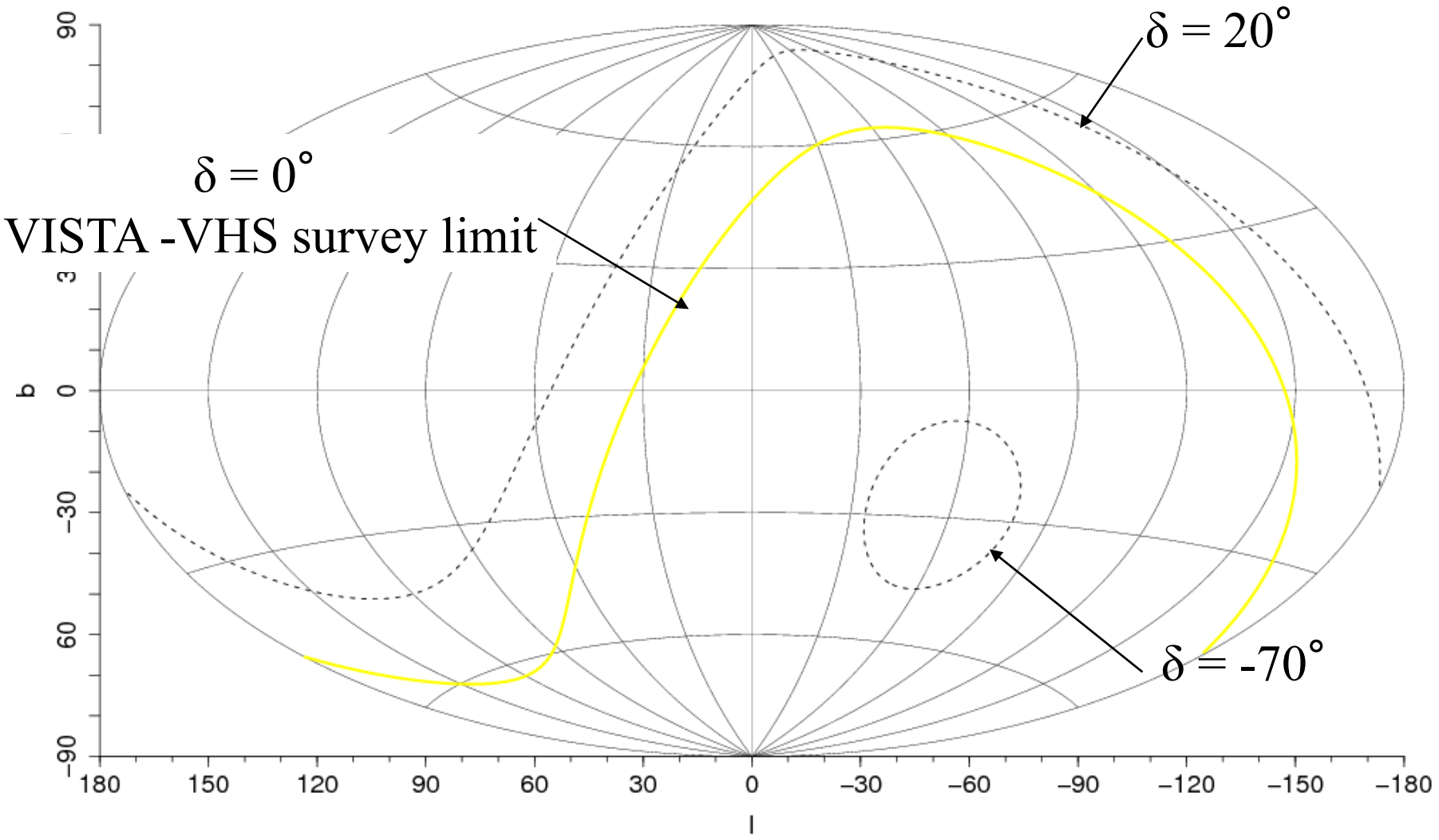
- Synergies with the data already in the ESO archive :

  HR21 : 585 OBs for 25 programs (+ 744 LR08)

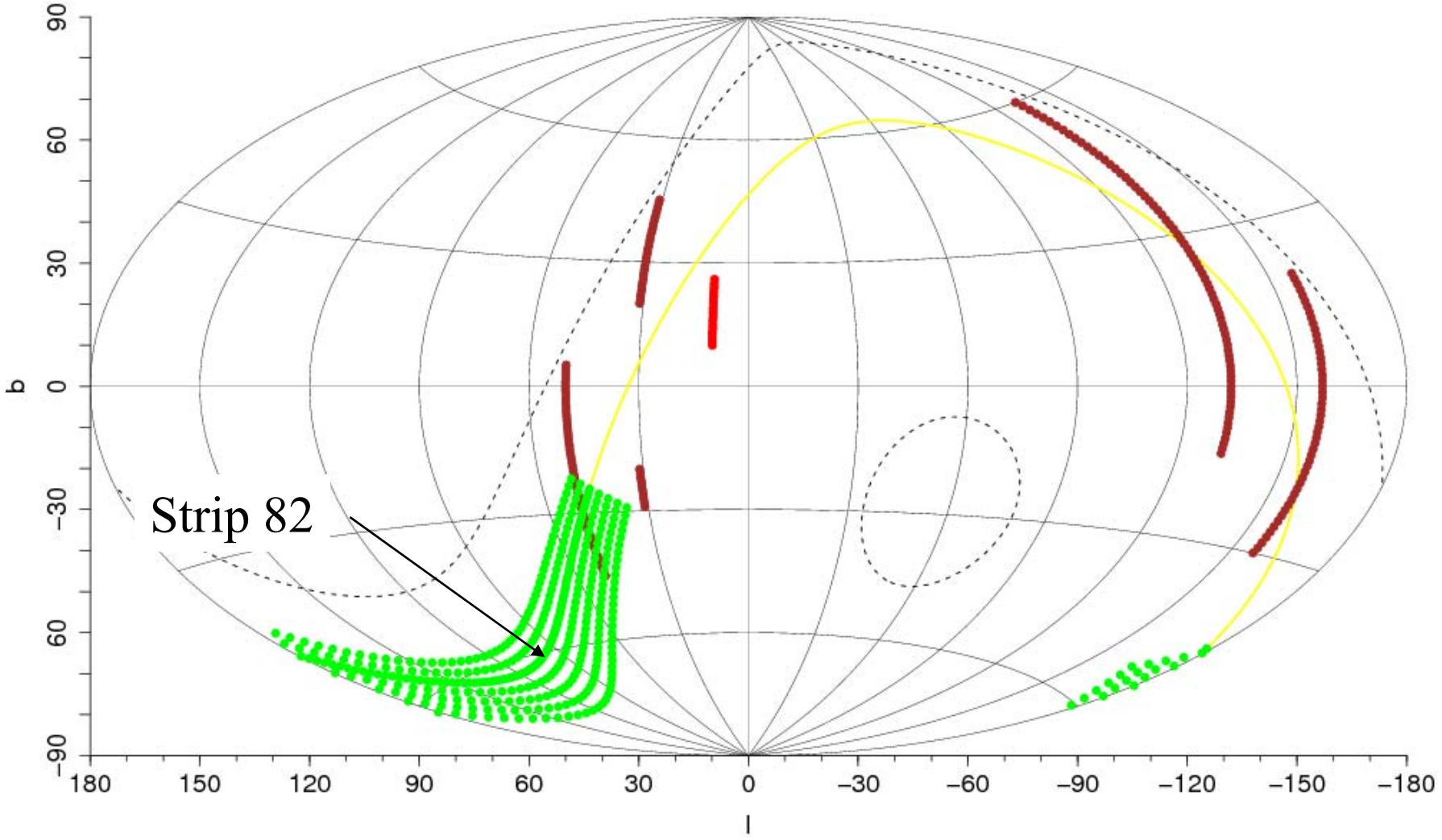
  HR12 : 42 OBs for 11 programs

- Clusters with HR21 and HR12:
  - M4 – two different PIs
  - NGC 1976 – young stars, CaII triplet in emission
  - NGC 6618 – young stars, ARGUS mode

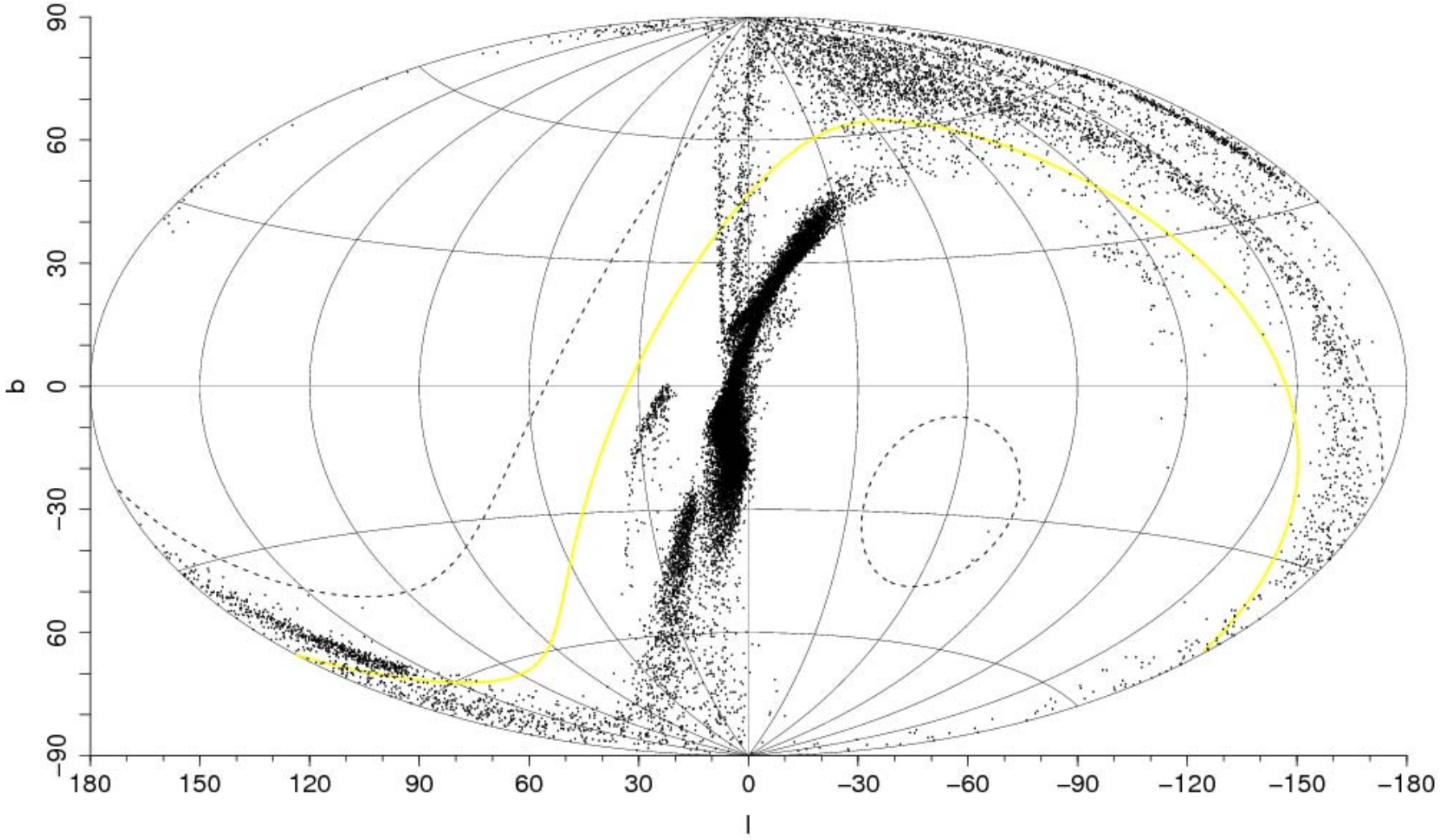
Fields - VLT constraints



Fields - SDSS

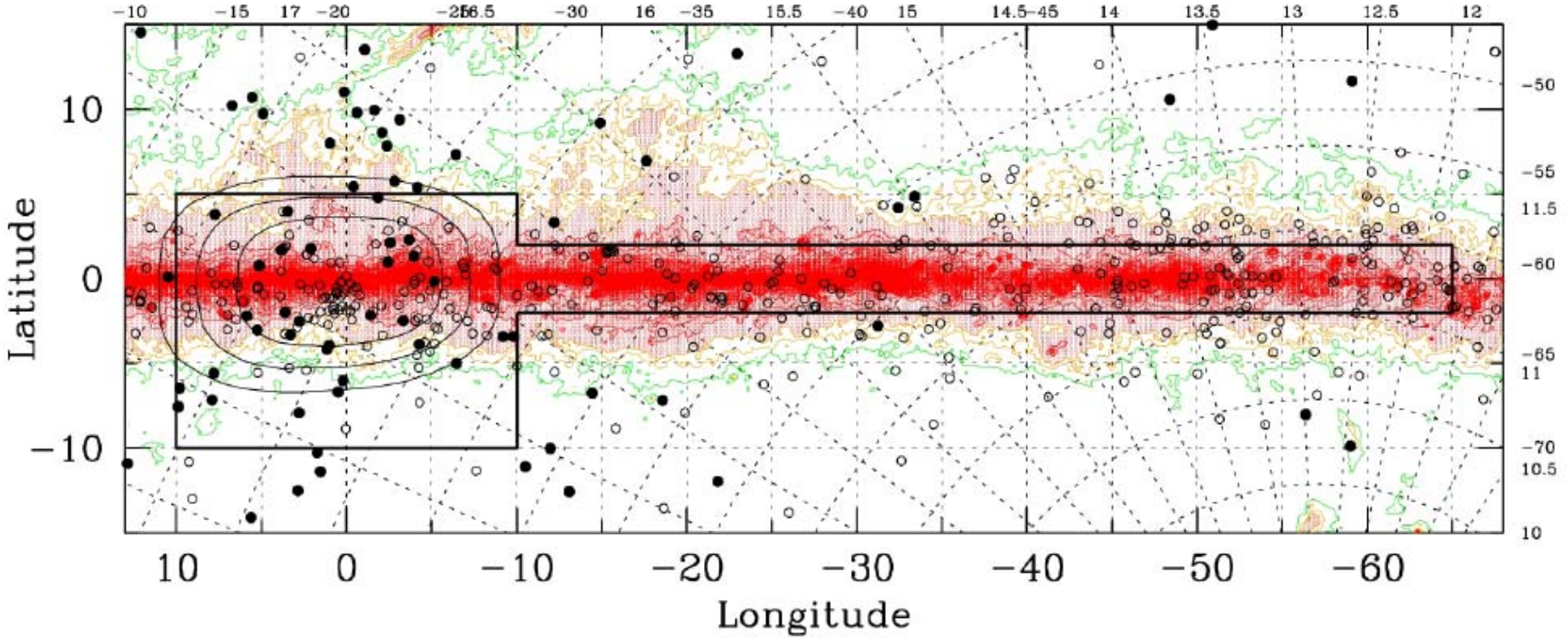

Strip 82
b
l
90
60
30
0
−30
60
−90
180
150
120
90
60
30
0
−30
−60
−90
−120
−150
−180

Fields – Sgr stream

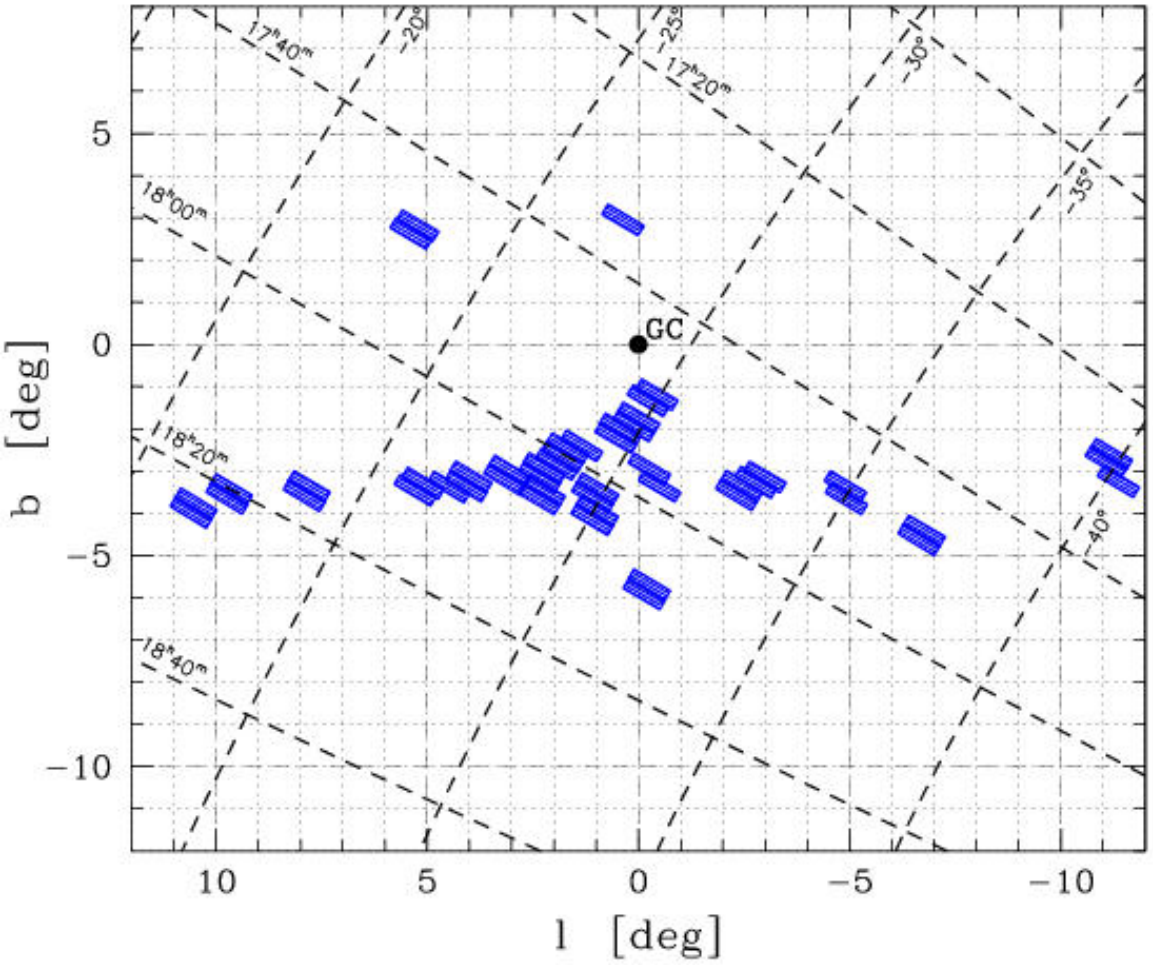


Model of Penarrubia et al. (2010): Sgr stream RC stars with V<19

Fields – Bulge : VISTA VVV



OGLE-II


17h40m
-20°
-25°
17h20m
-30°
-35°
-40°
18h00m
18h20m
18h40m
GC
5
0
−5
−10
b [deg]
10
5
0
−5
−10
l [deg]

For the bulge we will more than one OBs

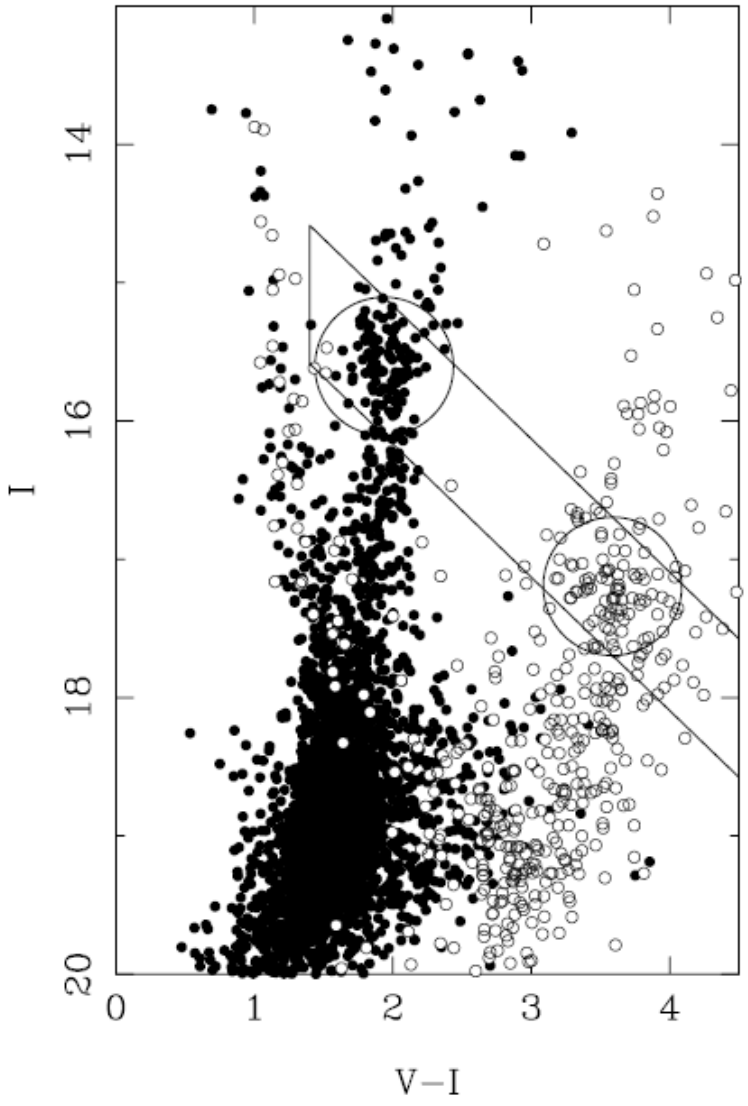
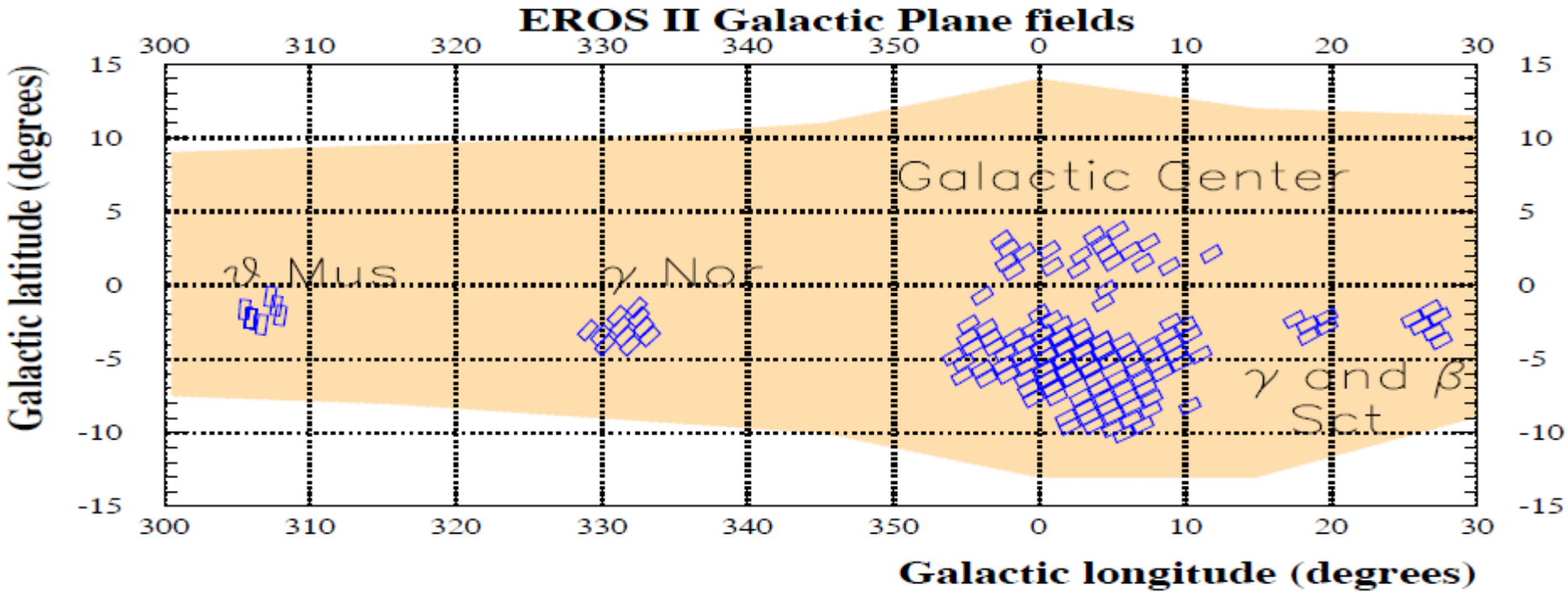


Figure 5. The CMDs of two groups in BUL_SC22. Filled and open circles represent stars in a group with low and high extinction, respectively.

OGLE-II
Sumi 2004

Fields – Bulge + Spiral arms : EROS

R_E B_E



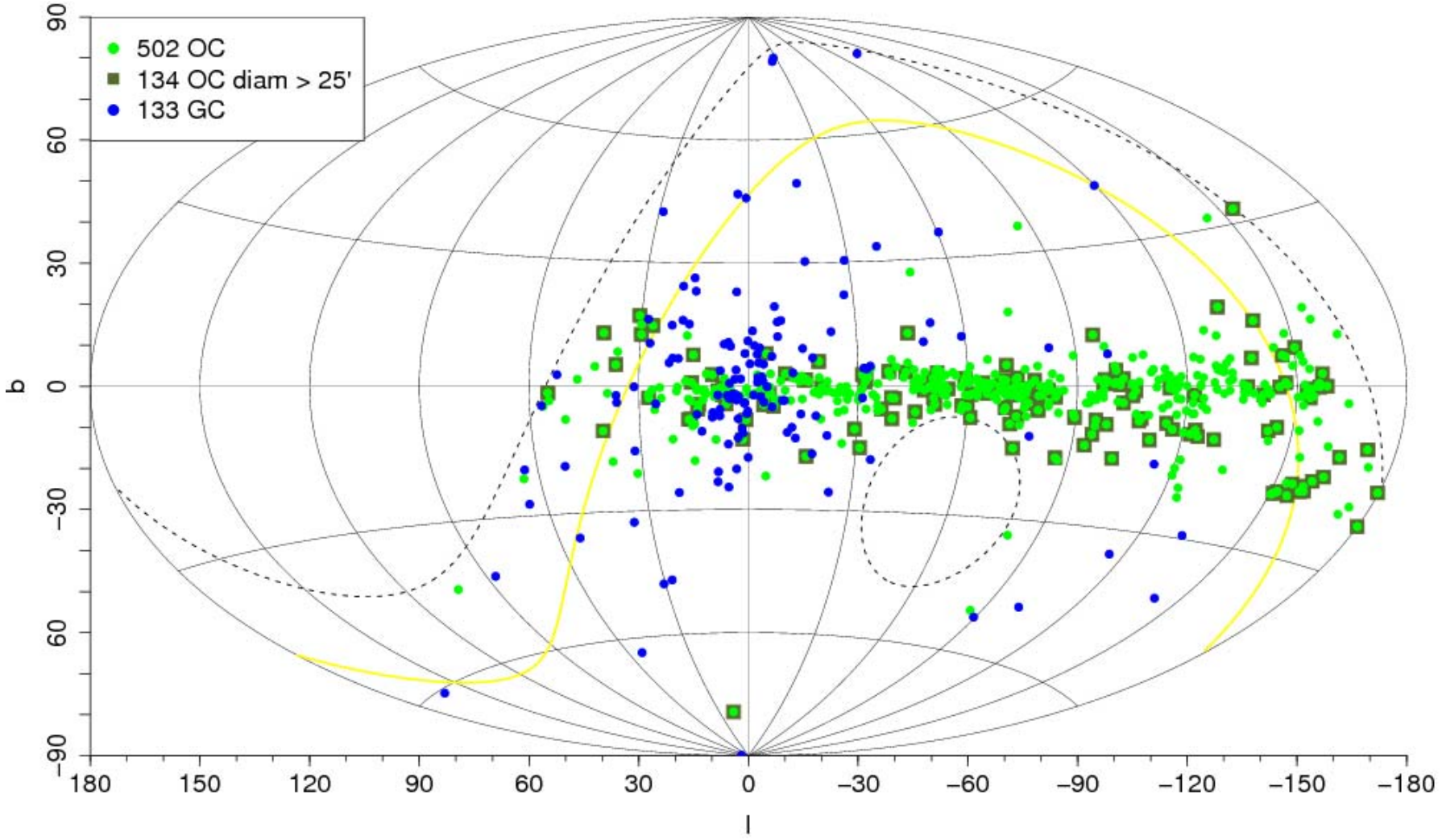
Fields – Disk kinematics

- Pencil beam survey of the thin disk / spiral arms

  (Minchev & Quillen 2008)

  - V=19.5, HR21 only
  - Red Clump targets
  - EROS fields: l=26.4, l=18.4, l=0, l=-29, l=-53.5
  - Plus e.g. : -15, -70, -85, -100 et -130

  → to be optimized, low extinction regions + dynamical models



Open Clusters: Dias+ 2002, Globular Clusters: Bica+ 2006

A few fibres for specific objects

- Variable stars (see Nami Mowlavi's talk):

  SDSS strip 82, VISTA VVV, OGLE, EROS

- Carbon stars (input from Mary Kontizas et al.):

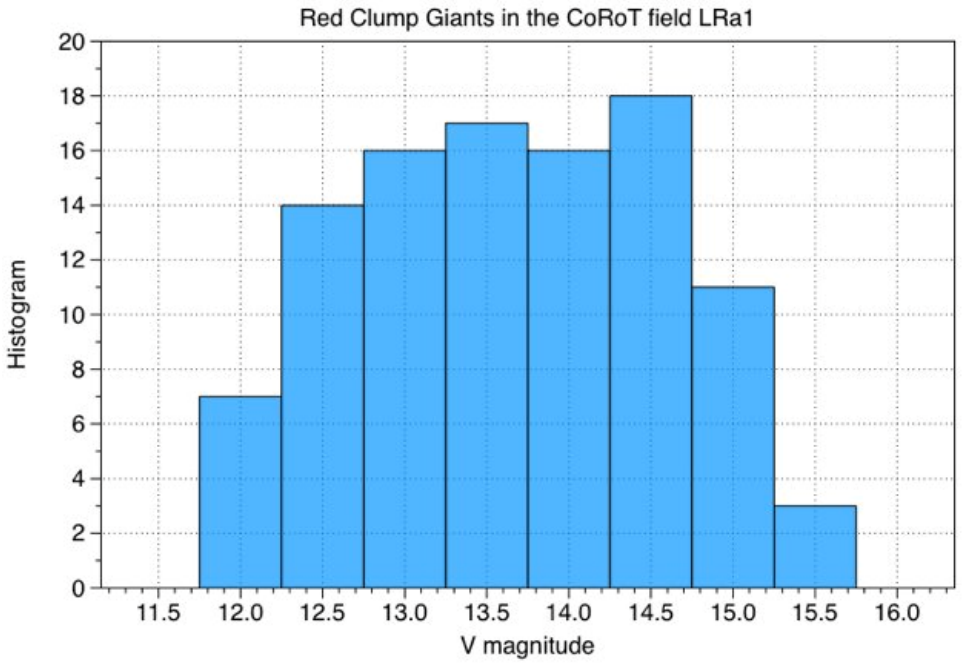
  input catalogue from Alksnis 2001

  abundances for V<16, Vr for V>16

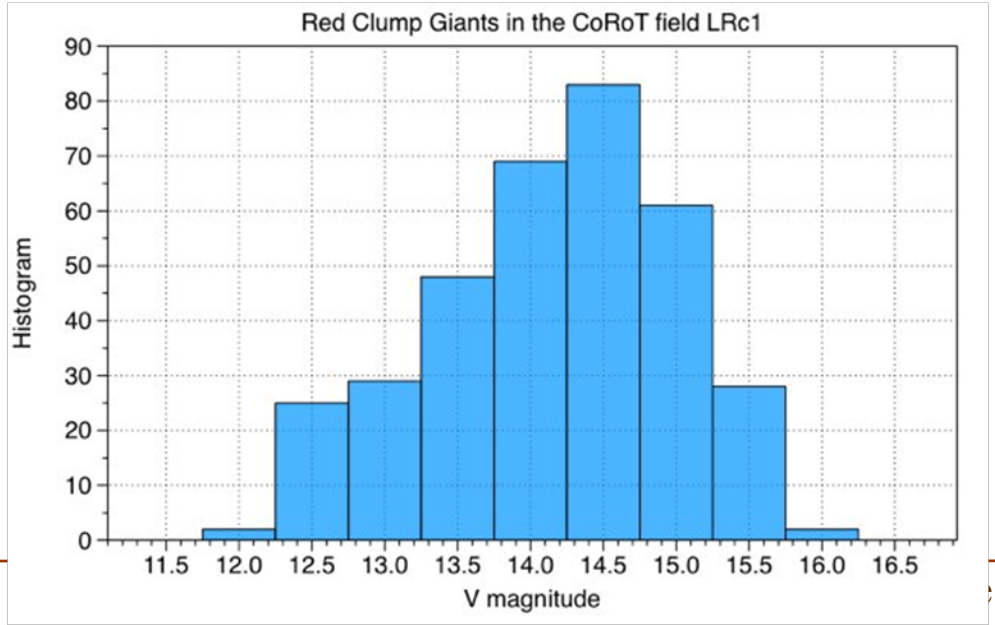
- WD / BHB

- ...

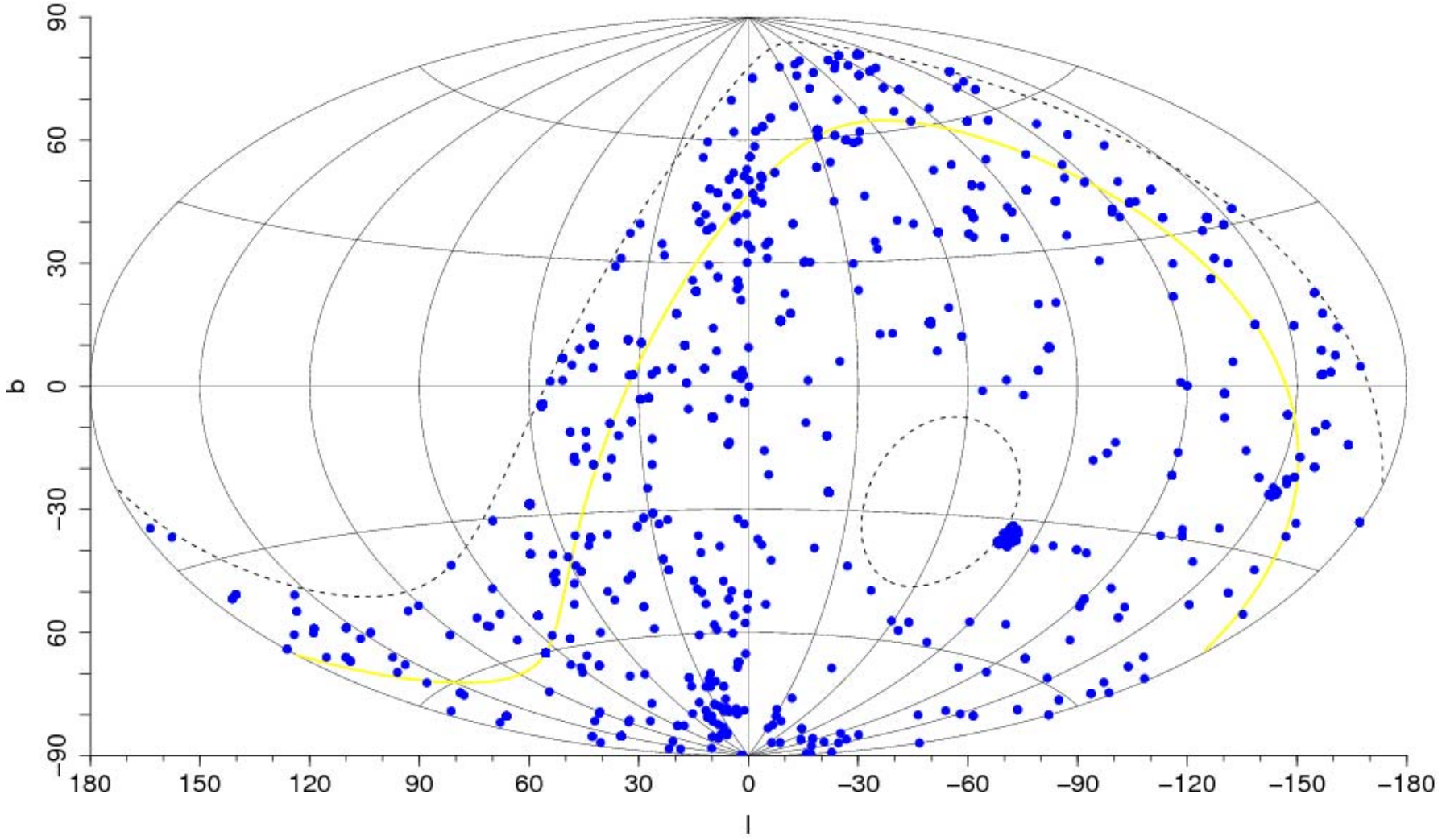
CoRot Fields



LRa1
l=212, b=-2

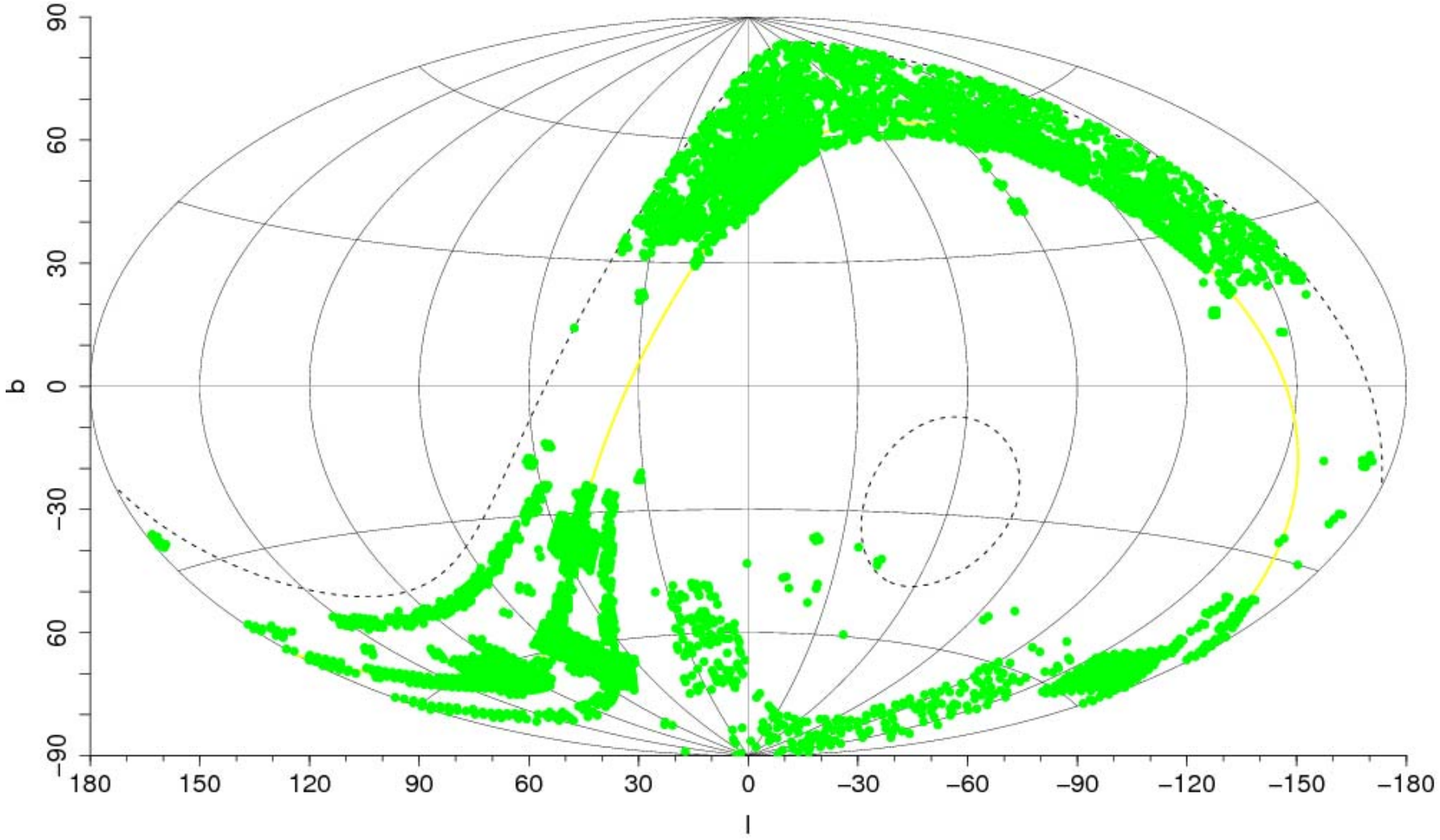


LRc1
l=37, b=-7



PASTEL (Soubiran+, 2010) : 1518 stars with 10<V<16

Optimising the multi-wavelength coverage if available



GALEX already observed Medium Imaging Survey (MIS)

Number counts from SDSS at V<16

- l = 228, b = 10
  - Besancon model:
    - 47% of F5-G5 dwarfs.
    - 7% of cool dwarfs
    - 6% of RC stars
  - SDSS i<16:

486 stars

314 with clean photometry

285 with proper motions

168 with Q>1

Number counts from SDSS at V<16

- l = 50, b = -5
  - Besancon model:
    - 20% of F5-G5 dwarfs.
    - 2% of cool dwarfs
    - 20% of RC stars
  - SDSS i<16:

2684 stars

1125 with clean photometry

731 with proper motions

474 with colors coherent with isochrones + Av

Number counts from SDSS at V<19.5

- l = 228, b = 70
  - Besancon model:
    - 29% of F5-G5 dwarfs.
    - 51% of cool dwarfs
    - 1% of RC stars
  - SDSS i<19.5:

417 stars

176 with clean photometry

155 with proper motions

TODO list

- HR12 / HR21 simulations and performances, confirmed set-ups?
- Target selection
  - F/G only in the range 16<V<19.5 (|b|>20°)?
  - RC stars – removal of close cool dwarfs
  - Automatic selection of the targets – avoiding biases!
  - Estimation of the contaminations (Besançon model)
- Field selection
  - Nb of fields in the plane / at high latitude
- Clusters
- Peculiar stars in a few fibres