

The Gaia-ESO Spectroscopic Survey

This is an ambitious Survey

1st large telescope stellar survey

1st use of multiple reductions

1st to target all populations

We have:
wide range of expertise
a lot of interest
strong ESO support

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The Gaia-ESO Spectroscopic Survey

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Our approach is to retain strengths of all proven methods, delivering both a recommended result and a range. Our challenge is to keep everything working together.

This

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- A. Ferguson¹⁶⁴⁹,
- Vallenari¹³⁴³,
- Altavilla⁷⁵³⁰,
- C. Babusiaux¹⁵⁸⁸,
- D. Barrado
- elokurov¹³⁷⁰,
- ⁵², J. Bland-
- Bouvier¹⁴⁴⁰,
- J. Caballero⁵⁵⁴⁵,
- S. Carraro¹²⁶¹,
- Y. Chorniy¹³⁷⁶, N.
- D. M. Collins¹⁴⁸⁹, M.
- 1200, F. Damiani¹³⁴⁴,
- son⁶¹⁸¹, H. Enke¹¹³⁵,
- ¹⁸²⁴, I. Ferreras¹²⁴²,
- 1200, E. Francosini¹³³⁵,
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- 1995, A. Gomez¹⁵⁸⁸,
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- P. Hadrava¹¹¹⁶, D.
- ¹, M. Haywood¹⁵⁸⁸,
- 1393, V. Hill¹⁵⁹¹, S.
- J. Jackson¹¹³², R. de
- ¹⁵⁸⁸, D. Kawata¹²⁴²,
- de¹⁹⁶⁶, A. Koch¹²⁴⁴,
- ky¹¹¹⁶, A. Lanzafame¹⁸⁷⁴,
- ², G. Lewis²⁰⁴⁴, K.
- wig²¹¹², T. Lueftinger¹⁸⁹³,
- G. Matijevic¹⁹²⁵, R.
- 1376, I. Minchev¹¹³⁵,
- ¹²⁶¹, M. Montalto¹²⁰⁰,
- ix¹⁴⁴⁹, T. Morel¹³⁵⁹,
- Napiwotzki¹⁶⁶⁸, N.
- am⁵³¹¹, G. Pace¹²⁰⁰,
- J. Penarrubia¹⁸²⁸, I.
- , A. Quirrenbach²¹¹²,
- o¹⁵⁹¹, C. Reyles¹⁵⁹²,
- ¹, A. Ruzicka¹¹¹⁶, S.
- M. Sarro Baro⁵⁶⁸⁸,
- choenrich¹⁴⁹⁰, R-D.
- c¹²⁶⁸, M. Smith¹⁶¹⁶,
- ¹, M. Steinmetz¹¹³⁵,
- F. Thevenin¹⁵⁹¹, J.
- on¹³⁷⁰, J. Wambsganss²¹¹²,
- V. Zeilinger¹⁸⁹³, M.

"The kid's good."

Gaia-ESO survey overview (1)

- VLT-FLAMES public survey of all stellar populations of the MW: Halo; Bulge; Thick & Thin disks; open clusters and associations. Beyond [Fe/H] to elements.
- Proposal March 2011. Recommendation from ESO/OPC: 300 nights (30n/semester) over 5 (4+1) years; start 1/ 2012 (P88), end 9/2016 (P97)+; visitor mode;
- will yield: $>10^5$ Giraffe spectra ($R\sim 20,000$); $> 10^4$ UVES spectra ($R\sim 47,000$)

Survey design and strategy.

Field stars

Bulge survey targets – technically easy to do.

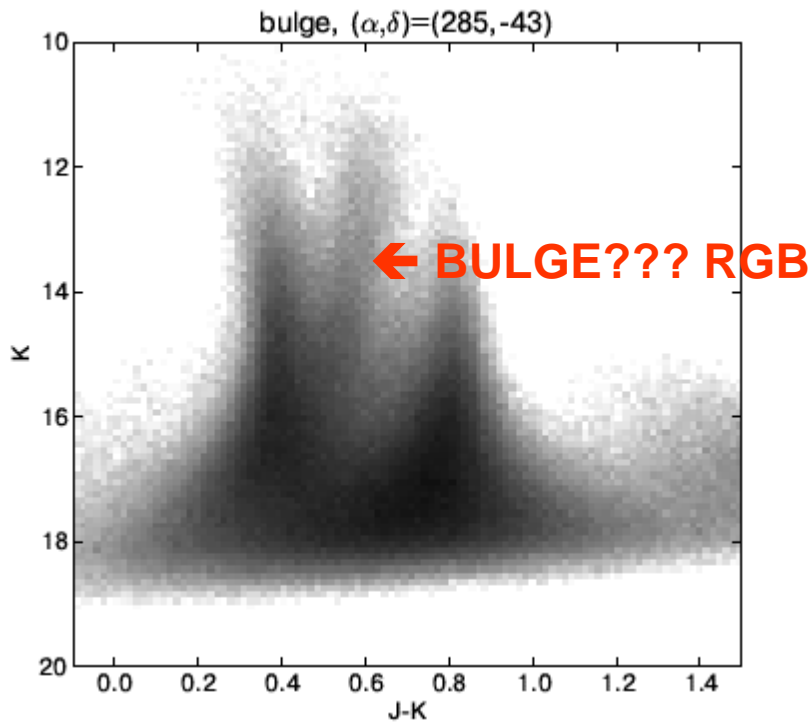
CHALLENGE: how to handle/model/select for the extreme biases due to red clump evolution?

Field target strategy:

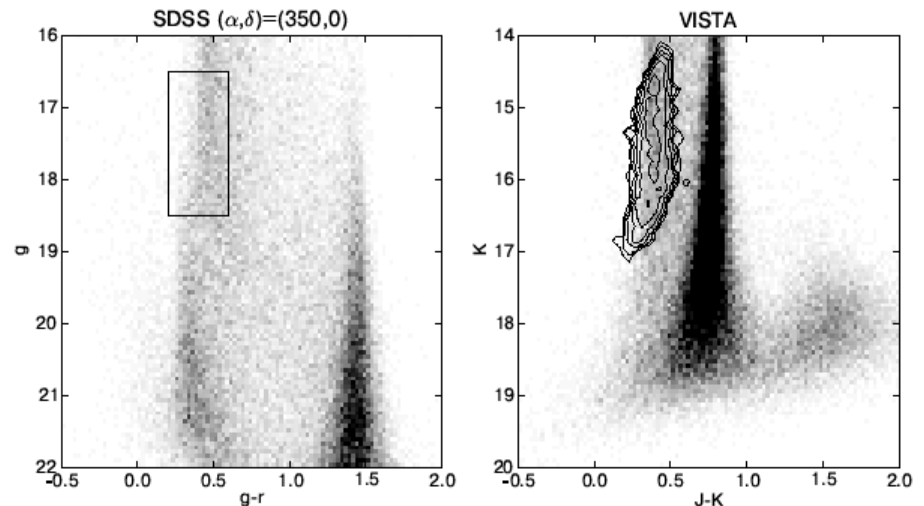
Fix a box in the CMD with thick disk & halo turnoff

Figures show sdss vs VHS

Select thick disk/halo locus (left),
Implement in VHS (right).



VHS bulge data, $b=40\text{deg}$

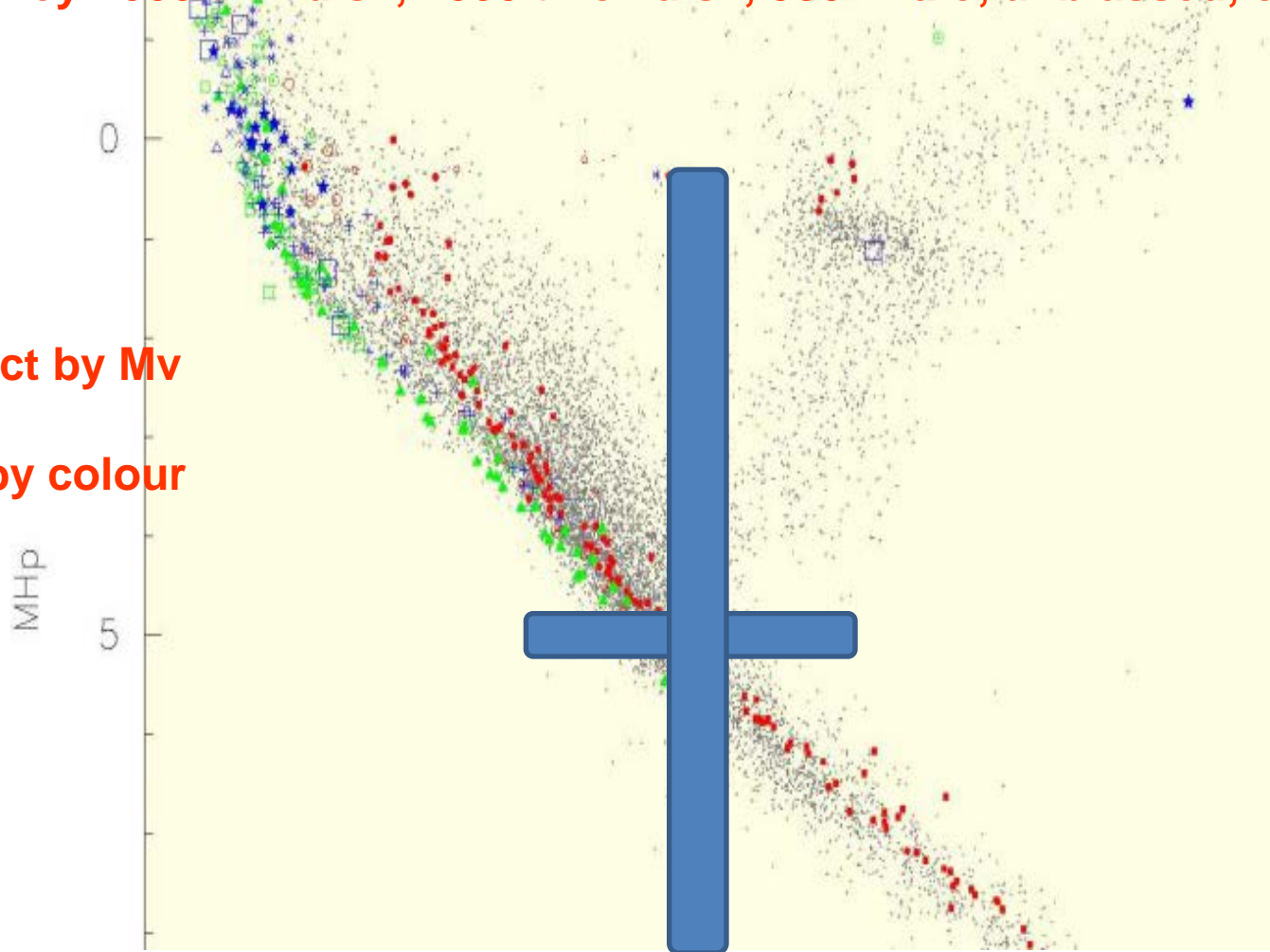


Solar Neighbourhood: want a complete unbiased 5000-star sample.
To be UVES parallel targets – definitive determination of local DF
Look at $M_v \sim 5.5$, \rightarrow unbiased survey to 1kpc at $V=15$. Plus subgiants...
At $V=15$, survey 2000 thin disk, 2000 thick disk, 500+ halo, unbiased, complete.

Cannot select by M_v

Can select by colour

$M_v=5.5$



colour

Survey Status

AEGIS & SkyMapper

- SkyMapper is the southern imaging survey with filters optimised for stellar astrophysics
- SkyMapper will (soon) provide targets for Gaia-ESO – halo turnoff & RGB, HBs, EMP candidates. Will allow us to better define the wings of the metallicity DF
- AEGIS is the AAT spectroscopic survey based on SkyMapper – 400 fibres, SNR \sim 15 at the Ca-K line for a G star (1.5hrs). 3700-5700Å; R \sim 3000, & Ca-T R \sim 11,000
- Plan 180 AAT fields, 60 done, 15000 spectra
- AEGIS is complementary to and coordinated with Gaia-ESO – we will also observe common calibrators
- Follow-up of S-M EMP stars collaborative, led by Stefan Keller, follow-up of halo turnoff stars is ours

Survey data products

**GIRAFFE Mg, Ca, Ti and Fe for F-G-K stars.
For Bulge K giants also Si, Cr, Mn, Co and Ni,**

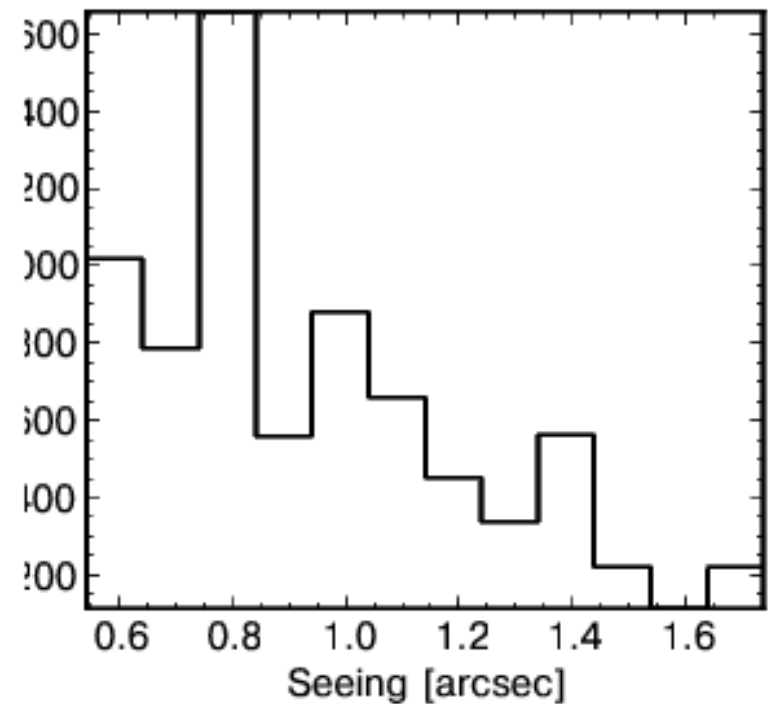
UVES: C, O, Na, Mg, Si, Ca, Sc, Ti, Cr, Mn, Fe, Ni, Zn, Y, Zr, Ba, La, Ce, Eu

- **LOTS!!!**

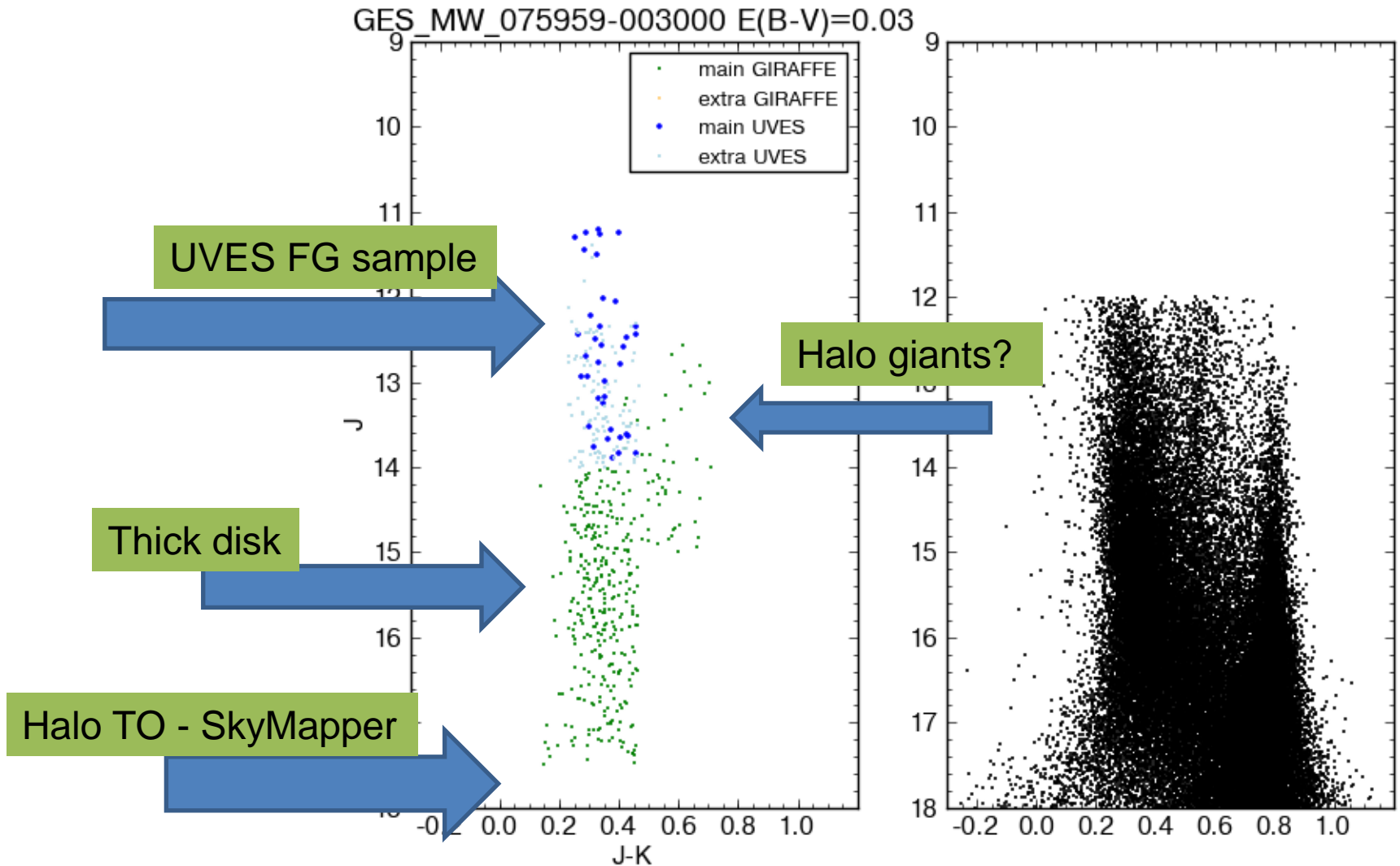
- reduced, wavelength calibrated 1D spectra
- the photometry (and additional membership information for the clusters) used to select the targets
- open cluster relevant data (e.g. distance, age) and star identifications
- object classification (for field stars)
- radial velocity and error estimate
- Projected rotational velocity and error estimate (where relevant)
- **for stars observed with GIRAFFE:**
- stellar astrophysical parameters: effective temperature, surface gravity
- equivalent widths of absorption and emission lines (when present)
- typically, stellar metallicity [Fe/H]
- whenever possible [alpha/Fe]
- lithium abundances for solar-type and cool stars in clusters
- robustly determined errors on all parameters
- measurements of chromospheric activity or accretion, for cluster members (where relevant)
- quantitative mass loss estimates, for early-type stars
- The GIRAFFE spectra should allow measurement of Mg, Ca, Ti and Fe for the majority of the F-G-K stars.
- For Bulge K giants also Si, Cr, Mn, Co and Ni, and possibly other elements, should be measurable.
- **for stars observed with UVES:**
- stellar parameters derived from the spectra
- robustly determined errors on all parameters
- elemental abundance estimates for some or all of the following elements (where stellar abundance and astrophysical parameters permit):
- C, O, Na, Mg, Si, Ca, Sc, Ti, Cr, Mn, Fe, Ni, Zn, Y, Zr, Ba, La, Ce, Eu
- We will also include selected matched multi-wavelength data for each source.

Survey status

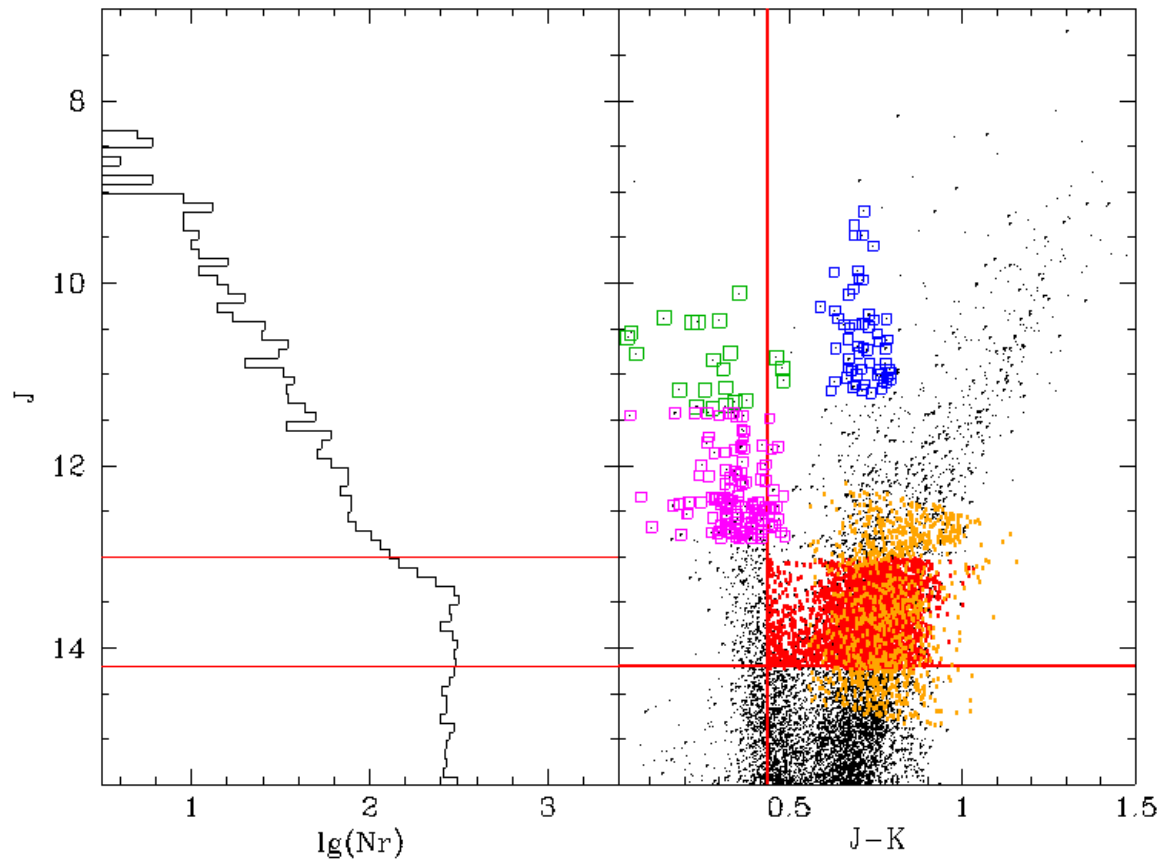
- 8 x 5N observing runs complete
- Weather mediocre ~25% loss
- Progress OK
- Processing OK
- RVs OK
- Abundances – tbc
- Big meeting: Dec 2012



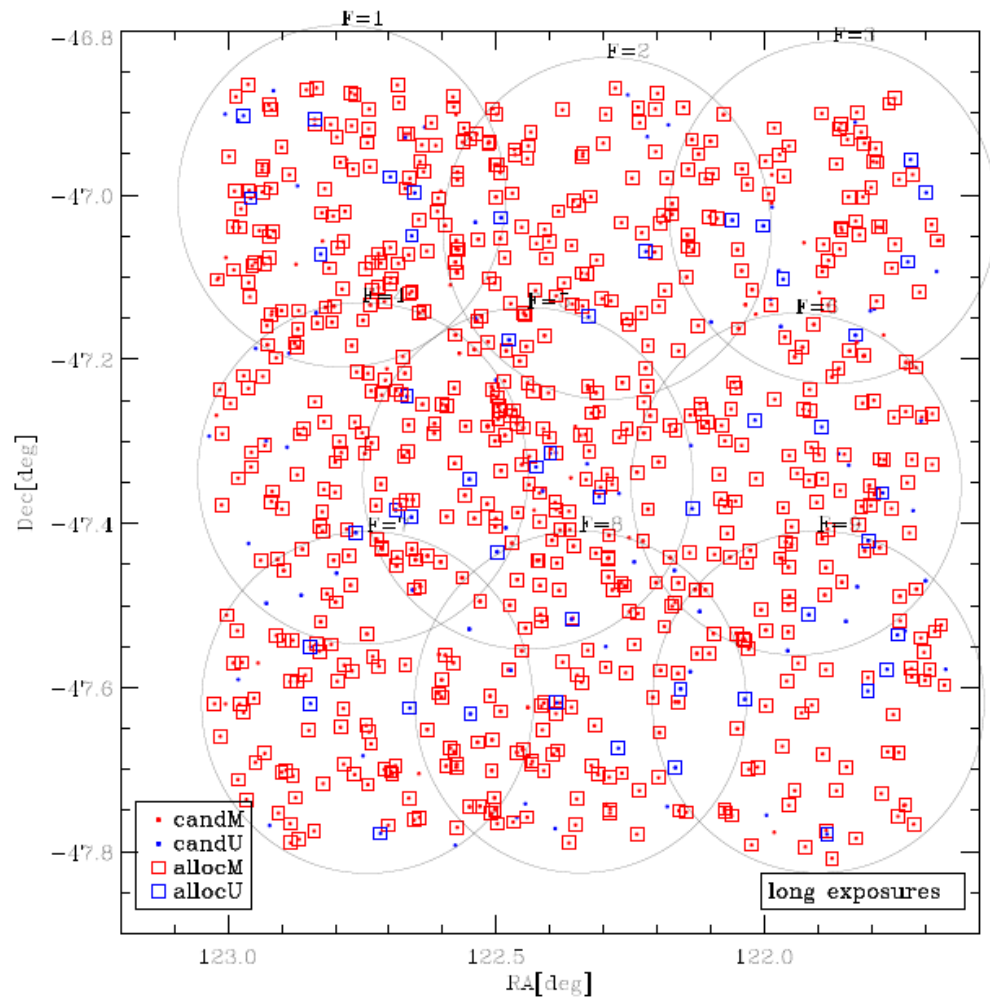
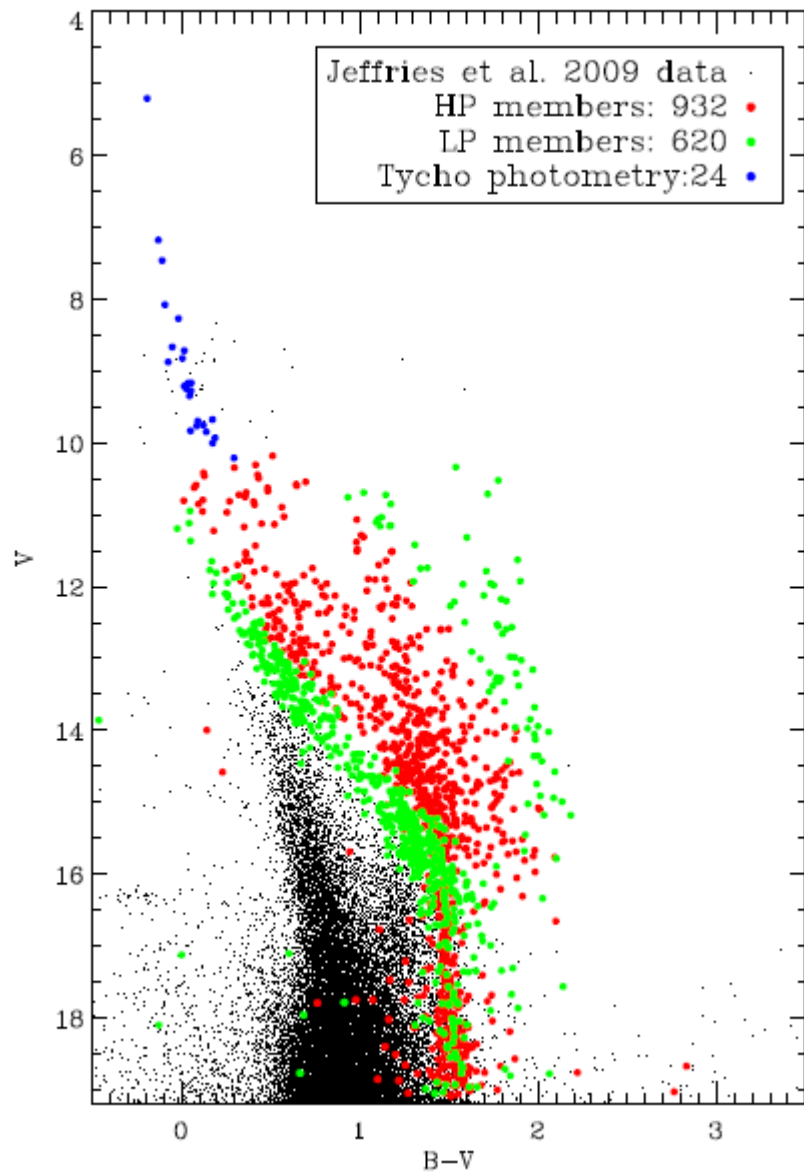
Low extinction, high latitude – need redder targets



BULGE TARGETS: red clump stars from VVV,
plus EMP candidates from SkyMapper



γ Velorum (5-10 Myr)



Trumpler 20 – 1 Gyr

