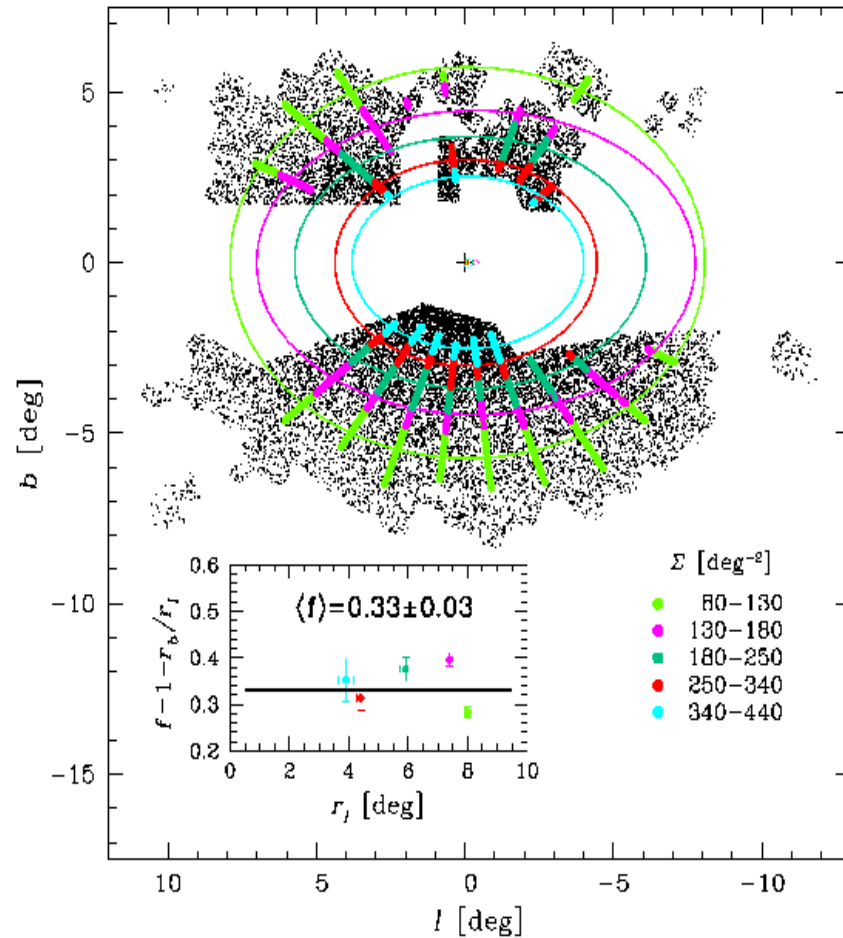


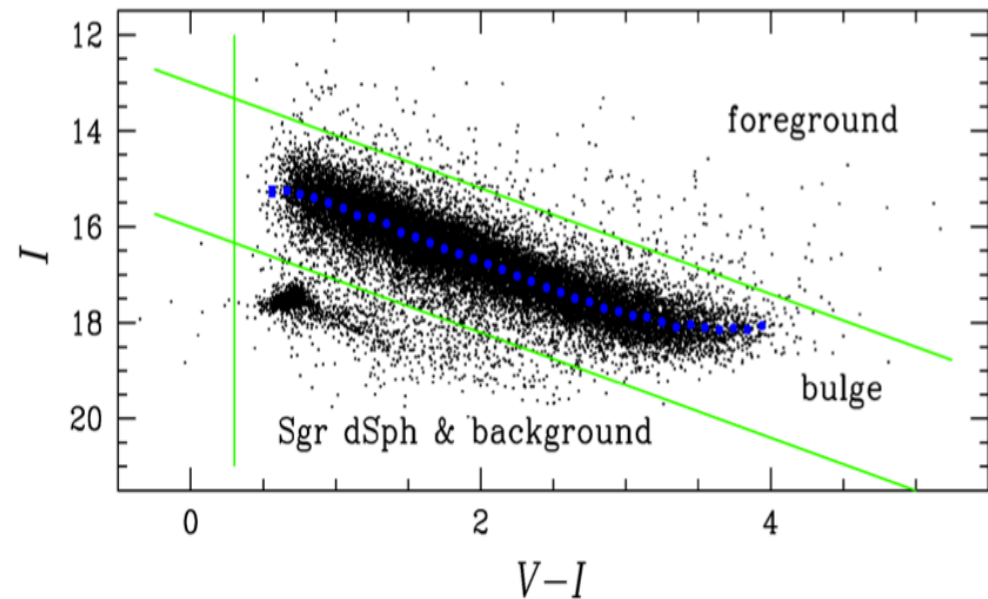
# The 3D structure of the Galactic Spheroid: Bulge



Pietrukowicz + (2015)

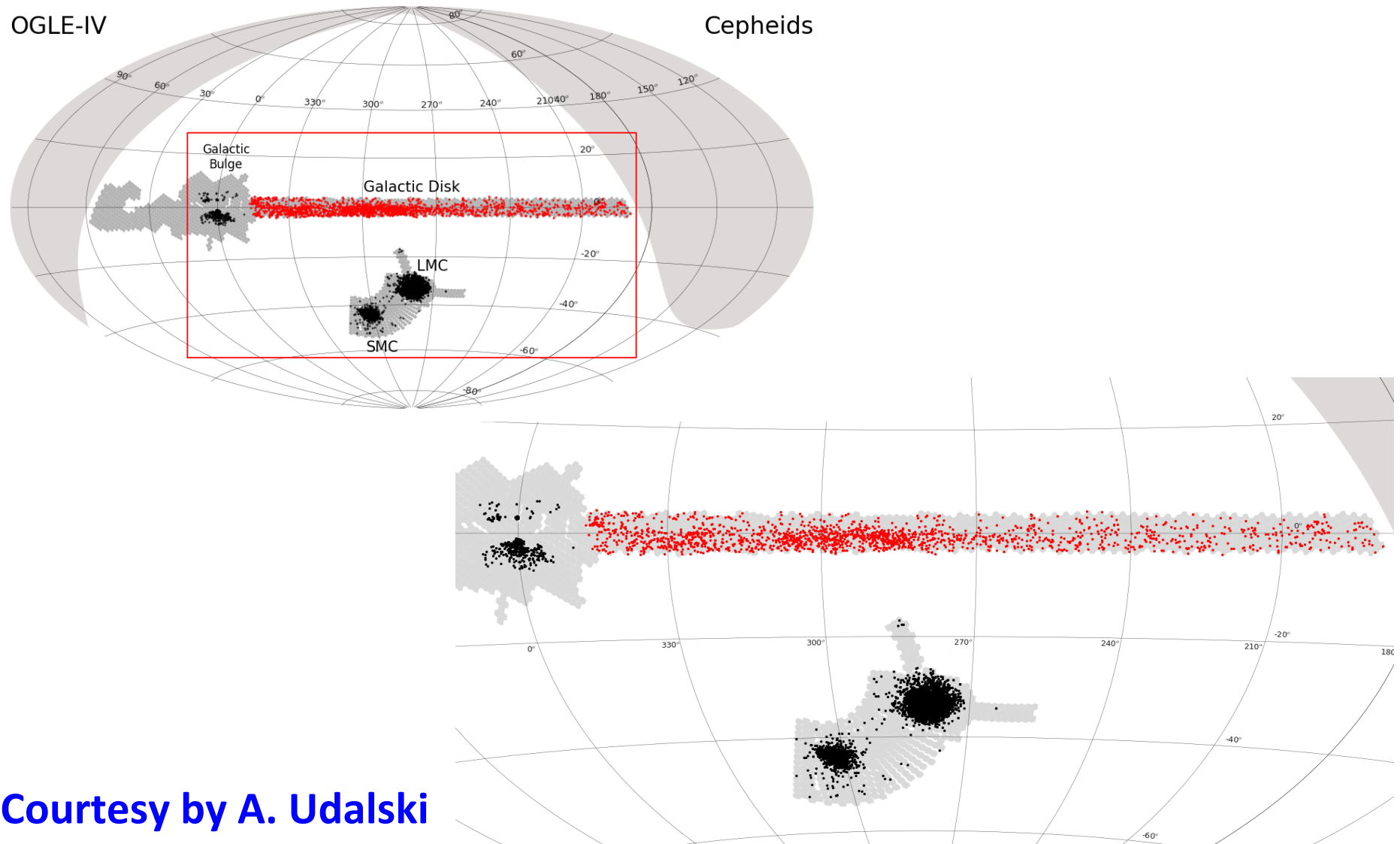
~27,000 RR Lyrae by OGLE IV

Census far from being complete!



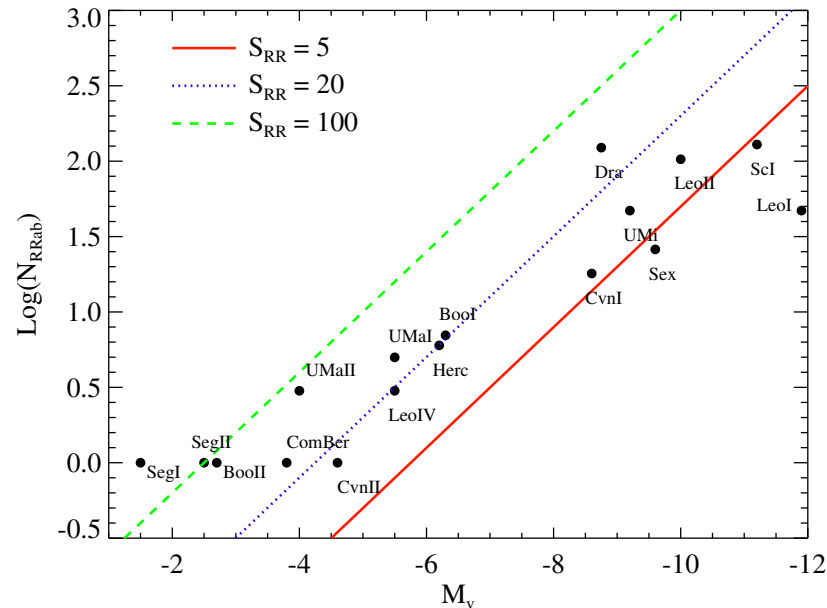
VVV  $\rightarrow$  JHK~16-18

# More than 1000 new Cepheids discovered by OGLE-IV along the Galactic plane



Courtesy by A. Udalski

# The 3D structure of the Galactic Spheroid: Halo

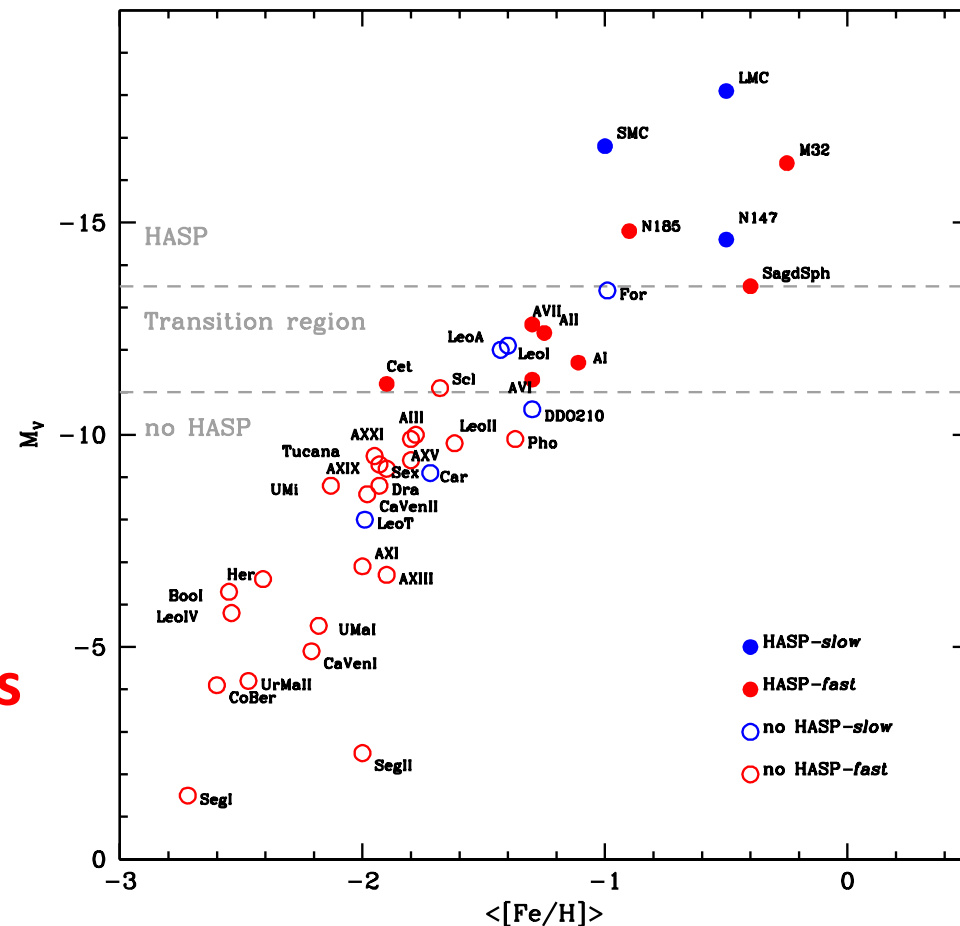


Williams + (2016)

Simultaneous discovery & characterization of LSB galaxies

Fiorentino + (2017)

RR Lyrae in nearby UFDs & dwarfs



## Partecipanti e relative responsabilità/interessi

### PIs:

G. Bono, UniToV -- **M. Dall'Ora**, INAF/OACN -- **G. Fiorentino**, INAF/OABO

**Post Doc:** **S. Marinoni** (ASDC, Rome), **D. Magurno (UniToV)** +  
**P. Marrese** (ASDC) → Astrometry/Cross Correlations

**Science Team: LSST Stellar variability teams +**

**Photometry:** M. Castellani, I. Ferraro, G. Iannicola, L. Pulone → INAF/Roma

**Modeling:** A. Pietrinferni, S. Cassisi, A. Piersimoni, E. di Carlo → INAF/TE  
L. Greggio, E. Tognelli, S. degl'Innocenti, P.G. Prada Moroni → UniPi

**Spectroscopy:** V. D'Orazi E. Held → INAF/PD, M. Nonino → INAF/TS,  
**M. Fabrizio** (ASDC), **R. da Silva** (ASDC)

**Stellar activity:** **A. Antonelli**, A.F. Lanza, G. Leto → INAF/CT

**+ International collaborations**

## Connessioni con osservazioni di altre *facilities*

## Spectroscopic follow up:

**NIR → WINERED@NTT + GIANO@TNG + ERIS@VLT, CRIRES+  
[MOONS@VLT], {MICADO/MAORY/HARMONI@E-ELT}  
IRCS@SUBARU, SHARK@LBT**

**Optical → AOF+MUSE, ESPRESSO, 4MOST@VISTA**

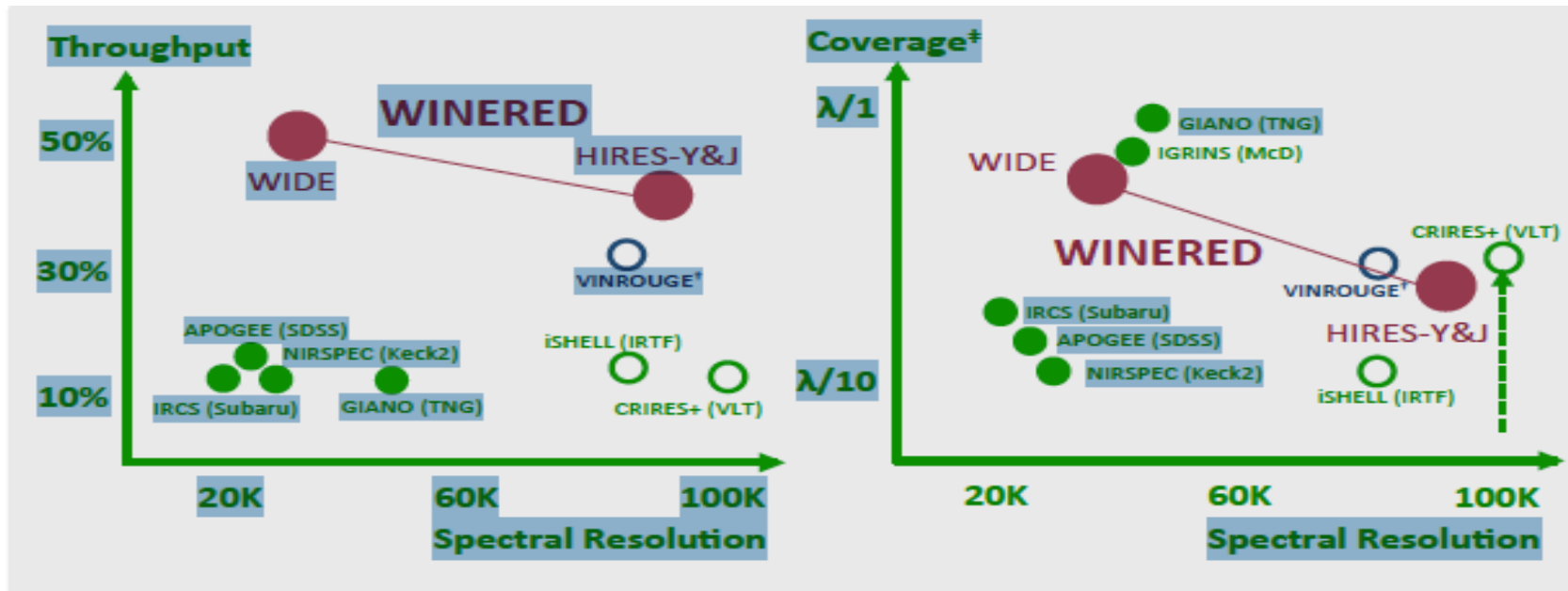
## NIR photometric follow up:

## Gaia/HST/SPITZER + JWST/Euclid

**AOF/HAWK-I, ERIS@VLT + {MICADO/MAORY@E-ELT}**

**LINC NIRVANA@LBT**

# Paving the way: WINERED@NTT



Two different observing modes:

WIDE  $\rightarrow$  zYJ in a single shot with  $R \sim 14,000$  & 28,000

HIRES  $\rightarrow$  either Y or J with  $R \sim 80,000$

Tipo di analisi dati prevista, inclusa di sviluppo e cadenza temporale

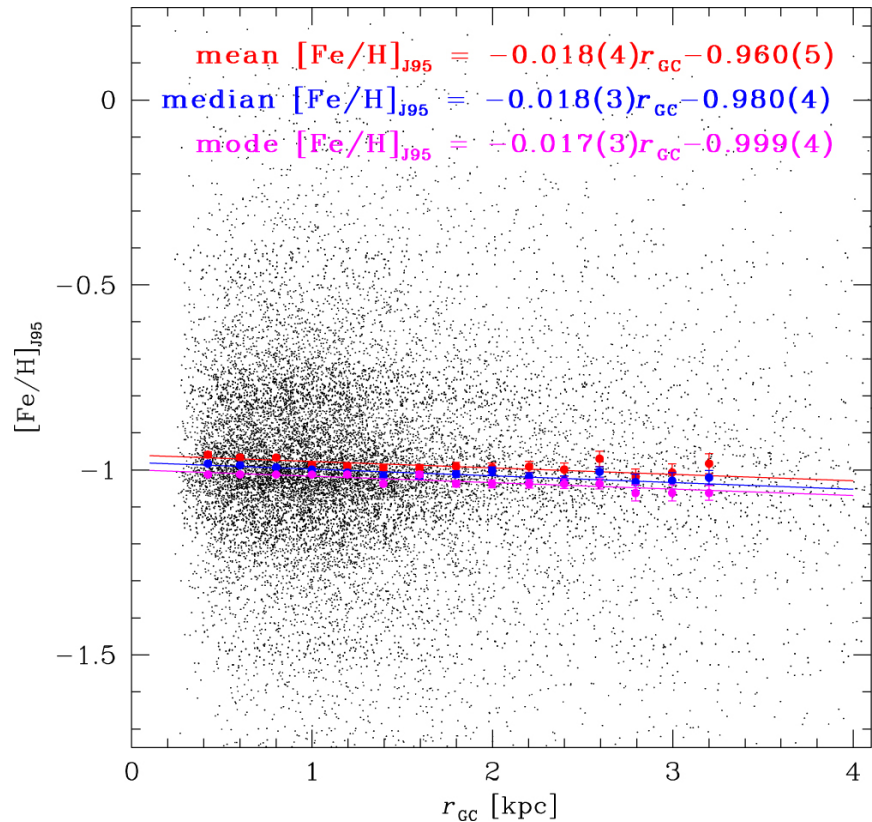
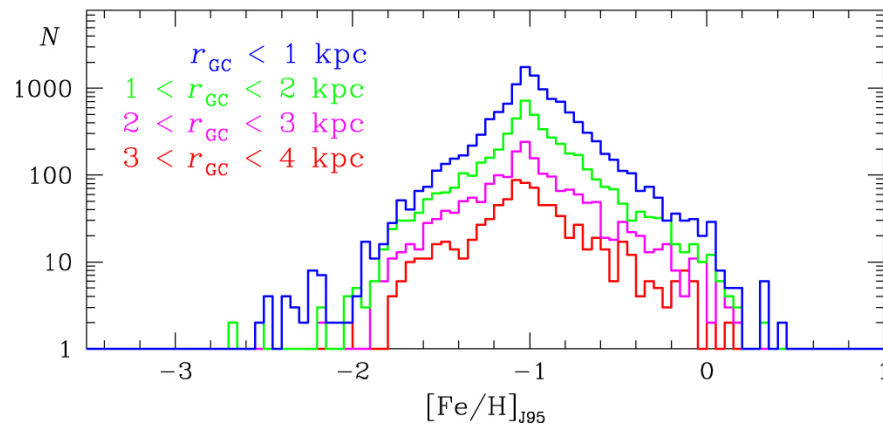
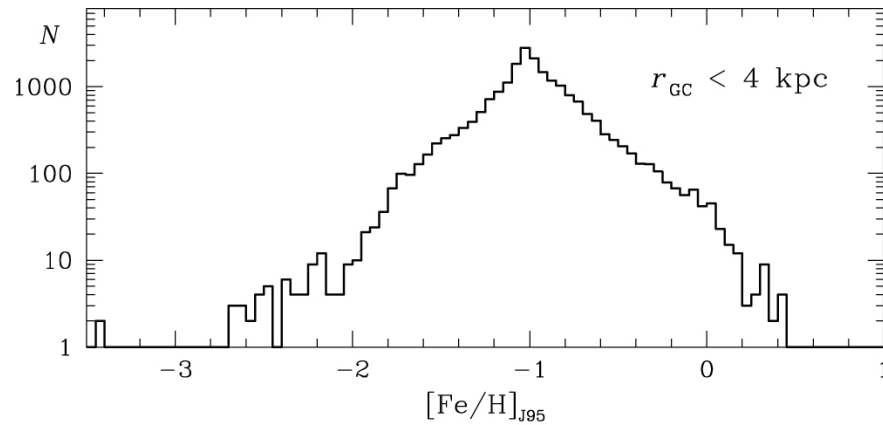
**A few relevant crucial issues we are interested in:**

- a) Cadence of visits across Galactic Bulge & Disk + izY imaging
- b) Development of new algorithms for PSF photometry in crowded fields
- c) Absolute and relative astrometry in crowded stellar fields

**Ready to start once we will have access to photometric catalogs used by LSST to train the pipeline**

**... even more for Eng. First Light and Commissioning ....**

# Bulge metallicity gradient



Pietrukowicz + (2015)

Based on Fourier parameters of the I-band light curve,  
no coverage in the metal-rich & in the metal-poor tail



# Galactic Bulge: Baade window RR Lyrae

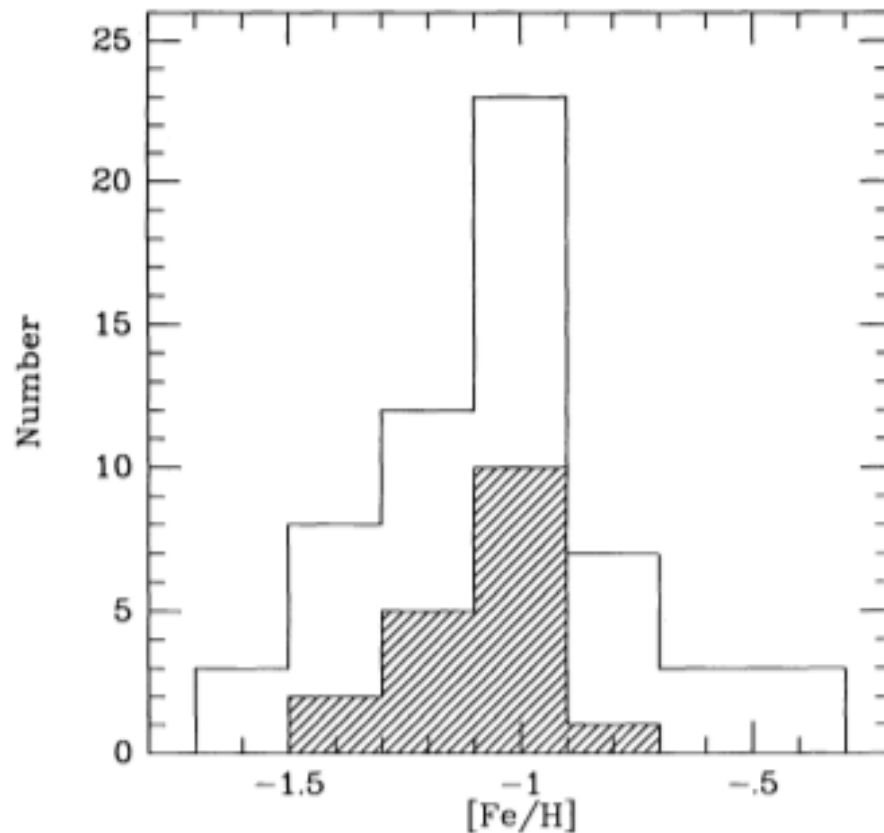


FIG. 7.—Histogram of the abundances determined for the BW RR Lyrae stars. The RRc stars are shaded.

Walker & Terndrup (1991) 59 RRLs using the  $\Delta S$  method