Analysis of the bulge RR Lyrae population from the OGLE-III data

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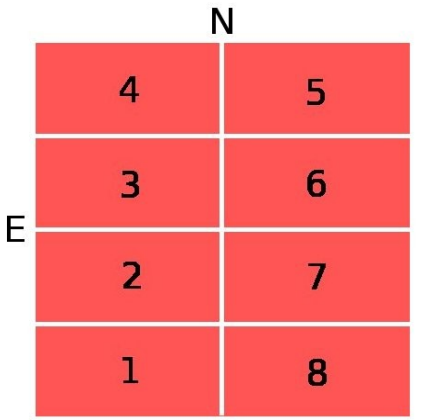
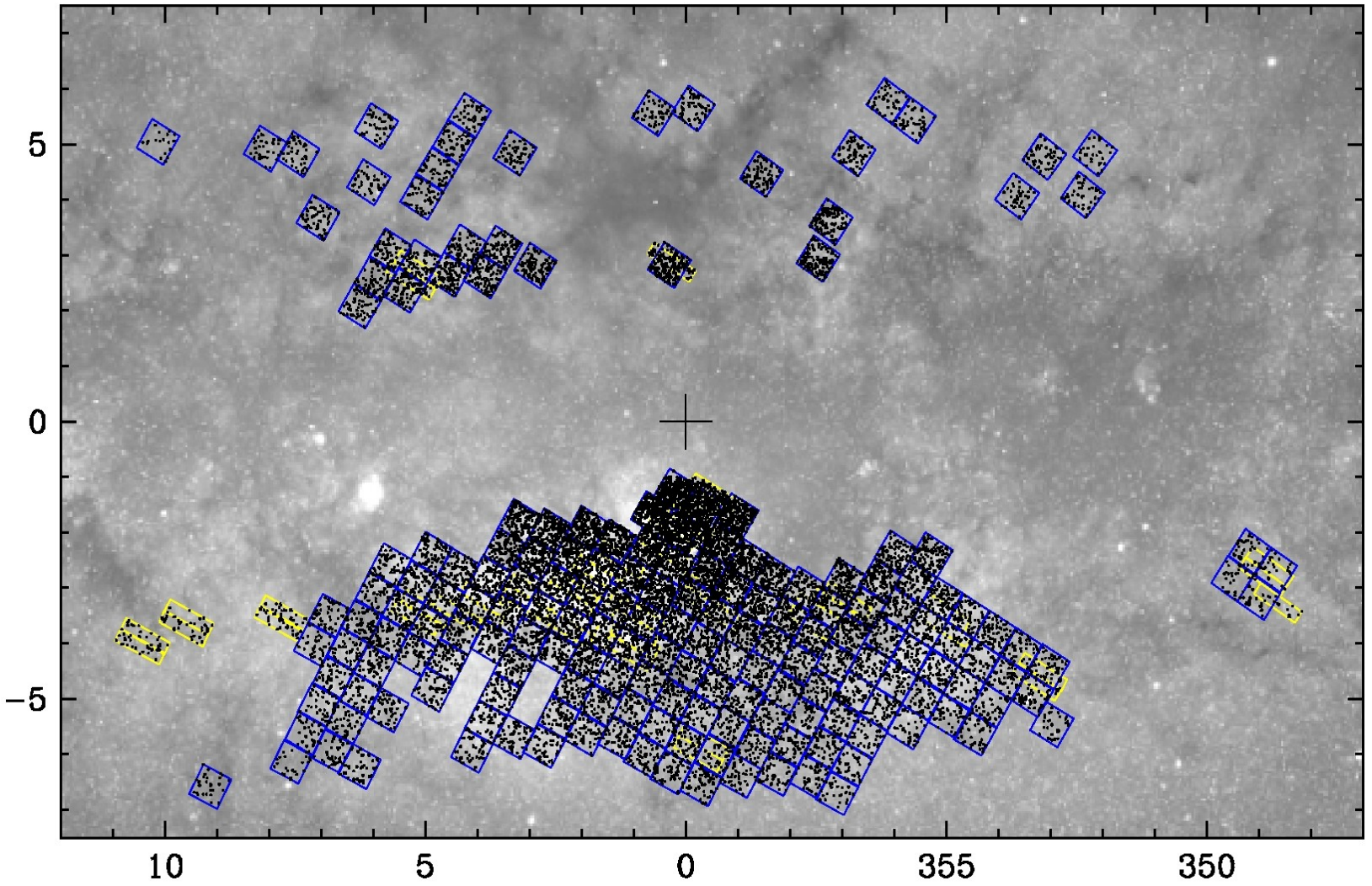
OGLE-III instrumentation

Telescope:	1.3-m Warsaw
Location:	Las Campanas, Chile
Years:	2001-2009
Camera:	8 chip CCD
Chip size:	2048 x 4096
Scale:	0.26 arcsec/pix
Field of view:	35' x 35'
Filters:	*V*, *I*

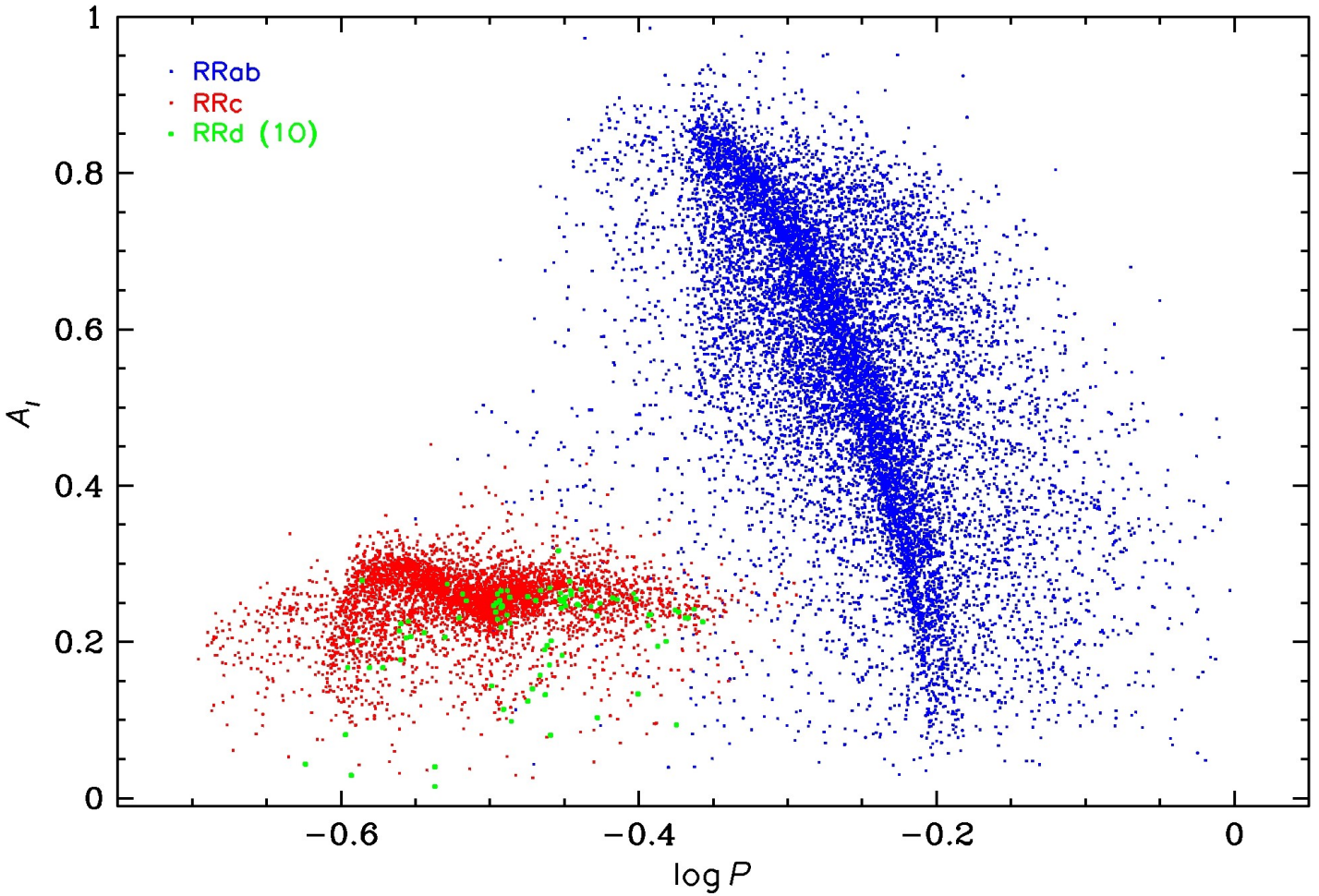


The catalog

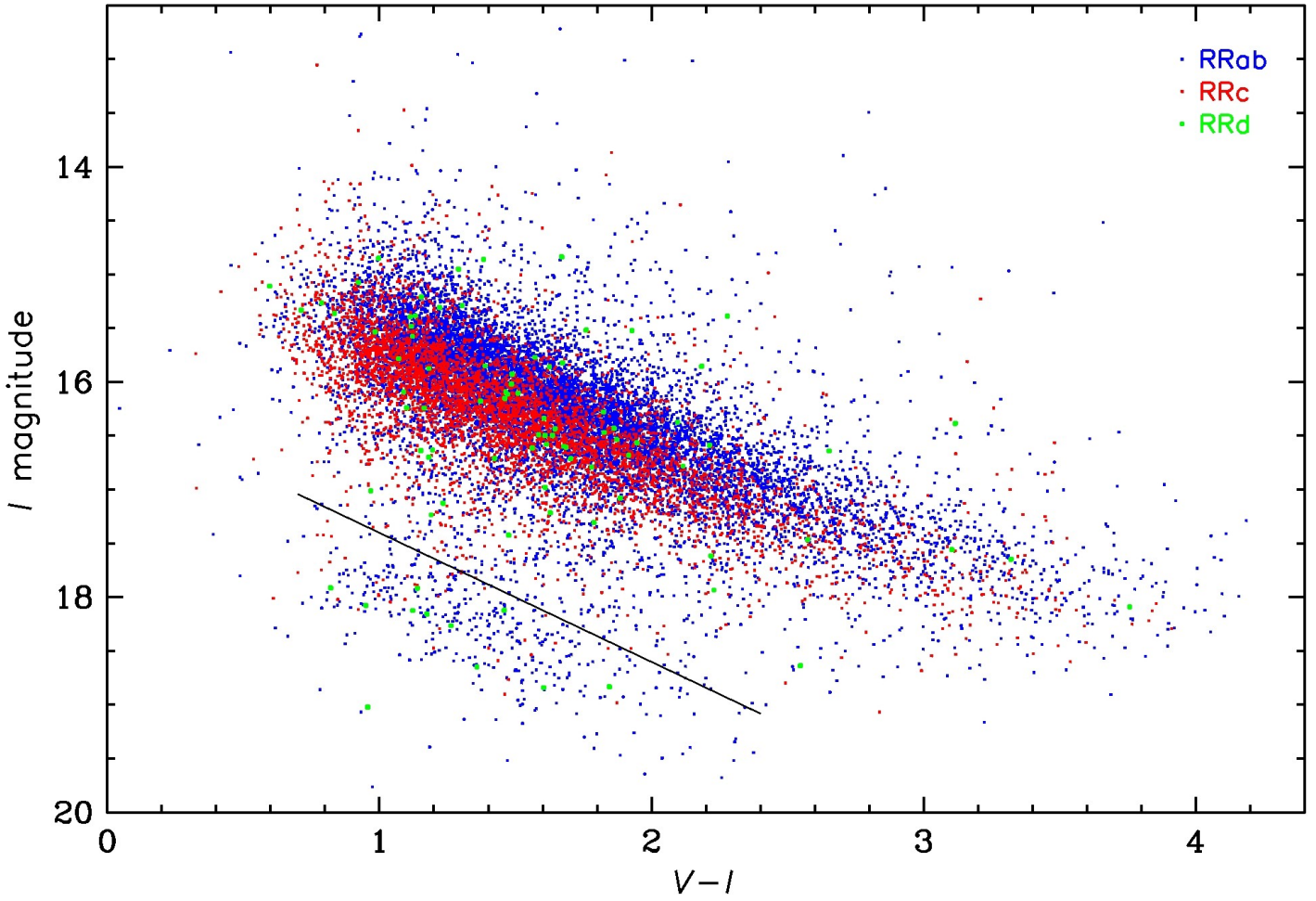


Content: 11754 RRab + 4991 RRc + 93 RRd = 16 838 stars

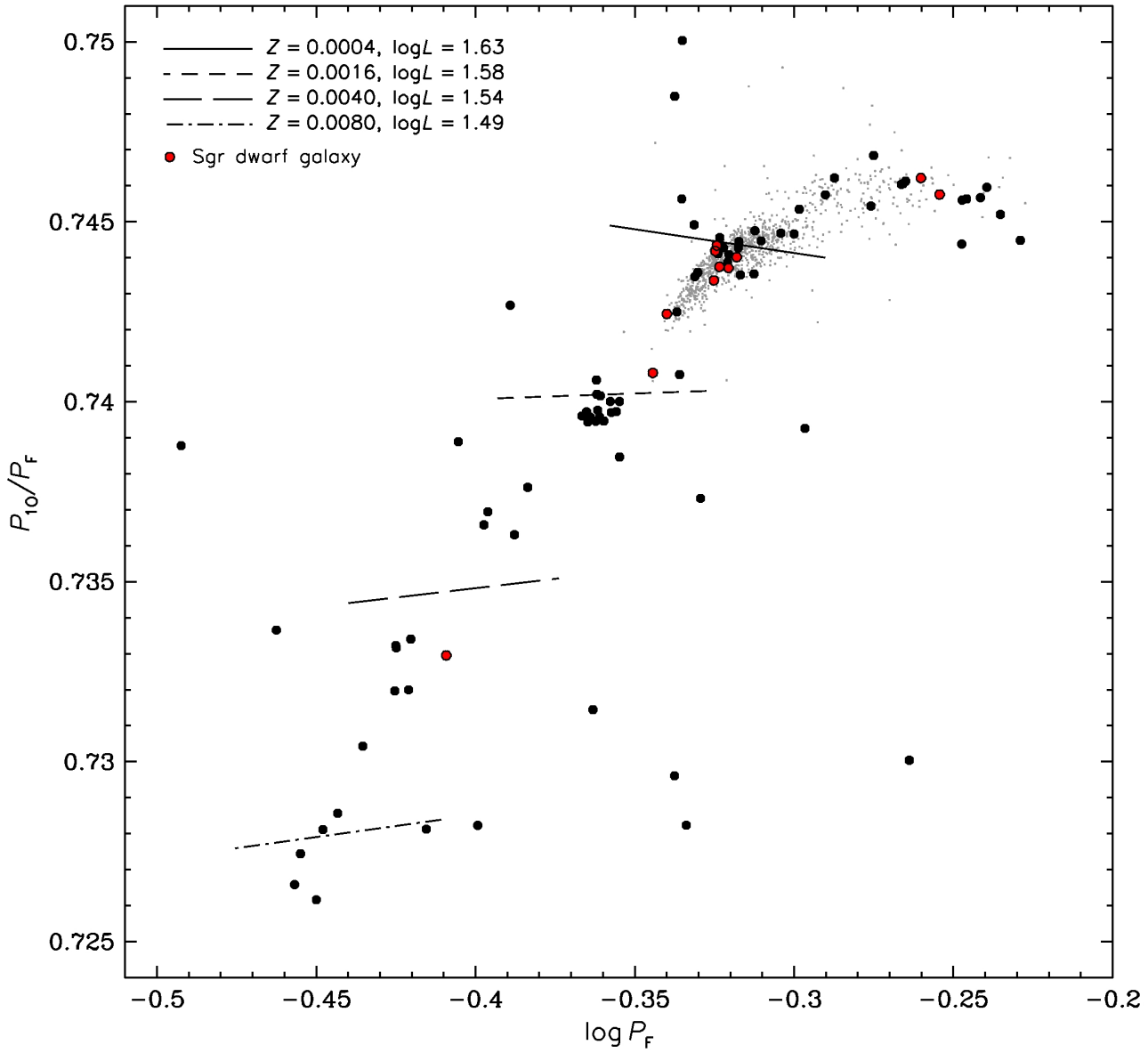
Bailey diagram



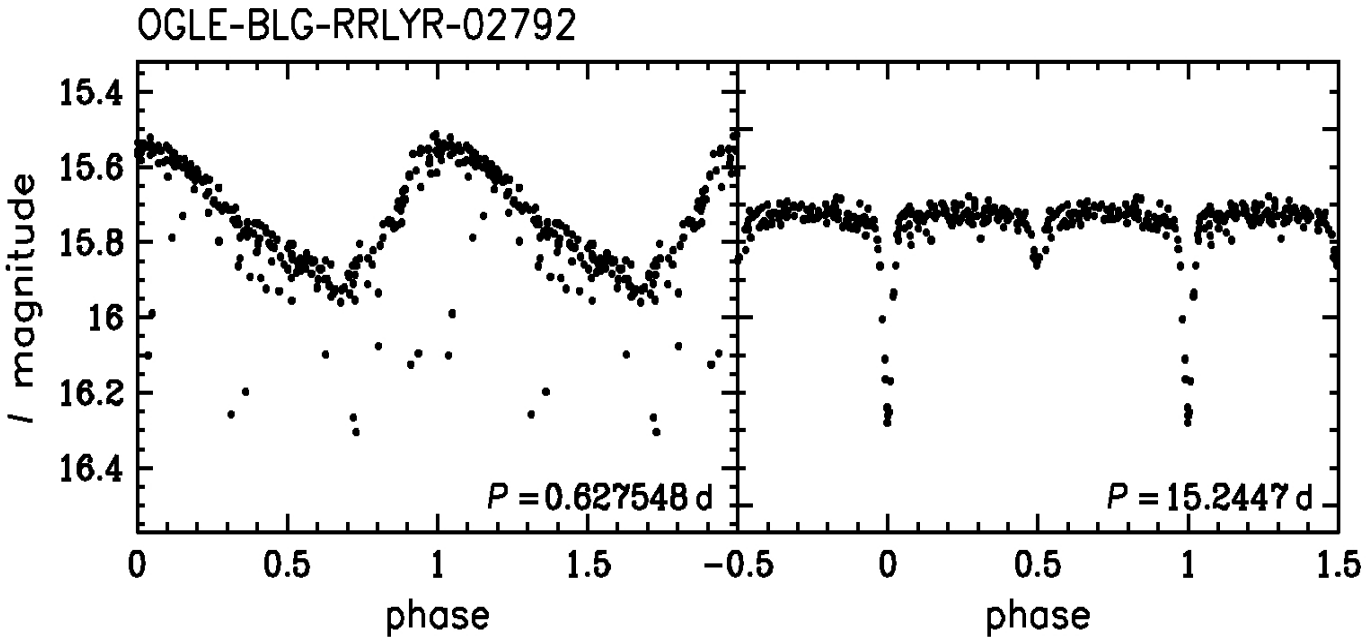
Color-magnitude diagram



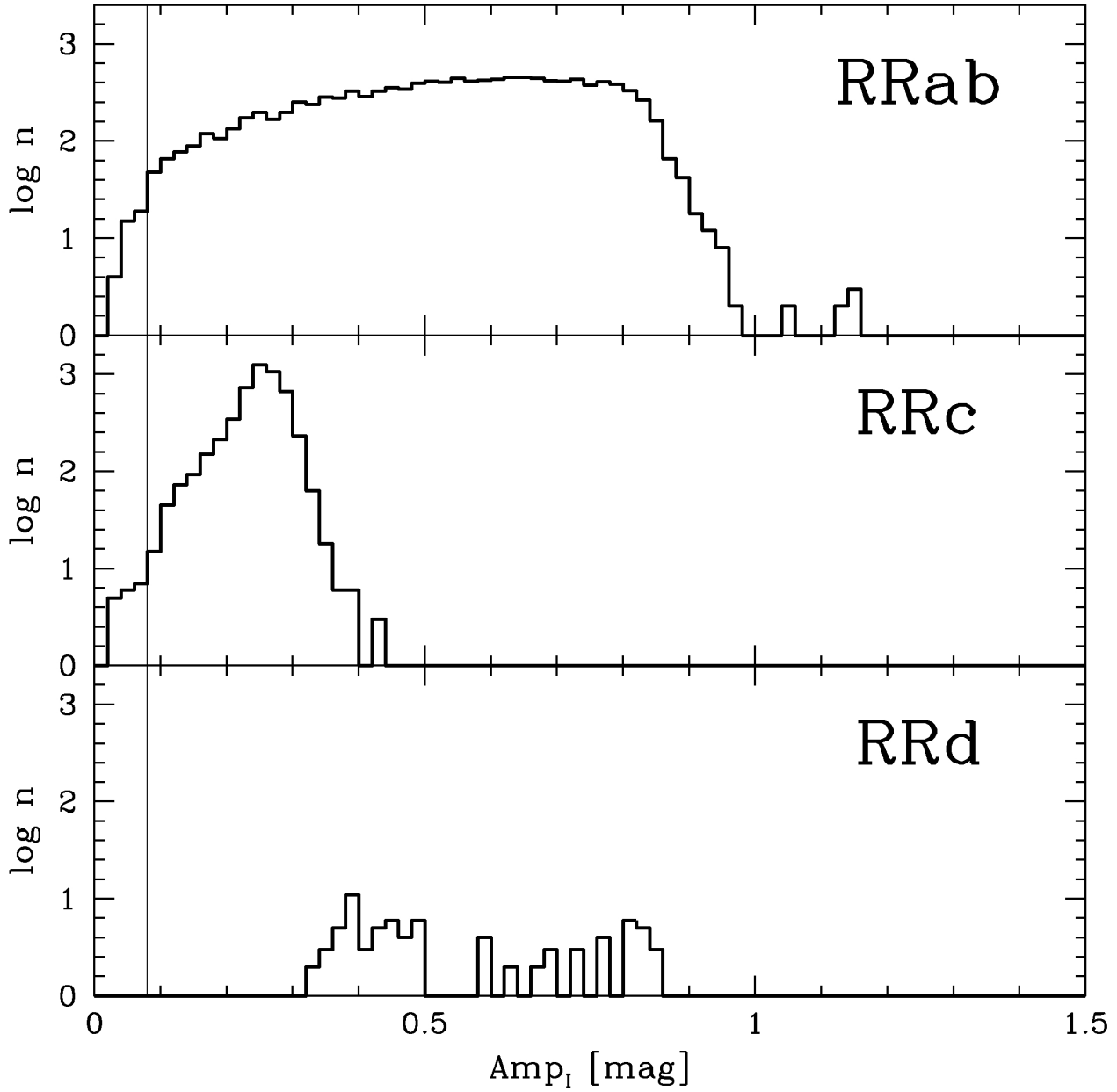
Petersen diagram



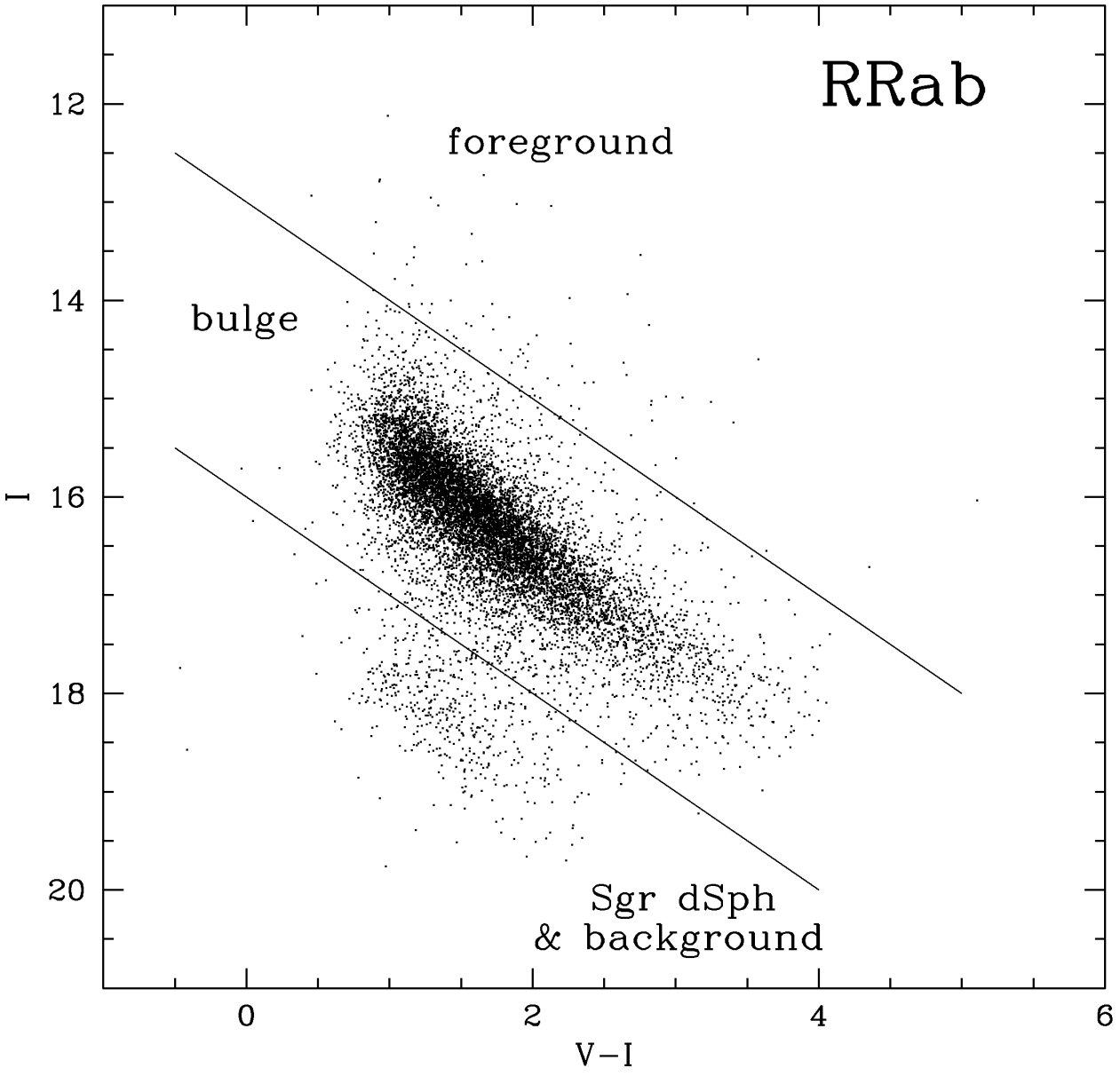
First RR Lyrae in a binary system?



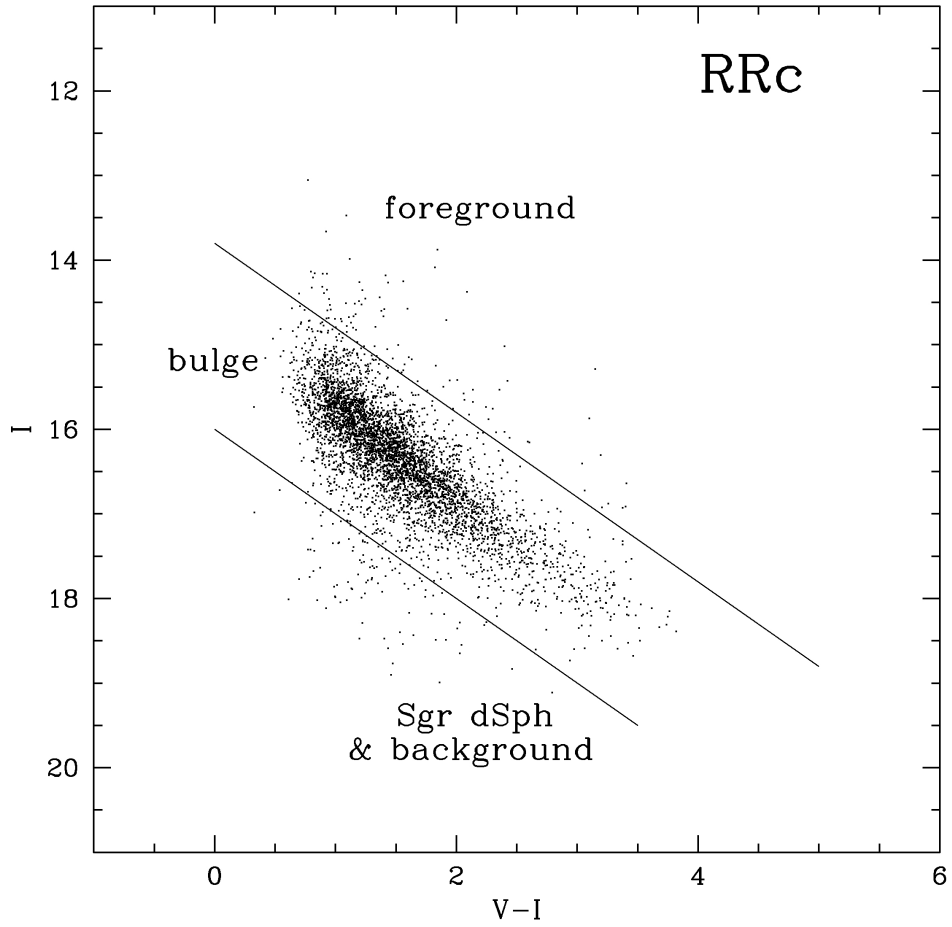
Cleaning the sample

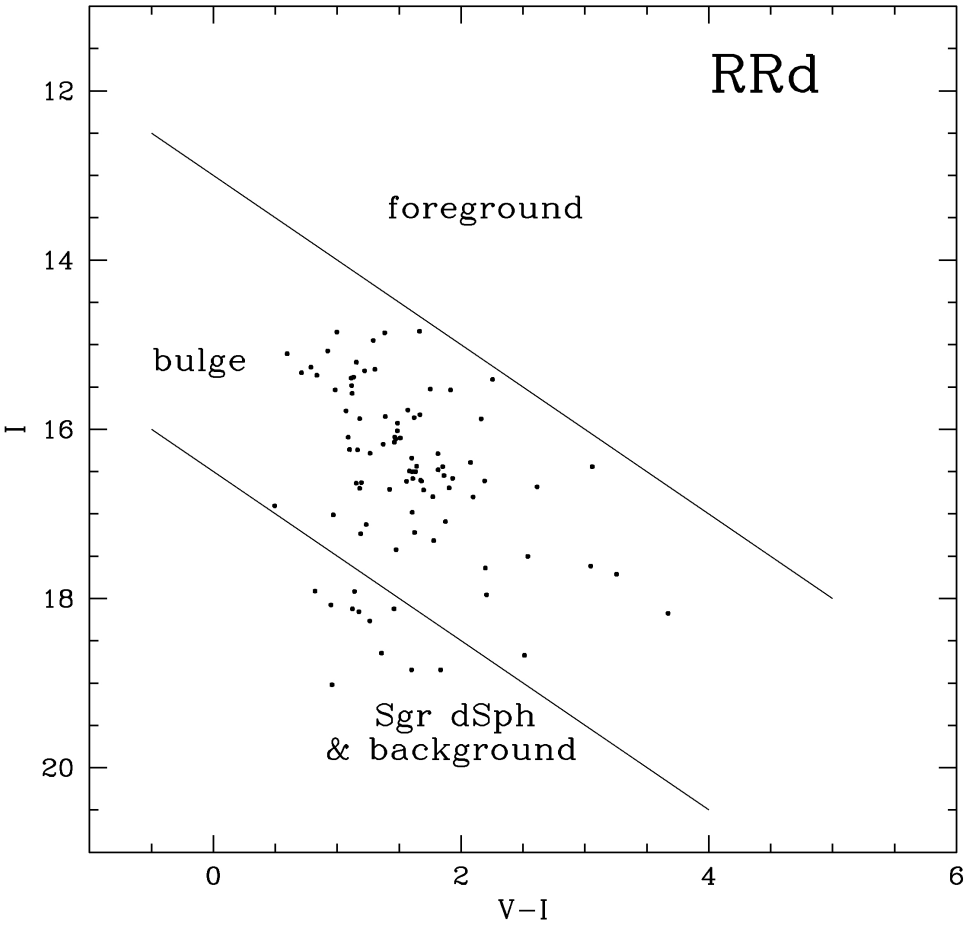


Cleaning the sample

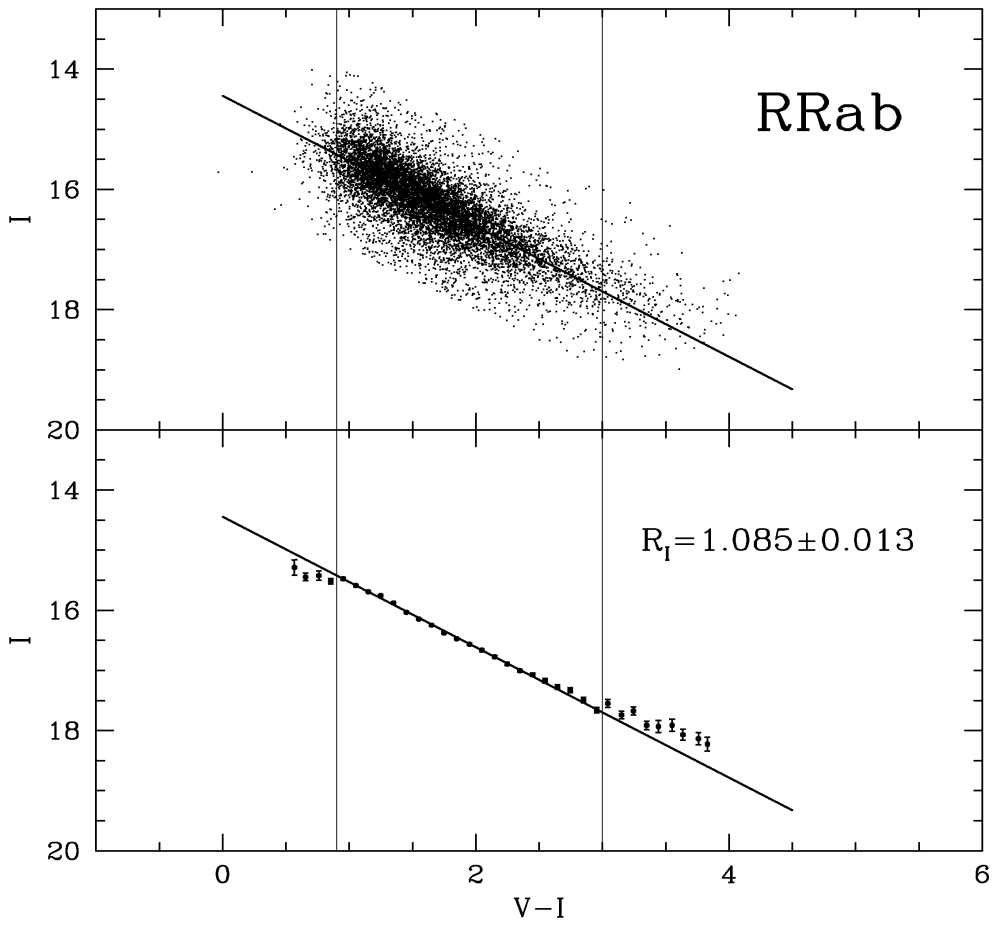


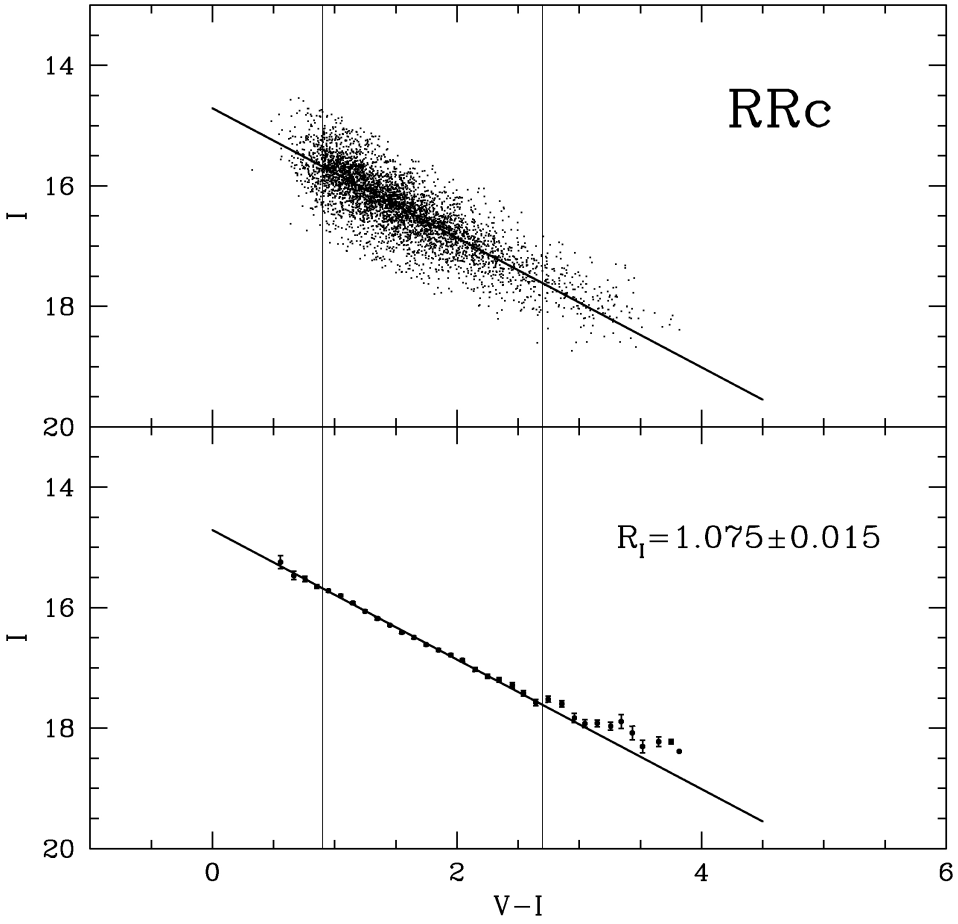
Cleaning the sample





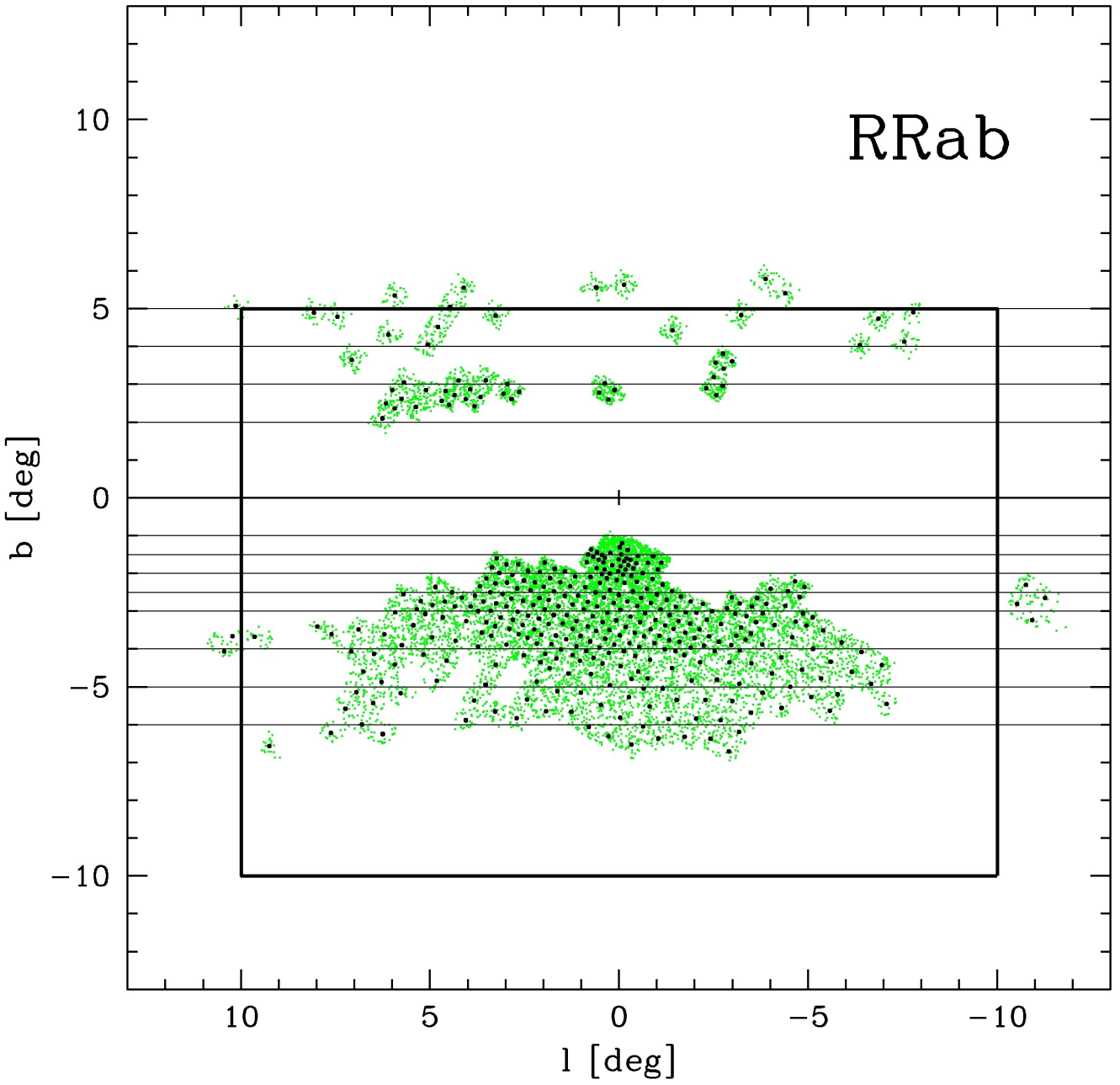
Reddening toward the bulge





$$R_I = A_V / E(V\text{-}I) = 1.082 \pm 0.010$$

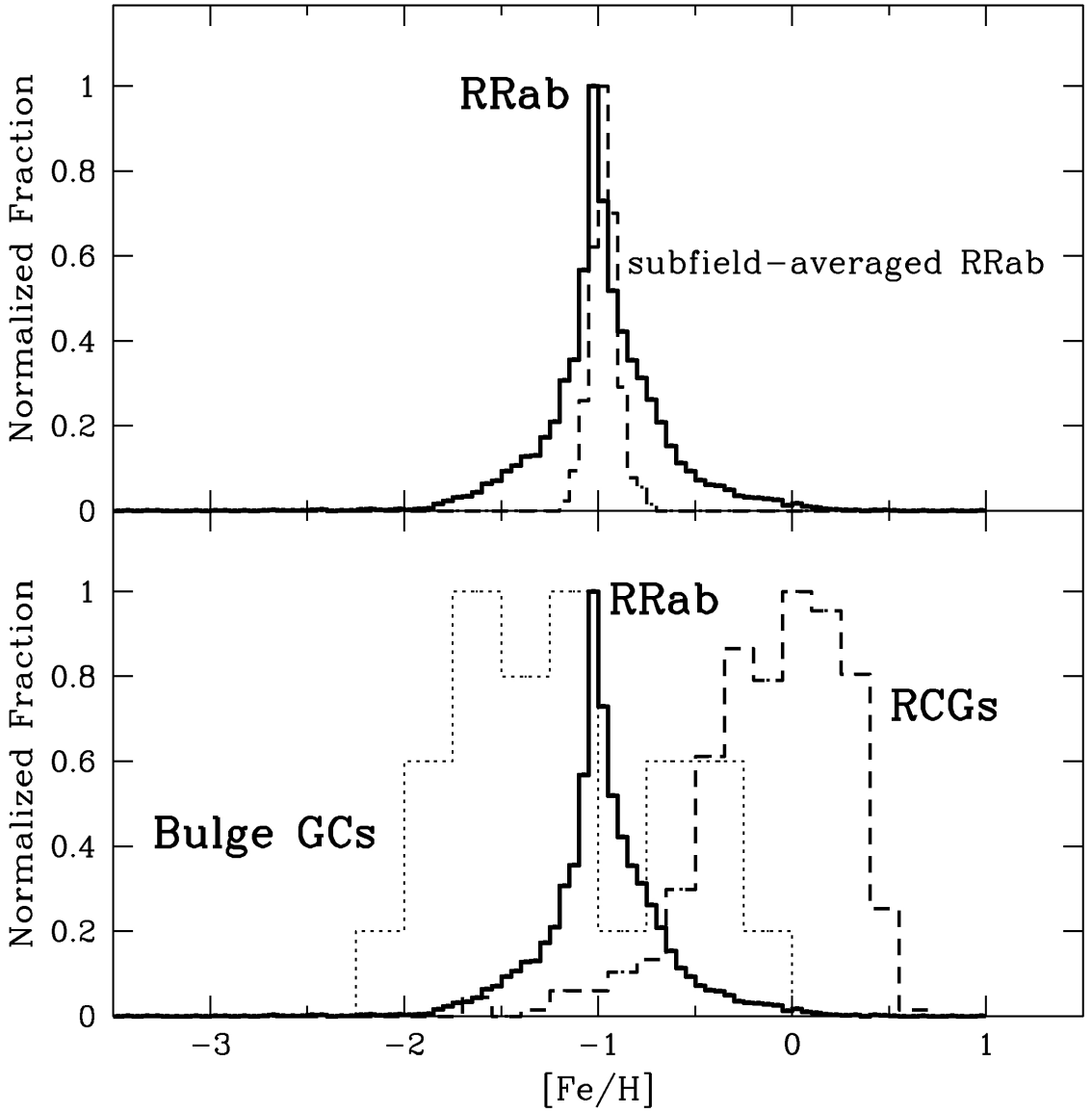
Distribution on the sky



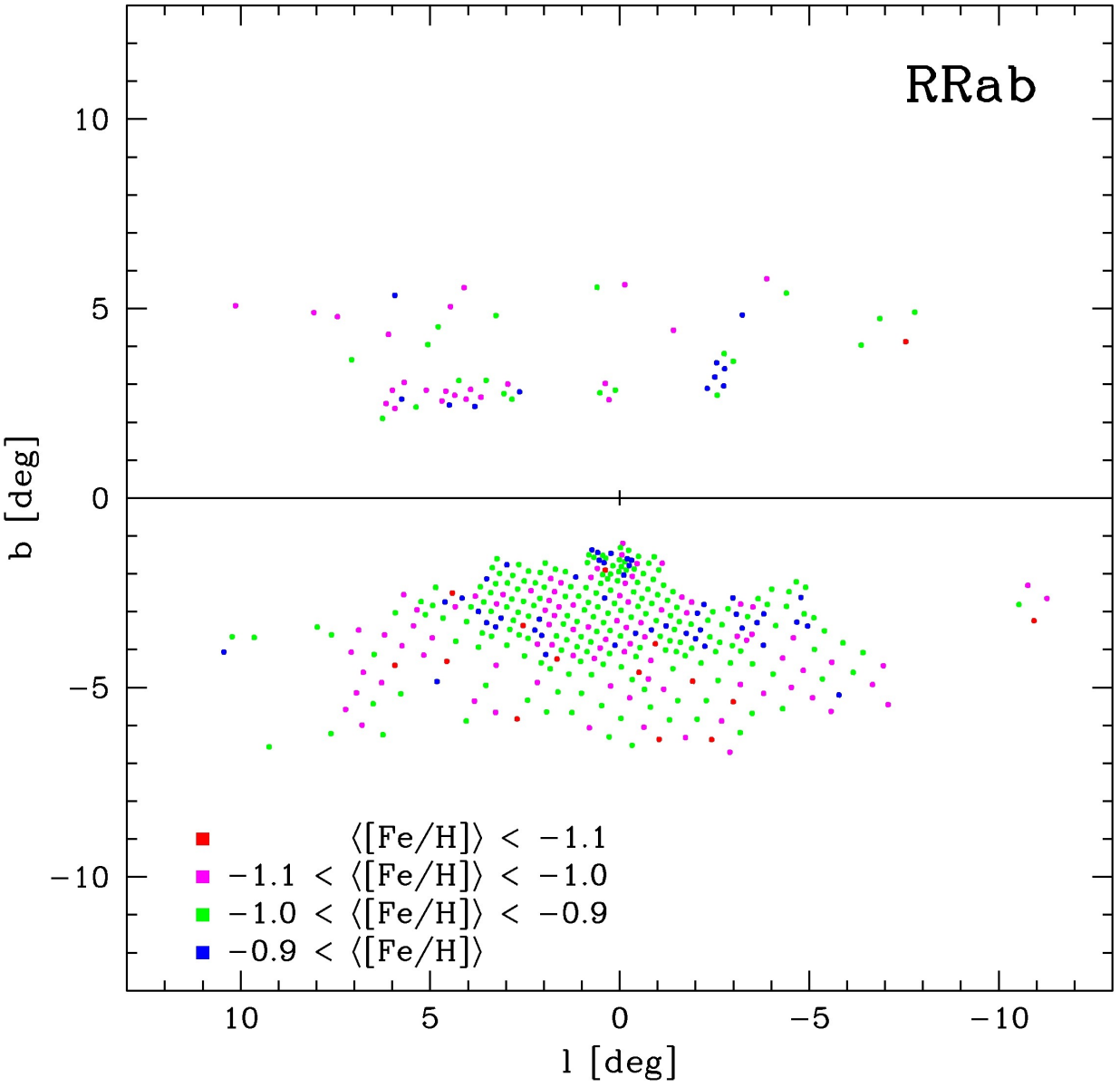
Metallicity

For RRab stars: $[Fe/H] = -3.142 - 4.902\,P + 0.82\,\Phi_{31}$

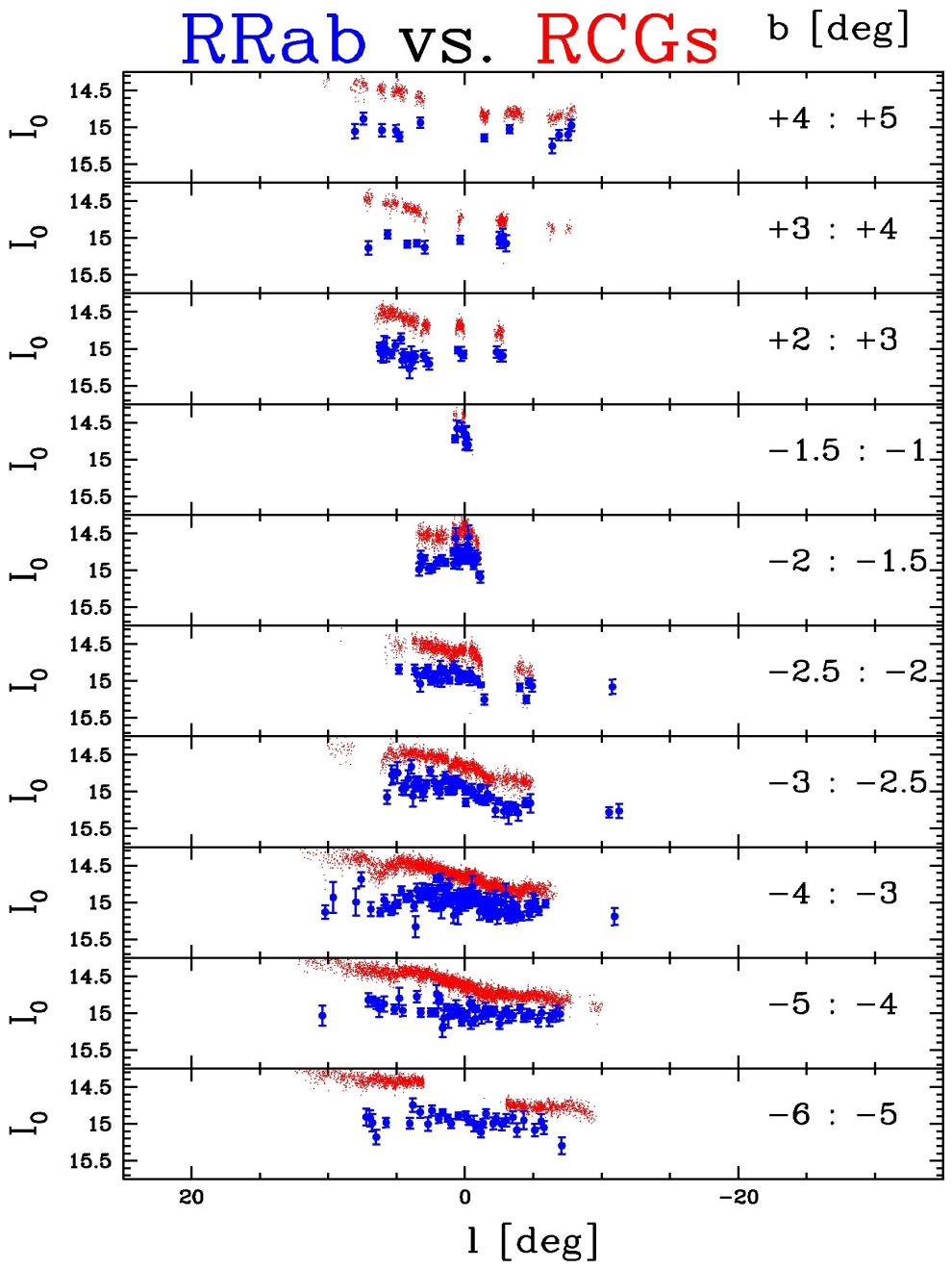
Smolec (2005)

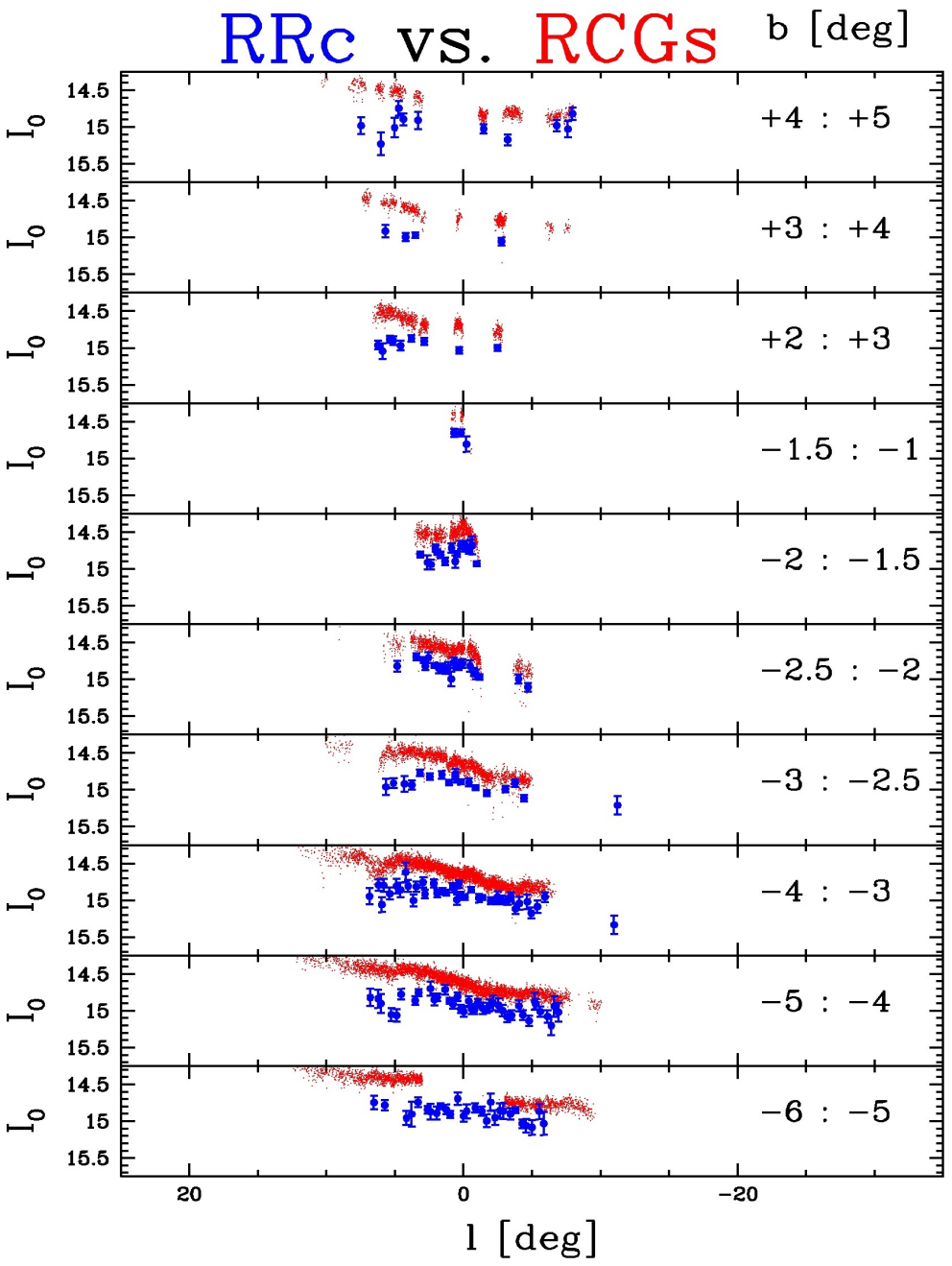


Metallicity

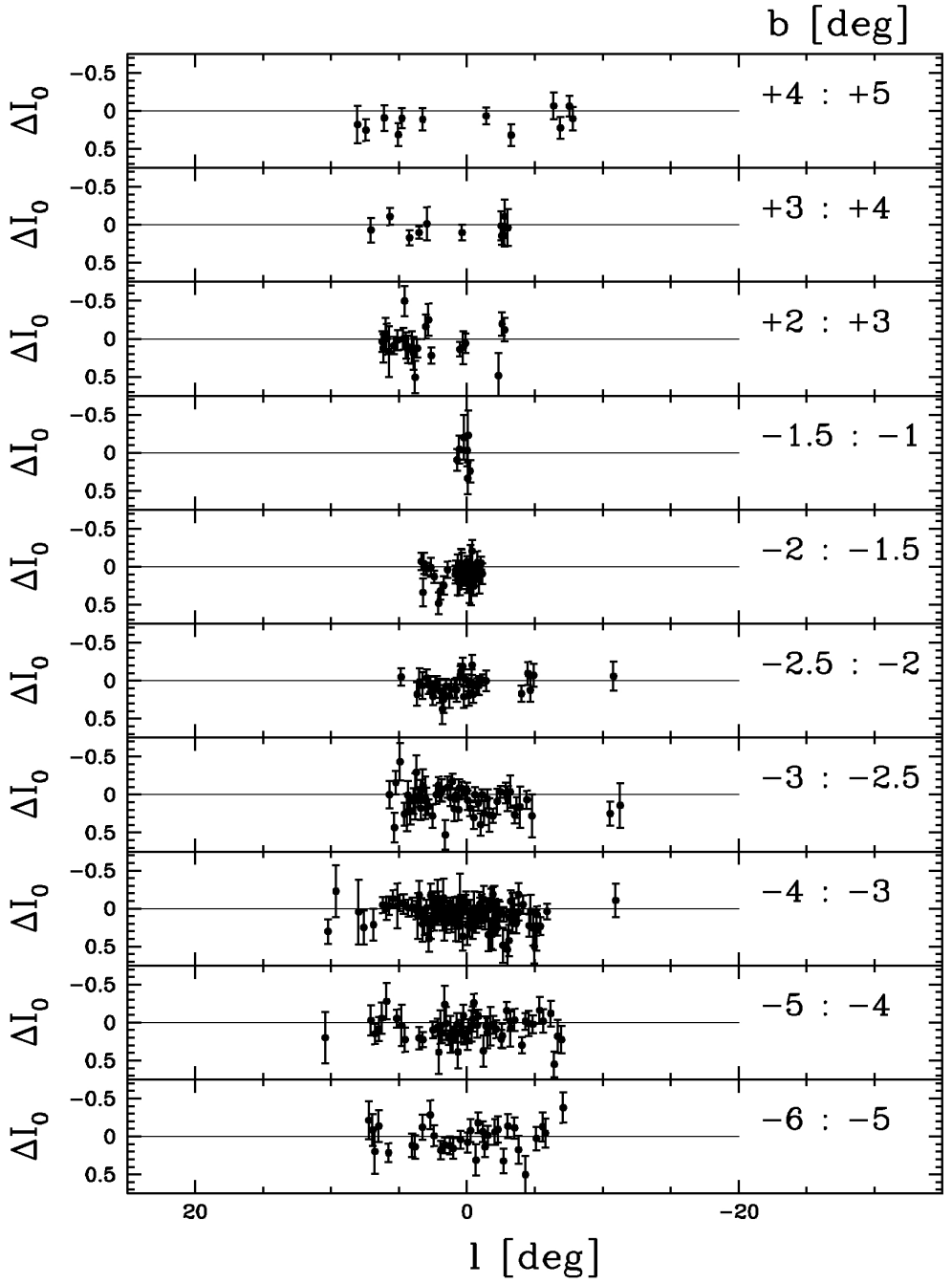


Magnitude distribution

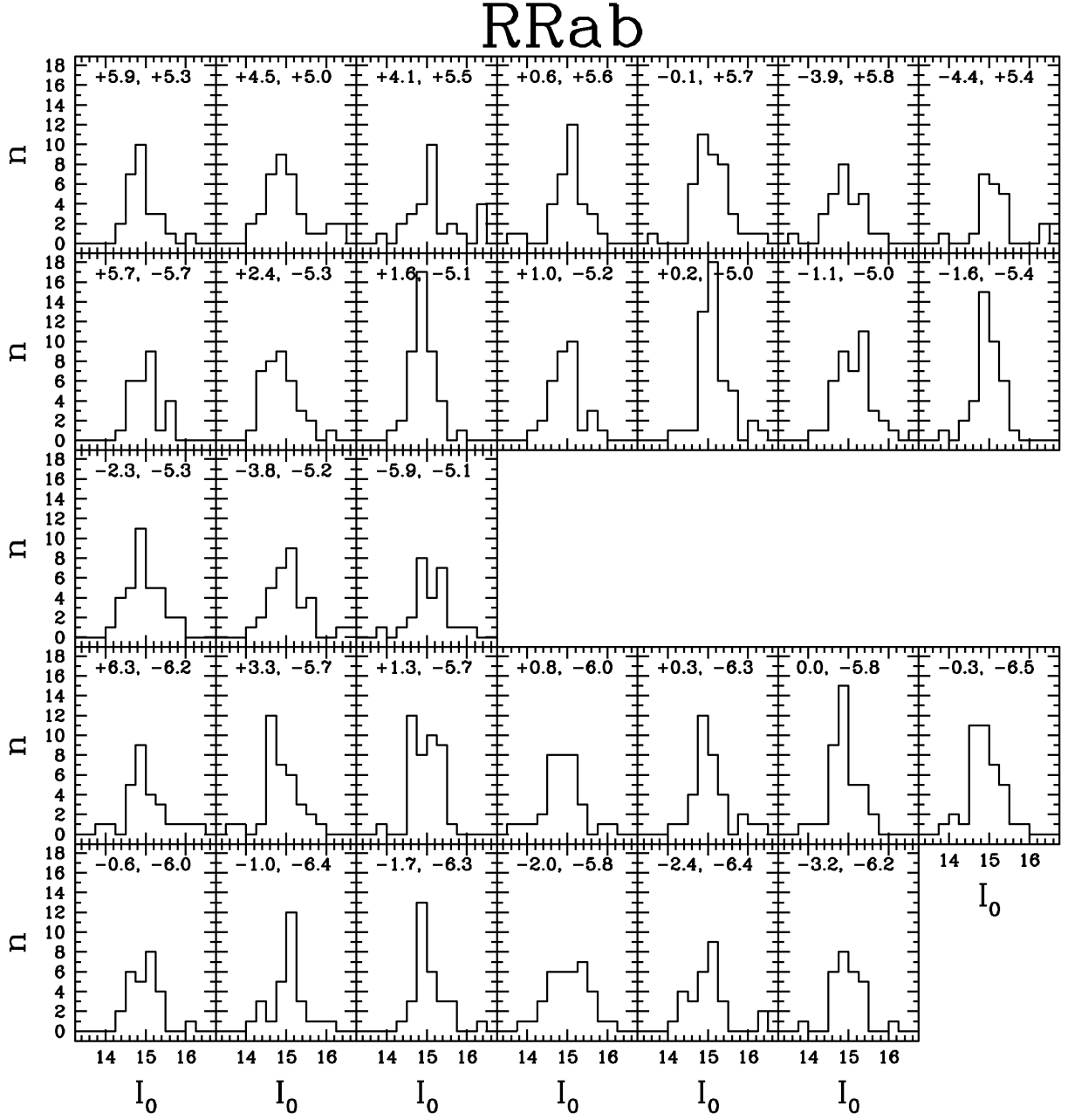




Search for metallicity differences



Searching for split



Distance to the Milky Way center

$$\log d = 1 + 0.2\,(I_0 - M_V + (V\text{-}I)_0)$$

where:

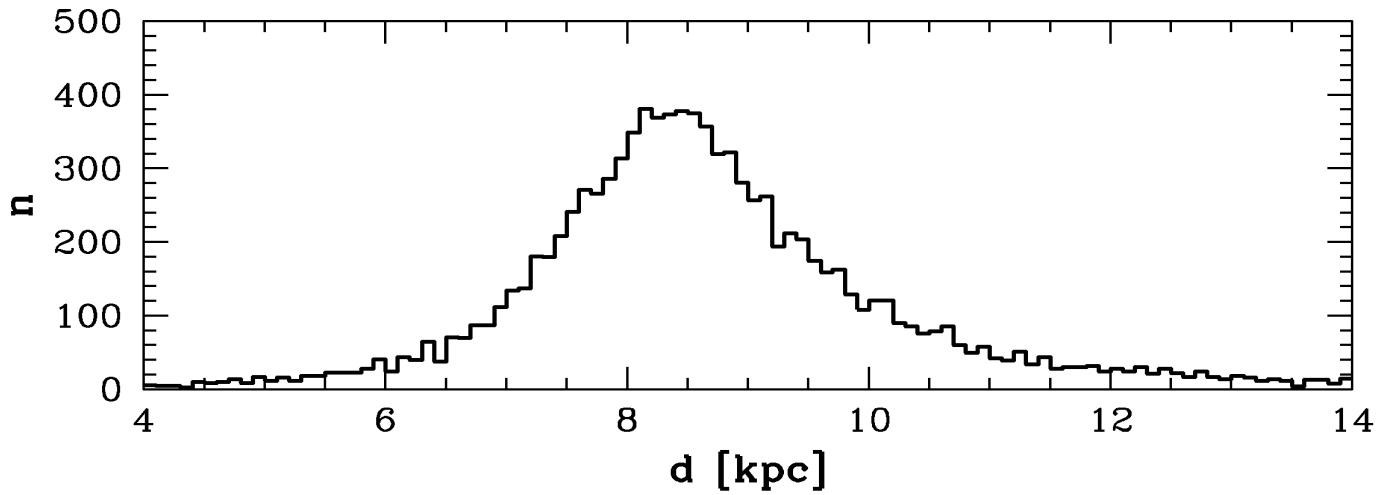
$$I_0 = I - R_I\,((V\text{-}I) - (V\text{-}I)_0)$$

$$M_V = 0.19[\mathrm{Fe/H}] + 0.99$$

Fernley el at. (1998)

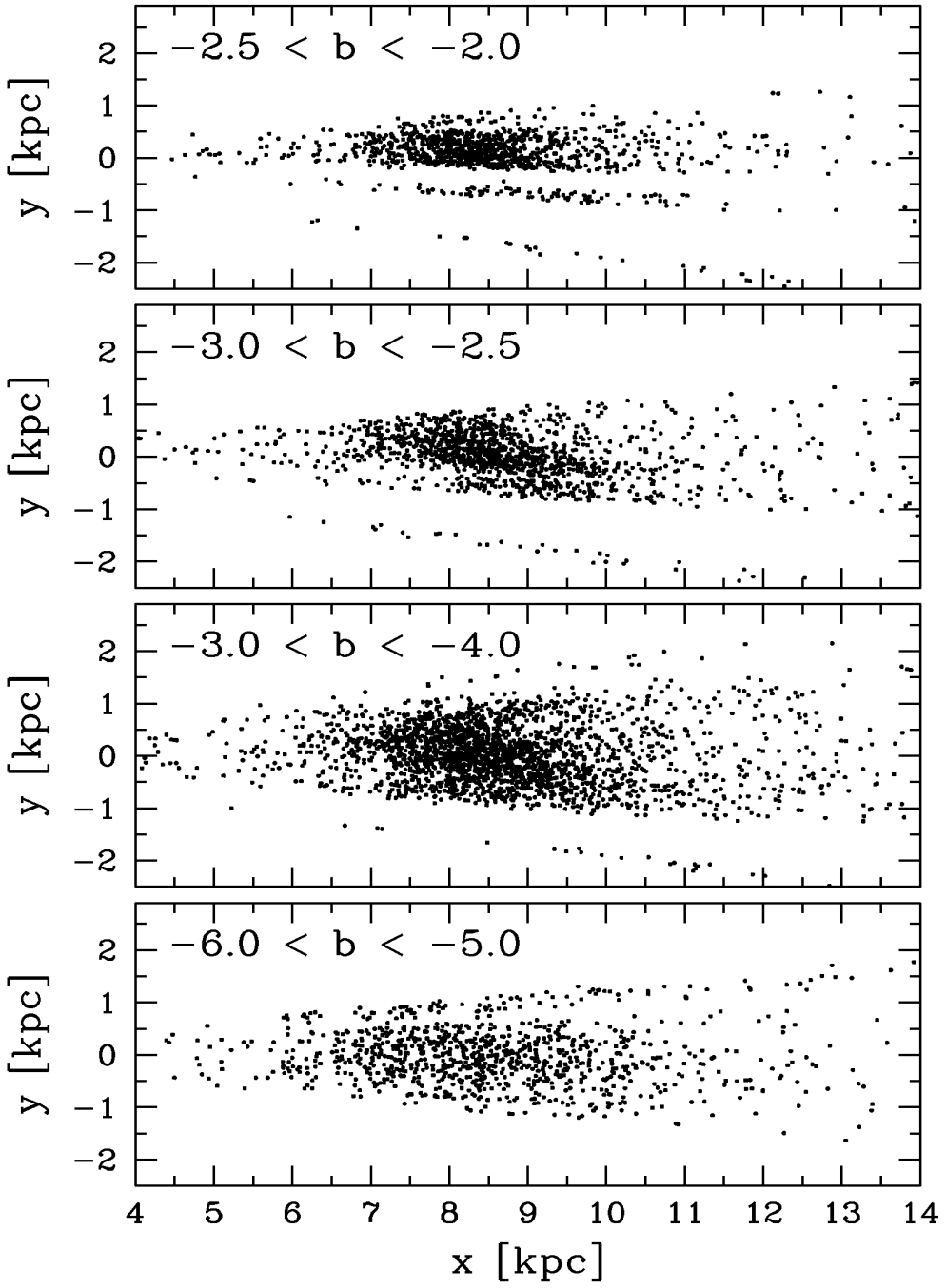
$$(V\text{-}I)_0 = 0.65 - 0.07\,\mathrm{Amp}_V + 0.36 \log P$$

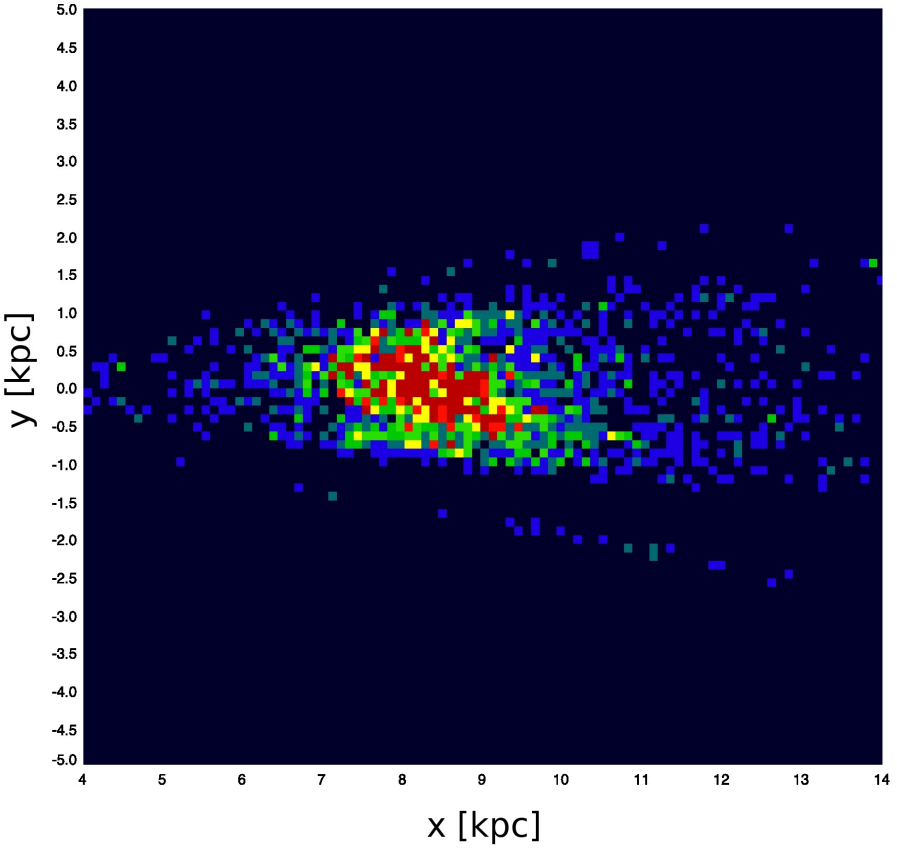
Pietrinferni et al. (2006)



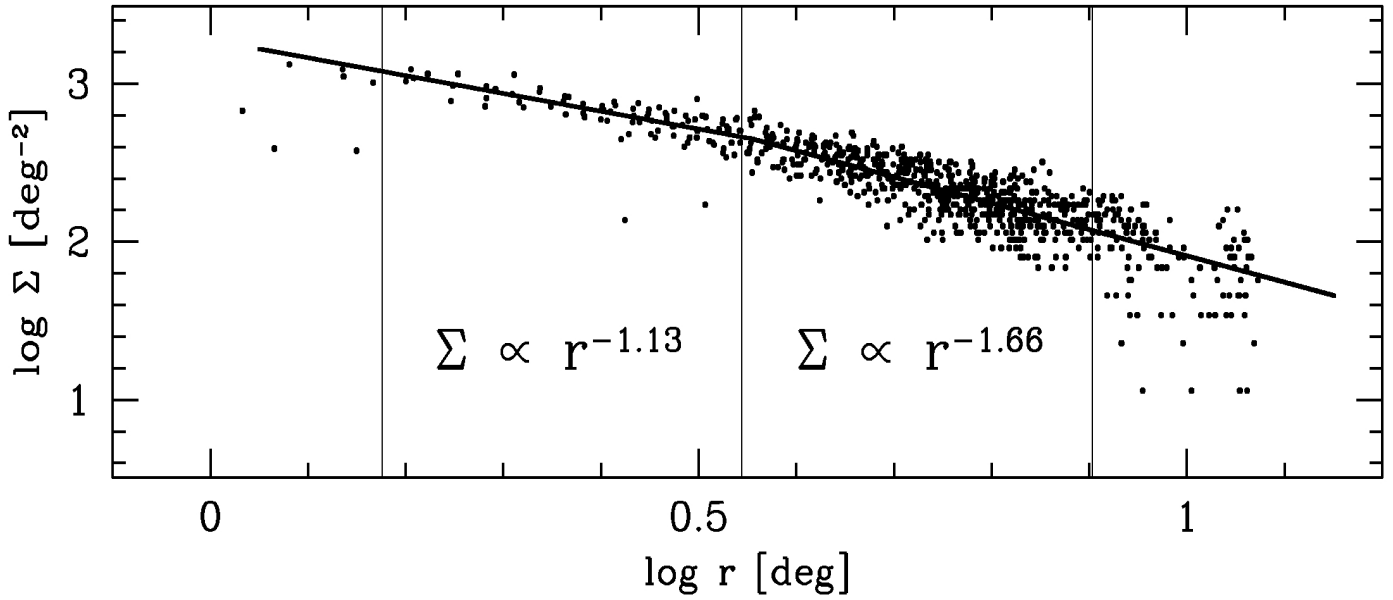
$$R_0 = 8.35 \pm 0.43 \ \mathrm{kpc}$$

Structure of the RR Lyrae population





Mean density distribution

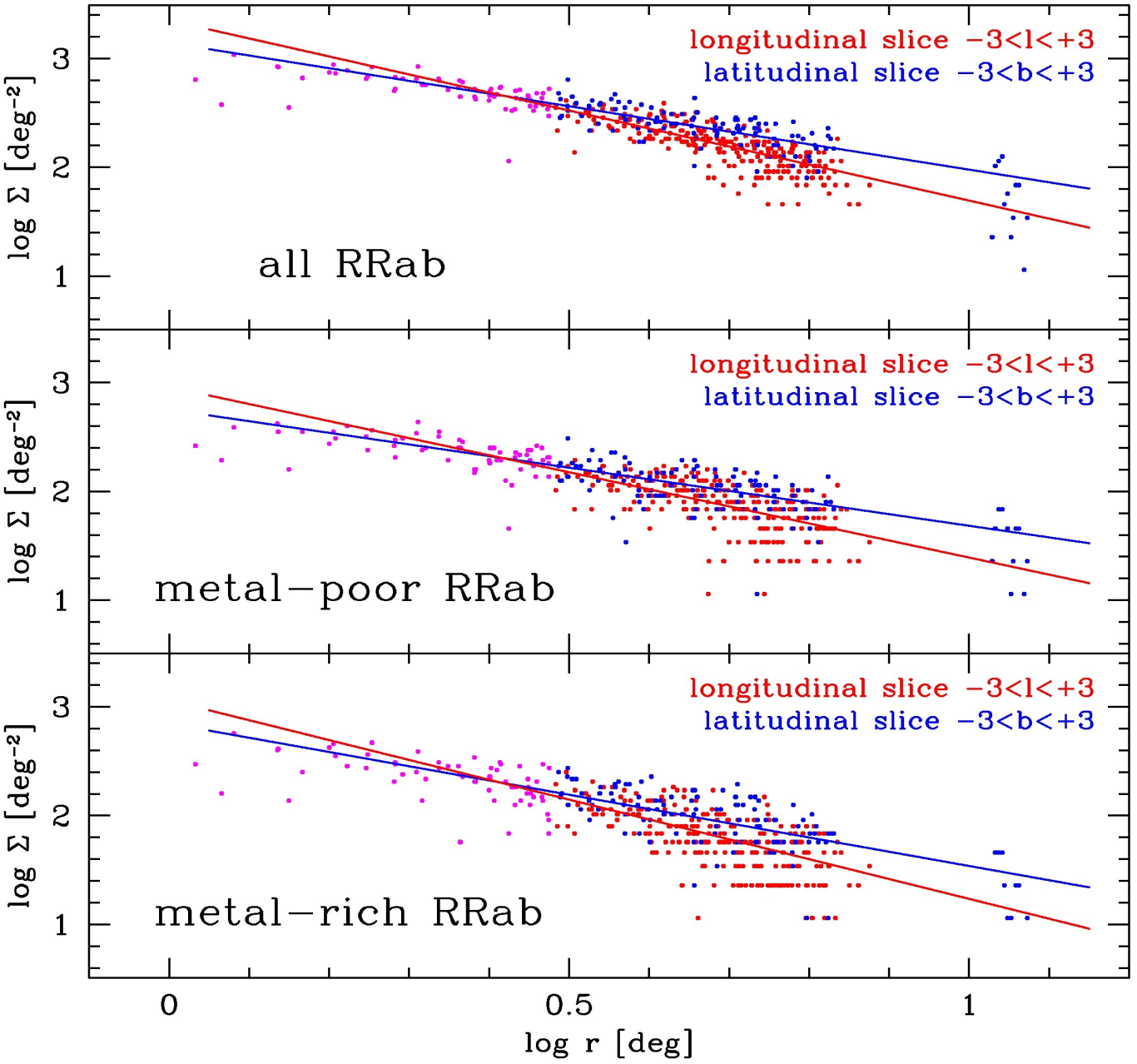


log Σ_{inner} = -1.13 log r + 3.28 $D_{inner} \sim r^{-2.13}$ 0.2< r <0.5 kpc

=>

log Σ_{outer} = -1.66 log r + 3.57 $D_{outer} \sim r^{-2.66}$ 0.5< r <1.2 kpc

Density distribution vs. metallicity



Conclusions

- The ratio R_I is constant with color and equals 1.082 ± 0.010.
- The RR Lyrae population is metal uniform with <[Fe/H]>=-1.0 dex.
- The central part follows the barred distribution of RCGs.
- The distance to the Milky Way center from the bulge RR Lyraes is $R_0 = 8.35 \pm 0.43$ kpc.
- We found a break in the density distribution at 0.5 kpc from the center.
- The number of expected RR Lyraes within the VVV bulge area is 7.0–8.5 x 10^4 stars.


Thank you!